

# MECHANICAL FERTILIZER SPREADER FOR YOUNG PALM

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**F**ertilizing young palm since its early stage is always necessary to establish vigorous healthy trees (Caliman *et al.*, 2001). It is also often recognized that future performance of poorly fertilized palm during immaturity might be affected for its whole life cycle.

Therefore, early manuring has been considered as an important activity that has to be included in the establishment cost. Tayeb and Ahmad Tarmizi Mohamad (2001) suggested that to overcome this setback, there should be no fertilizer cut back for the first three stages, *i.e.* nursery, immature or one to three years after planting and young mature or four to eight years after planting. Reduction of fertilizer application can only be done on mature palm of more than eight years after planting. However, the previous record of fertilizer application has to be excellent.

Effective fertilizer placement is in the area where the tertiary and quaternary roots (feeder roots) are, in which they are able to absorb nutrients more effectively. For palms below two years of age, the feeder roots are located within 2 m from the trunk; for palms aged between three to five years, they are located within 4 m from the trunk, and for mature palms the location is within 5 m or more from the trunk. Thus, for palm aged one to two years, fertilizer should be placed within 1.5 – 2.0 m from the trunk and for three to five years palm, placement should be within 1.5 - 4.0 m from the trunk. In general, it is advisable to place the fertilizer within the weeded circle where the feeder roots are found (Suboh Ismail, 1994).

Mechanized fertilizer application has widely been practised in mature palms for the past few years. Savings in terms of labour, operating cost and time have been experienced. Furthermore, the coverage area also increases with the use of machine. A turbo spin fertilizer spreader is now becoming a very familiar implement in a mechanized oil palm estate. In an estate of 2000 ha, the number of workers can be reduced by 16 and manuring time can be reduced to 18 days with this mechanical spreader.

However, the scenario in young plantations does not differ much, as manual methods are still being practised. There are several factors contributing to this scenario. Firstly, since the frond canopy is still very low, the use of existing mechanized fertilizer spreader is not suitable; the fertilizer will be deflected away as it hits the fronds, resulting in insufficient fertilizer that reaches the palm base. Secondly, the fertilizer that get caught or trapped in the palm crown, can lead to scorching of the shoot. MPOB has come up with a machine that can overcome these problems.

## OBJECTIVE AND BENEFITS

The main objective of developing this machine is to replace the manual method of manuring with a mechanized system. Benefits when using this machine include:

- labour reduction;
- increase in productivity per worker;
- increase in area covered per day; and
- exact placement of the fertilizer in the weeded circle, hence, reduce wastage.

## THE MACHINE

A prototype machine is developed where it consists of the fertilizer distributor assembly, fertilizer hopper and frond lifter (*Figures 1 and 2*). A four-wheel-steered 19 horsepower, transporter is used as the prime mover. The fertilizer distributor assembly is made of stainless steel to avoid corrosion. The spout of the distributor assembly is fixed with a movable plate that can guide distance of the fertilizer throw. The hopper, with the capacity of 200 kg, is of cone shape for easy discharging of fertilizer during the spreading process.

The frond canopy for young palm is still very low. When spreading the fertilizer, the canopy has to be lifted so that the fertilizer can be distributed uniformly within the weeded circle, *i.e.* under the frond canopy. To facilitate this requirement, the prototype machine is fixed with a frond





Figure 1. The mechanized fertilizer spreader for young palm.



Figure 2. Mechanical fertilizer spreader in action.

lifter. The lifter is hydraulically powered where the operator only needs to push the control lever.

The opening of fertilizer outlet or orifice of the hopper is synchronized with the power take off (PTO) engagement to avoid the fertilizer spillage into the fan casing. Cable is used for the synchronizing, so that when the PTO lever is engaged, only the orifice opens for the fertilizer delivery.

### FIELD TRIAL

A series of function tests were carried out at the MPOB workshop before sending the prototype machine out for field trials in commercial estates. One of the objectives of these tests was to ensure all parts and components were functioning as they were designed for. The prototype machine was field tested at MPOB/UKM Research Station, on three-year-old palms. From this trial, it was found that the machine mobility was good and the frond lifter performed very well. This prototype machine was then sent to Koperasi Bukit Keramat Estate for further field trials. The topography of the estate was flat where the palms were one and a half years old. The density of cover crop was quite moderate and passable. The palm canopies were still very low and this situation was very suitable for the machine. The estate was practising manual manuring using six to 10 workers.

The fertilizer used was compound NPK blue and the rate applied was 1500 g palm<sup>-1</sup>. Prior to application, the spreader was calibrated so that the correct amount of fertilizer could be applied.

### RESULTS AND DISCUSSION

From the field trials, the following parameters were recorded and observed:

- productivity;
- fuel consumption; and
- repair and maintenance costs.

On the average, the machine can cover an area of 6 ha day<sup>-1</sup> with the fuel consumption of 0.6 litre hr<sup>-1</sup>. For the economic analysis of the machine, the followings were assumed:

- purchase price of the machine, RM 32 000;
- economic life of five years;
- annual use of the machine of 2400 hr;
- depreciation cost of RM 5760;
- the fuel and oil cost (lubricating, grease, etc.) was RM 0.70 hr<sup>-1</sup>;
- repair and maintenance cost of RM 3.20 hr<sup>-1</sup>; and
- labour cost to be RM 3 hr<sup>-1</sup>.

From the above assumptions, the running cost is estimated to be at RM 6.10 hr<sup>-1</sup> or RM 8.13 ha<sup>-1</sup>. Taking into

consideration the labour cost at RM 4 ha<sup>-1</sup> (RM 24 day<sup>-1</sup>), the operating cost is estimated at RM 12.13 ha<sup>-1</sup>. In manual operation, the cost is RM 16 ha<sup>-1</sup>. Hence, there is a saving of RM 3.87 ha<sup>-1</sup>. In manual operation, one worker is able to cover 2 ha day<sup>-1</sup> compared with 6 ha day<sup>-1</sup> by this machine, hence giving a reduction of at least 60% of the workers required for this operation.

### CONCLUSION

Generally, the machine performs well. The placement of the fertilizer was at the right place without spillage to undesired areas. The lifting mechanism (frond lifter) functions well without spoiling the fronds of the young palm. The use of four-wheels-steered prime mover gave good manoeuvrability around the palm circle and easy access to the canopy. This machine could save at least 60% of the labour required in the manual application and possible reduction of 24% of application cost.

Since the hopper capacity was rather small (200 kg), more trips are required, hence slowing down the coverage per day. This can be improved by having a bigger capacity hopper of up to 750 kg and an increased power of the prime mover.

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