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RESEARCH PAPER

A comparative analysis of arecanut based cropping system in Uttara Kannada district

Lekhan N. Hebbur*, S. H. Gotyal[1] **and** S. G. Aski[1]
Department of Agricultural Extension Education, College of Agriculture (U.A.S.), Dharwad (Karnataka) India

Abstract : The study was conducted in Uttara Kannada district which comes under the jurisdiction of UAS, Dharwad during the year 2021-2022. To make comparative analysis of arecanut based cropping system by employing "*Ex-post facto*" research design and by using simple random sampling technique in Uttara Kannada district constituting a total sample size of 120 farmers. It was revealed that, 77.50 per cent of sole crop and 65.00 per cent of multiple cropping growers adopted Sirsi local variety, 77.50 per cent of sole crop growers done planting during May-August and 65.00 per cent of multiple cropping growers done planting during August-September, 95.00 per cent of multiple cropping growers adopted 2.7×2.7m spacing, 47.50 per cent of multiple cropping growers adopted square system of layout, 47.50 per cent of sole crop growers adopted covering of stem, 52.50 per cent of sole crop growers adopted method of fertilizer application, 67.50 per cent of sole crop growers adopted depth of drainage, 75.00 per cent of sole crop growers adopted mulching, both sole and multiple cropping growers adopted manual method of harvesting and 92.50 per cent of sole crop growers go for rashi type of processing to get maximum profit. There is enough scope to encourage adoption of arecanut based cropping system by using mass contact methods and concerned transfer of technology centers. Thus, the efforts should be made to conduct training programmes and demonstrations.So, it is another vital thing that needs to be given priority to adoption of production technology.

Key Words : Adoption, Arecanut, Production technology, Income, FYM, Irrigation

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INTRODUCTION

Horticulture holds immense importance as a subsector of agriculture, contributing significantly to the global economy. It involves the cultivation of fruits, vegetables, flowers, nuts, and ornamental plants, addressing not only food security but also nutritional diversity and aesthetics. Horticulture plays a crucial role in promoting healthy diets, providing essential vitamins and minerals, and enhancing the overall quality of life. Moreover, it generates employment opportunities, supports rural livelihoods, and fosters agribusinesses, thereby contributing to economic growth and social development.

***Author for correspondence:**
[1]Department of Agricultural Extension Education, College of Agriculture, Vijayapura (Karnataka) India (Email: gotyalsh@rediffmail.com; askisubhash@gmail.com)

The *Areca catechu* L. palm, commonly known as arecanut or betel nut, holds immense commercial significance in India and has far-reaching effects on politics, society, culture, and the economy. Its influence extends beyond India's borders, thriving in countries like Malaysia, Sri Lanka, Indonesia, the Philippines, and various PacificIslands. Beyond its role as a popular chewing habit, referred to as "mastication" in India, arecanut has diversified into various economic avenues.

Among the states of India, Karnataka stands first in arecanut production. Karnataka, Kerala and Assam, all three states together account for 88.59 per cent of the total arecanut production in the country. In Karnataka, around 5.40 lakh hectares is under arecanut cultivation, which accounts for 57.85 per cent of total arecanut area in India. The contribution to total production is around 59 lakh tonnes which accounts for 65.93 per cent of all India production in 2020-2021 (DASD, Calicut).

Among the districts of Karnataka, Shivamogga stands first both in the area (1,00,486 ha) with production of (1,84,730)tonnes of arecanut (Directorate of Economics and Statistics, Karnataka, 2020-2021), followed by Dakshina Kannada, Chikkamagaluru, Davanagere and Tumkuru are leading arecanut producing districts.

Arecanut-based cropping systems in India are highly diversified and adaptable, reflecting the versatility of this crop to thrive in various agro-climatic conditions. Arecanut trees are planted with a adequate spacing which creates suitable microclimate with varying light conditions humidity level and good air circulation these favourable conditions allow for multiple cropping in the available interspace.

In addition to these established systems, mixed plantations that incorporate a medley of crops are a hallmark of Uttara Kannada's agricultural ingenuity. These mixed plantations often feature a combination of arecanut, coconut, banana, black pepper, cocoa, and various spices.

Hence, this investigation was conceived with the primary objective of studying the comparative analysis of arecanut based cropping system by the farmers.

MATERIAL AND METHODS

The study was conducted in Uttara Kannada district which comes under the jurisdiction of UAS, Dharwad during the year 2021-2022by using *Ex-post facto* research design and simple random sampling technique.Uttara Kannada district was selected and further Three talukas from the district *viz.,*Sirsi (8592 ha) Yellapur (4120 ha) and Mundagod talukas were selected for the study.From each selected 3 Talukas of Uttara Kannada district, 4 villages were selected randomly, from each taluka Further, from each selected village 10 farmers were selected by simple random sampling procedure to constitute a total sample of 120 arecanut growers. To study the comparative analysis of arecanut based cropping systens a structured interview schedule was prepared by reviewing the previous studies and pretested in the non-sample area.Mean andstandard deviation were used for classification of the members into various categories.

Based on the package of practice, 23 crop production practices, four plant protection practices, six harvesting and processing practices were listed. Hence, a total of 33 recommended production technologies were considered for the study. Respondents were asked questions to know whether they have adopted each of recommended practices in arecanut or not. Each adopted practice was scored "1" and non-adopted practice was scored "0". The total score obtained by the respondents from all practices was the adoption score of the individual respondent. The total score was calculated after summing the scores obtained in the recommended practices, thus one could get the maximum of score 23 and minimum score of 0.Then 40 farmers for each cropping system like sole arecanut, arecanut + Banana and arecanut + Pepper were selected and compared.

RESULTS AND DISCUSSION

The experimental findings obtained from the present study have been discussed in following heads :

Net income :

The Table 1 Indicates comparative income of arecanut based cropping systems, arecanut, arecanut + banana and arecanut+pepper, in terms of yield, market price, gross income, cost of cultivation, net income and B:C ratio.

With respect to yield, sole crop of arecanut got more yield (9.5 q/acre) and arecanut +banana separately got a yield of (9.2 q/acre and 24 q/ acre). Whereas, in terms of price arecanut get equal price in both sole crop and mixed crop of about 44,000 Rs./q and compare to banana pepper gets good price/q. (48000 Rs./acre and 3500 Rs./ acre, respectively).With regard to gross income obtained

Table 1 : Comparative analysis of income of arecanut based cropping system adopted by farmers (n=120)

Particulars	Arecanut (40)	Arecanut + Banana (40)		Arecanut + Pepper (40)	
Yields obtained (qtl/acre)	9.5	9.2	24	9.3	2
Market rate (Rs./qtl)	44,000	44000	3500	44000	48000
Gross income (Rs./acre)	4,18,000	4,88,800		5,05,200	
Cost of cultivation (Rs./acre)	1,07,500	1,19,500		1,22,000	
Net income (Rs./acre)	3,10,500	3,69,300		3,83,000	
B:C ratio	1: 2.88	1: 3.09		1: 3.14	

from arecanut + pepper was more (5,05,200 Rs. /acre) compared to sole arecanut and arecanut +banana (4,88,800 and 4,18,000 Rs. /acre), respectively. The net income was high from arecanut+ pepper 3,83,000 Rs./q whereas arecanut+banana and arecanuut (3,69,300 and 3,10,500 Rs./q), respectively. Hence, the B:C ratio for arecanut is 1:2.88 and arecanut + pepper is high compared to arecanut + banana (1:3.14 and 1:3.09, respectively).

Sole crop grower gets income from only one source *i.e.,* arecanut sole. But, in case if multiple cropping, growers get additional income from intercrops like banana and pepper, so they can earn (21.00 %) more net profit than sole crop and also, they get high BC ratio compared to sole crop growers.

The findings are in line with the findings of Apoorva (2021), Shahapurmath (2010) and Akshath (2016).

Adoption :

Majority (77.50 %) of them adopted Sirsi local variety in sole cropping and 65.00 per cent of them adopted Sirsi local variety in multiple cropping. The reason is they have assumption that, if the Sirsi local variety grown with any other crop like pepper banana and other crops main crop yield get reduced compared to sole cropping system. Majority (77.50 %) of them planted the seedlings in May-August in sole cropping system, followed by 65.00 per cent of them in multiple cropping system. August -September. Multiple crop growers planting during August- September because arecanut need more time to adopt to the soil and other conditions. So, after that period, they plant intercrops during January-March.Square system layout of plantation was followed by nearly half (47.50 %) of the respondents in multiple cropping system and 22.50 per cent of them in sole cropping. Square layout of plantation was followed by multiple cropping growers the possible reason for this was square type of planting helps to accommodate more intercrops compared to other.

Planting of shade trees was adopted by (30.00 %) of multiple crop growers and (22.50 %) of sole crop growers. Planting of shade trees for protection is adopted by multiple cropping growers Planting shade trees around multiple cropping system with banana and pepper because those crops also need shade trees to get protection from wind. Growing of nurse crop was adopted by 37.50 per cent of sole crop growers and 16.25 per cent of multiple crop growers adopted the same.In sole crop, there space availability between two plants, so, they practice growing of nurse crops.

Large majority of the growers applied FYM at 20 kg/palm/yr in both sole cropping system (90.00%) and multiple cropping system (77.50%). Sole crop growers take more care of crop to get higher yield and profit so they adopt recommended method of organic manure application. Fertigation mode of fertilizer application by more than half of them (52.50 %) in sole cropping system and 32.50 per cent of them under multiple cropping system. The possible reason might be sole crop growers adopted drip irrigation methods so that it helps in fertigation.

Drip irrigation was adopted by large majority of the arecanut farmers in sole cropping system (80.00 %) and multiple cropping system (78.75 %). Drip irrigation has significantly improved water efficiency and crop yield for arecanut farmers in both sole cropping and multiple cropping systems. Majority (67.50 %) of them adopted the recommended depth of drainage (75-100 cm) under sole cropping system and 43.75 per cent of them under multiple cropping system. Adoption of depth of drainage high in sole crop growers compared to multiple crops because in sole crop, there is availability of space so they adopted it.

One fourth (25.00 %) of the arecanut farmers had grown cover crops under sole cropping system and half of them (50.00 %) of them under multiple cropping system, while three fourth (75.00 %) of them adopted mulching in sole cropping system and 35.00 per cent of them under multiple cropping system for moisture

Table 2: Comparative analysis of adoption of arecanut based cropping system **(n=120)**

Sr. No.	Cultivation practices	Sole (n=40)		Multiple (n=80)		Overall (n=120)	
		f	%	f	%	F	%
1.	**Variety**						
	SAS-1	10	25.00	15	18.75	25	20.83
	Sirsi local	31	77.50	52	65.00	83	69.16
	Other varieties (Mangala, Sagara local)	4	10.00	15	18.75	19	15.83
2.	**Planting**						
	Age of seedlings for transplanting	40	100.00	80	100.00	120	100.00
	12- 18 months old						
	Planting time	31	77.50	52	65.00	83	69.16
	May-august						
	August – September	18	45.00	32	40.00	50	41.67
	Spacing	32	80.00	76	95.00	108	90.00
	2.7 × 2.7 m						
	Other than recommended	16	40.00	9	11.25	25	20.83
	2.4×2.4 m						
3.	**Land preparation**						
	Pit size	18	45.00	30	37.50	48	40.00
	60 ×60× 60 cm for heavy soils						
	90× 90 ×90 cm for well drained deep soils	25	62.50	42	52.50	67	55.83
	Layout of plantation						
	Alignment facing S-W direction	7	17.50	19	23.75	26	21.66
	Square	9	22.50	38	47.50	47	39.16
	Triangle	26	65.00	21	26.25	47	39.16
4.	Protection against sunscald						
	Planting of shade trees	9	22.50	24	30.00	33	27.50
	Covering stem	19	47.50	20	25.00	59	49.17
	Growing nurse crops	15	37.50	13	16.25	28	23.33
5.	**Organic manure application**	36	90.00	62	77.50	98	81.66
	FYM at 20kg/palm/yr.						
	Vermicompost at 8kg/palm/yr.	19	47.50	20	25.00	39	32.50
6.	**Fertilizer application**						
	Recommended dose	21	52.50	26	32.50	47	39.16
	Local variety: 100:40:140 g /palm/ year						
	Improved variety:	13	32.50	11	13.75	24	20.00
	150:60:210 g/palm/year						
		15	37.50	23	28.75	38	31.70

Table 2 : Contd……..

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	Improved variety: 150:60:210 g/palm/year	13	32.50	11	13.75	24	20.00
	Time of fertilizer application						
	Irrigated: Feb-March, Sept-Oct	15	37.50	23	28.75	38	31.70
	Rainfed: April-May, Sept- Oct	18	45.00	28	35.00	46	38.33
	Method of application			26	32.50		
	Fertigation	21	52.50			47	39.16
	Ring method	18	45.00	36	45.00	54	45.00
7.	**Lime application**						
	1kg/ palm, once in two years	17	42.50	37	46.25	54	45.00
8.	**Irrigation**						
	Method of irrigation			42	52.50	95	79.16
	Drip irrigation	32	80.00				
	Sprinkler irrigation	14	35.00	25	31.25	39	32.50
	Flood irrigation	9	22.50	38	47.50	30	25.00
	Irrigation level		47.50		67.50		
	175 litres/week/ palm	19		54		73	60.83
	16-20 litres/day/ palm in drip irrigation	21	52.50	26	32.50	47	39.16
9.	**Depth of drainage**		67.50			62	51.66
	75 to 100 cm	27		35	43.75		
10.	**Moisture conservation techniques**	30	75.00	40	50.00	50	41.70
	Growing cover crops						
	Mulching	10	25.00	28	35.00	58	48.33
11.	**Major diseases**	8	20.00	22	27.50	30	25.00
	Koleroga / Mahali/ bud rot: Bunch covering with polythene bags						
	Bordeaux mixture (1%) spray to the bunches	18	45.00	51	63.75	69	57.50
	Yellow leaf disease:					42	35.00
	Remove diseased palms	11	27.50	31	38.75		
	Apply 1 g Phosphatic fertilizer + 2kg neem cake per plant as two applications	12	30.00	33	41.25	45	37.50
	Anabe roga/ foot rot:				46.25	53	44.20
	Dig trenches with 30cm width and 60cm depth all around the plants	16	40.00	37			
	Drench with 0.3 % Calixin (3 ml/l) at 15 l/ palm	9	22.50	20	25.00	29	24.17
	Neem cake 2kg/palm/year	7	17.50	19	23.75	26	21.67
	Nut splitting: Borax spray at 2g/l	15	37.50	33	41.25	48	40.00
	Band / Hidimundige:				40.00	45	37.50
	Borax 25g/palm/yr.	13	32.50	32			
	Apply 225g of copper sulphate + lime in equal quantity	9	22.50	27	33.75	36	30.00

Table 2 : Conted……

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	Leaf spot	8	20.00	20	25.00	28	23.34
	Spray Mancozeb 75 WP 2g/ltr or Copper oxychloride 50 WP 3g/ltr of water						
12.	**Major pests**	7	17.50	18	22.50	25	20.8
	Mites:						
	Dicofol 20 EC 2ml/ l spray						
	Dimethoate 30 EC 1.7ml/l	10	25.00	26	32.50	36	30.00
	White or Root grub:				5.00	9	07.50
	Collect and destroy beetles	5	12.50	4			
	Phorate 15 g/ palm twice a year	4	10.00	10	12.50	14	11.67
	Chloropyriphos 20 EC at 7ml/l at 3 l/ palm	3	7.50	10	12.50	13	10.83
	Spindle bug:	5	12.50	13	16.25	18	15.00
	Dimethoate 1.5 ml/l						
	Placing phorate granules in sachets in innermost leaf axil	38	95.00	78	97.50	116	96.67
	Inflorescence caterpillar:	12	30.00	7	8.75	19	15.84
	Remove and burn affected inflorescence						
	Chloropyriphos 20 EC at 2ml/l spray	7	17.50	21	26.75	28	23.34
13.	**Harvesting and processing**	26	65.50	54	67.50	80	66.67
	Season						
	July- Dec for tender nuts						
	Dec- March for ripen nuts	18	45.00	31	38.75	59	49.17
	Method of harvest	27	67.50	80	100.00	107	89.16
	Manual						
	Mechanical	13	32.50	0	0.00	13	10.83
	Method of processing	37	92.50	45	56.25	82	68.33
	Kalipak / Rashi / tender nut						
	Chali / kottapak / ripen nut	9	22.50	48	60.00	57	47.50

*Multiple responses

conservation. there is a space between two plants in sole crop compared to multiple crops so they grow cover crop to conserve moisture and to avoid weed growth. Adoption of mulching is also low in both sole and multiple cropping because difficult in collection of fallen nuts during harvesting.

Cent per cent of multiple crop farmers harvest manually and 67.50 per cent and 32.50 per cent of sole crop farmers harvest by manual and mechanical method, respectively due to the post-harvest losses during the transit so most of the farmers fallowed manual method of harvesting. 56.25 per cent and 60.00 per cent of multiple crop farmers adopted processing of Rashi variety and chali variety, respectively. 92.50 per cent and 22.50 per cent of sole crop farmers adopted processing of Rashi and Chali variety, respectively. Adoption of Rashi type processing is high in sole crop compared to multiple cropping, during the time of harvest tender nuts due to their high weight affect intercrop due to low spacing with main crop, whereas Chali type of processing because of its low weight can be harvested without affecting the intercrop due to this the above observations are made.The findings are in line with the findings of Apoorva (2021).

Conclusion:

It can be concluded from the above findings that

majority of the sole crop growers adopted recommended production technologies like recommended variety, spacing, fertilizer application, FYM application, pit size, growing of cover crops and mulching, time of fertilizer application, drip irrigation, depth of drainage and mechanical harvesting.There is enough scope to promote adoption of production technologies in multiple cropping growers by using mass contact methods and concerned transfer of technology centres. Thus, the efforts should be made to deliver the required knowledge and skills through training programmes and demonstrations and conduct study tours to observe the profitable cultivation of arecanutin other states and districts.

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