

Original Research Article

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Economics of Different Horticultural Crops under Arecanut Based Multistoreyed Cropping System in West Bengal Condition

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ABSTRACT

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Multi-storey cropping is practiced for growing two or more crops in the inter spaces during main crop growing season and which include both inter and mixed cropping. Mixed cropping in arecanut plantation has promoted more growth and yield of main crop of arecanut as indicated by increased number of leaves (fronds) and increased yield per palm compared to sole crop. Yield and income of five representative samples of arecanut (main crop) and the intercrops from all the seven models were observed. Maximum mean yield of arecanut was observed to be in var. Mohitnagar (1.590kg/plant), while minimum was in var. Mangala (1.348kg/plant). Maximum income and B:C ratio of Rs. 36,919.95 and 3.68:1 respectively were observed in Model-III, while minimum income Rs. 15,637.15 was in Model-I. Minimum B: C ratio of 1.13:1 was observed to be in Model-VI. It can be concluded that, Model – III (Arecanut + Banana + Turmeric) was the best remunerative one and the farmers can adopt this model in this region as areca nut based multi-storey cropping system for more income per unit area.

Introduction

Arecanut palm (*Areca catechu* L.), is important plantation crop in whole of South East Asia including India. Horticulture crops particularly fruit and plantation crops have self-sustainable system where solar energy can be harvested at different heights, soil resources are used efficiently and can increase cropping intensities. This modern approach is boon to small and marginal farmers who are major stakeholders in Indian Agriculture/Horticulture system in present and future days.

Due to various constraints, many arecanut growers are not able to adopt the multispecies cropping system to the desired level. Arecanut as a sole crop does not fully utilize the natural resources such as soil, space, and light.

The compact nature of arecanut crown, raised well above the ground (10 to 15 m), allows more sunlight to pass down to ground and maintain high humidity which in turn favors excellent growth of shade loving crops. So, multiple cropping in arecanut was the ability to provide substantial increase of diversified

crops and income per unit area through better utilization of resources like land, space, light and nutrients.

In West Bengal, arecanut cultivation is mainly restricted to North Bengal, but due to fluctuation of price, people are losing interest in arecanut cultivation. Arecanut is a perennial crop and it can produce fruits up to 40 to 50 years. Intercropping in plantation crop garden helps to meet the food requirement, besides increasing the net returns per unit area (Nair and Verghese, 1976). Areca nut based cropping systems have been developed for different places and net returns from the garden have been increasing many fold.

Materials and Methods

The experiment was undertaken at Horticultural Instructional Farm, UBKV. Seven different models (Table 1): Model-I with Arecanut as monocrop; Model-II with Arecanut + Turmeric, Model-III with Arecanut + Banana + Turmeric; Model-IV with Arecanut + Cow pea + Tomato; Model-V with Arecanut + Chilli + Spinach; Model-VI with Arecanut + Banana + Okra + Brinjal and Model-VII with Arecanut + Chilli + Coriander were established during 2014-15 (Fig. 1). The experimental site is of six years old.

Spacing followed for arecanut and banana and was 2.7m x 2.7m and 5.4m x 5.4 m, respectively and remained same under all treatment combinations. The package of practices recommended for the young arecanut was accordingly followed (Bhat and Leela, 1968). Crops were supplied with recommended fertilizers and other operations were carried out as and when required. The yield, cost of production and B: C ratio of different intercrops were estimated following simple statistical programmes taking into consideration of the prevailing Pundibari region market price.

Results and Discussion

The present investigation, seven plots of arecanut palm planted during 2003-'04 were selected. Various crops grown with their duration of cultivation have been presented in Table 1. In total, there were eight existing plots of arecanut in the block, out of which, for the present experiment seven plots, three plots with Mohitnagar and one each with Mangala, Sreemangala, Sumangala and Kahikuchi were selected for establishment of seven various models. In the first model (Model-I), had only arecanut as monocrop, In second model (Model-II), Turmeric was interplanted in the beds prepared in the interspaces of arecanut (main crop), banana suckers were planted in rows and turmeric in the beds between the rows of arecanut in the third model (Model-III). Sit *et al.*, (2006) studied the feasibility of growing 25 vegetables intercropping in 36 years old arecanut garden under sub-Himalayan Terai region of West Bengal.

Girijadevi and Muralidharan Nair (2003) also reported banana and turmeric as intercrops in coconut garden. In the fourth model (Model-IV), cow pea and tomato were grown in the inter spaces; in the fifth model (Model-V) chilli and spinach were interplanted in beds between the rows of arecanut. In the sixth model (Model-VI), banana in the same rows of arecanut (main crop) along with okra followed by brinjal were grown in the beds prepared in between arecanut, Girijadevi and Muralidharan Nair (2003) reported 7 cropping systems in coconut garden with banana, vegetable, cow pea, ginger and other crops in Kerala. Ray *et al.*, (2007) reported seven vegetable crops including tomato and brinjal and three flowering crops in a three year old arecanut (var. Mohitnagar) at CPCRI, RC, Kahikuchi, Assam. In seventh model (Model-VII), chilli followed by coriander was grown (Nair *et al.*, 2000).

Table.1 Details of various crops interplanted in existing arecanut based multistorey cropping models

Model	Main crop and inter-crops			
Model-I	Arecanut	--	--	--
Model-II	Arecanut	Turmeric (May.'14 to Feb.'15)	--	--
Model-III	Arecanut	Banana (May.'14 to till date)	Turmeric (May,'14 to Feb.'15)	--
Model-IV	Arecanut	Cow pea (Jun.'14 to Sept.'14)	Tomato (Oct.'14 to Jan.'15)	--
Model-V	Arecanut	Chilli (Jun.'14 to Sept.'14)	Spinach (Oct.'14 to Dec.'14)	--
Model-VI	Arecanut	Banana (May.'14 to till date)	Okra (Jun.'14 to Sep.'14)	Brinjal (Oct.'14 to Jan.'15)
Model-VII	Arecanut	Chilli (Jun.'14 to Sept.'14)	Coriander (Oct.'14 to Jan.'15)	--

Table.2 Observations on economics of main crop (arecanut) and component crops

Model	Cost of cultivation (Per plot of 324 m ²)								Per ha			
	Land Preparation, seed material, planting	Inter-cultural operations	Agro-chemicals	Harvesting and post-harvest operations	Gross expenditure	Gross return	Net return	B:C ratio	Gross expenditure	Gross Return	Net return	B:C Ratio
Model-I	--	2,300	258	1,074	3,632	15,523	11,891	3.3:1	1,12,099	4,79,105	3,67,006	3.3:1
Model-II	860	3,000	521	1,274	5,655	25,751	20,096	3.6:1	1,74,537	7,94,628	6,20,091	3.6:1
Model-III	1,604	3,800	1,008	1,474	7,886	33,522	25,636	3.3:1	2,43,395	10,34,435	7,91,040	3.3:1
Model-IV	1,454	3,400	476	2,274	7,604	26,075	18,471	2.4:1	2,34,691	8,04,614	5,69,923	2.4:1
Model-V	1,668	3,400	488	2,274	7,830	26,637	18,807	2.4:1	2,41,667	8,21,948	5,80,281	2.4:1
Model-VI	2,818	4,200	977	2,874	10,869	27,234*	16,365	1.5:1	3,35,463	8,40,555*	5,05,092	1.5:1
Model-VII	1,650	3,400	496	2,274	7,820	28,843	21,023	2.7:1	2,41,358	8,90,070	6,48,712	2.7:1

Fig.1 Photographs of various models



Reported cultivation of perennial intercrops in arecanut garden permits only a single return in a year whereas cultivation of vegetables as intercrops might help to get frequent returns (Nair *et al.*, 2000). Roy and Hore (2011) reported bio-organic inputs on growth, yield and economics of turmeric grown as intercrop in arecanut plantation at Horticulture Research Station, Mondouri, BCKV, West Bengal.

The economic analysis involving cost of cultivation, gross return, net return, and B: C Ratio for finding out the most remunerative model has been presented in Table 2. It is

clear from the table (Table 2) that in Model-I arecanut was grown as monocrop an income of Rs, 15,637.15 was obtained. For Model -IV arecanut, cow pea and tomato were grown. Total cost of cultivation (Table 2) was Rs. 7,604 for harvesting and related operations net return of Rs.26,986.38 could be obtained from that model.

Gross income from Model-V growing chilli, along with arecanut as main crop was Rs. 27456.82 incurring a gross expenditure of Rs.7,830 (Table 2). In Model-VI, arecanut, banana, okra and brinjal were grown. This model had maximum cost of cultivation of Rs

10,869, as it involved more number of labours for land preparation, intercultural operations and harvesting (Table 2). Net return from this model was observed to be Rs.23173.14. Roy and Hore (2011) also reported maximum cost of cultivation of Rs. 1,09,744 per ha, gross return of Rs 27234.

Benefit cost ratio, as revealed from Table 2, was the highest (3.68:1) in Model -III where, banana and turmeric were grown as intercrops with arecanut. While minimum (1.13:1) in case of Model-VI where banana, okra and brinjal were grown along with arecanut as main crop. Sit *et al.*, (2006) reported that the B: C ratio ranged between 0.37 in case of bitter gourd to 3.44 in case of cabbage as intercrop with arecanut. Model- II with turmeric as intercrops with arecanut and Model-I with arecanut as monocrop had the Benefit: cost ratios of 3.63:1 and 3.31:1; while Model-VII, the benefit cost ratio was observed to be 2.19:1. Girijadevi and Muralidharan Nair (2003) reported various B: C ratios- 1.59 with banana, 2.28 banana + ginger, 1.89 banana+ ginger +vegetable cowpea, 1.56 with banana+ turmeric and 1.64 with only banana in arecanut garden. In both the Models IV and V, the benefit cost ratio was observed to be 2.55:1 and 2.51:1, respectively. Sit *et al.*, (2006) also observed B: C ratio 1.39 with spinach as intercrop in 36 years old arecanut garden at Mohitnagar, West Bengal. Ray *et al.*, (2007) reported B: C ratio of 2.57 with tomato and 5.05 with brinjal as intercrops. Nath *et al.*, (2002) revealed that out of three models studied, the model with coconut + black pepper + banana + Assam lemon + pine apple + ginger was the most remunerative one, recording the highest net return of Rs. 63,488/ha, followed by coconut + betel vine + banana + Assam lemon + turmeric + colocasia with Rs. 31, 406/ha, while the minimum net profit of Rs. 16,074/ha was recorded in the coconut monocropping system. The mixed cropping

systems arecanut + cardamom + pepper and arecanut + pepper, respectively recorded 141.30% and 119.69% more profits over and above the profit from sole crop (Girish *et al.*, 2003). Bari and Rahim (2012) recorded the highest benefit cost ratio (BCR) from coconut + guava based MAF. Shahapurmath *et al.*, (2003) also obtained all the mixed cropping systems studied were found to be economically better, with a net profit per hectare ranging from Rs. 3,52,858 in arecanut + cardamom + pepper to Rs. 1,69,539 in arecanut + banana, compared to sole cropping of arecanut (Rs. 1,46,227/ha). Sit *et al.*, (2006) B: C ratio of all the crops ranged between 0.37 (bitter gourd) to 3.44 (cabbage), however, all the vegetables tested were found to be profitable.

It is clear from Table 2 that maximum profit of Rs.36,919.95 could be earned from Model -III where banana along the rows of arecanut and turmeric in the beds in the interspaces were grown. Minimum profit Rs.15,637.15 could be earned incurring minimum expenditure of Rs. 3,632 per plot of 324 m² growing arecanut as monocrop. Girijadevi and Muralidharan Nair (2003) also found benefit: cost ratio was reported to be the highest in banana + ginger + vegetable cow pea in coconut based intercropping system at Kerala Agriculture University. Kakaty *et al.*, (2002) opined that the combinations of banana + pineapple + arecanut and pineapple + cowpea + French bean + arecanut were effective in increasing yield, gross return and net profit along with higher benefit: cost ratio in both cases of bearing and pre-bearing areca-based multistored cropping system in Assam.

The present investigation for only one year, it could be concluded that incorporation of intercrops as multistoreyed cropping in arecanut garden besides generating more income from those crops, yield and return

from arecanut also increased. So, the farmers in this region, like in South India can very well cultivate various inter-crops as multistoreyed cropping system for more yield of not only arecanut but also getting yield and subsequently more income per unit area, reducing the risk of long gestation period and fluctuating prices of growing arecanut as monocrop.

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