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Evaluation Report 691

AGCO R72 Gleaner Combine

A Co-operative Program Between

ALBERTA FARM MACHINERY RESEARCH CENTRE

PAMI PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

AGCO R72 GLEANER COMBINE

MANUFACTURER:

AGCO Deutz-Allis
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Telephone: (816) 836-4600

RETAIL PRICE:

$195,665.00 [June, 1993, f.o.b. Humboldt, Sask., with a 12.8 ft (3.9 m) pickup header, 11.2 ft (3.4 m) Rake-Up pickup, hydraulic feeder reverser, 30.5L x 32 R1 drive tires, 16.9 - 24 steering tires, starting fluid injector kit, AM-FM radio, heater, air conditioner, acre estimator, power fold ladder, grain loss monitor and heavy duty final drives].

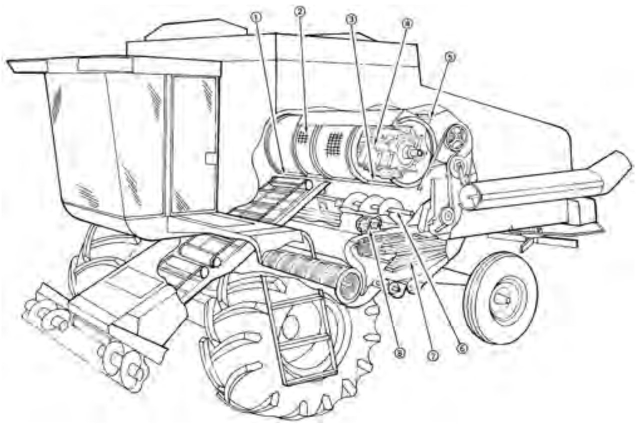

FIGURE 1. AGCO R72: (1) Threshing Concave, (2) Separating Grate, (3) Separating Concave, (4) Rotor[1], (5) Discharge Beater, (6) Distribution Augers, (7) Cleaning Shoe, (8) Accelerator Rolls.

SUMMARY AND CONCLUSIONS

Capacity: In the capacity tests, the MOG feedrate* at 3% total grain loss in Brier and Harrington barley was 555 lb/min (15.1 t/h) and 1245 lb/min (33.9 t/h) respectively. Combine capacity was 1005 lb/min (27.3 t/h) and 890 lb/min (24.2 t/h) in Katepwa and Laura wheat.

In the Brier and Harrington barley, the AGCO R72 had respectively 1.6 and 2.1 times the capacity of the PAMI Reference II combine when compared at 3% total grain loss. In the wheat tests, the capacity of the AGCO R72 was about 1.7 times that of the Reference II in the Katepwa crop and 1.5 times in the Laura crop.

Quality of Work: Picking performance was very good. The Rake-Up pickup picked cleanly in all reasonably well supported windrows and no plugging occurred. The pickup aggressively picked windrows laid on the ground and in long stubble. The windrow was shifted to the right as it was picked.

Feeding was good. Crop flow was smooth and unrestricted in narrow uniform windrows. However, large and bunchy windrows caused table auger and feeder plugging. The thresher door provided good stone protection and often prevented cylinder plugging by ejecting dense wads of crop. Resetting the thresher door was physically difficult.

Threshing was very good. Unthreshed losses were generally low in all crops. Filler strips provided extra threshing aggressiveness.

Separating was very good. Material flowed smoothly into, along or out of the cage. Separating loss was low in most crops.

Cleaning shoe performance was good. Shoe loss was generally low in barley, rye and wheat but limited capacity in canola, flax and mustard. Opening the chaffer greater than 0.75 in (19 mm) resulted in higher losses in barley, rye and wheat.

[1]Note the manufacturer refers to this as the cylinder, however, in this report, it will be referred to as a rotor to be consistent with PAMI's standard description.

**MOG Feedrate (Material-Other-than-Grain feedrate) is the mass of straw and chaff passing through the combine per unit of time.*

Clean grain handling was very good. The 297 bu (10.8 m^3) grain tank filled evenly in all crops. The large grain tank was convenient in high yielding crops. The unloading auger had ample reach for all trucks and trailers encountered. The auger discharged the grain in a compact stream and unloaded a full tank of dry wheat in about 117 seconds. Unloading in windy conditions without scatter loss was difficult without a spout extension.

Straw and chaff spreading was good. The straw was spread evenly up a maximum of 22 ft (6.7 m) while chaff was spread up to 16 ft (4.9 m). The total straw spread was shifted left of centre due to the offset discharge.

Ease of Operation and Adjustment: Operator comfort was very good. The cab was clean, quiet and was well suited for the operator and a passenger. The air conditioner and heater provided comfortable cab temperatures. The seat and steering column adjusted to suit most operators. The operator had a clear view forward and to the sides and large convex mirrors were provided for rear visibility. The incoming swath was partially blocked by the steering wheel.

Instrumentation was very good. Most important machine and engine components were monitored with a combination of gauges, a digital display, warning lights and audio alarm. Engine rpm and cylinder speed were very conveniently and separately displayed on the steering console. The controls were very good. All controls were conveniently located. The more frequently used controls were close to the operator while the less used controls were located out-of-the-way.

Loss monitor performance was very good in cereal crops but was poor in canola, flax and mustard. The loss monitor gave reasonable indications of both separator and shoe loss. However when switching between the separator and shoe, the meter had to be readjusted for suitable response.

Lighting was very good. Short, medium and long range lighting provided effective illumination when using the pickup header and could be adjusted to suit wider straight cut headers. Grain tank lighting was inadequate. The lights under the right, left and engine access panels were very convenient when servicing or checking at night.

Handling was very good. The AGCO R72 was easy to maneuver and picked around most corners without the aid of wheel brakes. The hydrostatic was smooth and responsive and the gear ratios were appropriate for typical harvest speeds. The combine was stable in the field and while transporting.

Ease of adjustment was good. Most components were very easy to adjust from the cab. Initial concave set up was easy and positive. Removing and replacing filler strips was time consuming. Ease of setting the components to suit crop conditions was good. Once familiar with the combine's performance, setting was quick and little fine tuning was required. The straw spreader was easily removed with hand tools. The shoe could be checked from directly behind or from the right.

Ease of unplugging was very good. The header reverser effectively backed material out of the feeder and table auger. The rotor was easily unplugged by following a systematic routine. Ease of cleaning the combine was very good. The grain tank was open and unrestricted. The cylinder was easily accessed through the large rotor door and access doors in the grain tank.

Ease of lubrication was good. Daily lubrication was quick and easy. Ease of performing routine maintenance was good although changing the hydraulic suction screens was difficult. Most belts had spring loaded idlers and the chain drives had bolt tighteners for simplified maintenance.

Engine and Fuel Consumption: The engine started quickly and ran well. The engine had adequate power to reach feedrates that limited combine capacity. Average fuel consumption was 9.5 gal/h (43.0 L/h) based on separator hours. Oil consumption was insignificant.

Operator Safety: No safety hazards were apparent. However, normal safety precautions were required and warnings on decals and in the manual had to be heeded. The operator's manual emphasized safety.

Operator's Manual: The operator's manual was good. The manual was clearly written and the table of contents and index made finding material easy. However, some incorrect referencing occurred and updating is needed. A separate header manual was supplied.

Mechanical History: Some concave bending was noted after season and a few other mechanical problems occurred during the test.

RECOMMENDATIONS:

It is recommended that the manufacturer consider:

1. Modifications to improve the ease of resetting the thresher door.
2. Modifications to prevent grain leaks between the clean grain sliding access door and clean grain elevator.
3. Providing better grain tank lighting.
4. Modifications to prevent the concave from being adjusted into contact with the cylinder.
5. Providing a safe and convenient method for sampling the return tailings.

Senior Engineer: J.D. Wassermann
Harvesting Manager: L.G. Hill
Project Engineer: S.J. Grywacheski

THE MANUFACTURER STATES THAT:

With regard to recommendation number:

1. A larger access hole has been provided to make it easier to attach the latching tool.
2. AGCO is taking measures to insure the proper sealing of this area.
3. AGCO is evaluating improved lighting for the grain bin.
4. The procedure described in the operator's manual for proper concave adjustment will prevent the concave from coming into contact with the cylinder.
5. Tailings sampling is not as important to good combine performance on a rotary combine as it is on a "conventional" combine.

GENERAL DESCRIPTION

The AGCO Gleaner R72 is a self-propelled combine with a single, transverse-mounted open rotor. The rotor cage (FIGURE 2) consists of threshing and separating concaves and separating grate. The discharge beater is located at the end of the rotor. Below the cage are two counter rotating accelerator rolls which deliver material to the cleaning shoe.

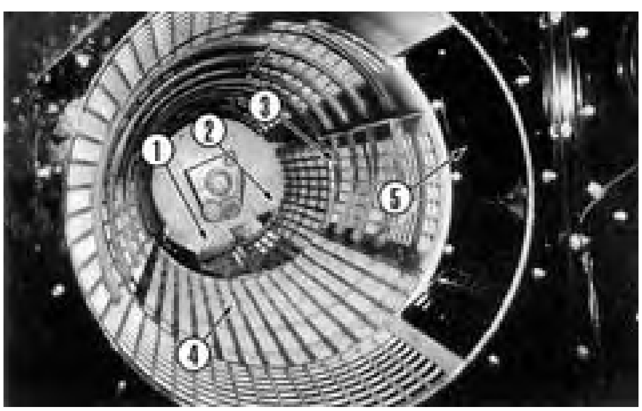

FIGURE 2. Rotor Cage: 1) Thresher Door, 2) Threshing Concave, 3) Separating Grate, 4) Separating Concave, and 5) Discharge Beater.

The rotor (FIGURE 3) is mounted between the grain tank and engine. The open or cylinder type rotor has eight sets of high profile rasp bars. Each length of rasp bar is made up of four sections that can be replaced with an optional reverse rib angle. The discharge section of the rotor consists of smooth edged bars. The threshing and separating concaves are bar and wire design. The separating and discharge grates are stamped metal. The fluted rubber intermeshing accelerator rolls extend across the full width of the cleaning shoe. The multi blade cross flow cleaning fan turns at a constant speed. Air from the fan is controlled by an adjustable inlet choke and the discharge is directed into two ducts, one delivers a pre-cleaning blast between the accelerator rolls and shoe and the other, a blast under the sieves. The grain pan, chaffer and cleaning sieve move as a single unit.

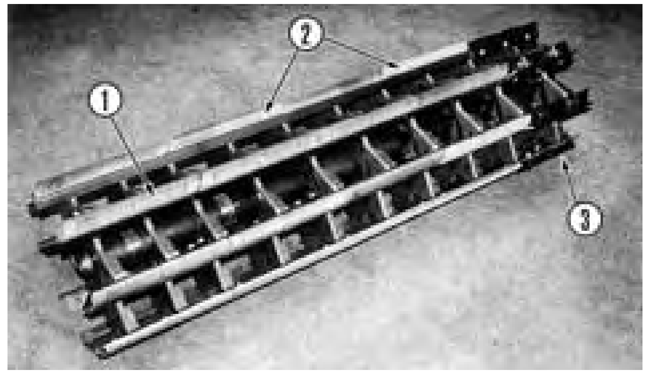

FIGURE 3. Rotor: 1) High Profile Rasp Bar, 2) Reverse Angle Rib, 3) Smooth Edged Bars.

Crop from the table auger enters the primary feeder and is transferred to the secondary feeder then into the rotor. Just before the crop enters the rotor it passes over a pressure released concave door. The rotor pulls crop over the threshing concave. The angle of the ribs on the rasp bars and the helical bars in the separator cage move the crop to the left. Most of the threshing takes place at the front of the threshing concave while final threshing and grain separation occurs along the full length of the threshing and separating areas. A four wing discharge beater strips straw from the cylinder, sweeps it over the beater grate for further separation and propels it out the discharge chute onto the straw spreader. Separated material is conveyed by the distribution augers to the accelerator rolls, which propel the material through a pre-cleaning air blast down onto a grain pan. Light material is blown out while the grain and heavy material pass through the air stream onto the grain pan and are fed to the cleaning shoe. On the cleaning shoe, air and mechanical sieving action provide final cleaning. The tailings can be routed either back to the rotor or to the distribution augers.

The test machine was equipped with a 295 hp (220 kW) Deutz, eight cylinder, air cooled, twin turbocharged diesel engine; 12.8 ft (3.9 m) pickup header, a 12.5 ft (3.8 m) Rake-Up pickup; and other optional equipment listed on Page 2. The AGCO R72 has a pressurized operator's cab, power steering, hydraulic wheel brakes, four-speed transmission and a hydrostatic drive.

The separator, header and unloading auger drives are engaged with electric clutches. Header height and unloading auger swing are electro-hydraulically controlled. Cylinder rpm, pickup speed, cleaning fan choke and feeder reverser are controlled within the cab. Concave clearance, tailings return and cleaning shoe adjustments are performed on the machine. There is no provision to safely and conveniently inspect the return tailings while operating. Important component speed and alarms are displayed by electronic monitors in the cab.

Detailed specifications are given in APPENDIX I.

SCOPE OF TEST

The machine evaluated by PAMI was configured as described in the General Description, FIGURE 1 and Specifications section of this report. The manufacturer may have built different configurations of this machine before or after PAMI tests. Therefore, when using this report, check that the machine under consideration is the same as the one reported here. If differences exist, assistance can be obtained from PAMI or the manufacturer to determine changes in performance.

The main purpose of the test was to determine the functional performance of the AGCO R72. Measurements and observations were made to evaluate the AGCO R72 for rate of work, quality of work, ease of operation and adjustment, operator safety and the suitability of the operator's manual. Although extended durability testing was not conducted, the mechanical failures were recorded.

The AGCO R72 was operated for 115 hours while harvesting approximately 1317 ac (533 ha) of various crops. The crops and conditions are shown in TABLES 1 and 2. Capacity tests were conducted in two barley crops and two wheat crops.

TABLE 1. Operating Conditions

Crop	Variety	Yield Range		Cut Width		Sep.	Field Area		Crop Harvested	
		bu/ac	t/ha	ft	m	hrs	ac	ha	bu	t
Barley	Brier Harrington	41-99 56-67	2.2-5.3 3.9-4.2	30 26,30	9.1 7.9,9.1	20.5 6.5	225 76	91 31	13705 5415	298 128
Canola	Legend Westar	30 23	1.7 1.3	22 21	6.7 6.4	9.0 7.0	69 78	28 32	2085 1790	47 41
Mustard	Brown	32	1.8	24	7.3	3.0	30	12	935	21
Rape-seed	Hero	45	2.5	21	6.4	8.0	70	28	3110	71
Flax	Vimy	24	1.5	42	12.6	6.0	67	27	1585	40
Rye	Cougar Musketeer Prima	37 44-49 42-50	2.3 2.8-3.1 2.6-3.1	20,24 20 24	6.1,7.3 6.1 7.3	6.5 11.5 5.5	53 90 55	22 36 22	1980 4215 2440	50 107 62
Wheat	Columbus Conway Kyle Katepwa Laura	31 22 21 33-45 39	2.1 1.5 1.4 2.2-3.0 2.6	50 42 24 30,36,60 42	15.2 12.8 7.3 9.1,11.0,18.3 12.8	5.5 1.5 4.0 17.0 2.0	115 32 50 28.2 25	47 13 20 114 10	3535 710 1060 10715 990	96 19 29 292 27
Total						115.5	1317	533	51315	1328

TABLE 2. Operation in Stony Conditions

Field Conditions	Hours	Field Area	
		ac	ha
Stone Free Occasional Stones Moderately Stony	78.5 32.0 5.0	927 329 61	375 133 25
Total	115.5	1317	533

RESULTS AND DISCUSSION

TERMINOLOGY

MOG, MOG Feedrate, Grain Feedrate, MOG/G Ratio and Total Feedrate: A combine's performance is affected mainly by the amount of straw and chaff it is processing and the amount of grain or seed it is processing. The straw, chaff, and plant material other than the grain or seed is called MOG, which is an abbreviation for "Material-Other-than-Grain". The quantity of MOG being processed per unit of time is called the "MOG Feedrate". Similarly, the amount of grain being processed per unit of time is the "Grain Feedrate".

The MOG/G ratio, which is the MOG Feedrate divided by the Grain Feedrate, indicates how difficult a crop is to separate. For example, MOG/G ratios for prairie wheat crops may vary from 0.5 to 1.5. In a crop with a 0.5 MOG/G ratio, the combine has to handle 50 lb (22.7 kg) of straw for every 100 lb (45.4 kg) of grain harvested. However, in a crop with a 1.5 MOG/G ratio for a similar 100 lb (45.4 kg) of grain harvested, the combine now has to handle 150 lb (68.1 kg) of straw - 3 times as much. Therefore, the higher the MOG/G ratio, the more difficult it is to separate the grain.

Total feedrate is the sum of MOG and grain feedrates. This gives an indication of the total amount of material being processed. This total feedrate is often useful to confirm the effects of extreme MOG/G ratios on combine performance.

Grain Loss, Grain Damage, Dockage and Foreign Material: Grain loss from a combine can be of two main types: Unthreshed Loss, consisting of grain left in the head and discharged with the straw and chaff, or Separator Loss which is free (threshed) grain discharged with the straw and chaff. Separator Loss can be further defined as Shoe Loss and Walker (or Rotor) Loss depending where it came from. Loss is expressed as a percentage of the total amount of grain being processed.

Damaged or cracked grain is also a form of grain loss. In this report, the cracked grain is determined by comparing the weight of the actual damaged kernels to the entire weight of a sample taken from the grain tank.

Dockage is determined by standard Canadian Grain Commission methods. Dockage consists of large foreign particles and of smaller particles that pass through a screen specified for that crop. It is expressed as a percentage of the weight of the total sample taken.

Foreign material consists of the large particles in the sample, which will not pass through the dockage screens.

Capacity: Combine capacity is the maximum rate at which a combine, adjusted for optimum performance, can process crop at a certain total loss level. PAMI expresses capacity in terms of MOG Feedrate at 3% total loss. Although MOG Feedrate is not as easily visualized as Grain Feedrate, it provides a much more consistent basis for comparison. A combine's ability to process MOG is relatively consistent even if MOG/G ratios vary widely. Three percent total loss is widely accepted in North America as an average loss rate that provides an optimum trade-off between work accomplished and grain loss. This may not be true for all combines nor does it mean that they cannot be compared at other loss levels. For this reason, PAMI is now including a comparison at 1.5% total loss, which may reflect a more realistic operating loss as machines and crops have been improved.

Reference Combine: It is well recognized that a combine's capacity may vary greatly due to differences in crop and weather conditions. These differences make it impossible to directly compare combines not tested in the same conditions. For this reason, PAMI uses a reference combine. The reference combine is simply one combine that is tested along with each combine being evaluated. Since the test conditions are similar, each test combine can be compared directly to the reference combine to determine a relative capacity or "capacity ratio". This capacity ratio can be used to indirectly compare combines tested in different years and under different conditions. As well, the reference combine is useful for showing how crop conditions affect capacity. For example, if the reference combine's capacity is higher than usual, then the capacity of the combine being evaluated will also be higher than normally expected.

For 10 years PAMI had used the same reference combine. However, capacity differences between the reference combine and some of the combines tested became so great that it was difficult to test the reference combine in conditions suitable for the evaluation combines. PAMI changed its reference combine to better handle these conditions. The new reference combine is a John Deere 7720 Titan II that was tested in 1984 (see PAMI report #426). To distinguish between the reference combines, the new reference will be referred to as Reference II and the old Reference as Reference I. Combines appearing in reports printed in 1986 or earlier have been compared to Reference I (Old Reference) and combines appearing in reports printed in 1987 or later are compared to Reference II.

RATE OF WORK

Capacity Test Results: The capacity test results for the AGCO R72 are summarized in TABLE 3.

TABLE 3. Capacity of R72 at a Total Loss of 3 and 1.5% of Yield

CROP CONDITIONS

Crop	Variety	Cut Width		Crop Yield		Moisture Content		MOG/G Ratio	Figure Number
		ft	m	bu/ac	t/ha	Straw %	Grain %		
Barley	Brier	30	9.1	83	4.5	18.9	14.1	0.59	4
Barley	Harrington	30	9.2	93	5.0	23.0	14.3	1.61	5
Wheat	Katepwa	24	7.3	50	3.4	9.3	14.3	1.21	6
Wheat	Laura	42	12.8	36	2.4	10.4	12.6	1.31	7

CAPACITY AT 3%

Crop	Variety	Feedrates: MOG		Grain		Total		Grain Cracks	Dock-age	Foreign Material
		lb/min	t/h	bu/h	t/h	lb/min	t/h	%	%	
Barley	Brier	555	15.1	1175	25.6	1495	40.7	0.4	0.2	0.1
Barley	Harrington	1245	33.8	965	21.0	2020	54.9	0.5	0.3	0.1
Wheat	Katepwa	1005	23.7	830	22.6	1835	49.9	0.9	1.6	1.3
Wheat	Laura	890	24.2	680	18.4	1570	42.7	0.9	0.9	0.6

CAPACITY AT 1.5%

Crop	Variety	Feedrates: MOG		Grain		Total		Grain Cracks	Dock-age	Foreign Material
		lb/min	t/h	bu/h	t/h	lb/min	t/h	%	%	
Barley	Brier	405	11.0	860	18.7	1090	29.6	0.4	0.2	0.1
Barley	Harrington	960	26.1	745	16.2	1555	42.3	0.5	0.3	0.1
Wheat	Katepwa	780	21.2	645	17.6	1425	38.8	0.9	1.6	1.3
Wheat	Laura	740	20.1	565	15.4	1305	35.5	0.9	0.9	0.6

The performance curves for the capacity tests are presented in FIGURES 4 to 7. The performance curves are plots of rotor, shoe, unthreshed and total grain loss for a range of MOG feedrates. From the graphs, combine capacity can be determined at various loss levels. The rate at which loss changes with respect to feedrate shows where the combine can be operated effectively. Portions of the curves which are "flat" or slope gradually indicates stable performance. Where the curves hook up sharply, small increases in feedrate cause loss to increase greatly. It would be difficult to operate in this range of feedrates without having widely varying loss.

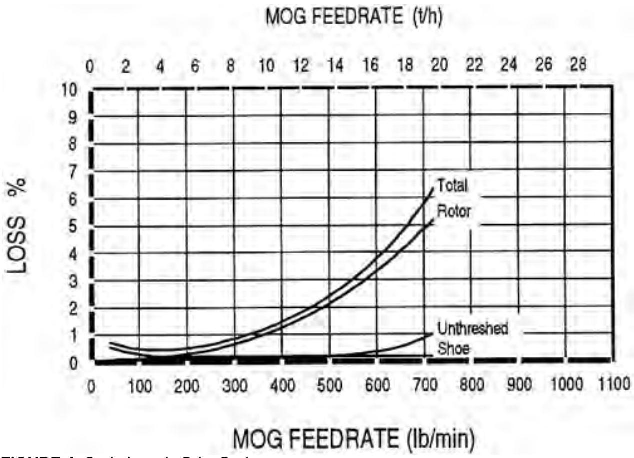

FIGURE 4. Grain Loss in Brier Barley.

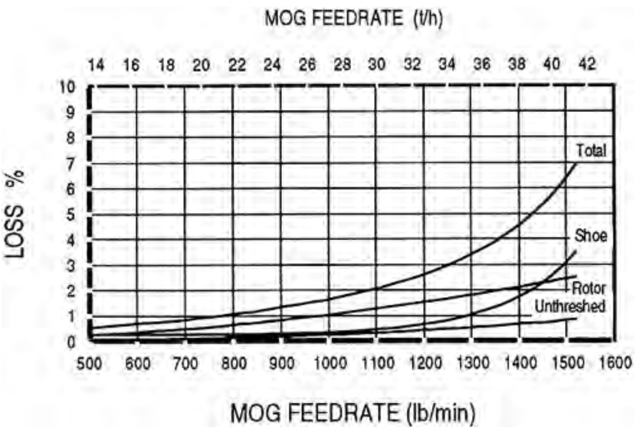

FIGURE 5. Grain Loss in Harrington Barley.

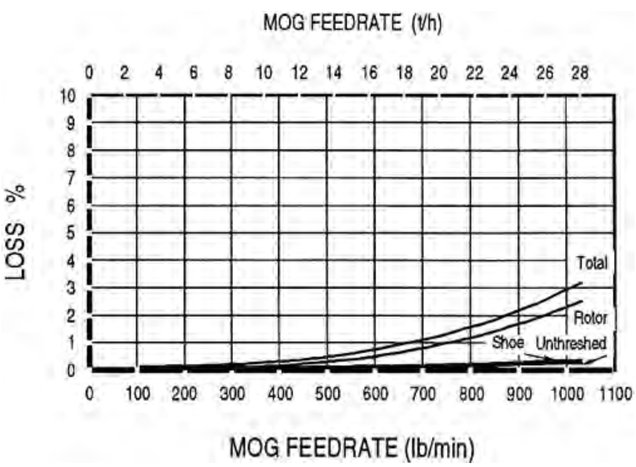

FIGURE 6. Grain Loss in Katepwa Wheat.

The Brier barley crop used for the test came from a uniform and ripe stand. The crop was cut two weeks before the test and had received some rain. Grain moisture was in the dry range even though the straw moisture was higher than typical. The grain yield was higher than average but the MOG/G ratio was typical. The grain had a typical "bushel weight" but kernel weight was less than average. Along with being light the kernels were long and thin. The grain was easy to thresh, however short pieces of awns remained on some of the kernels, which made separation difficult. The 30 ft (9.1 m) windrow was uniform with the heads evenly distributed across the windrow. The windrow was 1.5 to 2 times the width of the feeder. For this test, the front three sections of the concave had filler strips and the tailings were returned to the rotor.

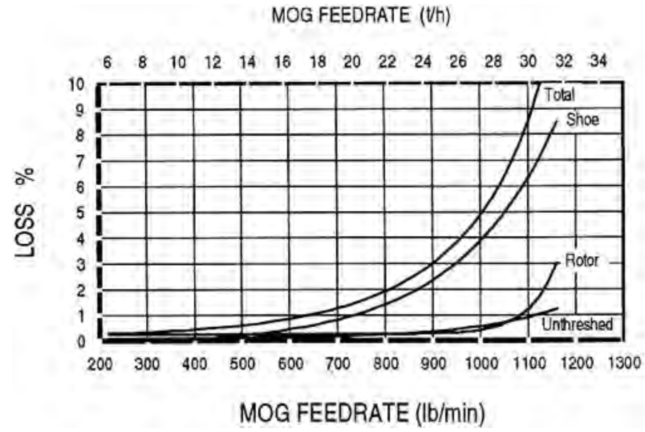

FIGURE 7. Grain Loss in Laura Wheat.

The MOG feedrate at 3% loss was 555 lb/min (15.1 t/h) and 405 lb/min (11.0 t/h) at 1.5%. Higher feedrates were reached without being power or feeder limited, but loss levels were unacceptable. This indicated that in these conditions typical harvesting rates would likely be in the 400 to 500 lb/min (8.7 to 10.9 t/h). Rotor loss became the largest component of total loss at MOG feedrates higher than 300 lb/min (6.5 t/h) and increased sharply with an increase in MOG feedrate. Shoe loss was stable and remained low through the entire range of MOG feedrates. Unthreshed loss was insignificant staying below 0.2% throughout the test. The long, thin, light weight kernel made separation difficult. Increasing rotor speed in this crop increased rotor loss.

The Harrington barley crop used for the test came from a heavy, green, and slightly lodged stand. The crop had received some frost but grain quality was not noticeably affected. The crop was cut two weeks before the test and had received some rain. Grain moisture was dry to slightly tough while the straw was tough and green. Both grain yield and MOG/G ratios were higher than average. In this crop, large quantities of straw had to be handled. The kernels were plump and heavy, only a few were green. The grain was easy to thresh and the awns were easily removed. The deep heavy windrow was relatively even with the occasional bunchy area. The windrow was about 1.4 times the width of the feeder. For this capacity test, the front three sections of the concave had filler strips and the tailings were returned to the rotor,

The MOG feedrate at 3% loss was 1245 lb/min (33.8 t/h) and 960 lb/min (26.1 t/h) at 1.5%. The 3% total loss was reached just prior to power limit. Even at power limit feeding still was not a problem. Rotor loss was the main component of total loss up to the 3% level. As power limit was reached, the shoe became unstable. At this point, both the shoe and rotor contributed almost equally to total loss. Unthreshed loss was low up to 1200 lb/min (32.7 t/h) then increased slowly with feedrate,

It should be noted that the capacities are based on as-tested results. The high straw moisture contributed considerably to the weight of the MOG. Adjusting the moisture to more typical levels would have reduced the MOG feedrates by a factor of 0.85.

The Katepwa wheat was from an average stand. The crop received frost, which noticeably affected sample quality. The crop was cut approximately three weeks before testing and had been rained on a number of times. Grain yield was still above average while the MOG/ G ratio was also slightly higher than normal. Both the straw and grain were dry. The windrow was uniform with the straw lying at a slight angle to the direction of travel. The windrows were about the same width as the feeder. Threshing difficulty was typical for Katepwa wheat. For this capacity test, the front three sections of the concave had filler strips and tailings were returned to the rotor.

The maximum attainable feedrate was limited by engine power, this occurred at a MOG feedrate of 1005 lb/min (27.3 t/h) with a total grain loss of 3%. Capacity at 1.5% total loss occurred at a 780 lb/min (21.2 t/h). Rotor, shoe and unthreshed loss contributed equally up to a MOG feedrate of 400 lb/min (10.9 t/h). Beyond this, rotor loss became the major loss but was stable. Shoe and unthreshed loss remained low. Typical operation at generally accepted loss would be in the 600 to 800 lb/min (16.4 to 21.8 t/h) range.

The Laura wheat tested was from a uniform stand. The crop received some frost damage. The crop was cut the same day as the test. Grain yield and MOG/G ratio were average. The grain was quite dry and straw moisture was typical for windrow conditions. The windrow was very even and uniform. The windrow greatly exceeded the width of the feeder. Straw break up and threshing difficulty were typical.

For this capacity test only the front section of the concave had a filler strip and tailings were returned to the rotor. The MOG feedrate at 3% total loss was 890 lb/min (24.2 t/h) and 740 lb/min (20.1 t/h) at 1.5% total loss. High losses limited practical operation before power or feeding limits were reached. Shoe loss contributed the main portion of total loss at feedrates above 750 lb/min (20.4 t/h). At higher feedrates, shoe loss increased sharply. Rotor and unthreshed loss remained low until about 900 lb/min (24.5 t/h) then increased steadily with feedrate.

Average Workrates: TABLE 4 shows the range of average workrates achieved during day-to-day operation in the various crops encountered. The table is intended to give a reasonable indication of the average rates most operators could expect to obtain, while acknowledging the effects of crop and field variables. For any given crop, the average workrate may vary considerably. Although a few common variables such as yield and width of cut are included in TABLE 4, they are by no means the only or most important factors. There are many other crop and field conditions, which affect workrates. As well, operating at different loss levels, availability of grain handling equipment, and differences in operating habits can have an important effect.

The effect of the variables as indicated in TABLE 4, explains why even the maximum average workrates may be considerably lower than the capacity results, which are instantaneous workrates.

Note that TABLE 4 should not be used to compare performance of combines. The factors affecting average workrates are simply too numerous and too variable to be duplicated for each combine tested.

TABLE 4. Field Workrates

Crop	Average Workrate	Grain Feedrate		Area Rate		Associated Conditions				
						Width of Cut		Yield		Variety
		bu/h	t/h	ac/h	ha/h	ft	m	bu/ac	t/ha	
Barley	High	991	21.6	10.0	4.0	30	9.1	99	5.7	Brier
	Low	477	10.4	12.0	4.9	30	9.1	40	2.3	Brier
	Season	675	14.7	10.4	4.2			65	3.7	
Canola,	High	411	8.9	9.2	3.7	21	6.4	45	2.6	Hero
Mustard &	Low	238	5.2	7.9	3.2	22	6.7	30	1.7	Legend
Rapeseed	Season	302	6.6	9.4	3.8			32	1.8	
Flax	High	292	6.4	11.6	4.7	42	12.8	25	1.4	Vimy
	Low	240	5.2	9.7	3.9	42	12.8	25	1.4	Vimy
	Season	259	5.6	10.9	4.4					
Rye	High	475	10.3	11.2	4.5	20	6.1	42	2.4	Musketeer
	Low	291	6.3	7.7	3.1	20	6.1	38	2.2	Cougar
	Season	366	8.0	8.4	3.4			44	2.5	
Wheat	High	670	14.6	14.9	6.0	30	9.1	45	2.6	Katepwa
	Low	265	5.8	12.2	4.9	24	7.3	22	1.3	Kyla
	Season	550	12.2	16.5	6.7			34	2.0	

Comparing Combine Capacities: The capacity of combines tested in different years or in different crop conditions should be compared only by using the PAMI reference combines. Capacity ratios comparing the test combine to the reference combine are given in the following section. For older reports where the ratio is not given, a ratio can be calculated by dividing the MOG feedrate listed in the capacity table by the corresponding MOG feedrate of the Reference combine listed in APPENDIX II for that particular crop.

Once capacity ratios for different evaluation combines have been determined for comparable crops, they can be used to approximate capacity difference. For example, if one combine has a capacity ratio of 1.2 times the Reference combine and another combine has a capacity ratio of 2.0 times the Reference combine, then the second combine is about 67% larger [(2.0 - 1.2) ÷ 1.2 x 100 = 67%]. An evaluation combine can also be compared to the Reference combine at losses other than 3%. The total loss curves for the evaluation and Reference combine are shown in the graphs in the following section. The shaded bands around the curves represent 95% confidence belts. Where the bands overlap, very little difference in capacity exist, where the bands do not overlap a significant difference can be noticed.

PAMI recognizes that the change to the Reference II combine may make it difficult to compare test machines, which were compared to Reference I. To determine a relative size it is necessary to use a ratio of the two reference combines. Tests indicated that Reference II had about 1.5 to 1.6 times the capacity of Reference I in wheat and about 1.4 to 1.5 times the Reference I capacity in barley.

Capacity Compared to Reference Combine: The capacity of the AGCO R72 was significantly greater than the PAMI Reference II combine in the wheat and barley crops. The AGCO R72 had 1.6 and 2.1 times the capacity of the Reference II combine, respectively, in Brier and Harrington barley at 3% total loss. For the Katepwa and Laura wheat crops the respective capacity of the AGCO R72 was 1.7 and 1.5 times that of the Reference II at 3% total loss.

Compared at 1.5% total loss, the capacity of the AGCO R72 was 1.4 and 2.0 times that of the Reference II in the Brier and Harrington barley tests. The AGCO R72 had 1.6 and 1.4 times the capacity the Reference II in Katepwa and Laura wheat.

FIGURES 8 to 11 compare the total losses of both combines over the range of feedrates tested. The graphs show that at total losses greater than 1% the AGCO R72 usually had significantly higher capacity than the Reference II combine. This difference in capacity would usually be easily noticed when harvesting. At losses less than 1%, the confidence belts in the graphs overlap, indicating that the difference in capacity may not be statistically significant. However, even when operating at low losses the difference in capacity would usually be quite noticeable.

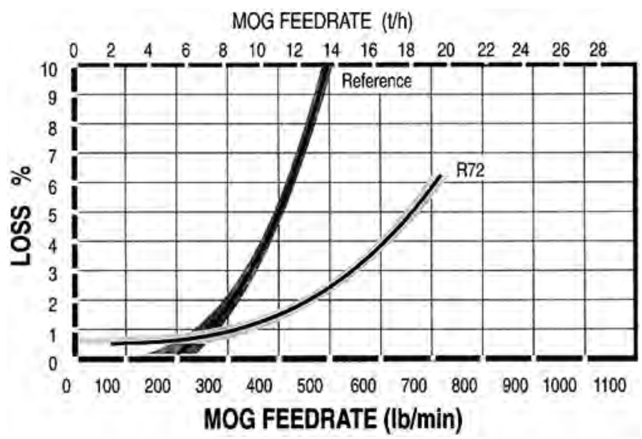

FIGURE 8. Total Grain Loss in Brier Barley.

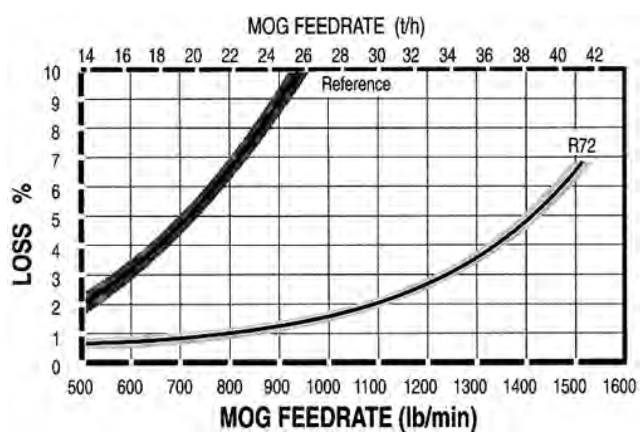

FIGURE 9. Total Grain Loss in Harrington Barley.

QUALITY OF WORK

Picking: Picking performance was very good.

The header was adjusted so the pickup wheels just touched the ground, which resulted in the header table floor being approximately 14 in (356 mm) from the ground. The gauge wheels were adjusted so the teeth cleared the ground by about 0.5 in (13 mm). The pickup speed was normally adjusted slightly slower than ground speed.

To centre feed a windrow, the operator had to pick the windrow slightly left of the feeder. The unique action of the Rake-Up pickup moved the windrow to the right as it was transferred to the header.

Since the feeder was offset to the right on the table, the movement of the windrow allowed the windrow to be fed closer to the centre of the table than with other pickups. This also allowed the spreader to distribute the straw back over almost the same cut area.

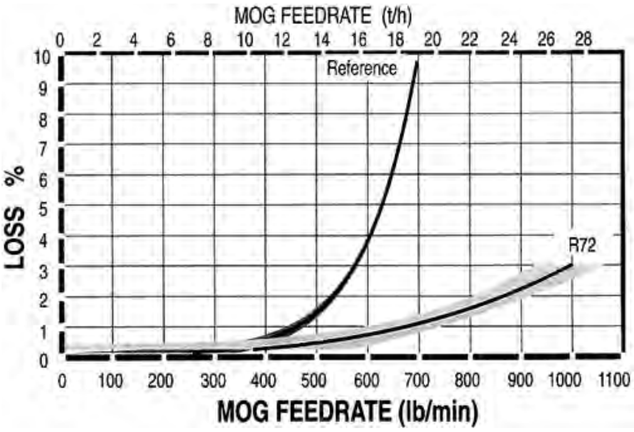

FIGURE 10. Total Grain Loss in Katepwa Wheat.

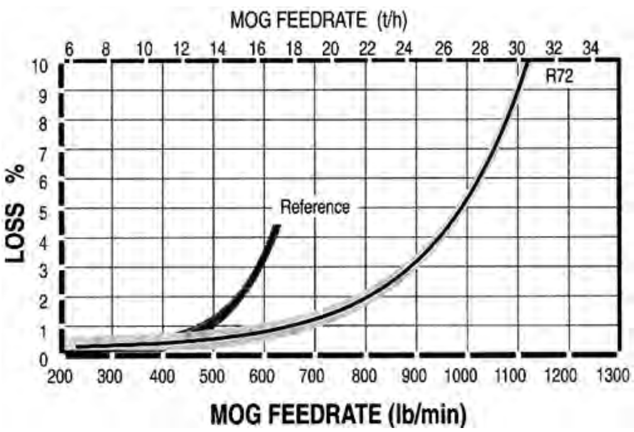

FIGURE 11. Total Grain Loss in Laura Wheat.

The pickup picked well supported windrows cleanly at speeds up to 10.5 mph (17 km/h) and did not plug. The unique sweeping action of the Rake-Up picked windrows that typically are difficult to pick. This occurred when windrows settled on the ground or were laid in high stubble. Reducing tooth clearance to zero was required to cleanly pick windrows, which had settled to the ground. Occasionally increasing pickup speed increased picking effectiveness. Although, with the teeth close to the ground, pickup speed had to be limited to prevent picking stones, dirt and other objects. In order to pick short barley crops that were cut close to the ground, the spring wires were lowered to 10 in (254 mm) above the pick-up teeth. This prevented the swath from rolling in front of the pickup. In this condition, increasing pickup speed threw the windrow into the spring wires causing uneven feeding. In windy conditions, the wind guard assisted in guiding material into the table. In canola windrows, the spring wire tube was removed and the wind guard had to be raised to prevent shatter loss. The wind guard was easily raised without the aid of tools.

Feeding: Feeding was good.

Feeding performance of the AGCO R72 was greatly affected by the size and uniformity of the windrow. In narrow uniformly laid windrows, crop flow was smooth and unrestricted from the pickup to the rotor. Large and bunchy windrows caused table auger and feeder chain plugging.

To achieve effective feeding, table height and table auger clearances were critical. The cutter bar tilt adjustment was tilted fully forward. This positioned the pickup transfer draper in its lowest position relative to the table auger, allowing the windrow to feed below the centre of the table auger. Also, the table auger was positioned to give minimum clearance to the table floor and rear strippers. With this adjustment, crop was conveyed under the auger instead of behind the auger and allowed the windrow to be condensed to the size of the feeder opening as it passed under the table auger and into the feeder.

Crop flow was smooth and unrestricted from the pickup to the rotor in uniform windrows similar to or slightly wider than the feeder. Table auger clearance was crucial in bunchy windrows that were more than 30% wider than the feeder. In this condition, low table auger clearances caused the table auger to plug and high table clearance reduced the effectiveness of the table auger to condense the windrow to that of the feeder. This resulted in table auger wrap at the opening of the feeder.

The rear feeder slipped, activating the warning light when in heavy windrows. This occurred when thick mats of crop pushed the rear feeder chain into a structural member, increasing drag. On final inspection, wear (FIGURE 12) was found on the structural member at the point of contact with the chain.

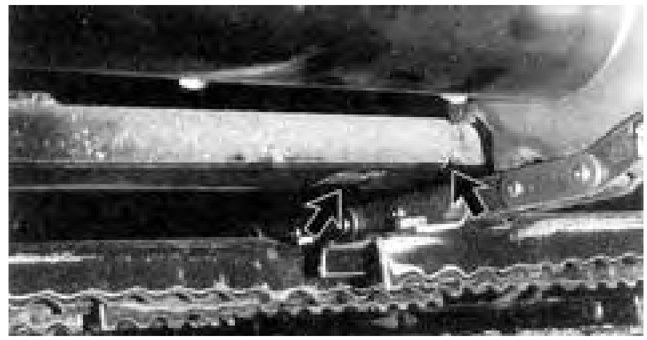

FIGURE 12. Wear on Structural Member Caused from Feeder Chain.

Stone Protection: Stone protection was good.

Although no large rocks were picked, objects 3 in (75 mm) in diameter and larger were effectively ejected. Smaller stones, probably less than 0.5 in (13 mm) in diameter, were heard passing through the rotor but did not cause damage.

The thresher door was located at the transition between the rear feeder and rotor inlet. This door was held shut by a roller latch that released the door by either impact or pressure. Once opened, material was deflected onto the cleaning fan inlet screen. Once opened, the thresher door light illuminated and an alarm sounded. This system not only acted as a stone protection, but also reduced the chances of plugging the rotor as dense wads of crop were ejected before they entered the rotor. The thresher door was reset using special tools. Closing the door required swinging the door shut with one tool and using another to engage a roller latch. Along with being awkward, resetting required considerable strength. It is recommended that the manufacturer consider modifications to more conveniently reset the thresher door.

Threshing: Threshing was very good.

Crop fed smoothly between the rotor and concave in dry, narrower windrows. In this condition feedrates could be increased to where the engine speed pulled down to 1700 rpm without plugging the rotor. This was well below the rated speed of 2250 rpm. In the wide and bunchy windrows, rotor vibration and "rumble", along with back feeding was noticed when dense wads entered the rotor. In these conditions, it was possible to plug the rotor when engine rpm dropped to 2200 rpm or below. The rotor drive was very positive through the full speed range.

Using the manufacturer's recommended rotor speeds and concave clearances produced adequate threshing in most crops. The rotor speeds were similar to combines with comparable cylinder diameters. To facilitate feeding into the rotor, the largest concave clearance occurred at the front and progressively reduced towards the rear. With the concave set this way unthreshed loss was low in barley, canola and rye. In harder-to-thresh crops such as wheat and flax, more aggressive concave settings were required to reduce unthreshed loss. These included adjusting the front portion of the concave to the same clearance as the rear and adding filler strips in the first three sections of the concave.

Grain damage was lower than the Reference II combine in all crops. TABLE 5 shows typical settings PAMI found to be suitable for the different crops harvested.

Separation: Separation was very good.

In all crops material flowed smoothly through the separating area. The rear beater effectively stripped material from the rotor and propelled it to the straw spreader. On one occasion the beater grate

TABLE 5. Crop Settings

Crop	Rotor rpm	Concave Setting		Sieve Opening						Fan Choke Position	Small Seed Kit	
		Index #	Front Setting	Chaffer		Tailings		Cleaning			Separator Duct	Cleaning Duct
				in	mm	in	mm	in	mm			
Barley	780 - 920	4 - 5	Min	3/4	19	3/4 - 7/8	19 - 22	1/4 - 3/8	6 - 10	5 - 6	No	No
Canola, Mustard & Rapeseed	500 - 850	10 - 12	Mid	5/8 - 3/4	16 - 19	3/4 - 15/16	19 -24	1/8	3	1.5 - 3	No	No
Flax - Setting 1	1050	1	Min	3/4	19	5/8	16	1/8	3	6	No	Yes
- Setting 2	1050	1	Min	1/2	13	5/8	16	1/8	3	1.5 - 2	No	No
Rye	900 - 1000	3.5 - 5	Mid	1/2	13	3/4	19	3/16	5	5.5	No	No
Wheat	900 - 1050	1	Min	5/8 - 3/4	16 - 19	7/8	22	3/16 - 5/16	5 - 8	5.5 - 7	No	No

plugged with damp green material.

Separator loss was typically low in most crops at engine speeds above 2250 rpm. At lower engine speeds, separator loss increased rapidly. In some crops, like in the Brier barley, separator loss limited combine capacity before power limit was reached. Increasing cylinder speed above 900 rpm increased separation in barley windrows that contained green Russian Thistle.

Separator loss increased when high amounts of grain were returned to the rotor. This occurred when sieve setting was too tight and the returns were directed to the rotor.

The settings used by PAMI are shown in TABLE 5.

Cleaning: Cleaning shoe performance was good.

Shoe loss was usually low in cereals but limited capacity in canola, mustard and flax.

Shoe loading was even in all crops and was not affected by feeding windrows off centre. Shoe loss was generally low in all crops when engine speed was above 2250 rpm. Once engine speed dropped below 2250 rpm, shoe loss increased rapidly. However, in canola, flax and mustard, shoe performance limited capacity even before the engine speed dropped below rated speed.

The cleaning fan provided a high volume of air that was split into the two air ducts. The separator duct or top duct provided the pre-cleaning blast through the chaff and grain as they were propelled downward by the accelerator rolls. It was estimated that 40 to 50% of the chaff was separated and blown from the combine without ever reaching the chaffer. The lower duct provided typical air to the sieves.

With the fan choke set at 5, the fan delivered about 90% of maximum air flow. Increasing the fan setting from 5 to 7 (maximum) had almost no effect on shoe performance. In barley, rye and wheat, where the fan choke was typically set at 5 or higher to achieve optimum performance, the chaffer could not be set more than 0.75 in (19 mm) open. Chaffer settings greater than this reduced the air velocity near the middle of the chaffer resulting in increased shoe loss.

In flax, optimum shoe performance required use of the small seed kit. This was achieved by engaging the damper in the cleaning duct and opening the fan choke to 7 with the chaffer at 0.5 in (13 mm). In comparison, without the small seed kit, fan choke position became critical at about 1.5. Any higher setting on the fan choke caused flax to be blown into the return, which in turn over-loaded the shoe on the right. With a fan choke set less than 1.5 the clean grain sample was dirty and a high amount of chaff was returned.

In canola and mustard, shoe loss limited capacity. However, due to wide spread frost most of the canola crops encountered had light seeds. Shoe performance was noticeably better in those crops with heavier seed. In canola, high amounts of MOG was passed to the shoe and made it difficult to separate the light seeds. The fan setting became critical around 2.5. Higher settings resulted in seeds being blown from the shoe and lower settings al lowed the chaff and seeds to be sloughed over the shoe.

Sample dockage in all crops was similar or slightly less than the Reference II combine.

Clean Grain Handling: Clean grain handling was very good.

The open grain tank filled evenly and completely in all crops. It held approximately 297 Imp bu (10.8 m^3) of dry wheat. This large grain tank was convenient when harvesting high yielding crops. The full bin sensors were adjustable and could be set to activate when the grain tank was 90% full. However, in tough crops and in barley the sensors were not triggered if they were in the full up position. This resulted in grain spills onto the cab roof. When activated, an alarm sounded for 2 seconds and a light illuminated until grain fell below the sensor.

When fully extended, the unloading auger had ample reach for unloading into most farm trucks (FIGURE 13). However, clearance was 12.0 ft (3.7 m) high making unloading into most trucks inconvenient and resulted in loss in windy conditions. A 4.0 ft (1.2 m) flexible spout, was installed by PAMI to minimize loss due to wind. This spout was too long for loading into semi trailers. A safety switch ensured that the unloader would operate only when the auger was fully extended.

The grain was discharged in a compact, uniform stream, and a full tank unloaded in about 117 seconds.

If the unloading auger was stopped while full and retracted to the transport position, about 0.1 bu (3 L) of grain trickled from the end of auger.

FIGURE 13. Unloading Auger Clearance.

Straw and Chaff Spreading: Straw and chaff spreading was good. The test machine was equipped with the optional rear beater in place of the straw chopper. The bat-type straw spreader spread straw up to 22.0 ft (6.7 m) under ideal conditions. This occurred when two bats had a forward angle and two bats had a reverse angle. Since the straw discharge was on the left (FIGURE 14) the total spread width was slightly offset to the left. When travelling back and forth in narrow cut windrows, the pickup picked some of the straw spread from the previous pass when the offset was towards the windrow being picked.

The high volumes of air from the shoe along with an adjustable tail plate with guide vanes were used to spread chaff (FIGURE 15). In dry wheat, the R72 was capable of putting 50% of the total MOG over the shoe, which made chaff spreading very important. Maximum spread width was 16.0 ft (4.5 m). The chaff spread pattern was greatly affected by wind.

FIGURE 14. Offset Straw Spread.

Material exiting the rear beater was broken into small pieces. In one dry barley crop where the straw was dropped, about 50% fewer bales were made from the AGCO R72 windrows than from the Reference II windrows. In tough barley straw, only 10% fewer bales were made.

EASE OF OPERATION AND ADJUSTMENT

Operator Comfort: Operator comfort was very good.

The AGCO R72 was equipped with an operator's cab positioned ahead of the grain tank and centred on the combine body. The wide and slightly angled ladder made access to the cab safe and easy. The wide glass door provided convenient access of the cab. The cab had plenty of room for the operator and had suitable space for a second person occupying the extra seat. The cab was quiet and pressurized with well filtered air. Air flow could be directed to suit the operator and the heater and air conditioner provided comfortable cab temperatures. The cab roof overhang was effective in preventing the sun from shining on the operator. The seat and steering wheel could be adjusted to suit most operators.

FIGURE 15. Chaff Spreading.

The operator had a clear view forward and to the sides. Rear visibility was provided by two convex mirrors. Typical of convex mirrors, it was difficult to judge the distances of objects appearing in the mirror. More mirrors would have been useful to gain a wider field of view to the rear.

Most operators had a clear view of the windrow coming into the pickup. However, when the header was close to the ground the operator had to lean forward to see the table auger. In a normal seated position, view of the table auger was obstructed by the steering wheel (FIGURE 16). Windows between the cab and grain tank allowed the operator to watch the grain entering the tank until it was about 40% full. After this, the operator could not view grain tank level from the operator’s seat until grain covered the screened windows on either side of the cab. This occurred when the tank was about 80% full.

FIGURE 16. View of Incoming Windrow.

Instruments: Instrumentation was very good.

Most of the instruments were located in the overhead console (FIGURE 17) and two digital displays were mounted on the steering column.

The instruments located in the overhead panel were grouped in three modules (Acre Estimator, Shaft Monitor and Warning System) along with three gauges. The Acre Estimator contained three mechanical counters for recording acres, engine and separator hours. The Shaft Monitor contained six red lights and an audible alarm that warned of a slow down of the rear feeder conveyer, tailings elevator, clean grain elevator, distribution augers, impeller chopper (discharge beater) and straw chopper. The Warning System contained eight lights indicating an open thresher door, park brake on, low engine oil pressure, high engine oil temperature, low engine blower speed, high hydraulic oil temperature, restricted engine air filter, high engine head temperature, full bin and unloading auger out and low battery voltage. One of the eight lights was used to show low engine oil pressure, high engine oil temperature or low engine blower speed. Amber lights were used on the thresher door, engine air filter and bin and unloader systems while red lights were used on the remainder. A warning was signalled by the corresponding light and an audio alarm. The warning system also had a test button and a dial to control volume of the audible alarm. The three gauges used a combination of color code and numbers that indicated battery voltage, oil pressure and engine oil temperature.

FIGURE 17. Overhead Console.

The digital displays located on the steering column displayed engine rpm, cylinder rpm, ground speed and fuel level. The left display continuously displayed engine rpm while the right display could be switched between cylinder speed, ground speed and fuel level. A low engine speed sensor was incorporated into the engine display. When the engine rpm fell below rated speed (2200 rpm) an audible alarm sounded. This alarm had a distinctive sound and was easily detected from the other warning systems alarm.

Although the instruments in the overhead console were easy to identify, the operator was distracted away from the header momentarily when viewing these instruments. This was inconvenient at times. The digital displays on the steering column were very conveniently placed allowing the operator to glance at them without shifting attention away from operating. As well, the separate displays for both engine rpm and cylinder rpm was very useful for monitoring performance.

Controls: The controls were very good.

Most of the machine function controls were located to the right of the operator (FIGURE 18). The remainder were in the overhead console, with the exception of the air conditioner temperature control, brakes and signal light lever. Accessory controls were also located to the right of the operator. The controls were conveniently placed and easy to identify and use.

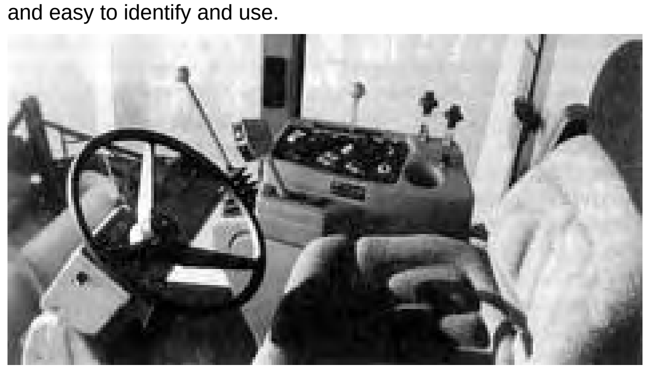

FIGURE 18. Control Console.

A neutral safety switch prevented the engine starter from engaging unless the transmission was in neutral. The throttle lever control located to the right of the operator had three stop positions, idle, full engine speed and fuel shut off. Any engine speed between idle and full speed could be selected by the throttle lever position. The gearshift was also located to the right of the operator. Gearshift action was smooth and easy, although the operator had to stretch to shift into first or third.

The mechanical park brake was located on the floor to the right of the seat. The hydrostatic control was located to the right of the operator. This location allowed the operator's arm to rest on the armrest of the seat while operating the hydrostatic control lever.

The separator, feeder and unloading auger were engaged electrically from the cab. The feeder could be engaged separately or with the separator. The header reverser was engaged by depressing and holding the reverser switch while the separator clutch was engaged. Header height and unloading auger engagement were electro-hydraulically controlled by switches located on the hydrostatic handle. Pickup speed, unloading auger position and access ladder lift were also controlled electrically from the right console. The access ladder was also controlled outside the cab by a switch at the base of the unloading auger pivot.

Manual or automatic pickup speed control was selected by a switch on the right console. Pickup speed was controlled manually with a dial. When set on automatic the pickup changed in relationship with ground speed. A minimum pickup speed and the pickup-to-ground speed ratio were set with adjusting screws located under the right control console. Cylinder speed was controlled electronically with a switch located on the right console. The fan choke position and the cab heat temperature were controlled by cable adjusters, which had coarse and fine adjustments. To make a coarse adjustment, the operator depressed a button and slid the cable control to the desired position. The fine adjustment was performed by simply turning a knob. Both had scales to show the setting. The warm air temperature was indicated on a colour coded red and blue scale and the fan choke position was a numeric scale. Both were easy to read at a glance.

The overhead console contained switches and dials for lighting, grain loss monitor, warning system alarm, unloading auger swing and acre estimator. These controls were easy to identify and use.

Loss Monitor: The loss monitor was very good in cereal grain but poor for canola, flax and mustard.

Shoe loss was monitored with two pad sensors at the rear of the chaffer. The rotor loss was monitored with a single pad sensor near the discharge. Loss level was indicated by a gauge needle located near the front of the right console. The scale on the gauge consisted of three coloured sections. Amber indicated low loss, green indicated acceptable loss and red indicated high loss. The loss monitor used an "area base" mode.

Once familiar with the monitor's behaviour and when set accordingly, the grain loss monitor provided a very useful and reliable indication of grain loss in barley, rye and wheat. It was important to recognize that the same sensitivity setting was not appropriate for both the rotor and shoe. Thus, when switching between the rotor and shoe, the monitor had to be readjusted to obtain reliable readings for each. This meant that it was set and run on whichever component had the major loss.

It was noticed that increasing rotor speed increased the meter display when in fact the loss stayed the same or decreased. The cause was not evident. The increased velocity of material hitting the rotor sensor may have caused the readout to increase.

In canola, flax, and mustard, the monitor often could not be adjusted to provide a suitable loss indication compared to observed loss. This may have been due to the air blast blowing the seed over the sensors or at other times when large amounts of MOG prevented the seed from hitting the sensors.

As with all loss monitors, meter readings had to be regularly compared to actual loss observed behind the combine for appropriate calibration.

Lighting: Lighting was very good.

Lighting for nighttime harvesting was provided by eight forward lights, an unloading auger light and a grain tank light. The forward lights illuminated the header well and provided suitable short, medium and long range lighting. The lights were adjusted to suit the pickup header and could be adjusted for wide straight cut headers as well. The clear plastic cover totally enclosed the six roof mounted lights. This cover was time consuming to remove which discouraged fine tuning of the lights to suit different operators. The unloading auger light was mounted on the left side of the cab and was not adjustable. This light illuminated the stream of grain and the truck box. The grain tank light was dim and became covered when the tank was about 90% full. This made topping off the grain tank at night difficult. It is recommended that the manufacturer consider providing better grain tank lighting.

Lights mounted behind the left and right access panels and under the engine hood made night servicing convenient.

The controls and instrumentation panel were lit only by the reflection of the forward lights. The switches on the right control panel and overhead console were identifiable but the symbols and lettering were difficult to read when operating. The gauges and loss monitor meter back lighting provided easy night viewing. One ceiling mounted interior light brightened the cab, making it easy for the operator to see all areas.

Two tail lights and four flashing warning lights aided in safe road transport.

Handling: Handling was very good.

The AGCO R72 was easy to drive and maneuver. The steering and hydrostatic ground drive were smooth and responsive. Although, when tilted fully rearward the steering wheel had a intermittent resistance from the universal connection in the steering column. During the first few hours of operating most operators noticed the action but after a period of time became used to it. The turning radii and quick steering allowed the AGCO R72 to pick around most windrow corners. Due to the larger right turning radius, right turns required swinging left and turning slightly before the corner in order to utilize the full width of the pickup. Although the wheel brakes did assist in cornering, considerable force was needed to apply them effectively.

The hydrostatic ground drive was very convenient for matching ground speed to crop conditions and made backing up quick and easy on hard-to-pick corners. The speed ranges in the various gears were appropriate with most harvesting being done in second or third gear.

The combine was very stable in the field even with a full grain tank. Normal caution was needed when operating on hillsides and when travelling at transport speeds. The combine transported well at speeds up to the maximum speed of 22.5 mph (36.2 km/h).

Adjustment: Ease of adjustment was good.

Pickup, fan choke and cylinder speed were adjusted from in the cab. Concave clearance, sieve openings, tailing returns and small seed kit were adjusted on the machine.

Table auger clearance, table auger finger timing, table auger stripper position, front feeder drum height, and cleaning sieve angle were easily adjusted with the aid of hand tools. Although there were a lot of adjustments, once adjusted for suitable performance, they seldom had to be readjusted.

Initial proportioning of the concave to the rotor was made simple and positive by adjusting turnbuckles at the rear and eye bolts on the front. Gauging clearances was easy due to access through the large rotor door at the rear of the rotor and to the front through a door in the grain tank. Adjusting the concave for operating was done with a lever on the right side near the tailings elevator. PAMI installed two locking nuts on the adjusting rod to prevent the concave from contacting the rotor. It is recommended that the manufacturer consider modifications to prevent the concave from being adjusted into contact with the rotor.

The rotor speed and fan choke were convenient to adjust. Air acting on the fan choke when the separator was at full speed made coarse adjustment difficult.

Concave filler strips were placed between the concave bars and attached to the concave by clamping them to the concave wires using four stud bolts. This was time consuming when a number of bars were installed or removed.

The chaffer tailing and cleaning sieve used a lever with a friction plate. The levers were easy to move and the sieves could be set to any desired openings. The cleaning sieve adjusting lever was accessible through a hinged door. To direct the return tailing to either the rotor or accelerator rolls, a hatch at the top of the return elevator had to be inverted. Limited access made removing this door difficult. Once this hatch was inverted, the returns could be easily directed by sliding a locking knob at the bottom of the return elevator.

Field Settings: Ease of setting components to suit crop conditions was very good.

Once familiar with the combine's performance, setting was usually quick and little fine tuning was required.

Threshing was easy to set for in all crops. The straw spreader was easily removed using hand tools. This provided an easy means to check processed straw. Maximum rotor rpm and minimum concave clearance provided the most aggressive threshing. These aggressive settings were often used in hard-to-thresh crops such as Katepwa wheat. In flax, and occasionally in wheat, filler strips were installed to assist threshing. In easier-to-thresh crops, a lower rotor speed and increased concave clearance were used.

Separation was also easy to set for since the setting, which provided suitable threshing also usually provided acceptable separation. Maximum separation was obtained with the rotor at the high speed and the concave at minimum clearance. To minimize straw break up and shoe loading in easier threshing crops like canola, the rotor speed was decreased to 600 rpm and the concave clearance increased.

To view or gather a grain sample from the grain bin, the operator had to climb the access steps on the tank side. Sample cleanliness was usually easily controlled by adjusting the clean grain sieve. No provision was made to easily check return tailings, which would have been useful. It is recommended that the manufacturer consider providing a safe and convenient method for sampling the return tailings.

With the straw spreader removed, shoe discharge could be checked from directly behind or from the right side. Straw discharge made checking shoe loss from the left difficult. Checking the shoe from behind allowed easy checking for loss and distribution uniformity. A wide range of shoe settings usually were possible while still maintaining low loss. The fan choke was typically set as high as possible without blowing grain into the return or off the chaffer. The chaffer and cleaning sieve were set as wide open as possible without allowing trash into the clean grain. However, as mentioned in the cleaning section, increasing fan setting above 5 provided very little more air. As well, setting the chaffer wide open increased shoe loss in barley, rye and wheat due to reduced air flow through the middle of the chaffer. Closing the cleaning sieve improved cleanliness of sample but at the same time increased the amount of grain entering the return system. High return loads overloaded the shoe on the right if directed to the accelerator rolls and increased rotor loss when directed to the rotor.

Unplugging: Ease of unplugging was very good. The header, rotor, feeder and discharge beater grate plugged during the test.

The table auger plugged occasionally when dense wads of crop wedged under the table auger. The header reverser easily backed out these obstructions.

The feeder plugged only once during the test. This occurred in a large tough wheat windrow. The feeder reverse would not back out the plug since the large dense wad would not pass back under the front drum. The operator had to open the access doors in the feeder and pull material from under the feeder chain. After some material was removed the feeder reverser backed out the rest.

The rotor plugged in tough and green windrows. It was easily unplugged by dropping the concave, reversing the header, shifting the rotor gearbox into low and engaging the separator. On some occasions the thresher door tripped open. The door was left open until the plug was cleared.

On one occasion the discharge beater grate became completely blocked. This did not restrict material flow through the combine but prevented any free grain from passing through it. This occurred in tough and weed infested barley. The grate was easily unplugged by pushing the material through the holes from the bottom.

Machine Cleaning: Ease of cleaning the AGCO R72 completely was very good.

Cleaning the grain tank was easy. The tank was open and accessible. Only about 0.7 bu (0.02 m³) of grain remained in the tank. Grain was left under the cross auger, in the unloading auger and on various ledges. The unloading auger was cleaned through the access doors at the base of the unloading auger.

Some grain remained on the grain pan and under the clean grain and tailings auger. A slide pan over the tailings auger restricted access and made cleaning difficult. The grain pan was easily cleaned with a vacuum while the sieves had to be removed to clean the clean grain auger.

Chaff and straw were easily cleaned from the engine compartment and internal machine components with the aid of a blower. The large rotor access door and access doors in the grain tank allowed clear access to the rotor cage and distribution auger for easy cleaning.

The small amount of chaff on the exterior of the machine was easily removed with the aid of a blower. Fine dust built on the inside surface of the separator clutch pulley. This dust was packed by centrifugal force and had to be broken up with a tool, or removed with compressed air.

Lubrication: Ease of lubrication was good.

Daily lubrication was easy, requiring about 5 minutes. Of the 48 pressure grease fittings, two required service at 10 hours, forty-two at 50 hours, and four once a season. The manufacturer also suggested lubricating one roller chain at 10 hour intervals. The manufacturer also recommended periodic lubrication of two sealed chains. The 50 hour service took approximately 25 to 30 minutes, while daily service required 5 minutes. No grease banks were provided, although they would have reduced lubrication time and would have improved the ease of servicing.

Engine, hydraulic and gearbox oil levels required regular checking. Changing engine oil was easy, however, removing the hydraulic suction screens was difficult.

The fuel inlet was approximately 8 ft (2.4 m) above the ground and was difficult to fill from some gravity fuel tanks.

Service schematics were placed on the combine and in the operator’s manual, which helped locate the service points, thus reducing time to lubricate. The schematics on the combine were colour coded and correct while the black and white schematics in the manual gave a couple of incorrect references.

Maintenance: Ease of performing routine maintenance was good.

Most shields or panels were hinged or easily removed to provide access to the drives for lubrication and adjustment. Most belts had spring-loaded idlers and the chain drives had bolt tighteners for simplified maintenance.

The spring tensioned feeder chains reduced the frequency of adjustment needed. Slip clutches protected the table auger, feeder, tailings, and clean grain drives.

The engine was accessible from the sides, back and top. Access to the front of the engine was restricted. The cooling fins on the engine remained clean throughout the test without cleaning. Cab and engine air filters were easily removed for servicing.

The rotor was quick and easy to remove from the side of the combine. However, a hoist or crane was needed to support the weight of the rotor. The concave was accessible through the large rotor access door. However, the weight and size of the concave made removal difficult.

The table and primary feeder assembly could be removed quickly with the aid of only a few hand tools.

ENGINE AND FUEL CONSUMPTION

The Deutz diesel engine started quickly and ran well. The engine had adequate power to achieve feedrates that limited combine capacity in uniform windrows. It also had sufficient torque reserve to recover from over loading in dry conditions.

Average fuel consumption was 9.5 gal/h (43.0 L/h) based on separator hours of operation and 6.9 gal/h (31.6 L/h) based on engine hours. Oil consumption was insignificant.

OPERATOR SAFETY

No safety hazards on the AGCO R72 were apparent. However, normal safety precautions were required and warnings had to be heeded.

The operator’s manual emphasized safety. The AGCO R72 had warning decals to indicate dangerous areas. All moving parts were well shielded and the shields were easily removed and replaced.

The neutral safety switch incorporated in the transmission ensured the combine would not move when started. The safety switch in the operator’s seat disengaged the feeder, separator and unloading auger if the operator left the seat. The combine came equipped with a horn to provide the operator with a means to warn individuals outside the machine. The AGCO R72 would start when the separator, unloading auger and feeder were engaged. This made it vitally important that the operator disengage all drives and shut oft the engine before making adjustments or working on the combine. A header safety stop was provided and should be used when working near the header or when the combine is left unattended.

The combine was equipped with a slow moving vehicle sign, warning lights, signal lights, road lights and rear view mirrors to aid in safe road transport.

While these safety features were effective, PAMI still emphasizes the importance of conscientious maintenance and operating practices to prevent accidents or injury.

A fire extinguisher, class ABC, should be carried on the combine at all times.

OPERATOR'S MANUAL

The operator's manual was good.

The operator's manual was well organized and well written. However some incorrect referencing occurred and some pictures needed to be updated. A table of contents and index made finding specific information quick and easy.

The manual contained sections on safety, operating controls and instrumentation, service, adjustments, setting up instructions, combine operation and specifications. A separate manual provided information on the header.

MECHANICAL HISTORY

The intent of the test was evaluation of functional performance.

Extended durability testing was not conducted. However, TABLE 6 outlines the mechanical history of the AGCO R72 for the 115 hours of operation during which about 1317 ac (533 ha) of crop were harvested.

TABLE 6. Mechanical History

Item	Operating Hours	Equivalent Field Area ac	(ha)
-Grain leaked from the top of grain elevator and was sealed at	Beginning of test.		
-Cylinder belt failed and replaced at	18.5	155	(63)
-Pickup tooth detached and replaced at	19	155	(63)
-Throttle cable spring disconnected from stub, washer was installed and spring was replaced at	23.5	200	(81)
-Pickup belt idler tension spring broke and replaced at	75	795	(322)
-Left concave eye bolt failed and was replaced at	87	1015	(411)
-Bent concave bars were noticed	102	1150	(466)
-Right shield hinge failed and was welded at	104	1175	(476)

Grain Leak: Small amounts of grain leaked past the slide access door on the top of the clean grain elevator. It is recommended that the manufacturer consider modifications to prevent grain leaks between the clean grain sliding access door and clean grain elevator.

Cylinder Belt Failed: The backing on the belt separated resulting in cord failure. Pieces of the belt contacted and broke the hydraulic union used for the cylinder variable speed. The belt and hydraulic union were replaced.

Throttle Cable Spring Disconnected: The throttle cable spring disconnected from the stub and when the throttle lever was pulled back to idle, engine rpm remained at 1600. The recess on the stub was not deep enough to retain the spring. A washer was installed and the spring was replaced. On replacing the spring, idle speed returned to the proper 1200 rpm.

Left Concave Eye Bolt Failed: Failure of the eye bolt used to adjust the front clearance of the concave was noticed during daily inspection.

The exact cause of the failure was unknown. At sometime after failure, the front left concave bar contacted the cylinder damaging the hardened surface of the front concave bar (FIGURE 19). Damage to the cylinder was insignificant. The eye bolt was replaced. On replacing the eye bolts, fractures and a missing bolt were noticed on the filler strip at the front of the concave. Two pieces were removed and repaired at the end of the season.

FIGURE 19. Damaged Hardened Surface and Bent Concave Bars.

Bent Concave Bars: When operating in flax, several concave bars bent (FIGURE 19). The exact cause of the bending was undetermined, however, a number of green and very tough piles had been taken in.

APPENDIX I
SPECIFICATIONS

MAKE:	AGCO
MODEL:	R72
SERIAL NUMBER:	Header - 1333092P Body - P723532 Engine - 8102914
WINDROW PICKUP:	
-- make	Rake-Up
-- model	14M
-- type	reel with bars and transfer drapers
-- pickup width	12.5 ft (3.8 m)
-- number of reel bars	6
-- teeth per bar	32
-- type of teeth	plastic
-- number of transfer belts	8
-- number of rollers	
- transfer drapers	2
-- height control	non-castoring gauge wheels
-- speed control	electro-hydraulic
-- speed range	
-- reel bars	0 to 393 ft/min (2.0 m/s)
-- transfer drapers	0 to 668 ft/min (3.4 m/s)
HEADER:	
-- type	offset centre (right)
-- width	
-table	1 2.8 ft (3.9 m)
-feeder house	39.0 in (990 mm)
-- auger diameter	24.1 in (614 mm)
-- feeder conveyor	2 stage 3 roller chain with staggered C slatted conveyor
-- conveyor speed	
-first stage	521 ft/min (2.64 m/s)
-second stage	545 ft/min (2.77 m/s)
-- pickup height	
-range	-38.2 to 42.4 in (-0.97 to 1.01 m)
-- number of lift cylinders	2
-- raising time	adjustable (3.7 s min)
-- lowering time	adjustable (4.0 s min)
STONE PROTECTION:	
-- type	concave door under cylinder inlet
-- ejection	force or impact release roller latch; manually reset with special tools
ROTOR:	
-- type	transverse mounted, open centre hardened and chromed rasp bars (25% reverse angle bars) paddles at discharge
-- number of rasp bars	8
-- diameter	24.4 in (620 mm)
-- width	
-rasp bar	72.2 in (1835 mm)
-discharge	15.5 in (395 mm)
-- drive	electric clutch engagement hydraulic control led variable pitch belt
-- speed	
-low range	210 to 530 rpm
-high range	440 to 1100 rpm
-- option	reverse angle bars
CONCAVE (THRESHING):	
-- type	bar & wire
-- number of bars	14
-- configuration	5 interval with 0.375 in (9.5 mm) wire and 0.79 in (20 mm), two stage clearance adjustment
-- width	39.1 in (995 mm)
-- radial length	22.8 in (580 mm)
-- wrap	107 degrees (maximum)
-- total area	895 in^2 (0.577 m^2)
-- open area	396 in^2 (0.256 m^2) 44%
-- grain delivery to shoe	distribution auger, accelerator rolls and grain pan
-- option	filler bars
SEPARATOR CONCAVE:	
-- type	bar & wire
-- number of bars	15
-- configuration	6 interval with 0.38 in (9.6 mm) diameter wires and 0.68 in (17.8 mm) spaces
-- width	38.1 in (970 mm)
-- radial length	26.6 in (675 mm)
-- wrap	114 degrees
-- area	
-total	1015 in^2 (0.655 m^2)
-open	489 in^2 (0.316 m^2) 48%
-- grain delivery to shoe	distribution augers, accelerator rolls and grain pan

SEPARATOR GRATE:

-- type	stamped metal
-- configuration	rotor cage stamped at various locations
-- area	
-total	2754 in^2 (1.776 m^2)
-open	1507 in^2 (0.972 m^2) 53%
-- spirals	
-number	12
-pitch	30 degrees
-- grain delivery to shoe	distribution augers, accelerator rolls and grain pan

BEATER:

-- type	4 wing box
-- diameter	24.2 in (616 mm)
-- speed	780 rpm

BEATER GRATE:

-- type	stamped metal
-- length	17.9 in (455 mm)
-- width	11.8 in (300 mm)
-- area total	211 in^2 (0.137 m^2)
-- area open	124 in^2 (0.080 m^2) 58%

SHOE DELIVERY:

-- distribution augers	
-number	2
-diameter	4.8 in (121 mm)
-pitch	10.8 in/turn (275 mm/turn)
-- accelerator rolls	
-number	2
-diameter	4.2 in (106 mm)
-- option	distribution plates

SHOE:

-- type	single action
-- travel	0.6 in (15 mm) vertical 1.3 in (33 mm) horizontal
-- speed	312 cpm
-- chaffer sieve	
-type	regular tooth - adjustable
-tooth depth	0.9 in (22 mm)
-louvre spacing	1.3 in (29 mm)
-total area	2321 in^2 (1.50 $m^2$2)
-effective area	2265 in^2 (1.46 m^2)
-- tailings sieve	
-type	regular tooth - adjustable
-tooth depth	0.9 in (22 mm)
-louvre spacing	1.3 in (29 mm)
-total area	552 in^2 (0. 36 m^2)
-effective area	434 in^2 (0.28 m^2)
-- cleaning sieve	
-type	regular tooth - adjustable
-tooth depth	0.4 in (10 mm)
-louvre spacing	1.3 in (29 mm)
-total area	3521 in^2 (2.27 m^2)
-effective area	2247 in^2 (1.49 m^2)

CLEANING FAN:

-- type	cross flow
-- diameter	11.0 in (280 mm)
-- width	63.4 in (1610 mm)
-- drive	belt
-- speed	1220 rpm
-- air control	mechanically varied choke inlet plate

ELEVATORS:

-- type	roller chain with rubber paddles
-- clean grain (top drive)	9.2 x 10.3 in (234 x 261 mm)
-- returns (top drive)	5.2 x 8.5 in (132 x 217 mm) returns directed to either cylinder or accelerator rolls

GRAIN TANK:

-- capacity	297 Imp. bu (10.8 m^3)
-- unloading time	119 seconds
-- unloading auger diameter	10.8 in (273 mm)
-- unloading auger length	17.4 ft (5.3 m)

STRAW SPREADER:

-- type	rotating disc, four metal paddles with rubber tips
-- diameter	54.3 in (1380 mm)
-- speed	280 or 160 rpm

ENGINE:

- make	Deulz
- model	BF8L-51 3C
- type	Twin Turbocharged, Air Cooled Diesel
-number of cylinders	8
- displacement	779 in^3 (128 L)
- governed speed (full throttle)	2480 rpm
- manufacturer's rating	298 hp (222 kW)
- fuel tank capacity	132 gal (600 L)

CLUTCHES:

-- header	electric
-- separator	electric
-- unloading auger	electric

NUMBER OF CHAINS: 4

NUMBER OF BELT DRIVES: 15

NUMBER OF GEARBOXES: 3

LUBRICATION POINTS:

-- 10 h	2
-- 50 h	42
-- seasonally	4

TIRES:

-- front	30.5 L - 32
-- rear	16.9 - 24

TRACTION DRIVE:

-- type	hydrostatic, 4 speed transmission
-- speed range	
-first gear	2.9 mph (4.7 km/h)
-second gear	5.8 mph (9.3 km/h)
-third gear	11.2 mph (18.2 km/h)
-fourth gear	22.5 mph (36.2 km/h)

OVERALL DIMENSIONS:

-- wheel tread (front)	10.0 ft (3.05 m)
-- wheel tread (rear)	10.6 ft (3.24 m) adjustable
-- wheel base	11.0 ft (3.35 m)
-- transport height	11.8 ft (3.60 m)
-- transport length	33.0 ft (10.05 m)
-- transport width	16.3 ft (4.98 m)
-- field height	13.9 ft (4.24 m)
-- unloader discharge height	13.1 ft (3.99 m)
-- unloader reach	12.7 ft (3.88 m)
-- unloader clearance	12.0 ff (6.98 m)
-- turning radius	
-left	22.9 ft (6.98 m)
-right	26.9 ft (8.20 m)

WEIGHT (GRAIN TANK EMPTY):

-- right front wheel	9740 lb (4420 kg)
-- left front wheel	10,140 lb (4600 kg)
-- right rear wheel	4190 lb (1900 kg)
-- left rear wheel	4190 lb (1900 kg)
TOTAL	28,260 lb (12,820 kg)

APPENDIX II

PAMI REFERENCE II COMBINE CAPACITY RESULTS

The tables below and FIGURES 20 and 21 present the capacity results for the PAMI Reference II Combine in various barley and wheat crops for 1988 to 1992.

FIGURE 20 shows capacity differences in barley crops for the different years, The 1992 Harrington barley crop had above average grain and straw yield. The grain and straw moisture contents were in the tough range. The high moisture content of the straw resulted in significantly higher than average MOG feedrates at 3 and 1.5% total loss levels.

FIGURE 21 shows the differences in wheat crops. In 1992, the Katepwa wheat crop selected had average grain and straw yield with average grain and straw moisture. The grain was damaged by frosts, but did not affect grain bushel weight. Wheat capacity in 1992 ranged near average for the Reference II.

The above average capacity of the Reference II in barley and average capacity in wheat during the 1992 season indicates that the combines tested alongside the Reference II would also likely have had a similar correlation in capacity. Results show that the Reference II combine is important in determining the effect of crop variables and in comparing results of combines evaluated in different years.

Reference Combine Capacity Results for 1992

CROP CONDITIONS								
Crop	Variety	Cut Width		Crop Yield		Moisture Content		MOG/G Ratio
		ft	m	bu/ac	t/ha	Straw %	Grain %	
Barley	Brier	30	9.1	84	4.5	21.0	13.5	0.59
Barley	Harrington	30	9.1	85	4.6	25.0	18.6	1.58
Wheat	Katepwa A	24	7.3	49	2.6	9.3	13.8	1.18
Wheat	Katepwa B	60	18.3	32	1.7	10.4	15.0	1.14
Wheat	Laura	42	12.8	39	2.1	10.3	12.4	1.11

CAPACITY AT 3%										
Crop	Variety	Feedrates						Grain Cracks	Dock-age	Foreign Material
		MOG		Grain		Total				
		lb/min	t/h	bu/h	t/h	lb/min	t/h	%	%	
Barley	Brier	345	9.4	730	15.9	930	25.3	1.1	0.5	0.1
Barley	Harrington	585	15.9	460	10.0	955	26.0	1.2	0.5	0.1
Wheat	Katepwa A	575	15.6	485	13.2	1060	28.8	2.7	1.2	0.4
Wheat	Katepwa B	605	16.5	530	14.4	1135	30.9	2.6	1.4	0.4
Wheat	Laura	591	16.1	530	14.4	1125	30.6	2.6	1.3	0.1

CAPACITY AT 1.5%										
Crop	Variety	Feedrates						Grain Cracks	Dock-age	Foreign Material
		MOG		Grain		Total				
		lb/min	t/h	bu/h	t/h	lb/min	t/h	%	%	%
Barley	Brier	285	7.8	605	13.2	770	21.0	1.2	0.6	0.1
Barley	Harrington	445	12.1	352	7.7	725	19.7	1.2	0.6	0.1
Wheat	Katepwa A	500	13.6	425	11.6	925	25.2	2.7	1.2	0.5
Wheat	Katepwa B	520	14.2	455	12.4	975	26.5	2.6	1.3	0.5
Wheat	Laura	525	14.3	475	12.9	1000	27.2	2.8	1.1	0.1

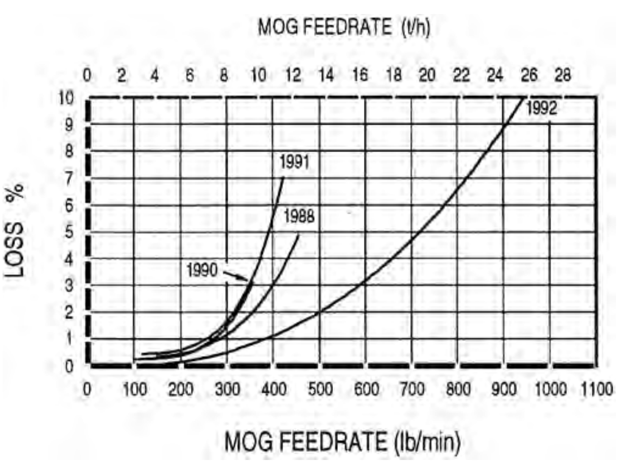

FIGURE 20. Total Grain Loss for the PAMI Reference II Combine in Barley.

Reference Combine Capacity Results for Previous Years

CROP CONDITIONS									
Crop	Variety	Cut Width		Crop Yield		Moisture Content		MOG/G Ratio	Year
		ft	m	bu/ac	t/ha	Straw %	Grain %		
Barley	Ellis	30	9.1	63	3.7	12.9	13.0	0.82	1988
Barley	Harrington	42	12.8	71	3.8	9.9	13.4	1.16	1991
Barley	Heartland	25	7.7	92	4.9	8.9	10.8	0.81	1990
Wheat	Katepwa	30	9.1	35	2.4	4.7	12.9	0.65	1988
Wheat	Katepwa	30	9.1	57	3.8	11.5	14.5	0.64	1989
Wheat	Katepwa	42	12.8	45	3.1	7.7	16.0	1.07	1991

CAPACITY AT 3%										
Crop	Variety	Feedrates						Grain Cracks	Dock-age	Foreign Material
		MOG		Grain		Total				
		lb/min	t/h	bu/h	t/h	lb/min	t/h	%	%	
Barley	Ellis	400	10.9	665	14.5	930	25.3	1.3	0.6	0.1
Barley	Harrington	350	9.5	580	12.6	815	22.2	2.1	0.7	0.0
Barley	Heartland	355	9.7	700	15.2	920	25.0	1.6	4.0	3.6
Wheat	Katepwa	540	14.7	580	12.6	1120	30.5	1.7	2.0	0.3
Wheat	Katepwa	405	11.0	370	8.1	775	21.1	2.8	0.5	0.3
Wheat	Katepwa	555	15.1	515	11.2	1070	29.1	2.8	2.3	1.1

CAPACITY AT 1.5%										
Crop	Variety	Feedrates						Grain Cracks	Dock-age	Foreign Material
		MOG		Grain		Total				
		lb/min	t/h	bu/h	t/h	lb/min	t/h	%	%	%
Barley	Ellis	325	8.8	541	11.8	760	20.7	1.0	0.5	0.1
Barley	Harrington	290	7.9	480	10.5	675	18.4	2.2	0.7	0.0
Barley	Heartland	300	8.2	600	13.1	755	20.5	1.6	4.0	3.6
Wheat	Katepwa	465	12.7	500	10.9	965	26.3	2.1	2.0	0.2
Wheat	Katepwa	335	9.1	305	6.6	640	17.4	3.5	0.5	0.4
Wheat	Katepwa	470	12.8	435	9.5	905	24.6	3.0	2.3	1.1

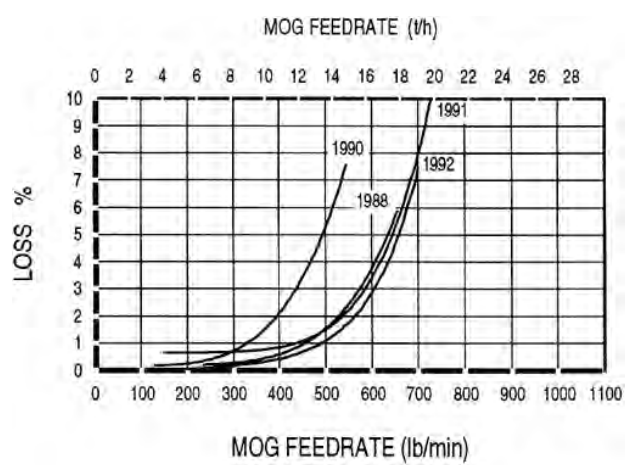

FIGURE 21. Total Grain Loss for the PAMI Reference II Combine in Wheat.

SUMMARY CHART
AGCO R72 GLEANER COMBINE

RETAIL PRICE	$195,665.00 (June, 1993, f.o.b. Humboldt, Saskatchewan)
CAPACITY	
Compared to Reference II	
- barley	1.6 and 2.1 x Reference II
- wheat	1.5 and 1.7 x Reference II
MOG Feedrates	
- barley - Brier	555 lb/min (15.1 t/h) at 3.0% total loss, FIGURE 4
- barley - Harrington	1245 lb/min (33.8 t/h) at 3.0% total loss, FIGURE 5
- wheat- Katepwa	1005 lb/min (27.3 t/h) at 3.0% total loss, FIGURE 6
- wheat - Laura	890 lb/min (24.2 t/h) at 3.0% total loss, FIGURE 7
QUALITY OF WORK	
Picking	**Very Good;** picked well in all crops, even windrows on the ground
Feeding	**Good;** smooth crop flow in narrow windrows, table auger and feeder plugged in large bunchy windrows
Stone Protection	**Good;** thresher door ejected most stones
Threshing	**Very Good;** aggressive threshing, filler strips in flax and some wheat
Separating	**Very Good;** low loss, no bridging or plugging on grate or concaves
Cleaning	**Good;** usually low loss in cereals, but limited capacity in canola, mustard and flax
Grain Handling	**Very Good;** large tank was convenient in high yielding crops
Straw and Chaff Spreading	**Good;** straw spread evenly up to 22 ft (6.7 m); chaff up to 16 ft (4.9 m)
EASE OF OPERATION AND ADJUSTMENT	
Comfort	**Very Good;** quiet, roomy cab, passenger seat
Instruments	**Very Good;** most functions monitored separate displays for cylinder and engine
Controls	**Very Good;** well placed, easy to use
Loss Monitor	**Very Good;** in cereals **Poor;** in canola, mustard and flax
Lighting	**Very Good;** forward area well lit
Handling	**Very Good;** brakes seldom required around corners, relatively large right turning radius
Adjustment	**Good;** most adjustments in cab; concave adjusted out of cab
Field Setting	**Very Good;** little fine tuning required
Unplugging	**Very Good;** feeder reverser worked well
Machine Cleaning	**Very Good;** all areas accessible except tailings auger
Lubrication	**Good;** decals in manual and machine
Maintenance	**Good;** most areas easily accessible
ENGINE AND FUEL CONSUMPTION	
Engine	Started quickly, ran well, good torque reserve
Fuel Consumption	9.5 gal/h (43.0 L/h) based on separator hours
OPERATOR SAFETY	Well shielded and many safety features
OPERATOR'S MANUAL	**Good;** well organized and easy to find information, some incorrect referencing
MECHANICAL HISTORY	A few mechanical problems occurred

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