

A NEW "MULCH RAKE" FOR INCREASED EFFICIENCY

Fertilizer is normally applied within the 1/75 m (about 6 ft) radius around the palm. It is beneficial to mulch the manure circle area with coconut fronds, husks or weed trash. Mulching helps to reduce the rate of soil moisture evaporation, reduce weed growth, soil temperature and soil erosion/run-off. It also increases rainwater infiltration. Thickness of a mulch may range from 10 cm to 20 cm.

Before the application of fertilizer, it is necessary to remove the undecayed mulch out of the manure circle area to expose the soil. After the application, the manure circle area should again be covered with the mulching material.

Presently the removal and the replacement of the mulch during fertilizer application in coconut plantations is done either by mamoty or by hand. Average cost of this operation is approximately Rs. 1.20 per palm. It takes about 2 - 5 minutes to remove the mulching material. Generally, one person could complete about 40 - 50 palms/day. Removal of mulching material by hand is very laborious and time consuming. The worker has to bend to collect each piece of material in the mulch from an area of about 10 sq.m (ie: 95 sq.ft). The use of a mamoty (ie: 20 cm wide blade) is also less efficient and leads to the removal of precious organic matter and nutrients from the top layer of soil.

Hence a simple but new implement named "Mulch Rake" has been designed and developed to remove and replace the mulch efficiently during fertilizer application in coconut plantations.

A schematic diagram of the new "Mulch Rake" is shown in Figure 1. Width of the "Mulch Rake" is 60 cm with seven 15 cm long rods at 10 cm distance to collect/trap different types of

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mulching material without removing the decayed organic matter and/or soil. Tines should have blunt ends. Creeping cover crops could easily be removed if the tines are made out of sharpen rectangular steel bars instead of normal steel rods. The 5 cm wide blade in the opposite side of the tines is to be used in crushing/cutting/pressing of grass and/or creepers and to move fine material such as coir dust. This "Mulch Rake" is also efficient in pulling/removing creepers such as *Calopogonium mucunoides*, *Pueraria phaseoloides* etc. The steel section of the "Mulch Rake" weighs about 1.8 kg without the handle. Handle length preferred to be is 1.3/4 m (6 ft) for easy manipulation and will serve as a stick to measure the manure circle radius.

Compared to other common techniques used under field conditions the efficiency and the cost-benefits in the use of the "Mulch Rake" and the data are given in Table 1.

Table 1 The efficiency and benefits of the "Mulch Rake" compared to other commonly practised techniques (by hand and mamoty)

Parameter	By hand	Mamoty	"Mulch Rake"
1. Time to remove the mulch (minute/ palm)			
a. Fronds, Weed trash	2-4	3	0.7 - 1.0
b. Husks	5	4	0.5 - 1.0
c. Creepers	4	4	1 - 2
d. Coir dust	Difficult	3	0.7 - 1.0
2. Time to replace the mulch (minute/palm)			
a. Fronds, weed trash	2-3	3	-0.5 - 1.0
b. Husks	2-4	3	0.5 - 1.0
c. Creepers	2-4	3	1
d. Coir dust	Difficult	2	0.5 - 1.0

3. No of palms/day/ person could complete (remove or replace the mulch)	40 - 50	40 - 50	100 - 120
4. Daily earning of a person (Rs./day) (Rs. 1.20/palm/operation)	48 - 60	48 - 60	120 - 144
5. Cost of implement Nil	Rs.250 - 300	Rs. 125	

6. Advantages/Disadvantages

a. Energy	Inefficient	Less efficient	Efficient
b. Serpent/insect bites	Possible	None	None
c. Injuries to hand	Frequent	None	None
d. Human fatigue	High pain	Medium	Negligible

Data show that the efficiency of the "Mulch Rake" is about 100% superior to the present practice of using hands and/or mamoty. The use of mulch rake has several cost-benefits and social advantages.

By introducing the "Mulch Rake, it will be possible to reduce the current rate of payment from Rs. 1.20 to Rs. 0.80/palm/operation. This will save Rs. 0.40/palm/operation and the saving

for a 10 acre coconut plantation will be about Rs. 245.00, while the earnings of a person will also increase from Rs. 48 to Rs. 80/day. Further the use of the "Mulch Rake" will save labour days by about 50%. Thus for a 10 acre plantation the labour use in removing the mulch in the manure circles alone could be reduced from 14 to 7. These savings could be better used for other essential agricultural practices.

Hence there will be a saving to the coconut grower and an increase in the daily earnings of the labour force by using this new "Mulch-Rake". It is important to identify the inefficient agricultural management systems and techniques in the coconut plantations in-terms of energy usage, cost-benefit and social factors and implement a suitable package for sustainable high productivity with increased profits. This new "Mulch- Rake" is another step towards improving the efficiency and the economic viability of the coconut plantations.

We welcome your suggestions on the "Mulch- Rake" or on any other agricultural practices.

