



Intercropping system in coconut for East Coast region of Tamil Nadu

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Among the eight models consisting of various intercrops evaluated in coconut from 2003-2009, the model IV comprising of Coconut, black pepper, banana, elephant foot yam and coriander recorded consistently higher BC ratio followed by the model II (Coconut + Banana + black pepper). With regard to soil health, model III (Coconut + Banana + black pepper + bhendi) recorded the higher soil available NPK and model IV (Coconut + black pepper + banana + E.F. Yam + coriander) recorded the highest fungal and bacterial population.

Introduction

About 80 percent of the coconut holdings in India are either small or marginal and the average holding size is 0.22 ha. The income derived from such small holdings is quite insufficient for even small families. Intercropping in coconut is a best alternative to boost the income of the coconut growers from a unit holding by using horizontal and vertical space more efficiently. It will ease the burden of farmers who suffer from frequent price fluctuation.

Coconut does not fully utilize the basic natural resources like soil and sunlight available in the garden owing to their unique physical structure. The active root zone of coconut is confined to 25 per cent of the available land area and hence the remaining area could be profitability utilized for intercrops. Intercrops should be selected in accordance with soil type, rainfall, irrigation facilities, climatic condition, age of the garden and marketing facilities for the proposed intercrops. In the present context of shrinking of agricultural land due to urbanization and industrialization enhancing unit income from unit holding is the need

of the hour. Raising high value commercial crops as intercrop in coconut can help in sustaining the income of coconut growers.

Coconut based cropping system

The main emphasize in planning coconut based cropping system model are the soil, climate, irrigation source, age of palm, labour, capital and market risk. These criterias are to be strictly adhered while selecting the intercrops. The subsidiary crops should be selected in accordance with their shade tolerance and solar radiation requirement. Besides, they should have a shorter life span than the main crop. The systems like intercropping, mixed cropping, multistoried cropping and high density cropping are the different systems that can be adopted in a coconut garden. Intercropping in coconut with annual and perennial crops can be chosen in such away that it should not compete with coconut (main crop). To assess the performance of different fruits, vegetables and spices in coconut, a field experiment was conducted at Coconut Research Station, Veppankulam between 2003 and 2009. The experimental soil is sandy loam with the P^H 7.7 and EC of 4.1.



Pepper as intercrop



Banana as intercrop in coconut garden

The soil is low, medium and high in its NPK status. The average rainfall is 1120 mm distributed over 52 rainy days. The experiment was carried out in 27 years old ECT palm spaced at 7.5 x 7.5 m. The whole cropping system was irrigated based on the field capacity in the soil. The required quantities of nutrients for coconut as well as for the intercrops were applied as per the recommendations. All the intercrops were raised in the interspace available (50%) in between two rows of coconut palms in all the years (2003-2009). The plot size was 18 cents model and area covered either side of the 5 coconut palms. The need based plant production measures were adopted as an when it was required. The nut yield was recorded to assess the effect of intercropping system on coconut. The intercrop's yield were recorded and economics were worked out and

also the nut equivalent ratio of intercropping systems. The soils of pre and post experiment were analyzed for its fertility and microbial load. The cultural requirements of the cropping system are depicted in table 1.

Based on the economic yield of each intercrop in a model and cost

of cultivation economics were worked out for different models in accordance with the prevailing market prices. Among these, model IV (Coconut + black pepper + banana + Elephant Foot Yam + coriander) recorded the maximum net return of Rs. 57,577 with the B : C ratio of 2.16 followed by

Table 1. Cultural requirements of intercropping system in coconut

	Models	Variety	Cropping period	Spacing	Population (Nos./ha)
I	Coconut monocrop	ECT	-	7.5 x 7.5 m	175
II	Coconut + black pepper + Banana	Robusta Panniyur 1	July-May	2 x 2 m	1,050
III	Coconut + black pepper + banana + bhendi / brinjal	Arka Anamica PLR 1	Jan.-May June-Nov.	45 x 30 cm	37,000
IV	Coconut + black pepper + banana + elephant foot yam / Coriander	Sri Padma Local	May-March	75 x 75 cm	9,000
V	Coconut + black pepper + banana + turmeric/Coriander	BSR - 2	June-March	50 x 15 cm	66,000
VI	Coconut + black pepper + banana + pineapple	Mauritius	June-June	90 x 60 cm	9,250
VII	Coconut + black pepper + banana + tapioca	Local	May-March	75 x 75 cm	9,000
VIII	Coconut + black pepper + banana + mango ginger	Local	June-March	50 x 15 cm	66,000



Table 2. Economics of intercropping system in coconut

Intercrop	Average yield (kg ha ⁻¹)	Income (Rs.)	Cost of Cultivation (Rs.)	Net return (Rs.)	B:C ratio
i. Monocrop					
II. Banana + black pepper	1452043.75	87587	42000	45557	2.08
III. Banana + black pepper + bhendi	43.7552704500	65507	40176	25331	1.63
IV. Black pepper + banana + Elephant foot yam + coriander	43.7561008360650	107167	49590	57577	2.16
V. Black pepper + banana + turmeric + coriander	43.7556605250540	71222	46458	24764	1.53
VI. Black pepper + banana + Pineapple	43.7554503100	57937	30970	26577	1.87
VII. Black pepper + banana + tapioca	43.7555207700	56657	31300	25357	1.81
VIII. Black pepper + banana + Mango ginger	437552408500	65440	32500	32940	2.01

the experimental area. The nut equivalent yield for the coconut based cropping system as a whole was 53,124.

The influence of different intercropping model on the main crop viz., coconut was assessed. The increasing in cumulative nut yield was 24.28 per cent in model IV (Coconut + black pepper + banana + E.F. Yam + coriander) followed by model III (Coconut + Banana + black pepper + bhendi), here the per cent

model II (Banana + black pepper), which recorded the net return of Rs. 45,557 with the B: C ratio of 2.08. According to the soil, irrigation and scope for marketing, the coconut farmers can chose any one of the above model of their convenience for enhancing his farm revenue.

The nut equivalent yield for the different intercropping systems were worked out based on the component crops yield and average nut yield of

Table 3. Nut equivalent yield for the coconut based cropping system

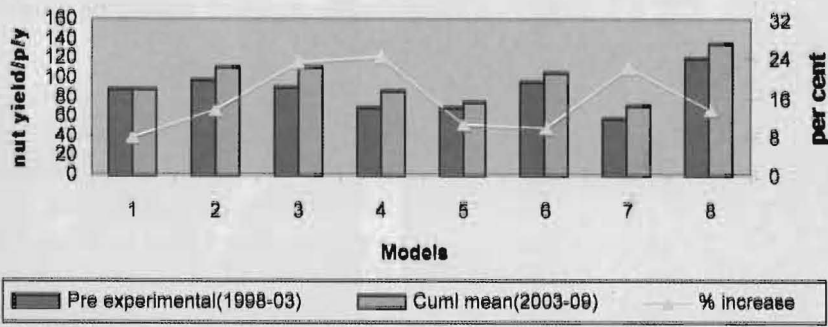
Component Crop	IC yield (kg 0.5 ha ⁻¹)	Unit price (Rs. kg ⁻¹)	% area of IC	IC yield (kg ha ⁻¹)	Gross return (Rs.)	Neq ha ⁻¹	Neq for the system
Banana	18417	5	13.5	4972.59	24862.95	4972.59	
Bhendi	4062	3	13.5	1096.74	3290.22	658.04	
Elephant foot Yam	10172	12	13.5	2746.44	32957.28	6591.45	
Turmeric	7748	12	13.5	2091.96	25103.52	5020.70	
Pine apple	6100	7	13.5	1647	11529	2305.8	53.124
Pepper	612.5	100	13.5	165.38	16538	3307.6	
Tapioca	8977	3	13.5	2423.79	7271.37	1454.27	
Mango ginger	10500	10	13.5	2835	28350	5670	
				29980.45			
Coconut nut yield	23143.75						



Intercropped coconut garden



Influence of CBMSCS models on the nut yield of coconut



Influence of intercropping system on coconut yield



Intercropped coconut garden



Various intercrops

increase in nut yield was 23.07 while in Monocropping, it was only of 1.1 per cent (Model I).

The soil fertility status viz., NPK availability in soil were analyzed after the experimental period (6 years) and compared with the pre experimental fertility status. The numerical increase in all the three major nutrients was observed over the pre-treatmental observation. The available NPK status was higher (281, 8.1, 139 kg ha⁻¹) in model III (Coconut + Banana + black pepper + bhendi). With regard to soil microbial load, the model IV (Coconut + black pepper + banana + E.F. Yam + coriander) recorded the maximum fungal and bacterial population of 3.33 and 12.30 x 10⁵ cfu / g. dry soil respectively. In model I (coconut monocrop), the fungi population was lowest (1.66) and the model II (Coconut + Banana + black pepper) recorded the lowest bacterial population (1.66).



Table 4. Influence of intercropping system on coconut yield (No/palm/year)

Intercrop	Pre - exptl. nut yield (98-03)	Nut yield						Cumulative mean nut yield (03-09)	% over increase pre- exptl. nut yield
		03-04	04-05	05-06	06-07	07-08	08-09		
I	88	84	96	91	93	109	61	89	1.10
II	98	97	105	108	121	162	75	111	13.26
III	91	95	111	97	93	137	141	112	23.07
IV	70	74	86	75	77	128	92	87	24.28
V	69	60	68	75	87	85	82	76	10.14
VI	96	90	113	102	107	129	91	105	9.37
VII	59	55	62	62	69	105	81	72	22.0
VIII	120	140	147	126	121	203	81	136	13.33

Table 5. The soil health under coconut based cropping system

Model	Available nutrients (kg ha ⁻¹)						Population (CFU x 10 ⁵ g ⁻¹ dry soil)	
	Nitrogen		Phosphorus		Potassium		Fungi	Bacteria
	Pre-treatment (2003)	2009	Pre-treatment	2009	Pre-treatment	2009		
I.	260	263	7.3	7.7	121	128	1.66	2.33
II.	252	265	6.8	7.9	115	131	2.00	1.66
III.	270	281	7.2	8.1	124	139	2.33	8.00
IV.	243	261	6.3	7.2	116	138	3.33	12.30
V.	263	277	6.4	7.5	128	137	2.66	2.66
VI.	253	268	6.9	7.7	131	138	2.00	5.33
VII.	265	278	7.2	7.8	127	135	2.00	2.33
VIII.	267	275	7.1	7.6	131	138	3.00	7.00

Conclusion

Among the eight models consisting of various intercrops evaluated in coconut from 2003-2009, the model IV comprising of coconut, black pepper, banana, elephant foot yam and coriander recorded consistently higher BC ratio followed by the model II (Coconut + Banana + black pepper). With regard to soil health, model III (Coconut + Banana + black pepper + bhendi) recorded the higher soil available NPK and model IV (Coconut + black pepper + banana + E.F. Yam + coriander) recorded the highest fungal and bacterial population. By considering the economic advantage, the field feasibility, marketability and economic viability, the model IV (Coconut + black pepper + banana + E.F. Yam + coriander) is the best suited intercropping system for coconut garden for the east coast region of Tamil Nadu.

Cheapest fertilizer

"The use of sodium chloride or common salt as fertilizer is a practical means of increasing coconut production. Salt is the cheapest and best source of chlorine to increase copra yield," Ms. Uy explained. It was learned that chlorine deficiency in coconut has been widespread in inland areas. A Philippine Coconut Authority (PCA) study conducted nationwide showed that at least 40 coconut-producing provinces, including Leyte and Southern Leyte, are severely chlorine-deficient.

Among the advantages of using salt is its relative cheapness, easy application, minimized leaf spot damage and accelerated crop growth.

In a long-term study of salt application, it was learned that applying 1.5 kg of salt per tree annually was considered the most effective and economical way to increase copra weight, as well as nut and copra yield per hectare.

The PCA regional office has projected a 5.7% growth output to 3.07 million MT this year as the coconut industry recovers from the calamities that affected the coconut farms. The PCA targets to increase copra production further to 3.4 MT in 2012.

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