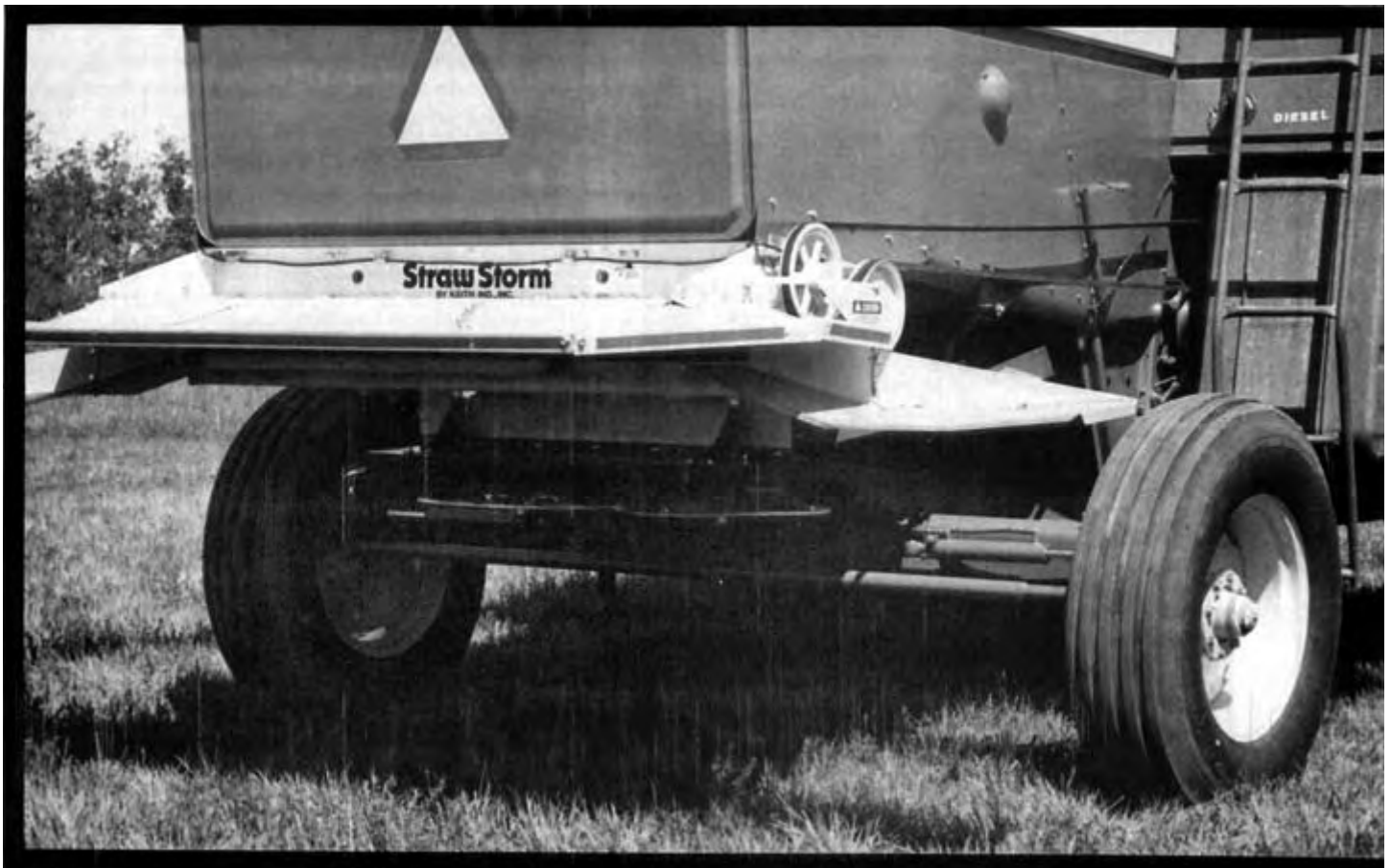


Evaluation Report

437



Straw Storm Straw and Chaff Spreading Attachment

A Co-operative Program Between



STRAW STORM STRAW AND CHAFF SPREADING ATTACHMENT

MANUFACTURER:

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DISTRIBUTORS:

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RETAIL PRICE:

\$4,235.00 (May, 1985, f.o.b. Humboldt, Saskatchewan. Model JD8820, suitable for mounting on 8820 John Deere Combine).

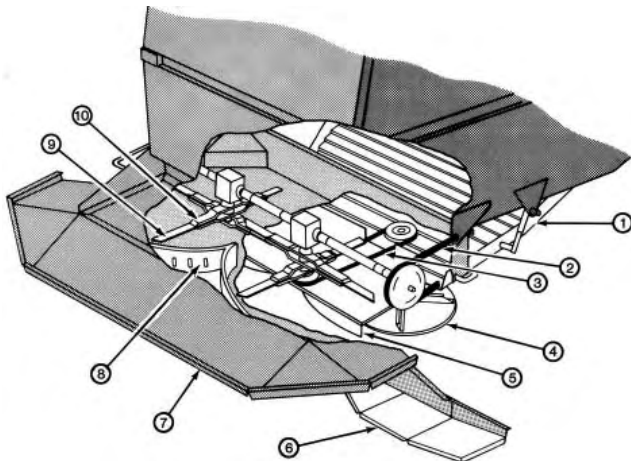


FIGURE 1. Straw Storm Straw and Chaff Spreading Attachment: (1) Chaff Pan, (2) Main Drive Belt, (3) Chaff Spreader Drive Belts, (4) Chaff Spreading Discs, (5) Chaff Deflector Shield, (6) Side Deflectors, (7) Rear Shield, (8) Shroud, (9) Flails, (10) Rotors.

SUMMARY AND CONCLUSIONS

Quality of Work: In dry average conditions, the Straw Storm spread straw 50 ft (15.2 m) and chaff 20 ft (6.1 m). The uniformity of the straw and chaff spread pattern was very good. The Straw Storm could be adjusted to reduce the straw being spread in the area of the chaff, thus producing a uniform spread of chaff and straw. The ability of the Straw Storm to chop the straw was good. The average length of chopped straw from the Straw Storm was longer than the straw from a typical straw chopper.

Capacity: The Straw Storm had sufficient capacity to chop and spread all of the straw and chaff from a John Deere 8820 combine while harvesting at a maximum acceptable feedrate in all crops.

Ease of Installation: Ease of installation was good. The Straw Storm was easily installed by two men in 8 hours, installation instructions were clear and well illustrated. The rear shield was difficult to install because of hole misalignment. Remounting the combine's grain loss monitor sensors was required.

Ease of Operation and Adjustment: Ease of adjusting the Straw Storm was good. The rear shrouds were difficult to adjust because the slots did not line up with the adjusting bolts. The chaff spreading discs and chaff deflector were easily adjusted to alter the chaff spread pattern. The spreading discs could not be raised fully without hitting the deflector shield.

Ease of adjusting the combine's cleaning shoe was poor with the Straw Storm installed. The chaff pan and chaff spreading discs restricted access to the combine shoe, making shoe adjustments difficult and inconvenient.

Ease of setting the Straw Storm to drop straw in a windrow for

baling was very good, and took one man about 15 minutes. Ease of unplugging was very good.

Ease of servicing was very good. Greasing was required seasonally and at 50 hour intervals. The gearbox sight glasses were clearly visible from the rear of the spreader and required checking daily.

Ease of cleaning was good. However, chaff collected on the combine's rear axle support under the chaff pan and was inconvenient to remove.

Power Requirements: Maximum power of the Straw Storm when spreading tough wheat at 20 percent moisture content was 30 hp (22.4 kW). This was the same as the power required by a typical straw chopper.

Safety: All combine choppers and spreaders are potentially dangerous. The Straw Storm operator's manual emphasized operator safety. Decals were provided and drives were adequately shielded.

Operator's Manual: The operator's manual was very good. It was well organized, clearly written, and well illustrated. It contained much useful information but did not contain instructions for adjusting the chaff spreaders.

Mechanical History: One rotor drive shaft failed during testing.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Improving alignment of the rear shield mounting holes for easier installation.
2. Improving alignment of the slots in the rear shrouds to provide easier adjustment.
3. Increasing the clearance between the chaff deflector shield and spreading discs to permit the discs to be fully raised.
4. Modifying the chaff pan to improve access to the combine shoe for easier chaffer and sieve adjustment.
5. Providing adjustment information in the operator's manual for the chaff spreading discs and deflector shield.
6. Modifications to ensure proper alignment of the lower rotor bearing.

Senior Engineer: G.E. Frehlich

Project Technologist: A.R. Boyden

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. This problem has been corrected. Misalignment was due to an error during one production run.
2. This problem has been solved by providing horizontal slots in the assembly to which the shrouds bolt. Adjustment can now be easily made.
3. Clearance in this area is normally adequate. The manufacturer will assess this recommendation to see how clearance can be further assured.
4. This recommendation will be taken into consideration in future design. The manufacturer has already introduced a more readily detachable sieve mount connection for the chaff pan on some other models.
5. Adjustment information for chaff spreading will be included when the new operator's manuals are printed.
6. Alignment of the lower bearings has been improved. In addition, the design of the gearbox rotor shaft has been strengthened.

GENERAL DESCRIPTION

The Straw Storm straw and chaff spreading attachment mounts on the rear of a combine (see APPENDIX I for applicable combines). It chops and spreads straw from the straw walkers or rotor, and spreads chaff from the cleaning shoe.

Straw from the straw walkers or rotor falls onto two sets of horizontally rotating sharpened flails. The flails chop and accelerate the material, throwing it out of the sides or rear of the spreader body (see FIGURE 1). A pan attached to the rear of the cleaning shoe conveys chaff to two spreading discs. Fins on these discs

accelerate material while a deflector shield directs material away from the combine.

The Straw Storm is driven from the combine's standard straw chopper drive. Two 90 degree gearboxes transmit power to the straw flails, which power the chaff spreading discs through a belt drive.

A shaft speed sensor that is compatible with the combine's monitoring system is supplied along with mounting hardware. Detailed specifications for the Straw Storm are given in APPENDIX I.

SCOPE OF TEST

The Straw Storm was mounted on a John Deere 8820 combine. It was operated in the conditions shown in TABLE 1 for about 39 hours while harvesting 335 ac (135.5 ha). It was evaluated for quality of work, capacity, ease of installation, ease of operation and adjustment, power requirements, operator safety, and suitability of the operator's manual.

TABLE 1. Operating Conditions

Crop	Hours	Field Area	
		ac	ha
Barley	8.5	45	18.2
Rye	22.0	225	91.0
Wheat	8.5	65	26.3
Total	39.0	335	135.5

QUALITY OF WORK

Spreading Width: In dry average conditions, and when properly adjusted, the Straw Storm spread straw 50 ft (15.2 m) (FIGURE 2). In heavy damp windrows, straw was spread up to 60 ft (18.3 m). In narrow windrow spacings, the spread could be reduced to 36 ft (11 m) to prevent straw from being thrown onto adjacent windrows. In dry average conditions, the chaff spread was usually 20 ft (6.1 m). With heavy damp chaff, the maximum chaff spread width was 28 ft (8.5 m). The widest chaff spread was obtained with the discs raised within the deflectors.

The spread pattern of the Straw Storm like other straw and chaff spreaders was greatly affected by crosswinds.

Spreading Uniformity: Depending on adjustment, the uniformity of straw and chaff spreading was very good. In most crop conditions, the straw was spread uniformly over about 50 ft (15.2 m) and the chaff over about 20 ft (6.1 m).



FIGURE 2. Typical Spread Pattern.

Typical straw and chaff spread patterns are shown in FIGURES 3 and 4. The coefficient of variation (CV)¹ was 39% for the straw and 19% for the chaff. These are well within the acceptable limit. The uniformity of the spread pattern will differ considerably with field conditions and machine adjustments.

In the field, the rear straw shrouds could be carefully adjusted to reduce the amount of straw spread in the areas that the chaff was spread. This provided a uniform distribution of the combined straw and chaff material across the spread width.

¹The coefficient of variation (CV) is the standard deviation of the material in each successive 24 in (508 mm) section across the spread pattern expressed as a percent of the average amount of material in a section. The lower the CV, the more uniform is the spread pattern.

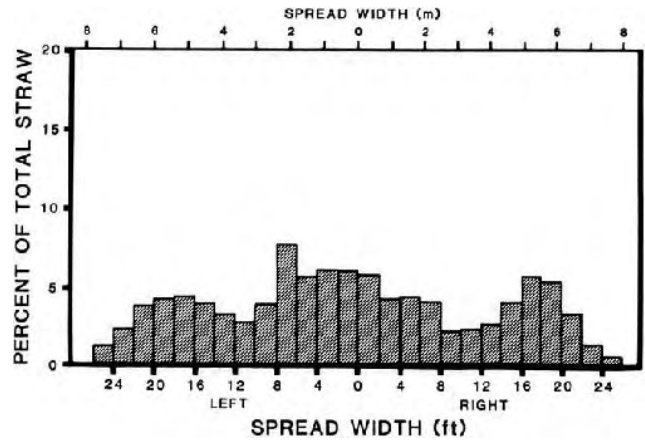


FIGURE 3. Typical Straw Spread Pattern Uniformity.

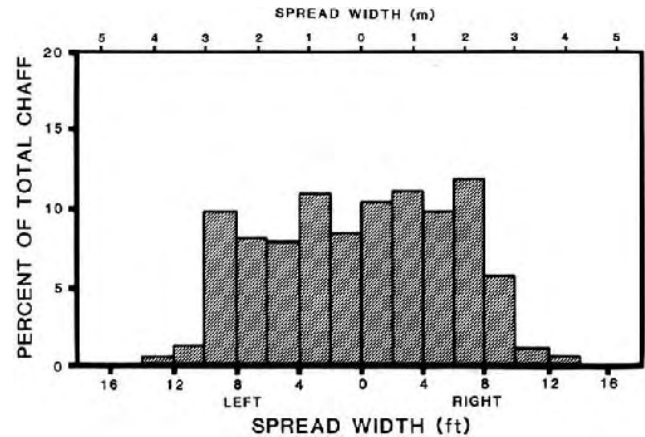


FIGURE 4. Typical Chaff Spread Pattern Uniformity.

Chopping: The ability of the Straw Storm to chop the straw was good. The chopped straw from the Straw Storm was longer than the chopped straw from a typical straw chopper. Dry barley and rye straw was usually cut 6 to 8 in (150 to 200 mm) long. Longer pieces were obtained in tough straw conditions.

CAPACITY

The Straw Storm had sufficient capacity to chop and spread all of the straw and chaff from the John Deere 8820 combine while harvesting at a maximum acceptable feedrate in all crops.

EASE OF INSTALLATION

Ease of installation was good. The Straw Storm was installed on the John Deere 8820 combine by two men in about 8 hours. The installation instructions were clear and concise, and well illustrated. No special tools were required.

The chaff pan was easy to install but required remounting the combine's grain loss monitor sensors. The spreader body was heavy, requiring four people to lift it into place. The slots in the mounting brackets greatly aided installation of the mounting bolts. The main drive belt was easily installed without modifications. The shaft speed sensor was easily mounted. It plugged directly into the wiring for the combine monitor. The rear sheet metal shield did not fit well because the holes were misaligned. It is recommended that the manufacturer improve the hole alignment of the rear shield. All components were received with adequate mounting hardware.

EASE OF OPERATION AND ADJUSTMENT

Spreader Adjustment: Ease of adjusting the Straw Storm was good. The side deflectors and the rear shroud were raised or lowered to obtain the desired straw spread pattern. The rear shrouds were difficult to adjust because the slots did not line up with the adjusting bolts. It is recommended that the manufacturer improve the alignment of the shrouds to make adjustments easier. The chaff spreading discs and deflector could be raised or lowered to adjust the chaff spread pattern. However, no instructions for this adjustment were provided. In addition, the spreading discs could not

be raised fully without hitting the deflector shield. It is recommended that the manufacturer consider increasing the clearance between the spreading discs and deflector shield, and providing instructions in the operator's manual for their proper adjustment.

Combine Adjustment: Ease of adjusting the combine's cleaning shoe was poor with the Straw Storm installed (FIGURE 5). The chaff pan and chaff spreading discs restricted access to the combine shoe, making it difficult to adjust the chaffer cleaning sieve. The operator had to remove the chaff spreading discs and climb onto the chaff pan to view the chaffer and sieve. It is recommended that the manufacturer modify the chaff pan to allow easy access to the combine shoe.



FIGURE 5. Limited Access to Shoe Adjustments.

Dropping Straw: Ease of setting the Straw Storm to drop straw in a windrow for baling was very good. It took one man about 15 minutes and no special tools were required.

The chaff spreading discs, shafts, and deflector shield, as well as the main drive belt and chaff spread belts had to be removed. By removing four mounting bolts, the spreader could be swung down and to the rear where it was supported out of the way by two U-bolts. An optional hand winch was available for easier one man positioning of the swinging section.

Unplugging: Ease of unplugging was very good. Plugged straw in and above the spreader body could easily be removed after the chaff spreaders and front straw panel were removed. For easier access, the spreader could be swung down.

Servicing: Ease of servicing the Straw Storm was good. The lower rotor bearings had to be greased every 50 hours. The rotor hubs required seasonal greasing. To prevent wrapping of straw on the rotor hubs, the grease fittings were installed for greasing, then removed. The gearbox sight glasses were clearly visible from the rear of the spreader and required checking daily.

The operator's manual recommends that the machine be inspected frequently for loose parts and to ensure proper belt tension and condition. The flails were easily reversed or replaced. They should be checked frequently for chipped or damaged surfaces. No damage or serious wear occurred to the flails throughout the tests.

Cleaning: Ease of cleaning was good. However, chaff from the spreading discs collected under the chaff pan on the combine's rear axle support, making cleaning inconvenient. Straw and chaff collected on the rear shield and was easily removed when dry.

POWER REQUIREMENTS

Maximum power of the Straw Storm, when spreading tough wheat at 20% moisture content, was 30 hp (22.4 kW). This was the same as the power required by a 66 in (1675 mm) conventional straw chopper tested in the same conditions.

SAFETY

All combine choppers and spreaders are potentially dangerous to operate. Extreme care is required when working near them to prevent possible injury from flying stones or other objects.

The Straw Storm operator's manual emphasized operator safety. Adequate decals warned of dangerous areas and drives were covered by shields.

OPERATOR'S MANUAL

The operator's manual was very good. It was well organized, clearly written, and well illustrated. It contained a parts list and useful information on safe operation, installation, adjustment, maintenance, and servicing. Information on adjusting the chaff spreading discs and deflector shield was not included. Recommendations to include these instructions have been made.

MECHANICAL HISTORY

The intent of this test was to evaluate the functional performance of the test machine. An extended durability test was not conducted. Only one failure occurred during the 39 hours of operation. The right rotor drive shaft failed and was replaced at 37 hours. The failure occurred because the lower bearing was not properly aligned when installed. No provisions were made for proper alignment of this bearing. It is recommended that the manufacturer consider modifications to ensure proper bearing alignment.

APPENDIX I SPECIFICATIONS	
MAKE:	Straw Storm Straw and Chaff Spreading Attachment
MODEL:	JD8820
MANUFACTURER:	Keith Industries Inc. 3 Winfield Way Winnipeg, Manitoba R2R 1V8
DIMENSIONS: (Spreader Body Only)	
--width	147 in (3734 mm)
--length	57 in (1448 mm)
--depth	16 in (406 mm)
STRAW SPREADING SYSTEM:	
-- type	twin rotors each with 4 flails rotating on vertical shafts driven by 2 angle drive gearboxes
-- inlet area	1104 in ² (0.712 m ²)
-- outlet area	
-each side	66 in ² (0.426 m ²)
-rear minimum	36 in ² , maximum 198 in ² (0.023 to 0.128 m ²)
-- rotor diameter (with flails)	36.5 in (927 mm)
-- flail size	14 x 22 in (356 x 56 mm)
-- drive	
- type	drive belt from existing chopper drive
- rotor speed	1630 rpm
CHAFF SPREADING:	
-- type	chaff pan directs chaff from the shoe onto spreader discs
-- chaff pan size	45 x 61.2 in (114 x 1554 mm)
-- spreader disc diameter	232 in (927 mm)
-- spreader disc height	1.2 in (30 mm)
-- drive	
-type	drive belt from straw rotors
-spreader disc speed	622 rpm
SERVICING:	
-- gearbox oil level	daily
-- 2 grease fittings	50 h
-- 2 grease fittings	yearly
COMBINES AVAILABLE FOR:	
-- Allis Chalmers Gleaner	L3, L2, L, N7, NG, N5
-- International Harvester	1480, 1482, 1460, 1440
-- John Deere	8820, 7720, 7721, 7700, 7701
-- Massey Ferguson	860, 850, 851, 852, 760, 750, 751
-- Sperry New Holland	95, 85, 75, 70

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

SUMMARY CHART

STRAW STORM STRAW AND CHAFF SPREADING ATTACHMENT

RETAIL PRICE	\$4,235.00 (May, 1985, f.o.b. Humboldt, Saskatchewan. Model JD8820, suitable for mounting on 8820 John Deere Combine).
QUALITY OF WORK	50 ft (15.2 m) straw spread and 20 ft (6.1 m) chaff spread in average conditions
Spreading Width	Very Good ; depends on adjustments and conditions
Spreading Uniformity	Good ; chopped straw was longer than straw from a typical chopper
Chopping	
CAPACITY	Sufficient for maximum acceptable feedrates
EASE OF INSTALLATION	Good ; was installed by two men in 8 hours
EASE OF OPERATION AND ADJUSTMENT	
Spreader Adjustment	Good ; altering the straw spread pattern was difficult
Combine Adjustment	Poor ; access to the shoe of the combine was restricted by the chaff pan
Dropping Straw	Very Good ; took one man 15 minutes
Unplugging	Very Good ; easy access was provided
Servicing	Very Good ; greasing required yearly and at 50 hour intervals
Cleaning	Good
POWER REQUIREMENTS	30 hp (22.4 kW) maximum, in tough conditions; similar to a conventional chopper
SAFETY	Operator's manual emphasized operator safety; decals and shields were provided
OPERATOR'S MANUAL	Very Good ; contained much useful information and was well written
MECHANICAL HISTORY	One rotor drive shaft failed because of misalignment



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