

A Multi-Tier Cropping Model for Oil Palm under Rain Fed Conditions

Oil Palm, a perennial oil yielding crop, is widely spaced at a distance of 9m x 9m x 9m in a triangular manner, so that the rows would be at a spacing of 7.8m. Oil palm also offers scope for integrating many crops at different stages of growth within its economic life period of 30-35 years. Once planted in the main field, during pre-bearing stage up to three years, any locally suited crops can be grown in the inter spaces, since enough light reaches the ground. As the palms grow and canopy overlaps each other, choice of crop is much limited. After 6-7 years, the light interception decreases further and hardly any crop can be grown satisfactorily because of dense shade up to 18-20 years. The relationship between palm age and light transmission through the palm canopy depends strongly on the local environment (Gerritsma and Soebagyo, 1999). As the palm grows taller, light infiltration improves and again permitting the growth of many crops, especially shade tolerant mixed and inter crops up to the stage of felling. Identifying suitable cropping models at different stages so as to get maximum net returns from the plantation would be an added advantage for expansion of this crop.

The experiment was conducted in a mature plantation at NRCOP, Regional Station, Palode and the crops were introduced at an age of 20 years. Three sets of crop combinations or models were tried along with the sole crop of oil palm. The experiment was laid out as single replicated trial, taking the yield data of different years as replications. Each plot consisted of 1600 sq m area comprising of 24 palms. The following were the treatments tried:

- 1) Oil palm alone
- 2) Oil palm + cocoa and cinnamon in alternate inter spaces + pepper trailed on palms + anthurium in the intra row spaces.
- 3) Oil palm + pepper on palms + pepper on glyricidea standards in the inter spaces + kacholam in the intra row spaces.
- 4) Oil palm + pepper on palms + guinea grass in the inter spaces.

Cocoa and cinnamon were planted in the inter spaces of alternate rows of palms. Pepper was planted in palm basin and trailed on palms. Anthurium and medicinal plant kacholam were planted in spaces within the rows. Glyricidea standards for trailing pepper were planted in the inter spaces. Six rows each of guinea grass were grown in the inter spaces. All the crops were planted at the recommended spacing and followed all the recommended package of practices. Irrigation was given during summer months using drip system except guinea grass where irrigation was given using sprinklers.

The palm yield was recorded for five years. The inter crops started flowering and yielding from second year onwards and the yield data were recorded continuously up to the 5th year. Cost of establishment of different inter crops and subsequent maintenance, the cost of maintenance of palms and the yield data up to 5th year were considered to work out the economics of the system. Based on this, average income expected every year from these different agri-horti systems was assessed in comparison to monocrop of oil palm.

The average yield of companion crops and their cost of cultivation and net income expected per hectare based on the performance over a period of 5 years are shown in Table 1 & 2 respectively.

Table 1 : Yield/Ha of different crops based on crop arrangement

Sl.No.	Crop	Average yield/ha/year
1	Cocoa	400 kg
2	Cinnamon	150 kg
3	Pepper on Oil palm	48 kg
4	Pepper on Glyricidea	42 kg
5	Guinea grass	46 tonnes
6	Kacholam	0.5 tonnes
7	Anthurium	11,250 flowers

Table 2 : Cost of cultivation and net income of different crop combinations (Rs. / ha / year)

Sl.No.	Crops	Gross Returns	Costof cultivation	Net Returns
1	Oil palm alone	68,640	23,595	45,045
2	Oil palm + cocoa + cinnamon + pepper + anthurium	1,62,247	78,490	83,757
3	Oil palm+ pepper on palm + pepper on glyricidea + kacholam	90,049	33,440	56,809
4	Oil palm+ pepper on oil palm+ guinea grass	87,093	31,099	55,994

*Oil palm—Rs.4/kg FFB, Cocoa -Rs.70/kg dry beans,Cinnamon-Rs.250/kg quills,Pepper-Rs.135/kg dry wt, Guinea grass-Rs.5/25kg fresh wt. ,Anthurium -Rs.5/flower,Kacholam-Rs.60/kg dry wt.

The palm yields in different treatments over the years were found to be on par which clearly indicates that none of the crops have adversely affected the palm performance (Table 3). The yield and net income from different combinations showed that mixture of oil palm, cocoa, cinnamon, pepper and anthurium is most profitable, giving maximum net returns (RS. 83,757/-), which is almost double compared to sole crop of oil palm (Rs.45,045/-). The most profitable crop was anthurium, followed by cocoa and then cinnamon and the least profitable ones were kacholam followed by pepper on glyricidea. Earlier findings of CPCRI also indicated that cocoa is a suitable mixed crop in oil palm plantations without adversely affecting the palm yields (Annual Report,1987). Kacholam did not perform well may be because of the severe competition in the root zone. Pepper vines both trailed on palms as well as on glyricidea were damaged by fronds and bunches while harvesting and pruning. This shock resulted in poor establishment of the crop compared to those planted in coconut garden. Amoah *et al.* (1995) also reported that when cocoa was under planted in oil palm plantations planted at different spacing of 8.7m,9.9m

and 10.5m ,there were no significant difference in oil palm yield between plots with cocoa and control. There was appreciable damage to cocoa trees from falling fronds and bunches during pruning and harvesting. cocoa growth and yield were significantly better under oil palm spaced at 9.9m and 10.5m than 8.7m.

Under rain fed scenario of limited land availability and the need to increase productivity and income, maximizing land use through suitable cropping systems of planting compared to traditional monoculture planting, offers an alternative option for the planting of potentially high value crops like oil palm. The data indicated that a combination of cocoa and cinnamon planted in inter spaces of oil palm in alternate rows, pepper trailed on palms and anthurium planted in the intra row spaces is an ideal cropping model for an established plantation under rain fed conditions for getting maximum net returns. This combination also ensures the maximum utilization of all spatial and temporal availability in an established plantation under rain fed conditions.

REFERENCES

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Table 3 : Average yield of palms (over five years)

Treatment	FFB yield (kg)
T1	120.0
T2	126.8
T3	133.8
T4	125.0
CD	NS

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