A SUMMARY OF THE FIELD TEST RESULTS OF THE HYDROGRAB CANE LOADER

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Introduction

The introduction of the self-loading cane trailer into the harvesting systems employed in Natal, has achieved the following advantages over the former method of hand loading the cane.

1. The cutting crew has been completely divorced from the transport system.
2. A standard cutting and stacking task can be set and the cutters are free to leave the field once this task has been completed.
3. The individual cutter can be made responsible for completing his basic task based on weight, and a bonus can be paid as an incentive to cut additional cane.
4. The fast cutter is not kept in the field to assist the slow cutter in loading the cane.
5. The above advantages have led to a far more contented cutting crew.
6. Cutting and stacking can continue in spite of a breakdown in the transport system and the cane can be moved at a later stage, even at night if necessary, without the help of the cutters.
7. The transport system is highly flexible and can be moved from one cutting area to another, at a moment's notice.

Harvesting systems employing self-loading trailers have resulted in increasing the individual cutter's output to a degree, with an Industrial average of between 3 and 3½ tons per unit, although higher outputs of from 5 to 8 tons have been reported.

While present labour conditions are such that there is no immediate need for increased mechanisation of the harvesting operation, the fact that labour shortages have occurred in the past, coupled with the trend towards increased industrialisation throughout South Africa, should be sufficient to cause each cane farmer to consider ways and means of reducing the number of labour units in his employ.

In studying the time it takes a cane cutter to complete his daily task, it was found that he spends approximately 80 per cent of his time cutting, using the remainder to either load the cane onto a golovan or to stack it for loading by a self-loading trailer. It is apparent, however, that the task of lifting, carrying and loading or stacking is far more tiring and requires more physical exertion than cutting the cane, especially if the cane has to be carried over long distances and up ladders.

From an engineering standpoint, it is far easier and less expensive to mechanise the loading operation than the cutting operation, especially when one has to handle badly lodged, twisted or trashed cane.

This paper is a summary of the data compiled during three seasons of field testing of the "Hydrograb" extension boom and cane grab, which was offered to the Mechanisation Committee by Messrs. R. Scott & Co. (Pty.) Ltd., and various Massey-Ferguson tractors. It should be noted that in field testing this machine, the loading operation was so organised that none of the advantages discussed above were lost, and that the introduction of the loader was so arranged to disrupt as little as possible the normal harvesting routine.

Brief Description of the Machine

The field test was conducted during the 1960, 1961 and 1962 seasons, during which various changes were made to the machine so as to improve its performance. For the purpose of this summary, all data etc. will be headed by the particular year concerned.

The machine can be divided in three basic units, namely the "Hydrograb" with its extension boom and cane grab, the hydraulic loader and the tractor.

1960

The "Hydrograb" was manufactured and submitted to the Mechanisation Committee by Messrs. R. Scott & Co. (Pty.) Ltd., P.O. Box 6, Maydon Wharf, Durban. This unit consists of an extension boom, to the end of which is pivoted, on a long shaft, a hydraulically operated cane grab which can swing freely through the vertical plane but cannot slew through the horizontal plane.

A "Horndraulic" loader, manufactured by Steel Fabricaters, Cardiff, United Kingdom, and submitted to the committee by Messrs. R. Scott & Co. (Pty.) Ltd., was attached to a standard Massey-Ferguson 35 tractor, which was supplied by the farmer on whose farm the machine was tested.

1961

The original "Hydrograb" cane grab was used throughout the 1961 season, while the extension boom was replaced half way through the test, by one of a new design.

A Massey-Ferguson 702 Industrial tractor and loader, manufactured and submitted on a hire basis by Messrs. Massey-Ferguson (S.A.) (Pty.) Ltd., P.O. Box 233, Vereeniging, was used.

1962

The original cane grab and the re-designed extension boom was used throughout the 1962 tests.

A Massey-Ferguson 205 Industrial tractor with hydrostatic transmission and a Massey-Ferguson 702 loader was submitted by Messrs. Massey-Ferguson (S.A.) (Pty.) Ltd.

The tractor was powered by a three-cylinder diesel engine and was fitted with an instant forward-reverse transmission plus torque converter. Six-ply 7.50 x 16, and six-ply 13 x 24 tyres were fitted to the front and rear wheels respectively. The rear tyres were not water ballasted as in previous tests but a set of rear wheel weights were fitted, each weighing 160 pounds. At the beginning of the test a "transporter box" half filled with earth was fitted to the three-point hitch to act as a counterbalance weight, however, this was replaced later in the test by a specially designed, earth filled, 44 gallon drum mounted at the rear of the tractor.

The 702 loader is of box-frame construction with two hydraulic rams being used to raise and lower the boom. The loader, with Hydrograb fitted, has a safe working load of 600 pounds and is able to load to a height of fifteen feet. The maximum outreach of the grab beyond the front tractor wheels is almost nine feet.

The Scope and Purpose of The Test

Most of the test during the three seasons, was conducted on the Umhlatuzi Flats where cane was loaded into 3½ ton golovans operating on a 24 in. gauge tramline. A limited test during the 1961 and 1962 seasons was also conducted on a farm at Gingindhlovu where the cane was loaded into two to three ton infield trailers, which were loaded to a height of approximately 6 ft.

The following amounts of cane were loaded:

	1960		1961		1962	
	Tons cane loaded	No. Golovans or trailers loaded	Tons Cane loaded	No. Golovans or trailers loaded	Tons Cane loaded	No. Golovans or trailers loaded
Umhlatuzi Flats	4,716	1,851	3,011	1,345	1,538	429
Gingindhlovu	—	—	917	314	114	39
Total	4,716	1,851	3,928	1,659	1,652	468

Total tons loaded during the entire test: 10,296 tons.

Total number of golovans or trailers loaded: 3,978.

The purpose of the 1960 test was as follows:

(*a*) to subject the loader to a prolonged test of loading cane under practical conditions and to study the efficiency of loading and the effect it had on the rate of cutting.

(*b*) To test the strength of the loader.

(*c*) To observe the effect its operation had on the tractor.

(*d*) To determine whether it is able to fit in with the normal system of harvesting.

During this test, it was found that although the loader could fit in with the normal harvesting operation, its construction was not robust enough to stand up to the work. Trouble was also experienced with the tractor and it was decided therefore that the 1961 test be run to:

(*a*) subject the re-designed "Hydrograb" unit to a prolonged practical test to determine whether the problems experienced in the earlier test had been overcome;

(*b*) determine whether the Massey-Ferguson 702 Industrial tractor was better suited, to this type of work than the Massey-Ferguson 35 tractor used in the previous test, and to observe the advantages of:

(i) the independent hydraulic system;

(ii) the heavy duty clutch;

(iii) the foot throttle;

(iv) the power steering.

(*c*) determine the advantages of using the Massey-Ferguson 702 loader in place of the Horndraulic loader used in the earlier test;

(*d*) obtain further performance data.

The 1961 test showed that most of the troubles which had been experienced with the "Hydrograb" and the "Horndraulic" loader had been overcome, however, considerable trouble was still being experienced with the clutch. The tractor driver also showed signs of fatigue and it was decided therefore that a further season of tests would be conducted using a tractor with a hydrostatic transmission to determine:

(*a*) whether the Massey-Ferguson 205 tractor could effectively overcome all clutch problems presented by the Massey-Ferguson 702.

(*b*) whether faster and more efficient loading could be achieved with this type of transmission bearing in mind the "operator fatigue factor".

(*c*) To continue the prolonged practical test of the Hydrograb to see if any mechanical or structural defect would show up.

(*d*) To obtain performance data.

All these tests were carried out under normal field conditions, loading both trashed and burnt cane.

Results of The Tests

This series of tests has resulted in the Hydrograb unit being modified to the point where it will stand up to the conditions found on the average cane farm.

Although there is a tendency of the grab jaws to bend outwards after a period of work thereby allowing cane to fall out of the grab, this is not considered serious as these can be bent back to their original position, a job which is only required after loading, from 5,000 to 6,000 tons of cane. It is planned to have an added adjustment in the production model which will close the gap between the grab times caused by the bending, thereby increasing the tons loaded to almost 8,000 tons before heating and re-bending is required.

The 702 loader gave no trouble at all during the 1961 and 1962 tests and it is felt that only loaders of this type should be used for this operation. The lighter loaders such as the one used in the 1960 test are not built strong enough for the work required

It is obvious from the 1962 results that an industrial type tractor equipped with a "hydrostatic" transmission and torque converter is necessary if large tonnages are to be handled. The recurring clutch trouble experienced in the two earlier tests was completely eliminated and the operator seemed quite happy to operate the machine and showed no signs of fatigue as he had done when operating the previous tractors.

A bumper was fitted to the front of the tractor and a hitch to the rear to facilitate better and more efficient operation when shunting golovans.

It is now felt after loading more than 10,000 tons of cane with this machine, that it can fit in with the normal system of harvesting cane.

It was found that it is best operated with the cutting face running across the rows rather than parallel to them. Each cutter was given a set number of rows of a specified length as his daily task. All he had to do was to cut and top the cane and throw the sticks into bundles weighing from 400 to 600 pounds. This eliminated hand loading which increased the cutters' daily production.

By having the cutting face running across the rows of cane, the tractor was able to run back and forth along the rows which provided a far smoother operation than would have been the case running across the rows. On the "Flats", portable tramline was laid along the fire breaks which were cut across the lines of cane. It was found that this resulted in a far more stable track than when the line was run parallel to the cane-row.

The same tractor which did the loading was used to haul the gollovans in and out of the fields. The empties were placed at the point on the spur-line beyond the cutting area, and as each was loaded, it was pushed a short distance down the line towards the main line.

It was found that the cane was generally loaded on the day after it was cut. This was desirable in that it completely separated the cutting and loading operations.

Each cutter left his identifying number on the rows of cane he had cut and the numbers of the golovans into which this cane was loaded were recorded against his number by the tractor driver and Induna. A basic task was set and a bonus paid for any amount cut above the task.

A number of advantages arose from the use of the Hydrograb. Firstly, it was possible to divorce the cutting operation from the loading operation which made the cutters independent of the arrival of the empties. Thus the fast cutters were not held back by the slow cutters which resulted in a more contented labour force. Similarly, the track laying and the moving of the golovans to the main line was left to the tramline and loading crews which completely relieved the cutter of any responsibility of the cane once it had been cut and placed in stacks in the field.

A second advantage was the ability to stockpile cut cane in the field in the event of no empties being delivered to the field. The cutting could continue and once the golovans arrived, the loading pace could be increased to take care of the stock-pile.

A third advantage was the fewer tipples which occurred. This was the result of not overloading the trucks, as was necessary with 'one cutter, one truck' system, which, incidentally, also limited the cutter's daily cut to the amount he could load onto one golovan. In some instances one cutter's daily task was loaded on to four or five golovans.

It was noticed that where the cane was being loaded on to infield trailers, the machine's loading rate was increased due to the trailer being able to be brought close to the stacks of cane for loading, whereas on the "Flats", the cane sometimes had to be carried 20 yards or more from the cutting face to the tramline. On the other hand, the loader sometimes had to wait for trailers returning from the South African Railways siding which reduced the actual operating time of the machine.

Summary of The Test Data

A complete record of breakdowns was kept for the information of the manufacturers which led to modifications in design and improvements in the efficiency of the machine.

The remainder of the data recorded included the individual cutter's performance and the performance of the loader.

It was found after the 1961 test that sufficient data had been obtained on the labour's performance and it was decided to concentrate the 1962 test on the performance of the machine.

Table 1 shows the actual performance of each unit of labour who cut cane and placed it in small stacks for either machine or hand loading during the 1960 tests. It will be seen that 970 unit days of labour cut 5,338 tons, an average of 5.5 tons per unit.

Table 2 shows the summary of the 1960 tests by fields. However, there is insufficient data available to draw a complete comparison of the performance of labour which cuts and stacks cane for self-loading trailers or cuts and loads golovans, or cuts only and stacks for mechanical loading with the Hydrograb.

It was decided therefore, that a complete record of these operations would be kept during the 1961 tests and this data is shown in Table 3. It will be seen that the average tons of cane cut and loaded into golovans was 2.76 tons, while the units who had to cut only and stack in small stacks for either mechanical or manual loading, averaged 5.2 tons per day, an increase of 88.2 per cent. The increase in burnt and trashed cane was 101 per cent and 80.5 per cent respectively. The overall average of cutting and stacking for Bell trailers was 2.94 tons per unit.

The effect of having two labour crews, one to cut only, and the other to load the golovans, was studied. From Table 3 it can be seen that their output was 5.2 tons and 5.46 tons respectively. This gives an average of 5.32 tons cut and loaded for two units of labour which is an average output of 2.66 tons per unit. This figure is less than the 2.76 tons per unit cut and loaded, which indicates that nothing was gained by separating the two operations.

A record of the Hydrograb's loading performance was kept throughout the three tests. This is shown in Tables 4, 5 and 6, which are for the years 1960, 1961 and 1962 respectively.

A good indication of the improvement in the loader's performance over the three years is shown in Table 7, where it can be seen that the average tons of cane loaded per hour was increased from 6.71 tons using the Massey-Ferguson 35 in 1960, to 11.52 tons using the Massey-Ferguson 205 in 1962, an increase of about 72 per cent. It should be pointed out however, that in 1962 a number of five ton golovans were used which increased the average load from 2.62 tons in 1960 and 2.22 in 1961, to 3.58 tons in 1962. Although this will account for part of the increased efficiency, it can be said that the main cause for the improvement is the hydrostatic transmission and torque converter of the Massey-Ferguson 205 tractor. The slipping clutch trouble experienced in 1961 which reduced performance, was eliminated, thereby contributing to the increased loading efficiency.

The 1962 figure of 8.85 tons per hour when loading on to trailers cannot be considered to be significant due to the limited amount of cane loaded and the wet conditions experienced during the test.

It was noticed when loading the trailers on slopes that greater stability could be achieved by widening the axles, fitting dual rear wheels, lowering the counterbalance weight and shortening the hydrograb boom to possibly 3 ft. in length. It will be appreciated that the long boom is needed when loading golovans in order to obtain height, however, this is not necessary when loading the low, long trailers.

Conclusions

1. The "Hydrograb" loader fitted to a Massey-Ferguson 205 tractor and 702 loader is able to satisfactorily load cane onto either golovans or trailers, without excessive or unreasonable mechanical failures.

2. This unit will fit into the average harvesting system presently found on gently sloping terrain on the Natal cane farm, without upsetting the normal routine.

3. The machine is able to load at an average loading rate of 11.5 tons per hour and this can be increased to as much as 15 tons per hour under suitable conditions.

4. Its use will result in an average increase of 82 per cent in the cutter's output and therefore will considerably reduce the required number of cane cutters.

Acknowledgments

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Table 1

LABOUR CUTTING PERFORMANCE

1960

Field No.		LABOUR UNIT NUMBER											
		1	2	3	4	5	6	7	8	9	10	11	12
A (Burnt)	Number of Unit Days	5	15	1	12	10	14	14	4	4	8	6	6
	Total Tons Cut	23.53	58.31	3.91	61.75	40.50	62.88	63.45	17.81	21.72	43.12	29.00	29.09
	Average Weight/Unit Day	4.71	3.89	3.91	5.15	4.05	4.49	4.53	4.45	5.43	5.39	4.83	4.85
B (Burnt)	Number of Unit Days		38			1	38	38			38	3	39
	Total Tons Cut		252.07			7.88	222.84	226.71			226.00	20.15	247.81
	Average Weight/Unit Day		6.63			7.88	5.86	5.97			5.95	6.72	6.35
C (Trashed)	Number of Unit Days		17			9	21	21			21		19
	Total Tons Cut		50.25			33.39	59.76	63.29			58.90		51.95
	Average Weight/Unit Day		2.96			3.71	2.85	3.01			2.80		2.73
D (Burnt)	Number of Unit Days						8	8			9		9
	Total Tons Cut						49.13	54.91			49.03		51.33
	Average Weight/Unit Day						6.14	6.86			5.45		5.70
E (Burnt)	Number of Unit Days						7	6			6		7
	Total Tons Cut						41.56	40.42			34.16		39.27
	Average Weight/Unit Day						5.94	6.74			5.69		5.61
F (Burnt)	Number of Unit Days						10	12			11		10
	Total Tons Cut						56.66	67.33			62.54		58.67
	Average Weight/Unit Day						5.67	5.61			5.69		5.87
G (Burnt)	Number of Unit Days						13	12			10		13
	Total Tons Cut						86.22	96.40			69.32		83.52
	Average Weight/Unit Day						6.63	8.03			6.93		6.42
TOTALS	Number of Unit Days	5	70	1	12	20	111	111	4	4	103	9	103
	Total Tons Cut	23.53	360.63	3.91	61.75	81.77	579.05	612.51	17.81	21.72	543.07	49.15	561.64
	Average Weight/Unit Day	4.71	5.15	3.91	5.15	4.09	5.22	5.52	4.45	5.43	5.27	5.46	5.45

Table 1b—(Continued)

LABOUR CUTTING PERFORMANCE

1960

Field No.		LABOUR UNIT NUMBER											TOTAL
		13	14	15	16	17	18	19	20	21	22	23	
A (Burnt)	Number of Unit Days	2	1										102
	Total Tons Cut	9.06	4.63										468.76
	Average Weight/Unit Day	4.53	4.63										4.60
B (Burnt)	Number of Unit Days	1		37	37	2	18						290
	Total Tons Cut	5.37		238.36	225.12	14.72	119.92						1806.95
	Average Weight/Unit Day	5.37		6.44	6.08	7.36	6.66						6.23
C (Trashed)	Number of Unit Days	3		20	20		21	17	5	4			198
	Total Tons Cut	5.83		62.72	66.09		65.13	54.96	18.19	14.48			604.94
	Average Weight/Unit Day	1.94		3.14	3.30		3.10	3.23	3.64	3.62			3.05
D (Burnt)	Number of Unit Days			9	9		8	8	9	9			86
	Total Tons Cut			55.78	56.18		48.32	49.00	55.79	52.05			521.52
	Average Weight/Unit Day			6.19	6.24		6.04	6.13	6.20	5.78			6.06
E (Burnt)	Number of Unit Days			7	7		7	7	6	6			66
	Total Tons Cut			42.89	48.24		43.20	42.05	32.52	34.58			389.89
	Average Weight/Unit Day			6.13	6.89		6.17	6.01	5.42	5.76			6.04
F (Burnt)	Number of Unit Days			11	9		10	9	7	9	4	1	103
	Total Tons Cut			71.18	61.73		66.96	51.79	39.48	56.08	20.01	5.09	617.52
	Average Weight/Unit Day			6.47	6.86		6.70	5.75	5.64	6.23	5.00	5.09	5.99
G (Burnt)	Number of Unit Days			12	14		13	12		13	13		125
	Total Tons Cut			112.44	110.40		87.60	85.80		89.85	98.33		919.88
	Average Weight/Unit Day			9.37	7.89		6.74	7.15		6.91	7.56		7.28
TOTALS	Number of Unit Days	6	1	96	96	2	77	53	27	41	17	1	970
	Total Tons Cut	20.26	4.63	583.37	567.76	14.72	431.13	283.60	145.98	247.04	118.34	5.09	5338.46
	Average Weight/Unit Day	3.38	4.63	6.08	5.91	7.36	5.60	5.35	5.41	6.03	6.96	5.09	5.50

Table 2

SUMMARY OF TEST BY FIELDS

1960

Field No.	Field Acreage	Tons Cut		Golovans Loaded		Cutting Units		Yield Tons Per Acre	Average Tons Cut per unit		Average Tons Load per Golo.	
		For Total Field	Loaded by Hydrograb	For Total Field	By Hydrograb	For Total Field	Loaded by Hydrograb		For Total Field	Loaded by Hydrograb	For Total Field	Loaded by Hydrograb
A (Burnt)	17.4	468.8	415.5	217	195	102	—	26 83	4.596	—	2.16	2.131
B (Burnt)	25.4	1806.7	1806.7	745	745	290	290	71.13	6.230	6.230	2.425	2.425
C (Trashed)	14.0	604.9	604.9	248	248	198	198	43.2	3.055	3.055	2.439	2.439
D (Burnt)	9.6	521.5	521.5	188	188	86	86	54.3	6.064	6.064	2.774	2.774
E (Burnt)	7.9	398.9	324.1	132	102	66	55	50.48	6.044	5.893	3.022	3.177
F (Burnt)	12.0	617.5	559.6	226	202	103	95	51.46	5 995	5.890	2 732	2.770
G (Burnt)	25.2	919.9	484.0	342	171	125	70	36.5	7 359	6.914	2.689	2.830
Totals	111.5	5338.2	4716.3	2,098	1,851	970	794	47.87	5.503	5.940	2 545	2.548

Table 4

HYDROGRAB LOADING PERFORMANCE

1960

Field No.	Total Days of Operation	Total Tractor Hours	Total Tons Loaded	Total Golovans Loaded	Average Tons Loaded Per		Average Number of Golovans Loaded Per	
					Day	Hour	Day	Hour
A (Burnt)	9 7	—* 36.60	209.2 206.3	93 102	23.24 29.47	— 5.64	10.33 14.57	— 2.79
Total	16	—	415.5	195	25.97	—	12.18	—
B (Burnt)	41	272.00	1806.7	745	44.05	6.64	18.17	2.74
C (Trashed)	20	102.66	604.9	248	30.25	5.89	12.40	2.42
D (Burnt)	9	62.58	521.5	188	57.94	8.33	20.89	3.00
E (Burnt)	6	44.92	324.1	102	54.01	7.21	17.00	2.27
F (Burnt)	9	78.58	559.6	202	62.18	7.12	22.44	2.57
G (Burnt)	11	74.17	483.9	171	43.99	6.51	15.54	2.30
Totals	112 103	— 671.51	4716.2 4507.0	1,851 1,758	42.11 43.76	— 6.71	16.52 17.07	— 2.62

* For the first nine days of operation, no record was kept of tractor hours.

Table 3

SUMMARY OF TESTS BY FIELDS

1961

Umhlatuzi Flats:

Field No.	Field Acres	Total Tons Cut		Av. Tons Acre		LABOUR UTILISATION								Hydrograb Loading	
						Cut and Stack Bell		Cut and Load Golovan		Cut Only		Load Manually			
						Burnt	Trashed	Burnt	Trashed	Burnt	Trashed	Burnt	Trashed	Burnt	Trashed
1 Golovan		Burnt	420.6		Unit Days	—	—	157	—	—	—	—	—	—	—
		Trashed	—		Tons	—	—	420.6	—	—	—	—	—	—	—
	8.5	TOTAL	420.6	49.48	Av. Tons/Unit	—	—	2.68	—	—	—	—	—	—	—
2 Bell		Burnt	275.5		Unit Days	101	59	—	—	—	—	—	—	—	—
		Trashed	128.1		Tons	275.5	128.1	—	—	—	—	—	—	—	—
	6.6	TOTAL	403.6	61.15	Av. Tons/Unit	2.73	2.17	—	—	—	—	—	—	—	—
3 Bell		Burnt	302.4		Unit Days	106	3	—	—	—	—	—	—	—	—
		Trashed	7.7		Tons	302.4	7.7	—	—	—	—	—	—	—	—
	5.0	TOTAL	310.1	62.02	Av. Tons/Unit	2.85	2.58	—	—	—	—	—	—	—	—
4 Golovan		Burnt	—		Unit Days	—	—	—	13	—	309	—	8	—	—
		Trashed	1533.9		Tons	—	—	—	34.0	—	1499.9	—	57.7	—	1442.2
	16.7	TOTAL	1533.9	91.85	Av. Tons/Unit	—	—	—	2.62	—	4.85	—	7.21	—	—
5 Bell		Burnt	484.8		Unit Days	166	60	—	—	—	—	—	—	—	—
		Trashed	120.9		Tons	484.8	120.9	—	—	—	—	—	—	—	—
	9.7	TOTAL	605.7	62.44	Av. Tons/Unit	2.92	2.01	—	—	—	—	—	—	—	—
6 Bell		Burnt	782.6		Unit Days	212	172	—	—	—	—	—	—	—	—
		Trashed	569.4		Tons	782.6	569.4	—	—	—	—	—	—	—	—
	15.1	TOTAL	1352.0	89.54	Av. Tons/Unit	3.69	3.31	—	—	—	—	—	—	—	—

Table 3b (Continued)

SUMMARY OF TESTS BY FIELDS

1961

Field No.	Field Acres	Total Tons Cut		Av. Tons Acre		LABOUR UTILISATION								Hydrograb Loading	
						Cut and Stack Bell		Cut and Load Golovan		Cut Only		Load Manually			
						Burnt	Trashed	Burnt	Trashed	Burnt	Trashed	Burnt	Trashed	Burnt	Trashed
7 Golovan		Burnt	2201.6		Unit Days	—	—	—	—	395	72	202	55	—	—
		Trashed	311.5		Tons	—	—	—	—	2201.6	311.5	1114.6	260.8	1087.0	50.7
	29.5	TOTAL	2513.1	85.19	Av. Tons/Unit	—	—	—	—	5.57	4.32	5.52	4.74	—	—
8 Bell		Burnt	261.1		Unit Days	92	464	—	—	—	—	—	—	—	—
		Trashed	1252.3		Tons	261.1	1252.4	—	—	—	—	—	—	—	—
	18.5	TOTAL	1513.4	81.81	Av. Tons/Unit	2.84	2.70	—	—	—	—	—	—	—	—
9 Golovan		Burnt	2633.9		Unit Days	—	—	757	197	66	3	36	—	—	—
		Trashed	574.4		Tons	—	—	2169.6	552.0	464.3	22.4	209.8	—	254.5	22.4
	31.4	TOTAL	3208.3	102.18	Av. Tons/Unit	—	—	2.87	2.80	7.03	7.47	5.83	—	—	—
10 Golovan		Burnt	2099.8		Unit Days	—	—	736	117	11	13	—	—	—	—
		Trashed	343.3		Tons	—	—	2009.1	279.8	90.7	635	—	—	90.7	63.5
	31.6	TOTAL	2443.1	77.31	Av. Tons /Unit	—	—	2.73	2.39	8.25	4.88	—	—	—	
11 Bell		Burnt	167.3		Unit Days	41	721	—	—	—	—	—	—	—	—
		Trashed	2096.2		Tons	167.3	2096.2	—	—	—	—	—	—	—	—
	31.4	TOTAL	2263.5	71.64	Av. Tons/Unit	4.08	2.91	—	—	—	—	—	—	—	—
TOTALS		Burnt	9629.6		Unit Days	718	1479	1650	327	472	397	238	63	—	—
		Trashed	6937.7		Tons	2273.7	4174.7	4599.3	865.8	2756.6	1897.3	1324.4	318.5	1432.2	1578.9
	204.0	TOTAL	16567.3	81.2	Av. Tons/Unit	3.16	2.82	2.78	2.65	5.83	4.78	5.56	5.05	—	—
TOTAL BURNT AND TRASHED					Unit Days	2197		1977		869		301		—	
					Tons	6448.4		5465.1		4653.9		1642.9		3011.1	
			16567.3		Av. Tons/Unit	2.94		2.76		5.2		5.46		—	

Table 5

HYDROGRAB LOADING PERFORMANCE

Data Summarised by Fields

1961

Umhlatuzi Flats:

Date	Field No.	Total Days operation		TRACTOR HOURS			Tons Cane Loaded	No. of Golovans Loaded	AVERAGE TONS LOADED				AV. GOLOVANS LOADED		
				Overall Hrs. Min.	Working Hrs. Min.	% Utilis.			Per Day	Per Hour Overall	Per Hour Working	Per Golovan	Per Day	Per Hour Overall	Per Hour Working
15. 5.61 ..			Burnt												
14. 6.61 ..			Trashed				1442.2	577							
	4	25	TOTAL	158:15	111:10	70.4	1442.2	577	57.7	9.1	13.0	2.49	23.1	3.6	5.2
14. 6.61 ..			Burnt				1087.0	544							
24. 8.61 ..			Trashed				50.7	27							
	7	29	TOTAL	202:55	136:55	67.4	1137.7	571	39.2	5.5	8.3	1.97	19.7	2.8	4.2
23. 8.61 ..			Burnt				254.5	122							
5.11.61 ..			Trashed				22.4	13							
	9	15	TOTAL	102:55	55:05	53.5	276.9	135	18.5	2.7	5.0	2.05	9.0	1.3	2.5
6.11.61 ..			Burnt				90.7	41							
19.11.61 ..			Trashed				63.6	33							
	10	7	TOTAL	49:15	28:20	57.3	154.3	74	22.0	3.1	5.5	2.08	10.6	1.5	2.6
15. 5.61 ..	All		Burnt				1432.2	707							
19.11.61 ..	Fields		Trashed				1578.9	650							
		76	TOTAL	513:20	331:30	64.5	3011.1	1357	39.6	5.9	9.1	2.22	17.9	2.6	4.1

Gingindhlovu:

Date	Field No.	Total Days operation		TRACTOR HOURS			Tons Cane Loaded	No. of Trailers Loaded	AVERAGE TONS LOADED				AV. TRAILERS LOADED		
				Overall Hrs. Min.	Working Hrs. Min.	% Utilis.			Per Day	Per Hour Overall	Per Hour Working	Per Trailers	Per Day	Per Hour Overall	Per Hour Working
27.11.61 ..															
24. 1.62 ..		21	TOTAL	179:10	103:25	57.7	917.2	314	43.68	5.12	8.87	2.92	15.0	1.75	3.04

TABLE 6

HYDROGRAB LOADING PERFORMANCE

1962

Date	Golovans or Trailers	Tons	Actual Working Hours (Vibrocorder)	Average Tons Loaded per Hour (Actual)	Average Tons Loaded per Golovan or Trailer
		On the Umhlatuzi Flats			
August 15	2	10.400	2:10	4.80	5.20
17	2	10.950	1:25	7.23	5.47
18	12	49.000	4:55	10.14	4.08
Weekly Total	16	70.350	8:30	8.27	4.40
20	18	59.150	5:50	10.14	3.28
21	13	45.900	5:35	8.20	3.53
22	13	65.200	5:50	11.20	5.01
24	19	61.950	4:45	13.04	3.26
25	15	51.400	4:40	11.00	3.42
Weekly Total	78	283.600	26:40	10.60	3.63
28	4	16.900	1:50	9.25	4.23
29	13	32.000	4:40	6.85	2.46
September 1	15	58.950	4:40	12.60	3.92
Weekly Total	32	107.850	10:10	9.65	3.37
3	15	61.750	4:35	13.50	4.11
4	15	59.850	5:45	10.40	3.98
5	15	58.000	6:30	8.92	3.87
6	20	72.850	5:50	12.50	3.64
7	10	45.950	4:35	10.03	4.35
8	15	53.050	4:45	11.15	3.54
Weekly Total	90	351.450	32:00	10.95	3.90
10	15	54.050	4:40	11.58	3.60
11	16	60.850	5:15	11.60	3.80
12	21	75.800	5:35	13.60	3.60
13	26	95.150	6:45	14.10	3.66
14	30	102.950	6:50	15.05	3.43
15	25	78.100	6:00	13.00	3.12
Weekly Total	133	466.900	35:05	13.30	3.51
17	17	50.400	4:50	10.42	2.96
18	28	90.450	6:30	13.92	3.23
20	28	99.000	7:00	14.11	3.53
21	7	17.950	2:00	8.97	2.56
Weekly Total	80	257.800	20:20	12.67	3.21
Total	429	1537.950	133:45	11.52	3.58
		At Ginginglovu			
24	23	67.450	8:10	8.26	2.94
25	4	11.700	1:15	9.36	2.93
October 3	12	35.200	3:30	10.00	2.93
Total	39	114.350	12:55	8.85	2.93

Table 7

Comparative Loading Performance of Hydrograb Mounted on M-F 35, M-F 702 and M-F 205 Tractors

Tractor Used	Total Golovans or Trailers Loaded	Total Tons Loaded	Actual Working Hours	Average Tons Loaded Per Hour	Average Tons Loaded per Golovan or Trailer
Loading Golovans:					
1960					
M-F 35 ..	1,758	4507.00	671:51	6.71	2.62
1961					
M-F 702 ..	1,357	3011.10	331:30	9.10	2.22
1962					
M-F 205 ..	429	1537.95	133:45	11.52	3.58
Loading Trailers:					
1961					
M-F 702 ..	314	917.20	107:25	8.87	2.92
1962					
M-F 205 ..	39	114.35	12:55	8.85	2.93

Mr. Bartlett replying to a question as to whether he had done, or was contemplating doing any work on the stacking of cane for self-loading trailers, said this had been considered but he was not in favour of such practice. It meant loading twice, the cane had to be picked up and stacked and then an expensive winch was required to haul the stack on to an expensive trailer. However he had no doubt that the Hydrograb could stack cane successfully for self-loading trailers.

To a further question on the use of the Hydrograb on slopes, the author said it had as yet been used only on gently sloping land but with dual wheels at the rear he believed it could be operated on steeper slopes than those tackled heretofore. On still steeper slopes it might be necessary to mount this type of loader on a crawler tractor.

One never really knew on how steep a slope one could operate a machine until one had tried it out and until the labour had developed the technique called for under steep conditions. At Tongaat when the side-loader was first used, it was thought suitable only for certain land but with the development of the necessary techniques it was now used on steeper slopes than originally expected.

The 205 with the hydrostatic transmission, dual wheels, and the 702 loader with the boom, cost just over R4,028. If the dual wheels were not required this would be less. The Hydrograb section itself cost about R240. Some cost studies had been made on the "flats" which worked out to 5 to 10 cents per ton more to load mechanically under such conditions.

He had preferred not to put costs in the paper because these would vary depending on each individual farmer's degree of efficiency and it would be better for individuals to work out their costs after knowing the price and loading performance of the machine. In the future, when the labour became scarcer to get, a slight rise in costs due to mechanical loading must be tolerated.

Dr. Dodds said the paper was one of great value and importance to the Industry and while Mr. Bartlett had commented on the fact that his papers had been last on the programme on each occasion, his efforts ensured that the Congresses would end on the high note at which they started.

Mr. Boic said that at Chirindu three loaders of the type mentioned were used, two mounted on Fordson Majors and one one an MB6 Marshall. In 1960 some 60,000 tons of cane were loaded by these machines. The machines worked well in the field but their use caused trouble in the factory. This was due to the cane at the bottom of the bundles picked up with the push and grab type loader also picking up much dirt, as much as 500 cubic feet of sand in eight hours. Because of complaints at the factory, by 1962 only about twenty per cent of the cane was loaded by the machines as against seventy per cent in 1960.

Mr. Bartlett explained that the push and grab type of loader was considered but the grab type was selected, as this only occasionally picked up any dirt, when the tines dug into the soil. When cane was stacked on trash, it could be picked up with very little trash adhering to the bundle. He therefore recommended the type of grab described in the paper in preference to the push and grab type.

Mr. Boic related that in 1962 the pusher type was discarded but much labour then had to be used to retrieve the cane left on the ground.

Mr. Bartlett said that the machine had worked at a rate of about 15 tons per hour, which was suitable to the requirements of about eighty-five per cent of our growers. Only one labourer, who worked with the operator of the tractor, was employed to pick up the odd sticks of cane left behind. At times, in very good cane, the bundles were too heavy for the machine, in which case this labourer would carry some of the cane on to the next heap or alternatively, this could be done by the machine.

Mr. Boyce asked if any compaction tests were made after the use of the machine.

Mr. Bartlett replied that Dr. Maud had visited the loading area on the Umhlatuzi flats and had checked on this.

Dr. Maud said that at Umhlatuzi on a silty alluvial soil there was no significant compaction and the cane ratooned well. Compaction on some other soils must be expected however, but this would happen with any type of infield transport and it could probably be partially overcome by sub-soiling or other similar operation later on.

Mr. Bartlett remarked that by fitting dual wheels on the rear axle, compaction could be reduced, however the front axle was chiefly responsible for compaction because the load was over this axle. There are tractors which operate in the reverse way, having the boom mounted over the large rear wheels, rather than the smaller front wheels and the driver's controls reversed. This was an ideal type of loader as it would cause much less compaction, but it was very expensive.

The fitting of bigger tyres on the front axle had been discussed but this was entirely a matter for the manufacturer's attention.