Perception of Farmers about Arecanut Based Multi-species Cropping System

D. Jaganathan[1] and Nagaraja, N.R.[2]

1&2. Scientist, Central Plantation Crops Research Institute, Regional Station, Vittal, Karnataka

Corresponding author e-mail: djaganathtn@gmail.com

ABSTRACT

Analysis on benefits and constraints in adoption of arecanut based multispecies cropping system was done during April – June, 2013 in Dakshina Kannada district, Karnataka through personal interview and focus group discussions. Majority of farmers (63.3%) belonged to middle age category, about 88 per cent of farmers were having more than 8 years of experience in arecanut cultivation, about 93 per cent had less than 2 ha area under arecanut, majority (58.9%) were cultivating both South Kanara local and improved varieties of arecanut, about 49 per cent of the farmers were having three component crops viz., cocoa, banana and black pepper, more than one fifth of farmers (21.1%) had undergone training. The major benefits as perceived by farmers were additional income from intercrops, more employment for family labourers and increased soil fertility. Arecanut growers expressed 17 constraints which were categorized as input, economic, biophysical, technological/extension and psychological constraints in the order of importance. The constraints faced by small and marginal farmers were multifaceted and warrants interventions at research, extension, development, input delivery, social and policy levels for increasing the adoption of multispecies cropping system.

Key words: *Multispecies cropping system; Arecanut; Benefits, Constraint analysis;*

Arecanut (*Areca catechu* L.) is one of the important commercial crops grown in parts of Karnataka, Kerala, Assam, Meghalaya, West Bengal and Andaman & Nicobar Islands. India is the largest producing country and Karnataka is the major producing state with a production of 3.5 lakh tones from an area of 2.16 lakh ha (*GOK, 2014*). Arecanut is the major source of livelihood for small and marginal farmers in Dakshina Kannada district of Karnataka. Long pre bearing period, fluctuations in market prices, unexpected loss due to adverse environmental conditions, pests and diseases etc. are some of the major problems in arecanut cultivation. In order to address these problems, farmers are advised to adopt multispecies cropping system in arecanut garden. Farmers have been raising some crops in the interspaces of arecanut as a common practice since many years. Scientific study on this multispecies cropping system was initiated during 1970s at CPCRI. The best cropping model for Dakshina Kannada region is Arecanut + cocoa + banana + Black pepper. Several studies reported that Arecanut Based Multispecies Cropping System (ABMSCS) is effective for increasing the production per unit area and maximizing the economic returns through better utilization of natural resources. In order to follow this cropping system, farmers need to be convinced about the socio- economic and technical feasibility in their local conditions. Due to various constraints, many arecanut growers are not able to adopt the multispecies cropping system to the desired level. Keeping this in view, the present study has been undertaken with the following objectives-

i. To investigate the profile characteristics of arecanut growers
ii. To assess the benefits and constraints in adoption of arecanut based multispecies cropping system as perceived by farmers
iii. To formulate strategies for enhancing the adoption of arecanut based multispecies cropping system

METHODOLOGY

A list of farmers was prepared based upon information from State Department of Horticulture and agencies involved in arecanut cultivation in the taluk. Five villages were identified for selecting the

respondents. Simple random sampling was used for selecting the sample. Eighteen farmers from each village were selected thus the total sample was 90. The data collection was done during April - June, 2013 through personal interview and focus group discussions using a pretested semi structured interview schedule.

Based on the review of literature, discussion with experts and observation made by the researchers, a list of profile characteristics were identified along with their operational definitions. The profile characteristics of farmers were analyzed by gathering data related to socio-personal and economic variables.

The benefits and constraints in adoption of ABMSCS as perceived by arecanut growers differ from individual to individual depending upon their socio-economic status, communication behaviour and scope and opportunities of marketing etc. Arecanut growers were asked to list the benefits and constraints in adoption of ABMSCS. The responses to each benefit and constraint were obtained as agreed, neutral and disagreed with a score of 3, 2 and 1 respectively. The frequencies of each response categories were worked out and respective frequencies were multiplied by the score allotted to it, then they were added and divided by the number of the respondents which gave the mean score for different benefits and constraints. The index values of observations were calculated with the help of mean score. The mean scores and index values were used to rank benefits and constraints in the order of importance as perceived by farmers. Statistical analysis was done using SAS and the tools employed were mean, standard deviation, percentage analysis, index and ranking.

RESULTS AND DISCUSSION

Socio economic profile of arecanut growers: Socio economic profile characteristics of arecanut growers were analyzed and are furnished in Table 1. The results showed that majority (63.3%) of the respondents were in middle age group (35-60 years) followed by 28.9 per cent belonged to young age group and only 7.8 per cent in old age category. The average age of the respondents was 42.3 years which led to a conclusion that middle age farmers opt for arecanut cultivation as their profession.

Educational status of the respondents varies from illiterate to post graduate with a mean score of 2.2. Majority of arecanut growers (60%) are confined to a secondary education followed by higher secondary (17.8%). An educated individual is likely to be more receptive to modern technologies in cropping system because education empowers individuals in terms of decision making, problem solving and change proneness. Since, majority farmers had secondary level education and above, they may be considered as potential adopters of cropping system in arecanut.

Average farming experience in arecanut was about 20 years which showed that arecanut growers were well experienced which might have helped them in adoption of cropping system in arecanut. Regarding the land holding size, 75.6 per cent of the respondents possessed area up to 1 ha (marginal), 17.8 per cent between 1-2 ha (small) and 6.7 per cent had between 2.1-4 ha (medium) under arecanut cultivation. The average land holding size was 0.8 ha with a SD of 0.5. Land holding might have influenced many decisions in adopting cropping system.

Age of the crop determines the yield and economic returns. Arecanut has a gestation period of 4-7 years and a long economic life of 35-40 years. Results showed that 57.8 per cent of the arecanut gardens were 10-20 years old, 30 per cent between 21-30 years old, 6 per cent were less than 10 years old and only 5.6 per cent were more than 30 years old. In the study area, majority of the garden were in productive stage and were suitable for intercrops for cropping system.

The data on training attended on ABMSCS is considered as an important factor for influencing adoption. Training was attended by only 21.1 per cent of farmers and majority did not have sufficient information about scientific cultivation of ABMSCS which needs attention by developmental departments.

Farmers had contact with extension agencies as well as they accessed information from extension sources *viz.*, seminars, meetings, study tours etc. which resulted in having medium level of extension orientation by 58.9 per cent of farmers. This might have led to adoption of cropping system.

Varieties grown by arecanut growers: Improved varieties play an important role in increasing the productivity and profitability of farming. Results from Table 2 revealed that majority (58.9%) of the respondents had both improved varieties released from

Table 1. Socio economic profile of arecanut growers

Profile characters	Classification	Respondents (N=90)	
		No.	%
Age (yrs)	Young (< 35)	26	28.9
Mean : 42.3	Middle (35-60)	57	63.3
SD : 11.5	Old (>60)	7	7.8
Educ. Status	Illiterate	3	3.3
Mean : 2.2	Primary	10	11.1
SD : 0.9	Secondary	54	60.0
	Higher secondary	16	17.8
	Graduate	06	06.7
	Post graduate	01	1.1
Farming (yrs)	Low (< 8.7)	11	12.2
Mean : 19.7	Medium (8.7-30.7)	66	73.4
SD : 11.0	High (> 30.7)	13	14.4
Area under	Marginal (< 1)	68	75.6
arecanut (ha)	Small (1- 2)	16	17.8
Mean : 0.8	Medium (2.1- 4)	6	6.7
SD : 0.5	Big (4.1-10)	0	0
	Very big (> 10)	0	0
Age of the	Low (< 10)	6	6.7
arecanut (Yrs)	Medium (10-20)	52	57.8
Mean : 19.7	High (21-30)	27	30.0
SD : 8.1	Very high (>30)	5	5.6
Traig. attended	Yes	19	21.1
	No	71	78.9
Ext. orientation	Low (< 5)	16	17.8
Mean: 7.25	Medium (5–10)	53	58.9
SD: 2.86	High (> 10)	21	23.3

Table 2. Varieties grown by arecanut growers (N=90)

Arecanut varieties	No.	%
Improved varieties & South Kanara local	53	58.9
South Kanara local	26	28.9
Improved varieties	11	12.2

CPCRI and South Kanara local. Local variety 'South Kanara local' alone was cultivated by 28.9 per cent of farmers. Improved varieties alone were cultivated by 12.2 per cent of the respondents. Overall, 71.1 per cent of arecanut growers were cultivating CPCRI varieties because of their high yielding potential, response to nutrition and good price in the market. Vicinity of CPCRI regional station, Vittal also might have influenced adoption of varieties by farmers.

Adoption of arecanut based cropping system: To minimize the degree of price risks and stabilize the farm income, the arecanut growers are advised to adopt various cropping models through crop intensification wherein two or more complementary crops are cultivated in the interspaces of the main crop. However, the degree of farm intensification and choice of the component crops depend on agro climatic, edaphic, biotic and socio-economic factors. It is revealed from Table 3 that the major component crops being Cocoa+ banana+black pepper by 48.9 per cent of the respondents followed by Cocoa+banana (12.2%) and Banana (8.9%). Crops *viz.*, fodder grasses, nutmeg and pine apple were found in 5.5 per cent of the gardens. Arecanut was cultivated as monocrop by 11.1 per cent of the respondents.

It was found that majority of arecanut growers were not adopting scientific recommendations in ABMSCS. As per CPCRI recommendations, population density of arecanut per ha is 1300, cocoa-650, banana-650 and black pepper–650. For instance it was observed that population of main crop and component crops varied from individual to individual depending on area, irrigation method, pests and diseases, marketing, price of the produce etc. Hence, efforts from research institutes, Department of Horticulture and other line departments are needed to educate the farmers to adopt scientific ABMSCS to reap maximum returns from unit area.

Benefits in adoption of arecanut based multispecies cropping system: The benefits in adoption of multispecies cropping system were collected using open ended interview schedule. Benefits as perceived by farmers were ranked using mean score and index values. It is revealed from the Table 4 that the benefit 'additional income from intercrops' was ranked first with a mean score of 4.44 out of maximum score of 5. The other benefits in the order of importance were more employment for family labourers (3.93), increased soil fertility (3.91), soil and water conservation (3.73) and self satisfaction (3.56).

Additional income from intercrops was perceived as a benefit of ABMSCS by farmers. Field survey conducted among 80 farmers in Dakshina Kannada district showed that benefit cost ratio and internal rate of return for arecanut + cocoa system were 1.22 and 17.2 per cent respectively (*CPCRI, 2005). Jayasekhar et al.,(2012)* reported that net returns from one ha of arecanut + banana + pepper was Rs. 65501/- which was more than the net returns (Rs. 12038) from one ha of arecanut as monocrop. *Jaganathan et al., (2013)*

Table 3. Component crops in arecanut garden (n= 90)

Component crops in arecanut garden	N.o.	%
Cocoa +Banana+ Black pepper	44	48.9
Cocoa + Banana	11	12.2
Banana	8	8.9
Banana+ Black pepper	4	4.4
Cocoa	4	4.4
Black Pepper	2	2.3
Others (Fodder, Nutmeg, Pine apple)	5	5.5
No component crops	10	11.1

also reported that average additional income realized from banana for three years was Rs. 37901 from six gardens of arecanut cropping system.

The second benefit was 'more employment for family labourers. Since the intercrops *viz.*, banana, cocoa, black pepper and other crops need attention round the year especially for intercultural operations, weeding, plant protection measures, harvesting, processing, marketing etc. for which family labourers were utilized.

Increased soil fertility by adopting arecanut based cropping system was perceived as third benefit. Soil and water conservation was the fourth benefit perceived by farmers. Intercrops utilized the interspaces effectively which helped in conserving the soil and water. Mulching with crop residues from intercrops helped in soil and water conservation. *Ravi Bhat and Vivek, (2001)* reported that evaporation and runoff losses are reduced because of crop cover and presence of crop residues with increased soil moisture storage and water use efficiency.

Self satisfaction in adopting arecanut based cropping system was expressed by farmers. Satisfaction is an important prerequisite for successful adoption of any technology. Cropping system provided them an opportunity to utilize the land fully with different crops for maximizing the farm returns from unit area. Farmers were satisfied by utilizing all resources effectively for cropping system.

Constraints in adoption of arecanut based multispecies cropping system: The constraints perceived by the farmers in adoption of ABMSCS were categorized into input, technological/extension, economic, biophysical and psychological constraints. The constraints under each category were ranked based on the mean score and index values obtained as per the farmers' perception (Table 5).

The constraints under input category were non availability of good quality inputs, skilled labour and good quality planting materials and poor electricity. Similar findings were reported by *Anithakumari et al., (2003)*. It was observed that non availability of good quality inputs was the first constraint in adoption of ABMSCS. Inputs *viz.*, fertilizers, plant protection chemicals were of poor quality as expressed by farmers. Many chemicals were unregistered and distributed to the farmers for use. Hence, quality control department should ensure the quality of inputs before it reaches farmers for use in the field. Non availability of skilled labour is another important constraint which hinders the adoption of ABMSCS. Though family labour was employed for farming, skilled labour was essential for pit making, spraying, harvesting and processing. Good quality planting materials is a prerequisite for plantation crops. Farmers were facing problems in getting good quality planting materials of intercrops *viz.*, banana and black pepper. Though, Government schemes like National Horticultural Mission (NHM) supplied planting materials which hardly met the demand for banana and black pepper. Farmers were forced to use locally available materials for planting. Hence, planting materials may be produced and supplied in sufficient quantities through participatory mode. Poor electricity is another

Table 4. Benefits of arecanut based multispecies cropping system (N=90)

Benefits	AF	NF	DF	Mean Score	Index	Rank
Additional income from intercrops	65 (72.2)	25(27.8)	0(0)	4.44	88.8	I
More employment for family labourers	48(53.3)	36(40.0)	6(6.7)	3.93	78.6	II
Increased soil fertility	47(52.2)	37(41.1)	6(6.7)	3.91	78.2	III
Soil and water conservation	37(41.1)	49(54.4)	4(4.4)	3.73	74.6	IV
Self satisfaction	43(47.8)	29(32.2)	18(20.0)	3.56	71.2	V

AF- Agreed farmers, NF – Neutral farmers, DF –Disagreed Farmers, Data within paranthesis indicate percentages
Index= (Mean score/ 5) $\times$ 100, where, 5 is the maximum attainable score for each statement

Table 5. Constraints in adoption of arecanut based multispecies cropping system (n=90)

Benefits	AF	NF	DF	MS	Index	Rank	OR
Input constraints							
Non availability of good quality inputs	61(67.8)	23(25.6)	6(6.7)	4.22	84.4	I	I
Non availability of skilled labour	57(63.3)	23(25.6)	10(11.1)	4.04	80.8	II	III
Non availability of good quality planting materials	52(57.8)	30(33.3)	8(8.9)	3.98	79.6	III	IV
Poor electricity	51(56.7)	25(27.8)	14(15.6)	3.82	76.4	IV	VII
Technological/Extension constraints							
Lack of knowledge on multispecies cropping system	46(51.1)	31(34.4)	13(14.4)	3.73	74.6	I	X
Lack of government support for cropping system	42(46.7)	35(38.9)	13(14.4)	3.64	72.8	II	XI
Lack of machineries for spraying and harvesting	40(44.4)	30(33.3)	20(22.2)	3.44	68.8	III	XII
Lack of resistant varieties for biotic and abiotic stress	32(35.6)	18(20.0)	40(44.4)	2.82	56.4	IV	XVI
Economic constraints							
Price fluctuation of farm produce	55(61.1)	33(36.7)	2(2.2)	4.18	83.6	I	II
Non availability of subsidies	45(50.0)	38(42.2)	7(7.8)	3.84	76.8	II	VI
Increased cost of cultivation	50(55.6)	24(26.7)	16(17.8)	3.76	75.2	III	IX
Biophysical constraints							
Incidence of Pests and diseases	46(51.1)	37(41.1)	7(7.8)	3.87	77.4	I	V
Attack by wild animals	48(53.3)	30(33.3)	12(13.3)	3.80	76.0	II	VIII
Non availability space for planting intercrops	26(28.9)	38(42.2)	26(28.9)	3.00	60.0	III	XV
Psychological constraints							
Difficult for intercultural operations/harvesting	37(41.1)	35(38.9)	18(20.0)	3.42	68.4	I	XIII
Time consuming	31(34.4)	35(38.9)	24(26.7)	3.16	63.2	II	XIV
Reduction in yield of main crop by component crops	19(21.1)	41(45.6)	30(33.3)	2.76	55.2	III	XVII

AF- Agreed farmers, NF – Neutral farmers, DF –Disagreed Farmers**,** Data within paranthesis indicate percentages
Index= (Mean score/ 5) $\times$ 100, where, 5 is the maximum attainable score for each statement; OR=Overall Rank

constraint which hindered the adoption of ABMSCS. Electricity is required for irrigation purpose especially during summer for maintaining three-four crops. Hence, regulated supply of electricity should be ensured which will lead to adoption of ABMSCS. Farmers can also adopt mulching and drip irrigation for minimal use of water which will reduce electricity use.

Lack of knowledge on multispecies cropping system, lack of government support in promotion of cropping system, lack of machineries for spraying and harvesting and lack of resistant varieties for biotic and abiotic stress were reported under technological/ extension constraints. Farmers have been practicing multispecies cropping system as a common practice since many years which was unscientific. Hence training programmes may be organized by research institutes, KVK and Department of Horticulture for improving their knowledge. Majority of the small and marginal farmers were resource poor and they wanted government support for adopting cropping system. Farmers were finding it difficult to do operations like pit making, spraying and harvesting of main crop and intercrops without suitable machineries. Custom hiring approach may be followed to overcome the problem of machineries usage by small and marginal farmers. Government may also develop small machineries which are affordable by resource poor farmers. Resistant varieties of arecanut and intercrops for biotic stress (pests and diseases) and abiotic stress (drought) may be developed for encouraging farmers to adopt multispecies cropping system.

The important economic constraints were, price fluctuation of farm produce, non availability of subsidies and increased cost of cultivation. The arecanut growers were very much concerned about the price fluctuation of farm produce. Farmers did not get assured price for arecanut and intercrops and there were fluctuations in prices both up and down for all the crops. Similar result was reported by *Surendran and Thomas (2009)*. Besides price fluctuation, non availability of subsidies and increased cost of cultivation hindered the adoption of ABMSCS. Farmers opined that there was an increase

in cost of inputs and labour wages which led to increased cost of cultivation. Small and marginal farmers could not afford the cost increase so they were not interested in intercrops. This could be overcome by providing subsidies to small and marginal farmers as an encouragement.

The biophysical constraints indicated that incidence of pests and diseases, attack by wild animals and non availability of space for planting intercrops were the hindrance in adoption of ABMSCS. *Anithakumari et al., (2003)* reported similar findings. The Participatory demonstration programmes for pests and diseases management could bridge the gap in technology adoption.

Difficult for intercultural operations/harvesting, time consuming and reduction in yield of main crop by component crops were recorded under psychological constraints. Farmers had the opinion that adoption of multispecies cropping system is time consuming affair, hinder the intercultural operations and also it may reduce the yield of main crop. Awareness cum training programmes coupled with demonstrations could remove all psychological barriers for adoption of multispecies cropping system.

CONCLUSION

On the basis of above results and discussions, it is evident that the major constraints faced by arecanut growers were non availability of good quality inputs, price fluctuation of farm produce, non availability of skilled labour and good quality planting materials, incidence of pests and diseases, non availability of subsidies, poor electricity etc. Thus there is a need for intervention from government at appropriate levels to strengthen quality control department for delivery of quality inputs, minimum support price for crops, training labour for skill development, production of planting materials in large quantities, plant protection measures, providing subsidies for small and marginal farmers etc. will encourage arecanut growers to adopt multispecies cropping system. No doubt, arecanut based multispecies cropping system provides additional income and also act as an income security against instability in price of main crop. It has potential to generate employment opportunities for improving the quality of rural life. Proper choice of crops and their quality planting materials is a prerequisite for a successful cropping system. A ready and assured market will encourage farmers to adopt multispecies cropping system. The scientific rationale behind multiple cropping needs to be understood by the areca growers before adopting it. It is strongly believed that multispecies cropping system is the need of the hour to make the farming profitable and sustainable.

Paper received on : January 06, 2015
Accepted on : March 15, 2015

REFERENCES

Anithakumari, P., Thamban, C. and Arulraj, S. (2003). Constraint analysis in coconut cultivation. *Indian Coconut J.*, **22** (9): 6-8.

CPCRI, (2005). Annual Report 1988-89, 1989-90 and 2004-05, CPCRI, Kasaragod.

GOK.(2014). www.horticulture.kar.nic.in, Department of Horticulture, Government of Karnataka.

Jaganathan, D., Elain Apshara, S. and Jose, C. T. (2013). Arecanut based multispecies cropping system – A success story. *Indian J. of Arecanut, Spices and Medicinal Plants*, **15** (1): 4-8.

Jayasekhar, S., Jose, C. T., Thamban, C. and Muralidharan, K. (2012). Economic impact of arecanut based cropping systems: A study of Dakshina Kannada district, Karnataka. *Journal of Plantation Crops*, **40**(1): 50-55

Ravi Bhat and Vivek R. Bhat. (2001). Multiple cropping in arecanut. Extension folder No.96. CPCRI, Kasaragod, India.

Surendran, S. and Thomas, E. K. (2009). Impact assessment of cluster approach in integrated coconut management. *Indian Coconut J.*, **42** (7): 8-14.

• • • • •