



Community Based Adoption of Intercropping in Coconut Based Farming Systems of Kerala with Special Reference to Tuber Crops

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Abstract

Tuber crops are highly suitable for intercropping in coconut gardens at all growth stages. Hence these crops were included as the major intercrops for enhancing the livelihood security of coconut farmers under two projects funded by International Fund for Agricultural Development (IFAD)/The Coconut Genetic Resources Network (COGENT) and National Bank for Agriculture and Rural Development (NABARD) operated through Community Based Organizations (CBOs) under the aegis of Central Plantation Crops Research Institute (CPCRI). The projects were implemented in four coconut communities, Thekkekkara (under NABARD), Pathiyoor, and Devikulangara of Alappuzha District and Thodiyoor of Kollam District of Kerala (IFAD). Data related to area under intercrops, extent of adoption, income derived from the intercrops and the utilization pattern were recorded before and after the project using a standardized questionnaire template during 2005-2012 period. Data collection was done through personal interview with 609 CBO members and the data were coded and analysed using SPSS.

All the four coconut communities indicated significant increase in the area and percentage of holdings under tuber crops and income from tuber crops alone as well as other short duration intercrops in general over the project period. The overall data for all the four communities revealed 3.7 fold increase in area under tuber crops alone and 29% increase in the holdings under adoption of tuber crops, whereas it was 2.2 fold and 24% in the case of intercrops in general. The share of income from tuber crops to total intercrop income increased from 49 to 60% in Thekkekkara, while that of the other three communities in general remained the same (72%) over the project period. The pre and post utilization pattern in terms of the value of product revealed increase in all categories- sold, consumed, supplied in kind and seed material- for tubers alone and intercrops together in all the four communities.

In general, the area, production as well as income from tuber crops showed significant improvements through community based adoption. The proportion of tuber crops consumed was much higher (more than 60% of the total production) in Thekkekkara, while more than 50% of the total production was sold in the other areas. The results thus highlight the scope of intensifying the cultivation of tuber crops as food and cash crops to enhance the livelihood security of the coconut farmers.

Key words: Intercropping, tuber crops, coconut, community-based adoption

Introduction

Coconut is predominantly cultivated in small and marginal holdings and about 10 million people are

depending on coconut cultivation, processing and related activities. But the income from coconut is inadequate to meet the requirements of their families mainly because

of the small size of holdings, declining productivity due to various reasons and unstable price of the commodity. Apart from increasing the productivity of coconut, augmenting the income through promotion of diversity through different kinds of interventions in Coconut Based Farming Systems (CBFS) can be a viable proposition for sustaining the livelihoods of the marginal coconut growers. A farming system model integrated with compatible intercrops, mixed farming activities and diversification of products can contribute to enhanced income as well as food and nutritional security of the coconut farmers.

The farm families need to have multiple livelihood opportunities as they cannot get minimum income from just one source (Swaminathan, 2001). Diversification of crops in coconut based farming system offers the desired outcome with judicious selection of compatible intercrops and separate management for coconut and each of the intercrops. In coconut plantations, on an average, 56% of solar radiation reaches the ground depending on the age of the coconut stand, its planting density and alignment and hence there will be a large area of land beneath the coconut plantations available for the farmer to use (Proud, 2005). Tuber crops are recommended as ideal intercrops in coconut gardens as they are highly suitable for accommodation at all growth stages. Further, farmers preferred tuber crops as the most suitable intercrops because of their ability to give economic yields under low input conditions. Adaptation of roots and tubers to marginal environments, their contribution to household food security and their great flexibility in mixed farming systems make them an important component of a targeted strategy for improving the welfare of the rural poor and linking smallholder farmers to emerging markets (Scott et al., 2000). Beyond food security, several nutritional disorders due to the deficiency of Vitamin A, Vitamin C and Ca could be easily alleviated by consumption of roots and tubers like cassava, sweet potato, yam and aroids (Lenka et al., 2012). Considering the above mentioned attributes, tuber crops were included as the major intercrop for enhancing the livelihood security of coconut farmers under two projects funded by International Fund for Agricultural Development (IFAD) / The Coconut Genetic Resources Network (COGENT) and National Bank for Agriculture and Rural Development (NABARD) operated through Community Based Organizations (CBOs) under the aegis

of Central Plantation Crops Research Institute (CPCRI). The major objectives of the project were to increase income from coconut gardens and improve food and nutritional security of farm family members through a CBFS model.

Materials and Methods

The projects were implemented in four coconut communities, Thekkekkara (under NABARD), Pathiyoor and Devikulangara of Alappuzha District and Thodiyoor of Kollam District of Kerala (IFAD). The activities were carried out through registered CBOs based on the annual action plans prepared by the members. Major thrust was given for training capacity building for the CBO members in developing their individual as well as group capacities in terms of technological interventions, arrangement of inputs and management of CBOs. The major interventions included intercropping cash, food and nutritional security crops, livestock integration and diversification of coconut products. The project team assisted the CBOs in procurement of planting material from various reliable sources like Central Tuber Crops Research Institute (CTCRI), Vegetable and Fruit Promotion Council Keralam (VFPCCK) and Kerala Agricultural University (KAU) during the initial stages and later on, the CBOs multiplied and exchanged the material among them. Effective linkages were established with various agencies for technological support, input supply and microcredit facilities. The CBOs were also envisioned to eventually continue the activities that had been initiated by the project in partnership with them, sustain and hopefully expand the activities and benefits to the members and other communities beyond the project duration.

Pre and post project data related to area under intercrops, extent of adoption, income derived from intercrops and the utilization pattern were recorded using a standardized questionnaire template during 2005-2012 period. Data collection was done through personal interview with 609 CBO members and data was coded and analysed using SPSS.

Results and Discussion

Intercropping was identified as the key intervention to ensure additional income and food and nutritional security to the coconut farmers of Thekkekkara, Pathiyoor, Thodiyoor and Devikulangara coconut

communities. Based on that, efforts were made to increase the adoption of intercrops and to intensify the area and the data pertaining to these were recorded before and after the project period and are presented in Table 1.

All the four coconut communities showed increase in the area under intercrops and percentage of holdings adopting cultivation of intercrops. The overall data for all the four communities indicated a 2.2 fold increase in area and 24% increase in the holdings under adoption of intercrops over the project period.

The major intercrops adopted was tuber crops viz., elephant foot yam, yams, cassava and taro and the details on increase in area and adoption are provided in Table 2.

Table 1. Increase in area under intercrops (including tuber crops) and adoption of intercrops in coconut gardens

CBO/Cluster	Area under intercrops (ha)			Percentage of holdings under intercrops		
	Pre	Post	Change (fold)	Pre	Post	% Change
Thekkekkara	4.90	11.92	2.4	69	96	27
Pathiyoor	3.25	8.25	2.5	62	94	32
Thodiyoor	2.25	5.00	2.2	62	96	34
Devikulangara	3.00	5.00	1.7	83	88	5
Mean	3.35	7.54	2.2	69	93	24

Table 2. Increase in area under tuber crops and adoption of tuber crops as intercrops in coconut gardens

CBO/Cluster	Area under intercrops (ha)			Percentage of holdings adopting tuber crops		
	Pre	Post	Change (fold)	Pre	Post	% Change
Thekkekkara	0.94	5.06	5.4	64	90	26
Pathiyoor	0.98	3.30	3.4	36	88	52
Thodiyoor	0.79	2.15	2.7	54	68	14
Devikulangara	0.81	2.40	3.0	64	88	24
Mean	0.88	3.23	3.7	55	84	29

Table 3. Income generation and utilization pattern of tuber crops and intercrops (including tuber crops) at Thekkekkara

Utilization pattern	Tuber crops alone			Tuber crops + other intercrops		
	Pre (₹)	Post (₹)	Change (fold)	Pre (₹)	Post (₹)	Change (fold)
Sold	301	2243	7.45	1193	4158	3.48
Consumed	765	6298	8.23	974	10467	10.74
Free supply	76	182	2.39	180	210	1.66
Seed	112	415	3.70	202	446	2.21
Total	1254	9138	7.29	2549	15281	5.99

The overall data for all the four communities indicated a 3.7 fold increase in the area under tuber crops and 29% increase in the holdings under adoption of tuber crops. Improvements in area under cultivation as well as adoption were higher for tuber crops like elephant foot yam, cassava, yams and taro compared to all the intercrops taken together (including tuber crops). Among the four areas, highest increase in the area under tuber crops was observed in Thekkekkara, which was earlier a traditional tract, where most of the farmers grew tuber crops on a small scale, whereas the percentage increase in the holdings adopting tuber crops cultivation was highest in Pathiyoor, which was earlier known for vegetable cultivation.

Remarkable improvements were observed in the income generated from tuber crops as well as other intercrops in all the four communities and the utilization pattern varied between communities. The income generation and utilization pattern of tuber crops and intercrops (including tubers) from Thekkekkara is provided in Table 3.

In the case of Thekkekkara community, the increase in income from tuber crops over the project period was 7.29 fold, while that of all intercrops taken together was only 5.99 fold. With regard to utilization pattern, sales, consumption, distribution to others and storage as planting material increased with increase in production. The scope for making chips from cassava and taro can be well exploited as Onattukara tract is known for chips made from cassava and taro, especially during Onam festival. In the project area at Thekkekkara, the consumption as well as sales of tuber crops enhanced by about 8 fold while the other intercrops were mainly utilized for consumption.

The income generation and utilization pattern of tuber crops and intercrops (including tuber crops) from Pathiyoor, Thodiyoor, Devikulangara and overall data for the three areas are provided in Tables 4, 5, 6 and 7 respectively.

The income generated from tuber crops increased by 5.11 fold and that from all intercrops (including tuber crops) increased by 4.37 fold over the

Table 4. Income generation and utilization pattern of tuber crops and intercrops (including tuber crops) at Pathiyoor

Utilization pattern	Tuber crops alone			Tuber crops + other intercrops		
	Pre (₹)	Post (₹)	Change (fold)	Pre (₹)	Post (₹)	Change (fold)
Sold	608	2895	4.76	895	4036	4.51
Consumed	178	1046	5.88	338	1340	3.96
Free supply	17	67	3.94	57	117	2.05
Seed	44	321	7.30	49	369	7.53
Total	847	4329	5.11	1339	5862	4.37

Table 5. Income generation and utilization pattern of tuber crops and intercrops (including tuber crops) at Thodiyoor

Utilization pattern	Tuber crops alone			Tuber crops + other intercrops		
	Pre (₹)	Post (₹)	Change (fold)	Pre (₹)	Post (₹)	Change (fold)
Sold	121	605	5.00	186	1632	8.78
Consumed	175	1050	6.00	260	1773	6.82
Free supply	21	137	6.52	21	163	7.76
Seed	18	104	5.78	18	156	6.67
Total	335	1896	5.66	485	3724	7.68

Table 6. Income generation and utilization pattern of tuber crops and intercrops (including tuber crops) at Devikulangara

Utilization pattern	Tuber crops alone			Tuber crops + other intercrops		
	Pre (₹)	Post (₹)	Change (fold)	Pre (₹)	Post (₹)	Change (fold)
Sold	213	1507	7.08	229	1583	6.91
Consumed	316	1059	3.35	381	1179	3.09
Free supply	23	156	6.78	24	160	6.67
Seed	64	218	3.41	64	221	3.45
Total	617	2940	4.76	698	3143	4.50

Table 7. Overall income generation and utilization pattern of tuber crops and intercrops (including tuber crops) for all the areas under IFAD project

Utilization pattern	Tuber crops alone			Tuber crops + other intercrops		
	Pre (₹)	Post (₹)	Change (fold)	Pre (₹)	Post (₹)	Change (fold)
Sold	314	1669	5.32	436	2417	5.54
Consumed	223	1051	4.71	326	1430	4.39
Free supply	20	120	6.00	33	147	4.45
Seed	42	214	5.09	43	249	5.79
Total	599	3054	5.10	838	4243	5.06

project period at Pathiyoor. Utilization pattern also revealed significant improvement in sales, consumption, distribution as kind and storage as seed material, with slightly higher improvement in the consumption of tuber crops when compared to all intercrops together.

In the case of Thodiyoor, the improvement in income from intercrops in general was higher (7.68 fold) when compared to that of tuber crops alone (5.66 fold). Utilization pattern also revealed higher improvements in sales as well as consumption of all intercrops together than that of tuber crops alone.

At Devikulangara, significant improvement were observed in the income generation from tuber crops as well as all intercrops taken together and utilization pattern was almost similar for both the categories. However, the improvement in sales was higher for tuber crops as well as other intercrops when compared to consumption.

The overall improvement in income generation and utilization pattern of tuber crops and intercrops (including tuber crops) were worked out for the three areas under IFAD project and presented in Table 7.

The overall data for the three coconut communities under the IFAD project revealed a 5 fold increase in income from tuber crops and intercrops (including tuber crops) and the utilization pattern also revealed similar, but remarkable improvements in all categories.

Apart from considering the improvements over the project period, the share of income from tuber crops to total income from intercrops (including tubers) as well as the proportion of tubers utilized for sales, consumption, distribution as kind and storage as seed material from the total quantity produced were also worked out. The details pertaining to the same for the NABARD project area at Thekkekkara and the overall for the other three areas under the IFAD project are presented in Tables 8 and 9 respectively.

Even with a 7 fold increase in production of tuber crops at Thekkekkara, about 69% of the total production was utilized for consumption, which

Table 8. Share of income from tuber crops to total income from intercrops (including tuber crops) at Thekkekkara

Utilization pattern	Before the project (₹)			After the project (₹)		
	Tubers (A)	Tubers+ other intercrops (B)	% share of A to B	Tubers (A)	Tubers+ other intercrops (B)	% share of A to B
Sold	301(24)	1193(47)	25.23	2243(24.5)	4158(27)	53.94
Consumed	765(61)	974(38)	78.54	6298(69)	10467(69)	60.17
Free supply	76 (6)	180(7)	42.22	182(2)	210 (1)	86.66
Seed	112(9)	202(8)	55.44	415(4.5)	446 (3)	93.04
Total	1254	2549	49.20	9138	15281	59.80

Figures in parenthesis indicate the percentage share of each category (sold, consumed, free supply and seed) to the total quantity (each of tubers separate and that of tubers+other intercrops) produced

Table 9. Overall share of income from tuber crops to total income from intercrops (including tuber crops) for the three areas under IFAD project

Utilization pattern	Before the project (₹)			After the project (₹)		
	Tubers (A)	Tubers+ other intercrops (B)	% share of A to B	Tubers (A)	Tubers+ other intercrops (B)	% share of A to B
Sold	314(53)	436(52)	72.02	1669(55)	2417(57)	69.05
Consumed	223(37)	326(39)	68.40	1051(34)	1430(34)	73.49
Free supply	20(3)	33(4)	60.60	120(4)	147(3)	81.63
Seed	42(7)	43(5)	97.67	214(7)	249(6)	85.94
Total	599	838	71.50	3054	4243	71.97

reveals the potential to expand the area under tuber crops as a supplementary food crop. Tuber crops such as cassava, sweet potato, yams, elephant foot yam and cocoyams contributed 4.2% of the human dietary intake and met the food and energy requirement of millions of farm families in the developing countries (The Hindu, 2000). At the same time, the share of tuber crops to total intercrops for sales was found to be doubled over the period. Further, among all the other intercrops, 93% of the seed material stored by farmers were that of tuber crops, which reveals its potential for mass multiplication by farmer groups.

When compared to Thekkekkara, the percentage share of income from tuber crops to total intercrop income was higher in the three areas under IFAD project, which remained the same over the project period (72%). Of the total intercrops consumed, the share of tuber crops increased from 68% before the project period to 73% after the project period. But more than 50% of the total quantities of tuber crops as well as intercrops produced

were sold both before and after the project, whereas the quantum of consumption ranged between 34-39% of the total. This clearly shows the potential of tuber crops as a cash crop as well as food crop. Tropical tuber crops such as cassava, yams and aroids are ideal for cultivation in the coconut gardens as it would offer multiple sources of food for the dependent families apart from augmenting their on-farm income and providing employment to the farmers (The Hindu, 2000).

In the IFAD project areas also, major share of the seed material stored by farmers were that of tuber crops when compared to other intercrops. Tuber crops, being vegetatively propagated, the multiplication rate is very low. This coupled with the absence of a proper seed distribution agency poses problems in the propagation and spread of the high yielding varieties released by the state and national agencies (Das, 2006). The coconut clusters of all project areas were able to solve this problem to a greater extent by multiplying and exchanging planting material of tuber crops among their members.

Conclusion

The results of the study clearly revealed the scope of expansion of area under tuber crops and augmenting the income from CBFS for sustaining the livelihoods of the marginal coconut growers through community based approaches. Major intercrops cultivated in the project areas were banana, vegetables and tuber crops like elephant foot yam, cassava, taro and yams. Apart from the area expansion under the existing crops, tuber crops like sweet potato and Chinese potato can be cultivated in the upland paddy areas. Between the two project areas, the procurement, multiplication and exchange of planting material of tuber crops were more efficient in the IFAD project areas because of the microcredit facility with the CBOs. Utilization pattern of tuber crops showed more of consumption than sales in some areas and other areas it was vice versa, which indicates its potential as a food as well as cash crop. When coupled with microcredit, the CBOs put more effort for organized marketing and exchange of produce as the farmers had to repay the loan availed. Community level efforts to procure, multiply and exchange planting material of different varieties of tuber crops suited for multiple purposes and locations coupled with input support mechanisms especially the initial microcredit support, if strengthened at a wider level can revamp the economy of the coconut based homesteads of Kerala.

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