QUEENSLAND DEPARTMENT OF PRIMARY INDUSTRIES
DIVISION OF PLANT INDUSTRY BULLETIN No. 676

TOOWOOMBA PLOT FORAGE HARVESTER

By I. W. GREVIS-JAMES, B.E., M.Eng.Sci., and G. E. LEE

SUMMARY

A small self-propelled harvester suitable for harvesting forage and pasture trial plots is described. Cutting width of the machine is 76 cm. A range of three travel speeds is provided. The harvester can be used in species yielding over 6000 kg/ha dry matter and is compact enough to be transported in a utility vehicle.

I. INTRODUCTION

The harvesting of experimental plots can represent a major problem associated with the running of trials with pasture species. Not only may the cutting of wanted material be difficult and time consuming, but the collection and disposal of unwanted material may also constitute a serious problem. No doubt there have been occasions when the difficulties posed by these problems have forced the abandonment of projected trials.

Within the Queensland Department of Primary Industries, the running of pasture trials created the need for a forage harvester with the following specification:

(1) The ability to harvest a range of species at heights ranging from 2·5 cm to 12·5 cm under conditions where plant height might be as high as 1·2 m.

(2) Wheels to be trailing so as to avoid passing over uncut sward.

(3) Machine to have a large cutting width and collection capacity consistent with easy manoeuvrability and transportation in a utility vehicle.

(4) Machine to be self-propelled and provided a range of ground speeds.

Various types and sizes of forage harvester have been reported on in the publications of the International Association on the Mechanization of Field Experiments and in various agricultural science journals. Within Australia several types of machine have been developed, one of the earliest being that of Johnson (1962). This harvester is a push type with a flail cutting head of 20 cm cutting width. Power source is a 2·25 to 3·75 kW petrol engine. A larger machine described by Poynter (1972) is a self-propelled, walk-behind model with a cutting width of 41 cm and powered by a 4·5-6 kW engine. The main driving wheels straddle the cutting head. Martin and Torssell (1971) described

a self-propelled, walk-behind model based on a small garden tractor. Cutting width is 64 cm and engine power 4·1 kW. A gearbox provides a range of speeds between 1·1 and 6·4 k.p.h.

None of the various overseas harvesters fully met the above detailed requirements, but of those available, that described by Thompson and Heinrichs (1963) and Thompson (1967) would come closest. This model was rejected, however, because (a) its collection container was too small, and (b) spare parts would have been difficult to obtain. At the time none of the locally designed harvesters was suitable so the only alternative was to design and construct our own machine.

II. DESIGN AND CONSTRUCTION

Figures 1, 2 and 3 show the general arrangement of the harvester, which in essence is similar to most other walk-behind models. Both the transmission and the cutting head are powered by the same engine, a 7·5 kW air-cooled petrol model. Power is transmitted to the cutting head by B section V belt *via* a centrifugal clutch. Drive to the transmission is also by B section V belt and incorporates a belt tightening clutch with overcentre control lever. The transmission is a "Peerless" model 1700 transaxle which incorporates a differential and gearbox giving three forward speeds and one reverse. The drive wheels are mounted behind the cutting head directly on the transaxle output shafts and are size 5·20-10 automotive type. The tyre size and weight of the harvester are such that good flotation is assured.

The cutting head and cover, obtained from a "Howard 2000" flail mower, are bolted to the frame, which is fabricated from 5 cm × 2·5 cm R.H.S. steel. Cut material is blown directly into the sample bin located behind the cutting

Fig. 1.—General view of harvester ready for use.

head. The bin is vented at the top to allow air to escape and its capacity is 0·35 m^3. Cut material is removed through the side of the bin, which opens completely as shown in Figure 2. All bin sides are steel sheeted to allow easy removal of material. Height of cut is varied by adjusting two small wheels straddling the cutting head. Initially these wheels were mounted behind the cutting head, but the short distance between the two sets of wheels caused large fluctuations in cutting height.

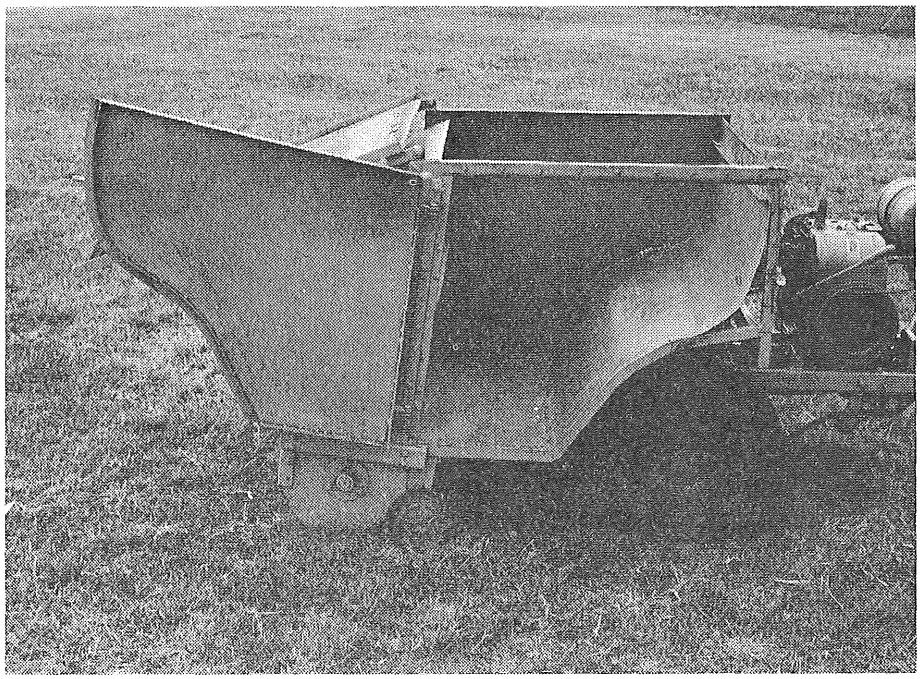

Fig. 2.—Side of bin opened.

III. PERFORMANCE

The machine has been used to harvest many plots of Rhodes grass, *Panicum coloratum* and *Sorghum almum* and to remove bulk material around plots of makarikari grass, buffel grass, kikuyu and green panic. Although the small front wheels push down grass outside the plot area, this has not been a problem. The machine has been capable of picking up and cutting most material pushed down on previous passes. The travel speeds selected for the machine give speeds of 1·0, 1·8 and 2·6 k.p.h. at maximum engine speed. These low speeds were found necessary to allow cutting of species such as makarikari grass, where yields may be greater than 6 000 kg/ha. When harvesting crops with yields greater than 6 000 kg/ha it is necessary to take two cuts, one high and one low. If the harvester were only to be used in lightly yielding crops, a faster range of travel speeds could easily be provided.

A consequence of the low travel speeds is the necessity of using a utility vehicle for transporting over anything but short distances. Loading is easily accomplished with the aid of loading ramps.

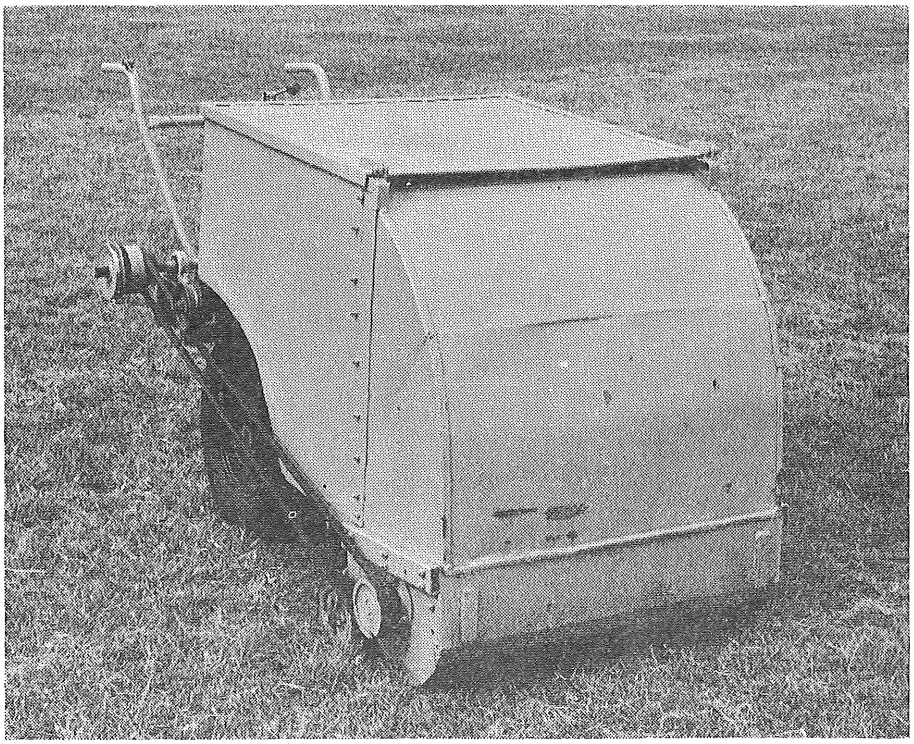

Fig. 3.—Front view of harvester.

IV. SPECIFICATION OF HARVESTER

	Overall length	216 cm
	Height	99 cm
	Width	107 cm
Weight		100 kg (approx.)
Cutting height		1 to 15 cm
Cutting width		76 cm
Engine	" Kirby " HK 100	7·5 kW
Transmission	" Peerless " model 1700	

Simplified plans of this forage harvester are available from the Queensland Department of Primary Industries, P.O. Box 102, Toowoomba 4350, Australia.

REFERENCES

JOHNSON, R. I. (1962).—Pasture sampling machine. *Agric. Gaz.* N.S.W. 73:607.

MARTIN, T. J., and TORSSELL, B. W. R. (1971).—A self-propelled harvester for pasture crops. *J. Aust. Inst. agric. Sci.* 37:244.

POYNTER, G. E. (1972).—Forage plot harvester. Proceedings of the Third International Conference of Field Experiments, Brno, Czechoslovakia 1972,

THOMPSON, J. L. (1967).—Modifications to the Swift Current Forage Harvester II. *Can. J. Pl. Sci.* 47:459.

THOMPSON, J. L., and HEINRICHS, D. H. (1963).—Note on the Swift Current Forage Plot Harvester II. *Can. J. Pl. Sci.* 43:602.

(Received for publication September 12, 1973)

The authors are officers of the Queensland Department of Primary Industries, located at Toowoomba.