

FARMERS' PARTICIPATORY DEMONSTRATION ON ARECANUT BASED CROPPING SYSTEM - A SUCCESS STORY

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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. Arecanut is cultivated in an area of 453 thousand ha with an annual production of 632 thousand tonnes in India. Karnataka, Kerala and Assam are the major producers (Table 1). Suitable agro-techniques for arecanut and economically feasible cropping systems were developed as an answer to the recurring problems faced by the arecanut farmers such as high investment, weather aberrations, price fluctuations and pest and disease problems. Efficient recycling of organic wastes from arecanut plantation through vermicomposting has been standardized to supplement the chemical fertilizers.

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 (Bavappa *et al.*, 1986) which have generated livelihood concerns of arecanut farmers in India. A check in additional area expansion and encouraging the farmer to adopt arecanut based cropping systems by strengthening the Transfer of Technology (ToT) activities would certainly benefit the arecanut farmers in the long run.

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.

Table 1: Area under arecanut in India

State	Area ('000 ha)	% share	Production ('000 t)	% share	Yield (kg/ha)
Karnataka	221.4	49	358.6	57	1620
Kerala	101.7	22	118.2	19	1162
Assam	75.1	17	72.6	11	967
West Bengal	11.4	2	21.2	3	1857
Meghalaya	16.0	4	23.0	3	1626
Others	28.0	6	39.0	6	-
India	453.6		632.6		1395

Source: NHB Final, 2013-14

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In order to follow this cropping system, farmers need to be convinced about the socio-economic and technical feasibility in their local conditions. ICAR - Central Plantation Crops Research Institute (CPCRI), Directorate of Arecanut and Spices Development (DASD), State Agricultural Universities (SAUs), Krishi Vigyan Kendra (KVK), Department of Horticulture and other organizations have been promoting the concept of arecanut based multispecies cropping system to increase the productivity and profitability of farming from unit area. Due to various constraints, many arecanut growers are not able to adopt the multispecies cropping system to the desired level. Survey on adoption of cropping system revealed that crop combinations like arecanut + banana were adopted by 36 per cent of farmers followed by arecanut + banana + black pepper (27 %) and arecanut + cocoa (11 %) (Jayasekhar *et al.*, 2012). Similarly, arecanut + cocoa + banana + black pepper were adopted by 33 per cent of farmers in Puttur taluk of Dakshina Kannada (Jaganathan and Nagaraja, 2015). Establishing participatory demonstration plots in farmer's gardens will encourage many others to follow arecanut based multispecies cropping system for the improvement of their livelihood. Keeping this in view, ten participatory demonstration plots on arecanut based cropping system sponsored by Directorate of Arecanut and Spices Development, Ministry of Agriculture and Farmers' Welfare, Kozhikode were established in Puttur taluk (4 nos.), Belthangady taluk (3 nos.) Kasaragod taluk (3 nos.) during

2012 for enhancing productivity and profitability of farming per unit area.

Partners: Participatory technology demonstration in arecanut based multispecies cropping system involves the following partners in achieving the stable, sustainable and productive technology transfer

- > Arecanut growers
- > Scientists of CPCRI
- > Directorate of Arecanut and Spices Development, Calicut
- > Department of Horticulture- Karnataka & Kerala
- > Krishi Vigyan Kendra, Mangalore and Kasaragod
- > Media - Press, Journals and Video

Selection of beneficiaries: Farmers who had interest in taking up intercrops were selected after following the principles of participatory demonstration. Socio-economic background, available resources, farming details, farming practices, knowledge on cropping system, yield details, constraints in farming etc. were collected in detail with the active participation of the farmers. Ten arecanut gardens of one ha area, aged 15 years were selected for establishing demonstration plots on 'arecanut based multispecies cropping system' with banana, cocoa and black pepper as component crops. Planting materials were supplied and expenditures for planting and organic inputs were provided through funding from DASD. The planting system followed is given below.

Crop	Spacing (m x m)	Population/ Ha	Method of planting	Varieties
Arecanut	2.7 x 2.7	1370	Square	South Kanara local/ Mangala/ Mohitnagar
Banana	2.7 x 5.4	685	Centre of 4 palms	Kadali, Nendran
Cocoa	2.7 x 5.4	685	Centre of 4 palms	CPCRI F1 hybrids
Black Pepper	2.7 x 5.4	1370 (2 vines/palm)	Trail on palms	Panniyur- 5

Capacity building and providing resources:

Team of scientists from CPCRI consisting of different disciplines selected the beneficiaries based on the scoring criteria. Medium growing banana *viz.*, Kadali and Nendran was introduced which gave big bunches with more number of fingers. Elite cocoa hybrid seedlings were supplied for early and high bearing. Panniyur-5, a shade tolerant and high yielding pepper variety was introduced. Inputs were supplied to the farmers during first three years for establishing demonstration plot. Farmers were trained on latest technologies with respect to arecanut, banana, cocoa and black pepper. Frequent farm advisory visits were carried out by the scientists of CPCRI to monitor the growth and yield performance of main crop and intercrops. The photos of demonstration plots are given in Fig. 1. The list of beneficiaries is given below.



No. Name and address of beneficiary

- 1 Mr. Shankaranarayana Bhat, Kondalakana house, Panaje, Puttur, Dakshina Kannada
- 2 Mr. Rama Prasad, Hindaru, Kemminja, Dharbe, Puttur, Dakshina Kannada
- 3 Mr. K. Aboo Bakar, Anaje, Kodippady village, Puttur, Dakshina Kannada
- 4 Mr. Narayana Gowda, Poila house, Nekkilady, Mardhala post, Puttur, Dakshina Kannada
- 5 Mr. Prabhakara Mayya, Surya, Nada, Permanu, Belthangady, Dakshina Kannada
- 6 Mr. Ganesh, A, Bolianje, Nada, Permanu, Belthangady, Dakshina Kannada
- 7 Mr. Ajith Kumar Ariga, Volabail, Nada, Permanu, Belthangady, Dakshina Kannada
- 8 Dr. D.C. Chowta, Chowtara Thotta, Meenja, Miyapadavu, Kasaragod
- 9 Mr. Abdul Azeez Marike, Marike Villa, Mulinja, Uppala, Kasaragod
- 10 Smt. Seetha Rai, Ramajiguli, Yenmakaje village, Katukukke, Kasaragod



Fig.1. Demonstration plots on arecanut based cropping system

Growth and yield performance of main crop and intercrops

Arecanut: Intercrops such as banana, cocoa and black pepper was introduced in 2012. Mean yield and income details from arecanut are given below. The data clearly indicates that arecanut yield will not be reduced by introducing intercrops (Jaganathan *et al.*, 2013). During 2015-16, the mean yield of arecanut was 2550 kg/ha and gross income was Rs. 6,52,800 (Table 2).

Yield and returns of banana: Banana was planted in the centre of four areca palms. Yield and income details are given below (Table 3 and Fig 2). Additional income realized from banana

was Rs.1,06,663. Banana wastes were recycled/reused as mulch in the garden for increasing the soil fertility.

Growth and yield performance of cocoa : Cocoa seedlings were planted in alternate rows to give a spacing 2.7 m x 5.4 m. Cocoa plants were pruned in August-September and shaped to get a canopy at a height of 1.5 to 2.0 m. Cocoa plants started yielding in demonstration plots from 2014-15 onwards. Yield stabilization will take another four years and will sustain for another thirty years so that farmers can reap maximum profits from cocoa. One tree will yield about 3 to 3.5 kg wet beans per year. Growth performance, yield and income details are given in Table 4 and Fig 3.

Table 2. Yield and returns of arecanut

Particulars	Year of observation				
	2011-12	2012-13	2013-14	2014-15	2015-16
Mean dry kernel yield (Kg/ha)	2,135	2,345	1,950	2,321	2,550
Price (Rs./Kg)	159	175	178	248	256
Gross Income (Rs./ha)	3,39,465	4,10,375	3,47,100	5,75,608	6,52,800

Table 3. Yield and returns of banana

Particulars	Year of observation		
	2013-14	2014-15	2015-16
Mean yield (Kg/ha)	727	2,280	2,530
Price (Rs./Kg)	16.7	22.3	17.3
Gross Income (Rs./ha)	12,140	50,844	43,769



Fig. 2. Yield performance of banana in the demonstration plots

Table 4. Yield performance of cocoa

Particulars	Year of observation	
	2014-15	2015-16
Mean yield - Wet beans (Kg/ha)	25.7	180
Price (Rs./Kg)	58.0	56
Gross Income (Rs./ha)	1,490	10,080



Fig.3. Growth performance of cocoa in demonstration plots

Growth performance of black pepper : Black pepper is an excellent crop for mixed cropping. Arecanut stems were used as live standards for training black pepper, two rooted pepper cuttings were planted on the northern side of the palm dug at a distance of 75 cm from the base. Pepper vines planted were well established and started giving yield from 2015 onwards (Table 5 and Fig 4). Yield stabilization will take another four - five years and will sustain for another twenty years so that farmers can reap maximum profits. One vine will yield about 0.5 to 1 kg dry black pepper per year.

Table 5. Yield and returns from black pepper

Particulars	Year of observation
	2015-16
Mean yield (Kg/ha) - Dry berries	4.8
Price (Rs./Kg)	540
Gross Income (Rs./ha)	2592



Fig. 4. Establishment of black pepper in demonstration plots

Knowledge of the beneficiaries

Knowledge test was administered to the beneficiaries during pre-demonstration, mid-term and post-demonstration using pre-tested interview schedule consisting of 15 knowledge items covering crop improvement, crop production, crop protection, post harvest processing aspects. Maximum score obtainable was fifteen and minimum was zero. There was significant improvement in the knowledge of the beneficiaries over the years as given in the Table 6. Knowledge will play a definite role in adoption of improved technologies and also helps other farmers by way of dissemination.

Table 6. Knowledge of the beneficiaries on arecanut based cropping system

Pre (2012-13)	Mid (2014-15)	Post (2015-16)	Difference
6.4	11.7	13.2	6.8

Economic impact of arecanut based cropping system : The cropping system consisting of arecanut, banana, cocoa, black pepper enhanced the profitability from unit area over the years as given in Table 7. Significant improvement was observed between the pre- demonstration (2011-12) and post- demonstration (2015-16) due to adoption of cropping system approach.

Table 7. Economic impact of cropping system

Crop	Income (Rs.)				
	2011-12	2012-13	2013-14	2014-15	2015-16
Arecanut	3,39,465	4,10,375	3,47,100	5,75,608	6,52,800
Banana	-	-	12,140	50,844	43,769
Cocoa	-	-	-	1,490	10,080
Black pepper	-	-	-	-	2,592
Total	3,39,465	4,10,375	3,59,240	6,27,942	7,09,241
% increase	-	20.89	5.83	84.98	108.93

Incidence of pests and diseases : Pests and diseases were observed in the demonstration plots and suitable recommendations were provided to the beneficiaries. Scale insects, pentatomid bug, fruit rot and die back in arecanut, leaf eating caterpillar and beetles in cocoa, leaf roller, bunchy top and sigatoka leaf spot in banana and quick wilt in black pepper were managed with integrated pest and disease management practices.

Transfer of technology programmes: The major objective of participatory technology transfer is to disseminate the technology to larger farming community by showing the feasibility of technology in their local conditions. Four training programmes, one seminar and field day were organized with the active participation of arecanut growers, CPCRI, Directorate of Arecanut and Spices Development, Kozhikode, Department of Horticulture, Belthangady, Puttur & Kasaragod, Krishi Vigyan Kendra, Mangalore & Kasaragod and Media.

Training programmes: Three on-farm and one on-campus training programmes on 'Arecanut based multispecies cropping system' were organized to mobilize and motivate the farmers to adopt multispecies cropping system. Lectures, demonstrations and discussions on various

topics related to arecanut based cropping system were organized which helped the farmers to know the scope, importance and advantages of the cropping system in arecanut garden to increase the profit per unit area.

to the farmers. Interactive session was organized between the farmers and scientists.

Field day on arecanut based cropping system:

Field day was organized on 29th February, 2016 at Hindaru, Puttur to celebrate the success of

Place of the training	Date	No. of Beneficiaries
1. Ujire, Belthangady	08.01.13	105 farmers from Belthangady, Dakshina Kannada
2. CPCRI, RC, Kidu	16.03.13	100 farmers from Puttur, Dakshina Kannada
3. Anaje, Puttur	18.03.14	115 farmers from Puttur, Dakshina Kannada
4. Miyapadavu, Kasaragod	21.03.14	108 farmers from Kasaragod

Seminar: Seminar on 'Arecanut based cropping system for enhancing profitability' was organized during Krishi Mela on 10th January, 2015 at ICAR-CPCRI, Regional Station, Vittal, Karnataka. Two thousand stakeholders covering farmers, development officials, processors, college students etc. had participated in the

demonstration plots on 'arecanut based multispecies cropping system'. For the benefit of other farmers to see and get convinced about the feasibility of 'Arecanut based multispecies cropping system' field day was celebrated at Mr. Ramaprasad, Hindaru, Puttur, Dakshina Kannada district. 100 stakeholders covering



Scientists- farmers interaction



Participants of the seminar

Fig 5. Seminar on arecanut based cropping system

seminar (Fig 5.). Scientists from CPCRI had presented topics viz., varieties in arecanut, crop production in arecanut, arecanut based cropping system, integrated pest & disease management, post harvest processing and marketing. Exhibits on agronomic practices, nursery management, pest and disease management and harvesting were displayed for giving first hand information

farmers, development officials, and input dealers participated (Fig. 6). As part of the Field day, all farmers, scientists and staff members of CPCRI visited the demonstration plot to see the performance of intercrops in arecanut garden. At the end, farmers expressed their satisfaction and willingness to adopt multicropping system in their gardens.



Field day on cropping system



Farmers- scientists interaction



Participants visiting the demonstration plot



Participants of the field day

Fig 6. Field day on arecanut based cropping system

Arecanut based multispecies cropping system provides additional income and also act as an income security against instability in price of main crop. Proper choice of crops and their quality planting materials is a prerequisite for a successful cropping system. Efforts from research institutes, developmental organizations, input agencies and arecanut growers are needed for increasing the adoption of arecanut based cropping system to make the farming sustainable in the long run.

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