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Evaluation Report 200



New Holland 718 Forage Harvester

A Co-operative Program Between



NEW HOLLAND 718 FORAGE HARVESTER

MANUFACTURER:

Sperry New Holland
New Holland, Pennsylvania
17557 U.S.A.

RETAIL PRICE:

\$15,387.00 (April, 1981, f.o.b. Portage la Prairie, with remote controls, 2.0 m (6.5 ft) windrow pickup, and two-row row crop head).

DISTRIBUTOR:

Sperry New Holland

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* 1055 McKay Street
Regina, Saskatchewan
S4N 4X9

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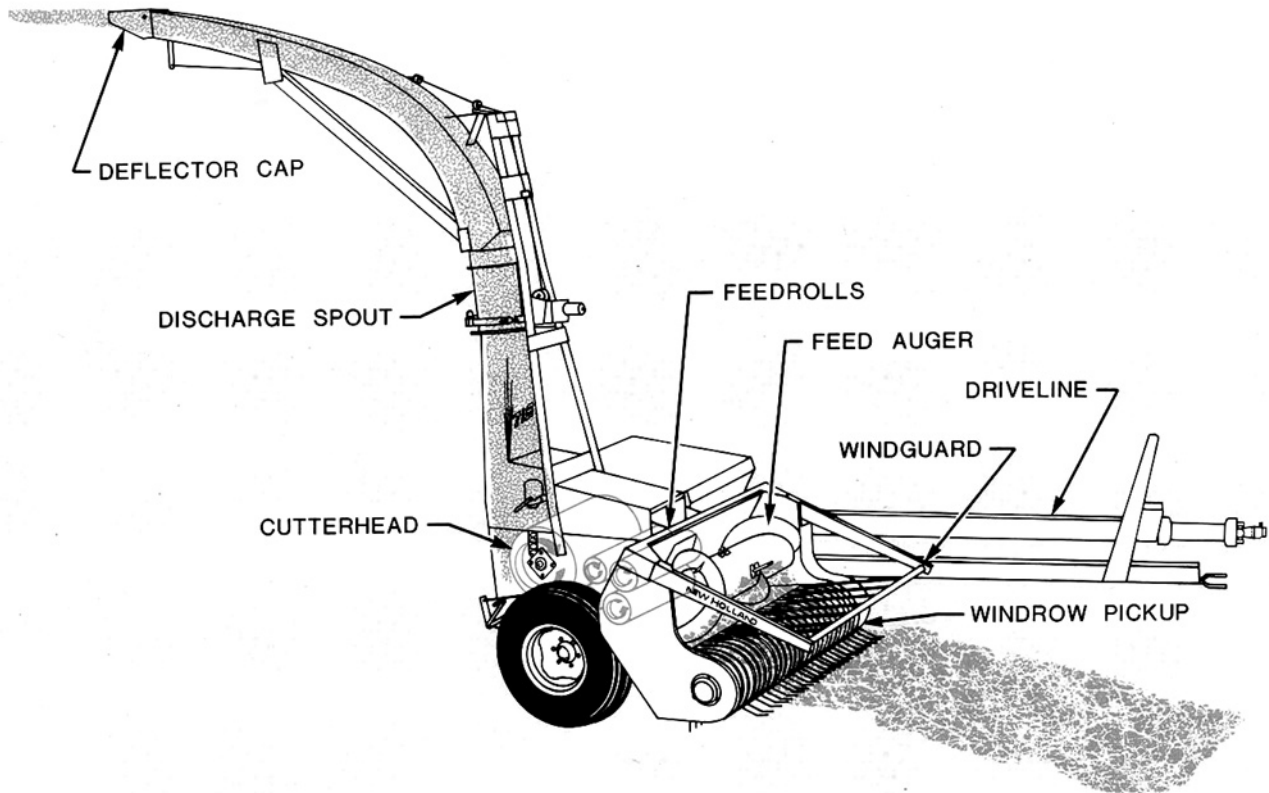


FIGURE 1. New Holland 718.

SUMMARY AND CONCLUSIONS

Overall functional performance of the New Holland 718 was very good. Ease of operation and adjustment was very good.

Workrates¹ ranged up to 19 t/h (21 ton/h) in standing corn, up to 18 t/h (20 ton/h) in alfalfa and up to 22 t/h (24 ton/h) in green rye. Dry-weight workrates ranged up to 8 t/h (9 ton/h) in corn, 11 t/h (12 ton/h) in alfalfa and 11 t/h (12 ton/h) in rye. The pickup header and two-row row crop head fully utilized cutterhead capacity.

At a 4 mm (0.16 in) cut length setting, 7% of alfalfa particles were longer than 25 mm (1 in) and only 2% of the corn particles were longer than 25 mm (1 in). At a 4 mm (0.2 in) setting, the average particle length was 10 mm (0.4 in) in alfalfa and 112 mm (0.4 in) in corn.

A tractor of 70 kW (90 hp) power take-off rating would have sufficient power to operate the New Holland 718 in typical prairie crops.

The harvester was easy to maintain and service.

¹The actual workrates, which include the moisture in the crop, indicate the total mass of crop harvested, but should not be used for comparing performance of different forage harvesters. The dry-weight workrates, which consider the mass of dry matter harvested, provide a better comparison of performance of different forage harvesters and assessment of the effect of crop variables and machine settings.

The New Holland 718 was safe to operate if the manufacturer's safety recommendations were followed. The operator manual was well written and illustrated.

Only minor mechanical problems occurred during the 175 hour test.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Modifying the electrical connector, between the tractor control console and the harvester, to eliminate separation during operation.
2. Modifying the cutterhead housing to improve accessibility and ease of adjustment of the cutterhead clearance and including detailed instructions on this adjustment in the operator manual.
3. Modifying the cutterhead paddles to allow easier installation.
4. Providing better access to the feedroll drive sprockets for changing the cut length setting.

Chief Engineer -- E.O. Nyborg

Senior Engineer -- J.C. Thauberger

Project Engineer -- C. W. Chapman

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. Modifications are under consideration.
2. Cutterhead housings are rarely adjusted in the field. The Operator's Manual points out that knife adjustments may be necessary to restore cutterhead size. Detailed instructions are given in the Operator's Manual.
3. Revisions to cutterhead paddles are under consideration.
4. No consideration is being given to re-designing the feedroll drive sprockets. Our experience shows that the length of cut is seldom changed in most applications. The length of cut can be changed in a minimal amount of time with the present design.

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

GENERAL DESCRIPTION

The New Holland 718 is a power take-off driven, pull-type forage harvester. The cylindrical cutterhead is fed by a reversible feedroll assembly. The cut length may be set either by changing feedroll drive sprockets or varying the number of cutterhead knives. Chopped forage is delivered directly to the discharge spout from the cutterhead. Optional paddles mounted to the cutterhead help to clear the forage from the cutterhead.

The test machine was equipped with a 2.0 m (6.5 ft) windrow pickup and a two-row row crop head.

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

SCOPE OF TEST

The New Holland 718 was operated in the crops shown in TABLE 1 for 175 hours while harvesting about 139 ha (348 ac).

It was evaluated for rate of work, quality of work, power requirements, ease of operation and adjustment, operator safety, and suitability of the operator manual.

TABLE 1. Operating Conditions

CROP	AVERAGE YIELD (t/ha at 60% Moisture Content)	HOURS	FIELD AREA (ha)
Alfalfa	8 to 10	15	10
Rye	12	4	3
Green Feed (Oats, Barley, Rape)	12	74	72
Sorghum	15	8	6
Corn (row crop head)	20 to 25	74	48
	Total	175	139

RESULTS AND DISCUSSION

RATE OF WORK

TABLE 2 presents typical workrates for the New Holland 718 in a variety of field conditions. The workrate for alfalfa was measured in crops yielding 8 to 10 t/ha (3.6 to 4.5 ton/ac) which had been double windrowed with a 6 m (20 ft) wide double-swath windrower. The workrate in green rye was measured in crops yielding 12 t/ha (5.4 ton/ac) and windrowed using a 6 m (20 ft) windrower, while the workrates in corn were measured in standing crops yielding 25 t/ha (11 ton/ac) harvested with the two-row row crop head. The reported values are for average continuous feedrates, with the harvester loaded to optimum levels. They do not include time for maintenance and unloading of wagons.

TABLE 2. Average Workrates

CROP	Moisture Content %	Length Setting (mm)	WORKRATES (t/h)	
			Actual	Dry-weight
Alfalfa	52	4	6.7	3.2
	45		7.1	3.9
	40		8.9	5.3
	52	9	11.3	5.7
	45		13.0	7.2
	40		17.5	10.5
Green Rye	48	4	16.0	8.6
		9	21.7	11.3
Corn	60	4	14.3	5.7
		9	18.8	7.5

Both actual workrates and dry-weight workrates are reported in TABLE 2. The actual workrates, which include the moisture in the crop, indicate the total mass of crop harvested, but should not be used for comparing performance of different forage harvesters. The dry-weight workrates, which consider the mass of dry matter harvested, provide a better comparison of performance of different forage harvesters and assessment of the effect of crop variables and machine settings. Actual workrates ranged up to 21.7 t/h (9.8 ton/h) whereas dry-weight workrates ranged only up to 11.3 t/h (5.1 ton/h). Workrates were influenced by crop moisture content, cut length setting and the type of header attachment used. Reducing the cut length setting from 9 to 6 mm (0.4 to 0.2 in) decreased the dry-weight workrates by 50% in alfalfa and 40% in corn.

The capacity of the two-row row crop head was adequate to provide full utilization of the cutterhead in corn.

QUALITY OF WORK

Uniformly of Cut: FIGURE 2 presents typical particle size distributions in second-cut, full-bloom alfalfa, harvested at 53% moisture content. Particle length variations are given for 4 and 9 mm (0.2 and 0.4 in) cut settings. At a 4 mm (0.2 in) setting, 7% of the silage had a length greater than 25 mm (1 in), while at the 9 mm (0.4 in) setting, 15% had a length greater than 25 mm (1 in). The average particle length at 4 mm (0.2 in) setting was 10 mm (0.4 in) and at 9 mm (0.3 in) setting the average was 18 mm (0.7 in). (APPENDIX IV, FIGURE 8).

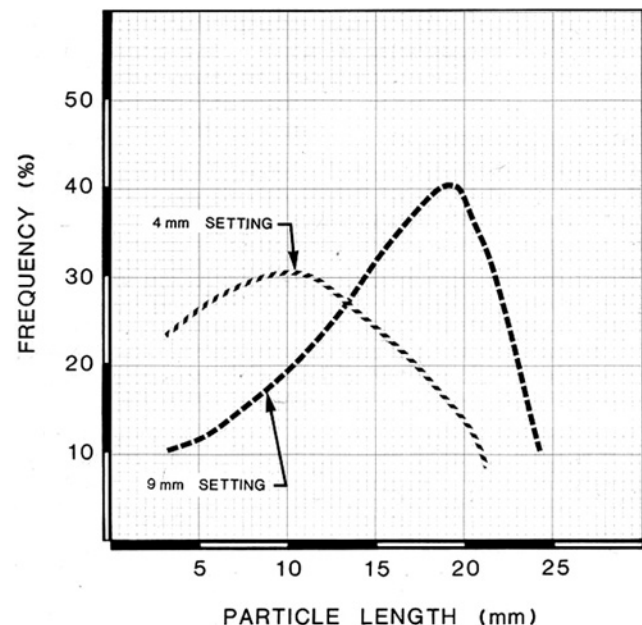


FIGURE 2. Particle Length Distribution in Alfalfa.

² For each cut length setting, a forage harvester produces a range of particle lengths. Although variation in particle length has little effect on silage palatability, the performance of some silage unloading equipment may be adversely affected if a significant quantity of material is longer than 40 mm. FIGURES 2 and 3 show material length distribution at various cut length settings. A narrow curve with a high peak indicates uniform particle length distribution. The average material length is about that at the peak of the curve. Forage with a wide range of particle lengths has a wide curve with a low peak.

FIGURE 3 presents typical particle length distributions in corn, harvested at 60% moisture content, for 4 and 9 mm (0.2 and 0.4 in) settings. Only 2% of the chopped corn had a length greater than 25 mm (2 in) at the 4 mm (0.2 in) setting and 7% of the corn particles were greater than 26 mm (1 in) at 9 mm (0.4 in) setting. The average particle length at 4 mm (0.2 in) setting was 12 mm (0.4 in) and at 8 mm (0.3 in) setting the average was also 12 mm (0.4 in) (APPENDIX IV, FIGURE 8). Changing cut length setting did not change average particle length, but reduced the number of longer particles. The smaller percentage of longer particles in corn, compared to alfalfa, was due to perpendicular feeding of the row crop header.

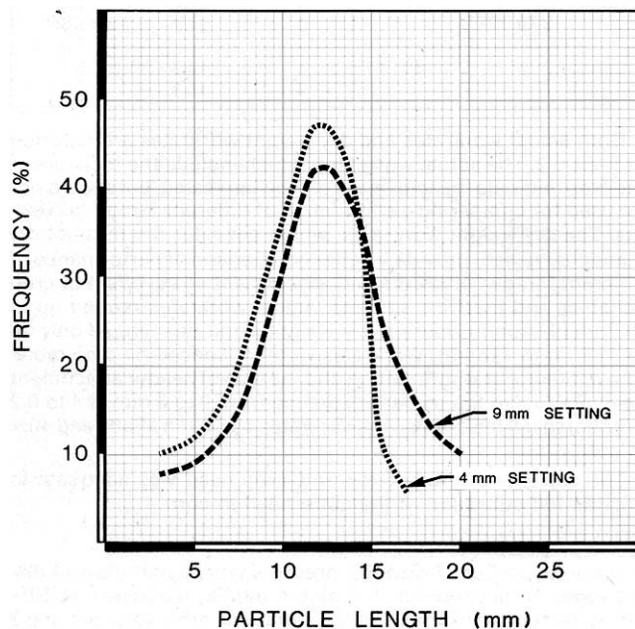


FIGURE 3. Particle Length Distribution in Corn.

Windrow Pickup Losses: Pickup losses were insignificant at speeds up to 5 km/h (3 mph), provided that the wind rows were not severely wind-scattered.

Row Crop Head Losses: Losses from the row crop head were insignificant at speeds below 6 km/h (4 mph) provided care was taken to keep the divider points centred between the rows.

POWER REQUIREMENTS

Tractor Size: The peak power take-off requirement, at maximum workrate, was about 75 kW (100 hp) in alfalfa and 38 kW (50 hp) in corn. Corresponding average power requirements were about 55 kW (73 hp) and 32 kW (45 hp) respectively.

Power requirements increased with shorter cut settings, and higher moisture contents. For example, reducing the cut length setting from 9 to 6 mm (0.4 to 0.2 in) while harvesting alfalfa at 55% moisture, yielding 8 t/ha (3.6 ton/ac), increased average power by 15 kW (20 hp). An increase of 10% moisture content in alfalfa increased the power requirements 12 kW (16 hp).

Total drawbar power on firm, level fields was about 10kW (13 hp) at 5 km/h (3 mph). This included the draft of the forage harvester and a dump wagon with a 3 t (3.3 ton) load. In soft, hilly fields, drawbar power requirements could be as great as 18 kW (24 hp).

A tractor of 70 kW (90 hp) maximum power take-off rating should have sufficient power to operate the New Holland 718 at optimum workrates, in most field conditions.

Specific Capacity: FIGURE 4 shows the specific capacity of the New Holland 718. Specific capacity is a measure of how efficiently a machine operates. A high specific capacity indicates efficient energy use, while a low specific capacity indicates less efficient operation.

³ Specific capacities in FIGURE 4 are based on dry-weight workrates. Direct comparison to specific capacities of haying equipment is not valid. Hay usually has a different moisture content and is not refined to the same degree as silage.

As shown in FIGURE 4, a 15% increase in crop moisture content reduced the specific capacity by about 10% in alfalfa. Changing cut length setting from 9 to 4 mm (0.4 to 0.2 in) reduced specific capacity by about 25%.

In corn, specific capacities ranged from 0.29 t/kW-h at 4 mm (0.2 in) cut setting to 0.33 t/kW-h at 9 mm (0.4 in) cut setting.

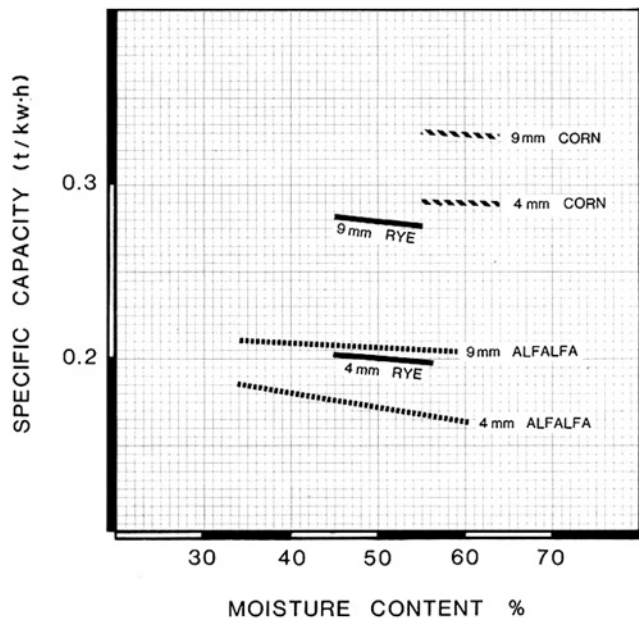


FIGURE 4. Specific Capacity based on Dry-weight Workrates.

In green rye, at 50% moisture content, specific capacities were 0.20 t/kW-h and 0.28 t/kW-h at cut length settings of 4 and 9 mm (0.2 to 0.4 in) respectively.

EASE OF OPERATION AND ADJUSTEMENT

Hitching: The New Holland 718 was equipped with a fixed clevis hitch. The manufacturer recommended that the tractor drawbar be from 330 to 430 mm (13 to 17 in) above the ground. The hitch height could be adjusted, by reversing the clevis hitch. The test machine was equipped with a 540 rpm power take-off drive.

Remote Controls: The New Holland 718 was equipped with electric remote controls for adjusting discharge spout direction, deflector angle, and the forward/reverse feedroll clutch. The electric control console, which mounted in the tractor cab, controlled the individual electric actuators.

The controls were effective and convenient to use.

Many times during the test the electrical connector between the tractor and harvester became separated. It is recommended the manufacturer supply a more reliable electrical connector.

Windrow Pickup: The pickup attachment had excellent feeding characteristics in most crops. Pickup losses were insignificant at speeds up to 5 km/h (4 mph). Two feed-auger speeds were possible. Adjustment took about 20 minutes. Wrapping of material around the feed auger occurred only rarely. Adjustable skid feet made it possible to match pickup height to field and windrow conditions.

Two-row Row Crop Header: The two-row row crop header (FIGURE 5) was equipped with a chain gathering system and rotary knives at a row spacing of 760 mm (30 in). It was possible to adjust the header to suit any row spacing from 710 to 1020 mm (20 to 40 in) in 50 mm (2 in) increments. The header worked well at speeds up to 6 km/h (4 mph). Three drive sprockets were supplied with the harvester to match chain gathering speed with ground speed. Overall stalk gathering performance was good. For proper performance, maximum side drift from the row had to be less than 150 mm (6 in) which required considerable operator vigilance to minimize losses.

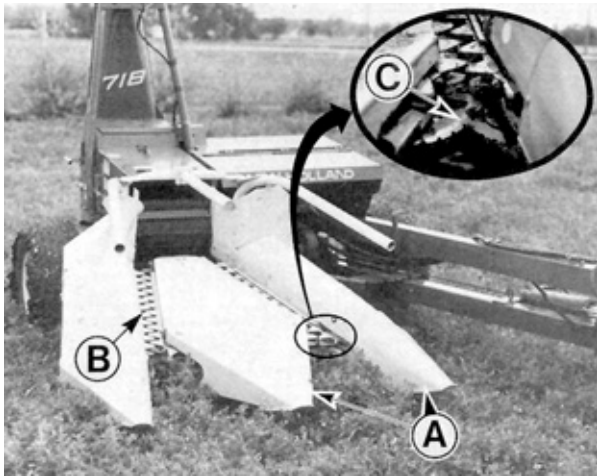


FIGURE 5. Two-row Row Crop Head: (A) Divider Points, (B) Gathering Chains, (C) Serrated Cutting Disks.

Feedrolls: The feedrolls were very aggressive in most crops. Occasional plugging occurred in bunchy windrows at high feed-rates. Unplugging was possible by reversing the feedroll drive with remote control in the tractor.

The smooth, lower rear feedroll was equipped with an adjustable scraper. Correct scraper clearance was easy to judge by releasing the feedroll tension lever and lifting the upper feedrolls (FIGURE 6).

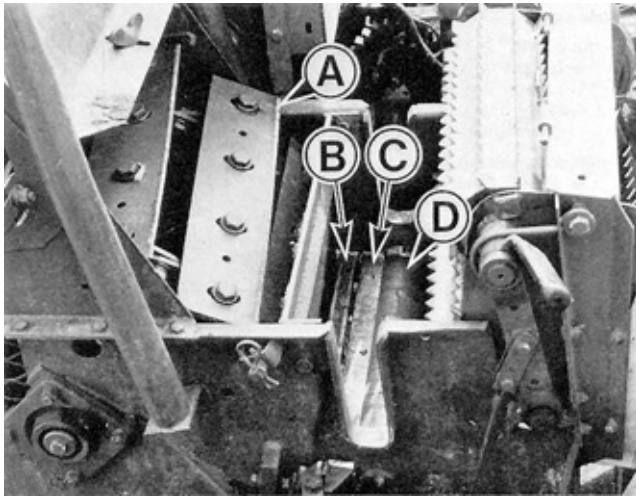


FIGURE 6. Feedroll and Cutterhead Assembly: (A) Knife, (B) Shear Plate (C) Scraper, (D) Smooth Feedroll.

Cutterhead Plugging: Cutterhead plugging occurred several times during the test, especially in forage above 60% moisture content. For best performance in high moisture crops the manufacturer recommended the cutterhead to cutterhead housing clearance be 1 mm (0.03 in). The adjustment procedure was poorly outlined in the operator manual and the clearance was impossible to judge properly. It is recommended that the manufacturer consider modifications to provide better access to the cutterhead housing for this clearance adjustment and that detailed instructions be included in the operator manual.

The manufacturer recommended the use of cutterhead paddles when harvesting high moisture forages. For proper installation the paddles had to be cut and bent. It is recommended the manufacturer consider modifying these cutterhead paddles to provide easier installation.

Discharge Spout: The lift and reach of the discharge spout could be adjusted by adding or removing Pipe sections, as shown in FIGURE 7. The extensions used were 1220 mm (48 in) horizontal and 380 mm (15 in) vertical. A 680 mm (27 in) horizontal extension was also available. The dimensions in FIGURE 7 were

determined at the maximum ground clearance setting of the adjustable axle, which could be positioned to give discharge spout heights 60 mm (2.5 in) and 120 mm (4.5 in) lower than those shown.

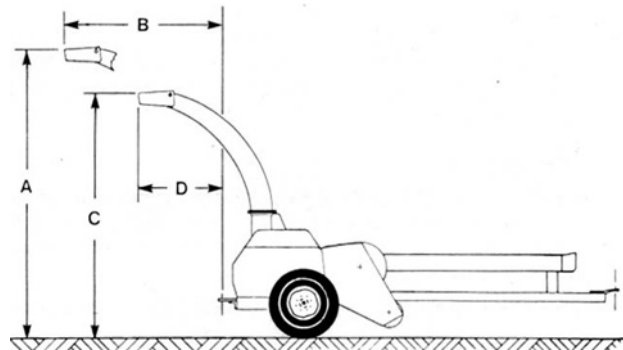


FIGURE 7. Discharge Spout Dimensions: (A) Lift, with extensions, 3850 mm; (B) Reach, with extension, 2470 mm; (C) Lift, 3295 mm; (D) Reach, 1010 mm.

The forage discharge direction was controlled by spout rotation and deflector cap angle, which were operated by the remote controls. Both adjustments were adequate for operation with wagons and trucks.

Knife Sharpening: The New Holland 718 was equipped with a cylindrical sharpening stone and a reversing cutterhead drive for knife sharpening. To reverse the cutterhead, the cutterhead drive shaft was moved to an alternate input shaft. This operation was convenient.

A ratchet mechanism automatically lowered the stone to contact the knives while a lever mechanism drew the stone across the cutterhead. Shear plate clearance was adjusted by loosening two clamp bolts and moving the shear bar with two adjusting bolts and jam nuts. Limited access was provided to the adjusting bolts. Clearance was set with the use of a feeler gauge. It took an experienced operator about 30 minutes to sharpen the knives and set the shear plate.

The average period between knife sharpenings was about 12 hours. During the 175 hour test, the knives incurred about 7 mm (0.25 in) of wear, due mainly to sharpening.

One edge of the reversible shear plate became badly rounded when the shear plate adjusting bolts loosened, resulting in excessive clearance. The shear plate was reversed at 150 hours to provide a new shearing edge.

Adjusting Cut Length: The length of cut could be adjusted either by adding or removing cutterhead knives or by changing the feedroll drive sprockets. Changing the feedroll drive sprockets was the easier method and provided a more uniform cut. The sprockets provided several cut length settings from 3 to 16 mm (0.1 to 0.6 in) with a complete set of knives.

Accessibility to the feedroll drive sprockets was poor, causing difficulties in changing cut length setting. It is recommended that the manufacturer consider modifications to allow easier access to the feedroll drive sprockets.

Exchanging Header Attachments: The ease of mounting or removing the windrow pickup or row crop head was good. Two pins held the header in place. Access to the pins was good. It was necessary to release header floatation spring tension or to pin the lift arms in the down position and break the header drive chain when changing attachments. The optional header transport wheels would make exchanging the headers easier.

Removing either attachment took one man about thirty minutes while mounting required two men and took about forty-five minutes.

Transporting: The drawpole could be placed in one of four positions. The extreme right position was used for transporting while the two left positions were used during field operation. The spring-loaded rope from the tractor seat made changing from field position to transport position easy.

The New Holland 718 was easy to maneuver and towed well in transport position. Ground clearance was adequate and there was ample hitch clearance for turning sharp corners. An adjustable hitch was provided for towing a wagon.

Lubrication: The New Holland 718 had 30 pressure grease fittings which required daily lubrication and four which required lubrication twice daily. The windrow pickup header had two pressure grease fittings, while the two-row row crop header had 15 pressure grease fittings. A total of three chains on the main unit, one on the pickup header and four on the row crop header required daily lubrication. Complete daily and seasonal lubrication could be completed in 25 minutes.

OPERATOR SAFETY

The New Holland 718 was safe to operate and service, as long as common sense was used and the manufacturer's safety recommendations were followed. Several safety recommendations were included in the operator manual.

Most shields were hinged and opened easily for service providing good accessibility to machine components.

The 718 was equipped with a slow moving vehicle sign mounting bracket.

OPERATOR MANUAL

The operator manual was concise and clearly written, containing much useful information on operation, adjustment, servicing and safety. Information on the cutterhead clearance adjustment was inadequate.

DURABILITY RESULTS

TABLE 3 outlines the mechanical history of the New Holland 718 during 175 hours of operation while harvesting about 91 ha (228 ac) of windrowed crop and 48 ha (120 ac) of corn. The intent of the test was evaluation of functional performance. An extended durability test was not conducted.

TABLE 3. Mechanical History

ITEM	Operating Hours	Equivalent Field Area (ha)
The slip clutch was worn, and replaced at	25	18
The gathering chains required retiming at	127 149	103 121
The shear bar adjusting bolts were lost and replaced at	130	109

DISCUSSION OF MECHANICAL RESULTS

Slip Clutch: The slip clutch was worn after 25 hours of operation. The problem arose due to improper clutch adjustment.

APPENDIX I

SPECIFICATIONS

Make: Sperry New Holland
 Model: 718
 Serial No.: 389095

Overall Dimensions:

-- height (discharge spout removed)	1900 mm
-- length	3900 mm
-- width	
-- without attachments	2300 mm
-- with windrow pickup	2600 mm
-- with two-row row crop head	2870 mm
-- ground clearance	150, 205, 260 mm

Windrow Pickup:

-- serial number	393577
-- type	floating cylindrical drum
-- height adjustment	skid shoes
-- working width	1650 mm
-- overall width	1960 mm
-- tooth spacing	70 mm
-- number of tooth bars	3
-- pickup speed	96 rpm
-- tooth tip speed	10.2 km/h
-- auger diameter	455 mm
-- auger length	1590 mm
-- auger speed	79, 92 rpm

Two-row Row Crop Head:

-- serial number	403993
-- distance between rows	adjustable, 710 to 1 020 mm @ 50 mm intervals
-- type of cutter	rotating disc
-- cutter speed	80, 95, 105 rpm adjustable
-- type of stalk gatherer	chain
-- gathering chain/ground	1.9, 2.2, 2.5 kmh adjustable

Feedroll Assembly:

-- throat opening	430 x 102 mm			
-- roll width	415 mm			
	Front		Rear	
	Upper	Lower	Upper	Lower
-- roll diameter	280 mm	220 mm	140 mm	110 mm
-- roll speed (rpm)	60 rpm	73 rpm	112 rpm	156 rpm
	(at 6 mm cut setting)			

Cutterhead:

-- type	cylindrical
-- number of knives	12
-- width	450 mm
-- diameter	609.6 mm
-- speed	975 rpm

Knife Sharpener:

-- type	cylindrical stone (manual)
-- size	38 mm dia

Tires:

two, 11 L- 14, 6 ply

Weights:

	With Pickup	With Two-row Row Crop Head
-- left wheel	488 kg	420 kg
-- right wheel	726 kg	830 kg
-- hitch	116 kg	158 kg
TOTAL	1330 kg	1408 kg

Lubrication:

-- main unit	
-- grease fittings	4 every 4 h, 30 every 8 h
-- chains	3 every 8 h
-- wheel bearings	2 seasonal
-- gear boxes	2 every 100 h
-- windrow pickup	
-- grease fittings	1 every 4 h, 1 every 8 h
-- chains	1 every 8 h
-- two-row row crop head	
-- grease fittings	15 every 10 h
-- chains	4 every 10 h

Optional Equipment:

-- 2.0 m windrow pickup head	
-- one-row and two-row row crop heads	
-- mower bar head	
-- cutterhead paddles	
-- axle extensions	
-- automatic wagon hitch	
-- hard surfaced cutterhead knives	
-- spout extensions	
-- horizontal	680, 1220 mm
-- vertical	380 mm
-- hydraulic spout control	
-- spout support	
-- spout liner	

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

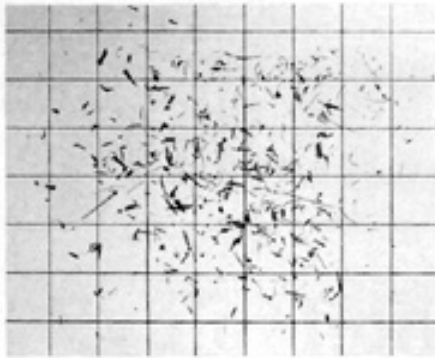
CONVERSION TABLE

1 hectare (ha)	= 2.5 acres (ac)
1 kilometre/hour (km/h)	= 0.6 mile/hour (mph)
1 metre (m)	= 3.3 feet (ft)
1 millimetre (mm)	= 0.04 inches (in)
1 kilowatt (kW)	= 1.3 horsepower (hp)
1 kilogram (kg)	= 2.2 pounds mass (lb)
1 tonne (t)	= 2200 pounds mass (lb)
1 newton (N)	= 0.2 pounds force (lb)
1 tonne/hour (t/h)	= 1.1 ton/hour (ton/h)
1 tonne/kilowatt hour (t/kW-h)	= 0.8 ton/horsepower hour (ton/hp-h)

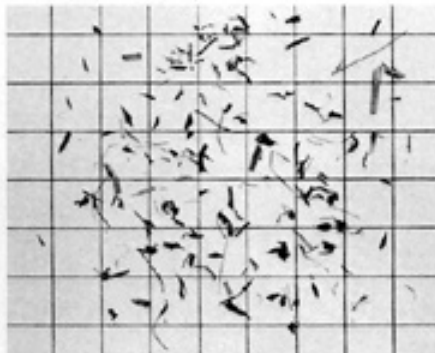
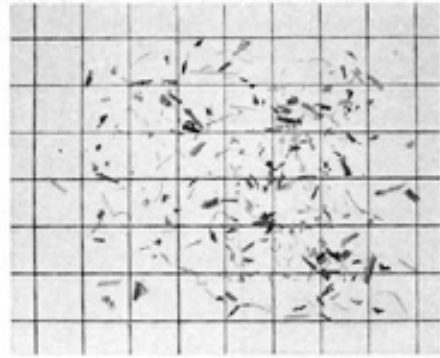
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APPENDIX IV

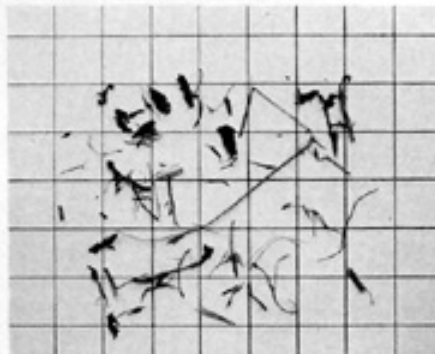
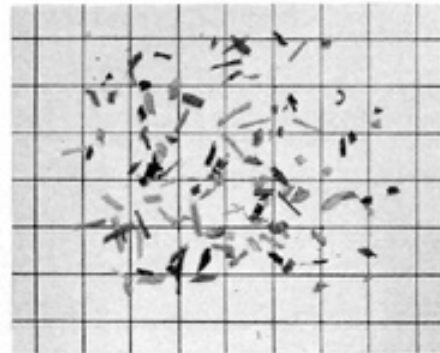
CORN



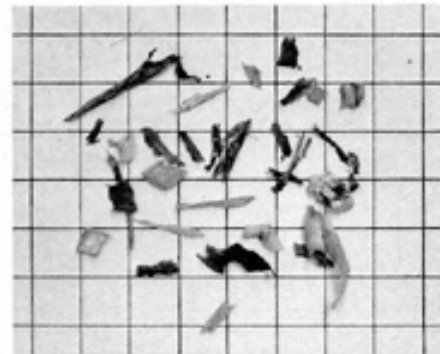
LESS THAN
5 mm



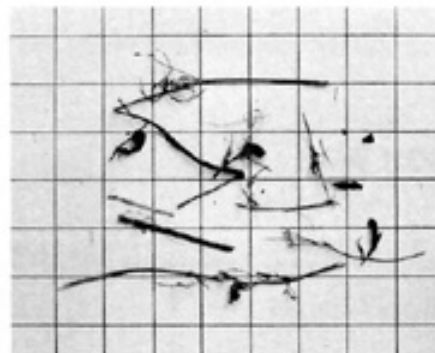
5 TO 9 mm



9 TO 13 mm



13 TO 26 mm



GREATER THAN
26 mm

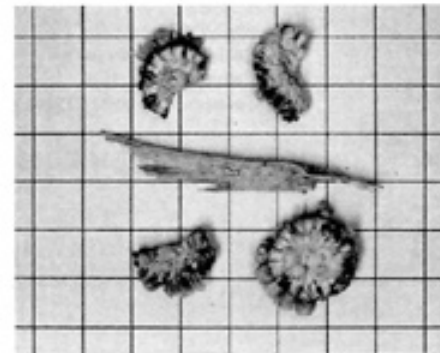


FIGURE 8. Distribution of particle lengths (20 mm grid)



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