HAND-HELD MECHANICAL CUTTER

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Mechanical harvesting of oil palm fresh fruit bunches (FFB) remains an issue that needs to be solved. The current methods involve the use of a chisel or sickle, where the use of such tools require manual labour and this activity is a tedious job. This paper describes a newly innovated mechanical cutter which complements the manual tools.

It is recognized that manual cutting of FFB requires skill and energy to ensure an effective cutting operation.

DESIGN CONCEPT

Several criteria have been considered in the design of a mechanical cutter. The cutter should be easy to handle and efficient and should improve productivity. It must be able to minimize fatigue to the worker during the cutting operation.

A sickle attached to a pole is normally used for harvesting FFB from palms of more than 3 m high. Although lots of effort have been expanded in developing various types of cutting devices, the manual method (*i.e.* using sickle), still remains as the most effective way of harvesting. The sickle, with its unique design, could effectively get access to the fronds as well as the bunch stalks during the harvesting process.

In this invention, sickle is still used as the cutting device, however the cutting operation is executed mechanically.

FEATURES

Vibrating action has been used for cutting in domestic kitchen. The cutting action is mainly horizontal which is simple and effortless. For harvesting FFB, this cutting method can be adopted whereby the vibrating action is transferred to a vertical direction so that the cutting operation can be performed vertically.

Thus, a vibrating mechanism has therefore been designed and developed for the harvesting sickle which causes it to vibrate at high speed in the longitudinal direction of the pole's axis. The vibration is developed by an oscillating mechanism (a pair of bevel gears). The rotational movement from the engine is transmitted by a cable to these bevel gears to create the rapid vibration of the sickle along the pole's axis. The speed of vibration can reach up to 3000 cycle min^{-1}.

A special cutter has been designed and developed to fit into the vibrating mechanism for efficient cutting. To minimize vibration transfer to the operator, the centre of cutting at the cutter was made in line with the axis of the vibrating mechanism.

PROTOTYPE

This mechanical hand-held cutter *(Figure 1)*, consists of a special cutter, a pole and a petrol engine of 23.6 cc (two-stroke). Its light weight of only 5.5 kg makes it easy to be carried and handled. Most of the components are made of

aluminum alloy that contributes to its lightweight. Two prototypes of different lengths have been designed and developed; *viz*. 2.1 m and 3 m lengths.

Figure 1. The cutter in operation.

Results

Field trials carried out showed that the cutter was able to prune fronds at the rate of 120 to 140 fronds hr^{-1} and cutting FFB at a rate of 40 to 60 bunches hr^{-1}. Fuel consumption was recorded at 0.4 - 0.6 litre hr^{-1}. However, the productivity depended much on the crop yield and the operator's skill.

From these trials, this specially designed cutter has greatly reduced the vibration effect transferred to the human body during the cutting operation. This reduces fatigue of the worker.

CONCLUSION

The use of this mechanical cutter has to some extent, opened up a new perspective of mechanizing the harvesting operation. This cutter conserves the energy of workers during the cutting operation, thus prolonging their working hours. Palms of 2 to 3.6 m high can be harvested with this cutter. Productivity of the worker can be maximized with improved skill.

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