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RESEARCH NOTE

Evaluation of Turbo Cutter for Pruning and Harvesting in Oil Palm Plantations

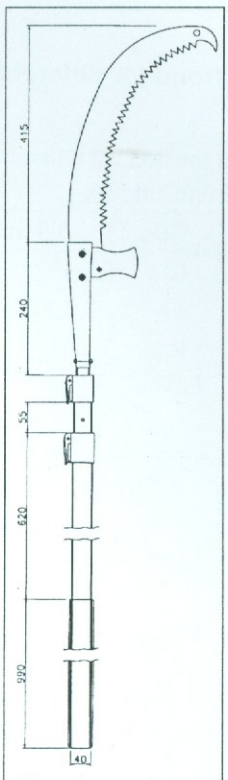
Oil palm is one of the few perennial crops that are harvested all year around. The quality of oil depends upon the timely harvest of fresh fruit bunches (FFB). Pruning and harvesting of oil palm are tiresome operations and consumes high-energy, time and manpower. Efficient harvesting and pruning plays a vital role towards improving the quality of harvested FFB. Pruning of palm fronds is one of the main operations carried out for easy harvesting of FFB. This pruning operation done just before harvesting FFB.

Turner and Gillbanks (1974) found that 20 per cent of the harvester's total infield time was involved in pruning fronds and harvesting bunches. It is highly laborious, tedious and high-energy and time consuming operation. Muirhead (1980) measured the time required for harvesting and pruning and reported that the time taken for harvesting and pruning varied from 26 to 37 percent of the total harvesting operation, which also included stacking of fruit bunches on to the nets. There are two important components in harvesting and pruning, one is the labour and the other is tool (Stanner, 1993).

The labour efficiency depends mainly on the skill of the harvester and currently the oil palm industry is facing shortage of labour. Hence, a tool is the only component, which can be designed and improved for better performance. Presently, pruning and harvesting are done manually by traditional tools like chisels, sickles, sickle attached to bamboo, GI pipes or by climbing the tree with a bamboo ladder or rope. The method adopted for harvesting and the type of tool used vary from place to place and person to person, which in turn affect the harvesting efficiency. Thus, the use of improved harvesting devices with better performance is very essential for increasing the efficiency in harvesting. Hence, a turbo cutter used for pruning and harvesting other horticultural crops was tried for its suitability in pruning oil palm fronds and its performance was evaluated. The turbo cutter was selected for the study because of its lightweight, better blade performance and ease in handling due to telescopic extension pipes.

Technical specification of Turbo Cutter

An extendable turbo cutter (Fig.1) consisted of a curved blade with sharp teeth over the edge and was fixed to the top portion of the pole through a button lock. The blade was made of hard chromium - plated surface with a length of 0.41 m. It has two extension poles with telescopic adjustment fixed to the main body by means of button locks. At the bottom of the blade, there was a sharp cutter to avoid peeling of the bark while cutting the frond. The length of turbo cutter was 2.4 m without extension, 3.75 m with first extension pole and 5.1 m with second extension pole. Safety locks were provided to adjust and fix the length of turbo cutter. The two extension poles and the blade could be separated easily as and when required from the main body for easy repair or replacement. The total weight of the turbo cutter was 2.4 kg. Cross sectional dimension for the main pole and the two extension poles are given in Table 1.



Dimensions are in mm

Fig. 1: Turbo Cutter

The turbo cutter was operated like a manual saw. The saw was moved on the base of the frond to its full length so that all the teeth of the saw were operational and cutting was faster. The cutting process involved sawing over the frond or bunch until it was cut.

The shape of frond cut was triangular in general. The base length and height of cut were measured and recorded. The area of frond cut was measured using the following formula:

Area of frond cut = 0.5 X Base length X Height

Evaluation of Turbo Cutter

The performance evaluation of turbo cutter was carried out at three heights of oil palm plantations *viz.* 2.4, 3.75 and 5.1m. At each height of plantation, 25 trees were selected and all the excess fronds were pruned. The data on time taken for cutting the frond and area of frond cut were measured and analysed. It was observed from Fig. 2 that the time required for cutting the fronds increased with the increase in the area of frond cut. As the tree height

Table 1: The cross sectional dimension of the three poles

Item	Length (m)	Dimension in m		
		A	B	C
Main body pole	1.60	0.0150	0.030	0.030
First extension pole	1.65	0.0125	0.025	0.025
Second extension pole	1.70	0.0100	0.020	0.020

Table 2: Time taken for cutting the frond for different heights and areas of frond cut

S.No	Height of plantation (m)	Time taken to cut the frond at different areas of frond cut (Sec.)			
		50 cm^2	100 cm^2	150 cm^2	200 cm^2
1	2.40 m	6	8	10	13
2	3.75 m	6	12	18	22
3	5.10 m	107	127	142	150
Difference in time between 1 & 2		0	4	6	9
Difference in time between 2 & 3		101	115	124	128

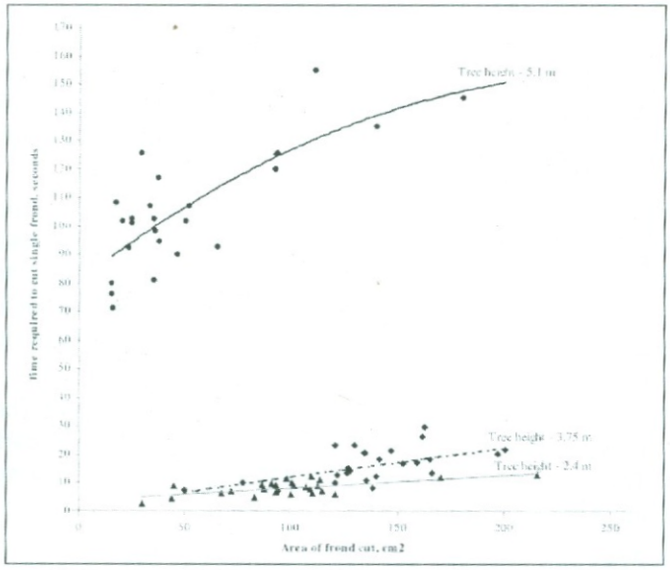


Fig. 2: Effect of area of frond cut on the time required to cut the frond.

increased from 2.4 to 3.75 m, the time required to cut the fronds increased gradually from 6 to 22 seconds. When the height of plantation increased from 3.75 to 5.1m, the time required for cutting increased drastically from 6 to 150 seconds.

The time taken for cutting was compared at four areas of frond cut *viz.* 50 cm^2, 100 cm^2, 150 cm^2 and 200 cm^2 for the three heights of plantation and is shown in Table 2. When the area of frond cut increased from 50 to 200 cm^2, the difference in time observed for cutting the frond at 2.4 m and 3.75 m height of plantation varied from 0 to 9 seconds, whereas the difference in time for cutting the same frond area at 3.75m, and 5.1m height of plantation varied from 101 to 128 seconds. This indicated that, beyond 3.75m, the pruning operation using a turbo cutter was time consuming. It was also observed during the field trials that, when the turbo cutter was extended to its maximum length, pruning of fronds by sawing action was difficult due to the deflection of the cutting pole at the top. This could possibly be due to the smaller cross sectional area of the pole at the top and increase in the number of joints. This has resulted in drastic increase in the time required for pruning the fronds at 5.1m height of plantation. Thus considering the suitability of the turbo cutter for pruning oil palm fronds, it was found more suitable for harvesting and pruning oil palm plantations up to 3.75m height.

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