
INTERCROPPING OF VEGETABLES IN COCONUT GARDENS

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ABSTRACT

Among the different vegetable crops tried in a coconut garden, snakegourd (10,580 kg/ha), amaranthus (6,610 kg/ha) and brinjal (6,120 kg/ha) in *kharif*; bottlegourd (7,930 kg/ha), ridgegourd (3,830 kg/ha) and coccinia (3,810 kg/ha) in *rabi* and amaranthus (7,560 kg/ha), brinjal (6,310 kg/ha) and coccinia (4,060 kg/ha) in summer were highly productive and economical. Snakegourd-ridgegourd-amaranthus sequence was found to be most remunerative (Rs 22,217/ha/annum) followed by amaranthus-bottlegourd-brinjal (Rs 20,920/ha/annum). Coccinia, a perennial crop also can be grown successfully in coconut garden and it yields about 10,700 kg/ha. Intercropping helped to create additional employment to the tune of 215 to 365 mandays/ha/year in different sequences of intercropping.

INTRODUCTION

Coconut is grown in about five million holdings in the country and about 98 per cent of the holdings are below 2 ha in extent (Thampan, 1988). The income derived from most of the coconut holdings is insufficient to sustain dependent families and also does not provide an adequate on-farm employment. Vegetable crops constitute one such group of annuals which can be conveniently grown as intercrops in a coconut garden to alleviate such problems. In India, vegetables are grown in 1.2 per cent of the total cultivated area and the total production is about 30 million t per year. As against per capita requirement of 400 g vegetables per day the average intake is 75 g. To provide at least 50 per cent of per capita requirement of vegetables, it is necessary to produce about 55 million t of vegetables by 2000 A.D. Various research workers have reported about the feasibility of growing vegetables in a coconut garden in different countries (Sahasranaman, 1961; Abilay, 1983; Liyanage *et al.*, 1984; Rethinam, 1989).

In India, coconut is cultivated in about 1.5 million ha and if in a considerable area vegetable intercropping can be done, the vegetable requirements can be met and production and productivity of the land could also be increased. With these objectives in view a trial on intercropping of vegetables in a coconut garden was taken up to find out the suitable vegetable crops for different seasons of the year and their profitability.

MATERIALS AND METHODS

This trial was initiated in a 30-year old coconut garden during June 1989 in the experimental farm of Central Plantation Crops Research Institute, Kasaragod. The coconut palms were spaced at 7.5 × 7.5 m. The soil of the experimental plot was red sandy loam (Arenic Paleustult). The pH of the soil was 5.6. Mean rainfall during *kharif*, *rabi* and the summer of 1989 were 3211.6, 291.4 and 498.8 mm, respectively and 2819.2 mm, 221.8 mm and 148.2 mm, respectively during 1990. Vegetable crops were grown in the interspaces, in plots of 112.5 sq. m. in randomised block design and were replicated three times.

The vegetable crops grown during different seasons with their varietal names are furnished below:

	<i>June to September (kharif)</i>	<i>October-January (rabi)</i>	<i>February-May (summer)</i>
1.	Amaranthus (Kannara local)	Bottlegourd (Arka bahar)	Brinjal (Arka navaneet)
2.	Vegetable cowpea (Pusa barsati)	Bhendi (Pusa sawani)	Tomato (Pusa early dwarf)
3.	Bittergourd (Priya)	Chilli (N.P.46-A)	Chilli (NP-46-A)
4.	Brinjal (Pusa purple cluster)	Dolichos (Arka komal)	Watermelon (Arka manik)
5.	Coccinia (Local)	Coccinia (Local)	Coccinia (Local)
6.	Snakegourd (Arka sheetal)	Ridgegourd (Pusa nasdar)	Amaranthus (Co-1)

The above crops were selected based on their suitability for a particular season. The spacing and fertiliser schedule followed for various vegetable crops is given in Table 51.1. Bottlegourd, coccinia, bittergourd and snakegourd were trailed on a *pandal*. Other crops were raised on a flat bed system. Crops were raised as rainfed in *kharif* (June-September) but during other seasons, irrigation was given during rainless periods.

Pre-experimental coconut yield was recorded for the period 1985 to 1989. Incident sunlight was recorded between 10:00 and 11:00 hours and 14:00 and 15:00 hours at the top of the intercrop canopy using Steady State Porometer. The incident light varied from 35 to 66 per cent.

RESULTS AND DISCUSSION

Yield of Vegetable Crops

Among the vegetable crops grown in *kharif*, snakegourd gave higher yield followed by amaranthus and brinjal (Table 51.2). These crops in rainy season

Table 51.1: Cultivation details of various vegetable crops

S.No.	Vegetable crops	Scientific names	Duration (days)	Method of planting	Plants per ha**	Inorganic fertilizers (kg/ha) [†]		
						N	P ₂ O ₅	K ₂ O
1.	Amaranthus	<i>Amaranthus</i> spp	75	Flat bed	333333 (30 cm between rows)	100	50	50
2.	Vegetable cowpea	<i>Vigna unguiculata</i> (L) Walp.	90	Ridges	148148 (45 × 15)	25	50	100
3.	Snakegourd	<i>Trichosanthes anguina</i> L	116	Ridges	9259 (120 × 90)	75	50	50
4.	Bittergourd	<i>Momordica charantia</i> L	124	Ridges	9259 (120 × 90)	75	50	50
5.	Bottlegourd	<i>Lagenaria leucantha</i> Buch	114	Ridges	6172 (180 × 90)	50	50	50
6.	Coccinia	<i>Coccinia indica</i> Wight & Am.	Perennial	Pits	3086 (180 × 180)	50	100	50
7.	Ridgegourd	<i>Luffa acutangula</i> (L) Roxb.	112	Basins	6172 (180 × 90)	50	50	50
8.	Watermelon	<i>Citrullus lunatus</i>	114	Basins	3703 (300 × 90)	100	75	100
9.	Brinjal	<i>Solanum melongena</i> L	130	Ridges	22222 (75 × 60)	75	50	25
10.	Chilli	<i>Capsicum annuum</i> L	175	Ridges	49382 (45 × 45)	75	50	25
11.	Bhendi	<i>Abelmoschus esculentus</i> (L) Moench.	72	Ridges	55555 (60 × 30)	50	25	25
12.	Tomato	<i>Lycopersicon esculentum</i> Mill.	96	Ridges	27777 (60 × 60)	75	50	25

[†] 10 t/ha FYM applied uniformly;

** Figures in parenthesis indicate spacing in cm.

were found to tolerate dripping of water from coconut leaves and shade to a greater extent. Performance of bottlegourd followed by ridgegourd and coccinia was encouraging when grown in the *rabi* season. Among the crops tried in summer, amaranthus gave a higher yield followed by brinjal. Performance of bittergourd in *kharif*, chilli in *rabi* and watermelon in summer was not satisfactory due to the incidence of downy mildew in bittergourd, leaf curl in chilli and occurrence of more male flowers in watermelon.

Table 51.2: Yield and monetary returns of vegetables grown in different seasons

S. No.	Crops	Yield (q/ha)	Cost of cultivation (Rs/ha)	Additional gross returns (Rs/ha)	Additional net returns (Rs/ha)
Kharif (June-September)					
1.	Amaranthus	66.10	5850	9915	4065
2.	Bittergourd	24.27	7225	8494	1269
3.	Brinjal	61.20	7975	15300	7375
4.	Coccinia	28.30	7100	8490	390
5.	Snakegourd	105.79	9620	26447	16827
6.	Vegetable cowpea	28.50	8050	9975	1925
Rabi (October-January)					
1.	Bottlegourd	79.3	9620	19825	10285
2.	<i>Bhendi</i>	34.6	7055	10380	3325
3.	Coccinia	38.1	4575	9525	4950
4.	Dolichos	24.8	7250	7440	190
5.	Chilli	18.6	7650	6510	-1140
6.	Ridgegourd	38.3	7575	9575	2000
Summer (February-May)					
1.	Brinjal	63.10	9125	15775	6050
2.	Amaranthus	61.60	5850	9240	3390
3.	Tomato	39.10	9675	11730	2055
4.	Watermelon	19.80	7150	4950	-2200
5.	Coccinia	40.60	4500	12180	7680
6.	Chilli	26.50	6250	7950	1700

Performance of Crop Sequences

Yield and monetary returns from various vegetable crop sequences are presented in Table 51.3.

Growing of amaranthus-bottlegourd-brinjal combination gave a higher total yield (208.5 q/ha) followed by snakegourd-ridgegourd-amaranthus sequence (205.7 q/ha). Performance of bittergourd-chilli-chilli sequence was not satisfactory (69.4 q/ha). Best possible combination will be to select either snakegourd or brinjal or amaranthus in *kharif*, bottlegourd or *bhendi* or ridgegourd in *rabi*, and brinjal or amaranthus or tomato in summer and make suitable sequences.

Table 51.3: Yield, monetary returns and employment potential from various vegetable crop sequences

S. No.	Vegetable crop sequences			Total yield (q/ha)	Total cost of cultivation (Rs/ha)	Additional net returns (Rs/ha)	Additional employment (mandays/ ha/year)
	<i>Kharif</i>	<i>Rabi</i>	<i>Summer</i>				
1.	Amaranthus + Bottlegourd + Brinjal			208.5	24595	20920	260
2.	Bittergourd + Chilli + Chilli			69.4	21125	1829	290
3.	Brinjal + Dolichos + Watermelon			105.8	23375	5365	300
4.	Snakegourd + Riddegourd + Amaranthus			205.7	23045	22217	305
5.	Vegetable cowpea + <i>Bhendi</i> + Tomato			102.2	24780	7305	365
6.	Coccinia + Coccinia + Coccinia			107.0	17175	13020	245

Effect on Coconut Yield

The average yield of coconut palms has increased from 90.8 nuts/palm/year during 1985–89 to 98.7 nuts/palm/year during 1990–91 indicating beneficial interaction of vegetable cultivation as intercrops in coconut gardens.

Monetary Returns

Among the vegetable crops grown in *kharif*, intercropping with snakegourd resulted in higher returns followed by brinjal and amaranthus. During the *rabi* season bottlegourd gave a higher income followed by coccinia and *bhendi*. Growing coccinia was profitable in summer followed by brinjal and amaranthus (Table 51.2).

Adoption of various vegetable crops resulted in considerable extra monetary returns. Among these, snakegourd + riddegourd + amaranthus sequence gave the highest net returns followed by amaranthus + bottlegourd + brinjal. Bittergourd + Chilli + Chilli combination resulted in lower monetary returns.

Employment Potential

Growing of the vegetables as intercrops has been found to enhance considerably the employment generation which ranged from 245 to 365 mandays in addition to about 150 mandays required to manage one ha of coconut garden.

Pest and Diseases

There was no severe incidence of pests and diseases in various vegetable crops except downey mildew on bittergourd and leaf curl of chilli caused by jassids and thrips, and shoot and fruit borer (*Aulocophora foreicellis*) insect in brinjal when grown in *kharif* and bacterial wilt in brinjal when grown in summer. The insects and diseases noticed on different vegetable crops were controlled with appropriate chemicals.

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DISCUSSION

- K. Aravindakshan:* Will it be profitable to grow vegetables in coconut garden when the yields are much below those in the open ?
- M.R. Hegde:* As the results have indicated many of the vegetables are giving profitable returns and it is over and above the returns realised from coconut.