

PERFORMANCE OF CACAO AS MIXED CROP WITH ARECANUT

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ABSTRACT

Cacao, as mixed crop with arecanut had not affected the performance of areca during the first ten-year period of plantation. In fact, a beneficial effect, as indicated by the higher yield of areca in the mixed cropped plot (50:50) was obtained.

INTRODUCTION

The cacao (*Theobroma cacao* L.) is a native of the low land tropical forest of the Upper Amazon basin of South America and the coastal strip west of the Andes. In its native habitat, it grows as an 'under-storey' species beneath the tall 'upper-storey' forest trees (Urquhart, 1961). For commercial cacao cultivation, regions which approximately correspond to the ecoclimatic conditions of the Amazon basin were preferred in all important cacao growing countries of the world. In India, though cacao is reported to have been introduced as early as 1793 (Rao, 1962), it was only from the early 1960's that efforts were made to cultivate it, as an agricultural plantation crop. The environmental conditions viz. rainfall, shade and climate required for the large scale cultivation of cacao as a monocrop, are limited to a few scattered areas of south India. Even in these areas, the rainfall distribution was found to be the limiting factor.

Urquhart (1961) reported that cacao had been grown along with rubber in Sri Lanka and with coconut in Papua and New Guinea without any evidence of competition between cacao and coconut/rubber. Rodrigo and Mangabat (1964) stated that in the Philippines, the yield from a trial planting of cacao under coconut ranged from 1.5 to 3.0 kg dry beans/tree/year.

Blencowe (1968) discussed the prospects of growing cacao under rubber in Malaya. According to him, shade-tolerant cacao could be established as a system of permanent mixed cropping with rubber. Tam Tai Kin (1968) reported that coconut yields had not been reduced by the cacao, and, in fact, claimed that coconut yields were better where cacao had been underplanted. McCulloch (1968) found that the initial growth of cacao planted in nine year and older oil palm stands was good; but in a high density stand of cacao, the combined shade of cacao and oil palm was too heavy for optimum yields. Bhat and Leela (1968) suggested that on the west coast of India, cacao is likely to go well with arecanut palm as a mixed crop. Bhat and Bavappa (1972) discussed the possibility of raising cacao in normally spaced coconut and arecanut plantations.

Arecanut (*Areca catechu*) to a considerable extent, and coconut (*Cocos nucifera*) on a limited scale, are raised as irrigated crops in South India. These palms are planted wide apart to accommodate the large crown canopy, although their effective root zones are confined to only 25–50% of the land area in the plantation. Also the shade, soil moisture and microclimate existing in these gardens appeared to satisfy the requirements of cacao. Exploratory trials were, therefore, initiated in 1964 at the Central Plantation Crops Research Institute, Regional Station, Vittal (Karnataka) to raise cacao as a mixed crop with arecanut. The performance of cacao during the initial ten year period of its existence, as a mixed crop with arecanut, is discussed in this paper.

MATERIAL AND METHODS

A field trial was initiated at Vittal in 1964 by planting arecanut seedlings (18 months old) and cacao (variety-Criollo) seedlings (9 months old) under three systems viz. (i) arecanut and cacao at 50:50, (ii) arecanut as pure crop and (iii) cacao along the border of the arecanut garden. The trees were planted in the quincuncial method with a spacing of 4m×4m. In the first system the cacao seedlings occupied the centre of the square (4m×4m). The arecanut palms, as well as, the cacao trees were fertilised @ 100g N+40g P₂O₅+140g K₂O/plant/year. They were also irrigated during the dry months from December to May.

RESULTS AND DISCUSSION

The flowering in cacao was first observed 14 months after planting and the first crop of mature pods was harvested 13 months later. The arecanut plants commenced flowering three years after planting in all the plots. There was a steady increase in the yield of cacao till 1969–70. The yield was maintained at about the same level thereafter, indicating that the trees have attained the normal bearing in five years after planting (Tables 1 and 2). The data on the yield of areca palms showed that they have attained the stabilised bearing stage in the sixth year after planting. The mean yield of areca per palm in the mixed cropped plots was higher than that in the monocrop of areca. The cacao planted as a border crop suffered from sunscorch.

Table 1. Flowering and yield—areca and cacao mixed garden during the first five years

Year	Treatment	Cacao No. of pods/ tree	Areca		
			Palms flowered (%)	No. of nuts/ palm	Weight of nuts/palm (kg)
1965–66	1	..	..	..	..
	2	..	..	..	..
	3	..	..	..	..
1966–67	1	10.6	..	..	..
	2	..	..	..	..
	3	..	..	..	..
1967–68	1	21.8	52.8	..	..
	2	..	44.6	..	..
	3	4.6	37.6	..	..
1968–69	1	23.2	88.9	..	..
	2	..	82.1	..	..
	3	4.9	75.0	..	..
1969–70	1	81.7	100.0	95.5	3.4
	2	..	100.0	42.7	1.6
	3	30.9	100.0	28.7	1.2

Treatment 1 — Areca and cacao (50:50)
 2 — Pure plantation of areca
 3 — Cacao as border crop in areca garden.

Table 2. Yield of areca and cacao mixed garden during the second five years

Year	Treatment	Cacao No. of pods/ tree	Areca	
			No. of nuts/palm	Weight of nuts/palm (kg)
1970-71	1	63.5	225.2	7.7
	2	..	169.5	6.8
	3	35.6	125.4	4.4
1971-72	1	49.9	321.8	12.2
	2	..	169.3	6.8
	3	17.0	232.9	8.0
1972-73	1	76.8	391.1	13.3
	2	..	210.0	7.5
	3	21.7	242.1	8.3
1973-74	1	107.0	230.0	8.4
	2	..	116.0	4.4
	3	40.0	124.0	4.3
1974-75	1	95.0	313.5	11.4
	2	..	269.9	10.0
	3	40.8	267.2	9.3

Treatment 1 — Areca and cacao (50:50)
 2 — Pure plantation of areca
 3 — Cacao as border crop in areca garden.

The first flowering in arecanut was observed in 1967-68 i.e. during the fourth year after planting in all the plots and 100% flowering recorded in the sixth year. However, the mean yield of nuts/palm (both number and weight) was much higher in the mixed cropped plot in all the years. The results showed that cacao had no adverse effect on areca; but had some beneficial effect resulting in the better performance of areca when grown as mixed crop with cacao (50:50) compared to the pure stand.

Cacao prefers shade. This had been evidenced by the comparatively poor performance of cacao grown on the border. Not only the flowering in cacao was delayed but also the per tree yield was markedly lower in cacao planted on the border. The difference in yield also persisted over the years.

Table 3. Yield and gross income from the mixed garden (areca and cacao) and pure garden (areca)—(1970-'75)

Particulars	Yield in the mixed garden		Yield in the pure plantation
	Cacao	Areca	Areca
No. of fruits per tree	78	296	187
No. of trees per ha (4m x 4m)	625	625	1250
Estimated No. of fruits ('000)/ha/year	49	185	234
Estimated dry weight (kg) of cacao beans or arecanut kernel/ha/year	1225	1482	1869
Estimated value of produce/ha/year	8575*	10,374**	
Gross income	18,949		13,083

* Cacao at Rs. 7.00/kg.

** Areca at Rs. 7.00/kg.

The market price of both arecanut and cacao fluctuates widely. Any attempt to work out the economic merits or otherwise of growing mixed crop of arecanut and cacao, based on the prevailing prices of the two commodities may not remain realistic. However, based on the prices, which prevailed between 1973-1975, the gross income from the areca-cacao mixed planting was estimated at Rs. 18,949/- per annum per ha compared to Rs. 13,083/- from the pure plantation of areca (Table 3). Mixed cropping, where the farm income is dependent on more than one crop, also provides an insurance against financial stress on the farmer, arising out of market fluctuations on a single crop produce.

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