

# Integrated farming of coconut based homesteads in root (wilt) affected area – The impact of extension interventions

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**Diversification is a proven choice among the marginal land holders in improving the productivity and income from the holdings. The most commonly agreed choices were found to be backyard poultry, intercropping in coconut holdings, vermicomposting units for value addition of the organic wastes available in their homesteads, coconut product diversification as a group activity and dairying.**

## Introduction

Intensification and diversification of small, marginal and sub marginal farmers are critical for realizing income and livelihood to farmers. But this requires hard work including utilization of family labour, careful planning of the plots, diversification and integration of cropping and allied activities. An appropriate technical change would be needed to shift from mono cropping or specialized farming system to more diversified farming system with complementary allied sector activities such as dairy, poultry etc. which fulfill both the economic demands of small scale farmer and ecological demands for sustainability (Theodore *et al.*, (2001). Swaminathan (1998) has illustrated that intensive crop and animal husbandry techniques practiced on an ecologically sustainable basis are essential for the rehabilitation of degraded lands and to conserve our rich genetic heritage. Farm diversification helps conserve natural resources and protect the environment. FAO also reported that the integration of crop and livestock production is a factor which strongly influences the sustainability of a farm

(FAO, 1991). The study area, Karunagappally is a hot spot of root (wilt) disease of coconut which was estimated to incur a loss of 968 million nuts per annum in the Kerala State (CPCRI, 1985). For sustaining the production and productivity of coconut palms, integrated management package is developed and recommended by the Central Plantation Crops Research Institute (CPCRI) and established the feasibility and efficacy in farmer's field conditions through large scale demonstrations. Diversification of farm income sources could be a viable option for farmers in improving the livelihood choices and total income from unit area. Hence, it is important to document the nature and extent of farm diversification among small and marginal farm holdings so that, it could be considered while deriving policy suggestions. The objectives of the study were

- to assess the socio economic profile of small and marginal coconut farmers of root (wilt) affected area
- to bring out the impact of extension interventions among the farming community in diversification of their coconut based homesteads

- to analyze the relationship of socio economic variables with the diversification of the small and marginal holdings.

### Materials and Methods

The study was conducted during 2005-06 at Karunagappally panchayath of Kollam district. The respondents were the participants of a project implemented by the Central Plantation Crops Research Institute (Regional Station), Kayamkulam as a participatory training and demonstration programme in an area of 25 hectares. The data were collected using a pre-tested interview schedule through personal interview of 80 participant farmers. The improvements in the intercropping were assessed by actually measuring the area under intercrops in the farmers' fields before and after the interventions. The improvement in income was calculated by documenting the actual income before and after interventions in consensus with the farmers/family members. Regarding the profile characters of farmers, age was taken in completed years, knowledge was measured using teacher made knowledge test and adoption as adoption quotient using the methodology adopted by Anithakumari (2005). The data were analyzed using percentage, mean and correlation coefficient.

### Results and Discussion

#### Profile characteristics of respondents

**Age of the farmers** - Majority of the farmers were found to be in the middle age (31-50 years) group (60.19 per cent) and 36.89 per cent of the farmers were in the old age (above 50 years) category. Only 2.9

per cent of the farmers were in the younger age category involved in farming operations. This is an indication of the low level of interest among the youth in taking up farming as a vocation for realizing income. Further, the old age group of people could not directly involve in farming operations even though they have more farming experience. The availability and cost of the skilled labourers are very less and this is critical in the case of coconut farming since climbers are very essential for harvesting and plant protection operations. The categorization based on the age of farmers indicates that they themselves may not be able to perform all the needed interventions in coconut farming and have to depend on external labourers for timely operations. Hence, the strategies in extension and research would have to focus in these profile characters for practical approaches.

**Education level** - All the respondents were found to be literate ranging from just literate to graduate level. The education level of more than 60 per cent of the respondents was above or equal to high school education (high school- 34.25 per cent, higher secondary - 20.55 per cent and graduation -12.33 per cent). Almost quarter (24.66 per cent) of them were educated upto middle school level and the rest primary school (5.48 per cent) and just literates(2.74 per cent). Extension functionaries could very well use video/slide projections, extension literature in local languages and personal/group methods for technology dissemination.

**Occupation status** - Since all the respondents are having marginal land holdings the choice of options for

livelihood seems to be also concentrated on and off farm and non farm income sources. Only 17.81 per cent of the respondents depend on farming only as their livelihood source. About one fifth (farming +retired service - 8.22 per cent) and farming + government job - 13.69 per cent) of them were associated with government jobs of various capacities. Caste related jobs like tree climbing, carpentry, masonry works and labourers constitute 16.44 per cent. Non farm income sources were adopted by 32 per cent of the respondents which include small shops, skilled jobs, small business and engaged in coconut processing yard in the village premises.

**Knowledge and adoption** - The knowledge and adoption of the farming/diversification was found to be low among the farmers especially in the case of application of inorganic fertilizers (25-35 per cent), plant protection aspects (10-15 per cent), post harvest/processing techniques (below 5 per cent), azolla cultivation (1 per cent), mushroom cultivation (nil) and vermicomposting (nil).

**Land holding size** - The average land holding size was found to be 0.13 ha (32 cents). One of the features noted was the cultivation in the neighbours, plots also by those having very less land holding size. This practice was not taking the land on lease, but on mutual cooperation/help. About 88 per cent of the farmers cultivate in their own plots only and 12 per cent cultivate in their own area and neighbours' area. The diversification of the farms depends on the personal and socio economic factors of the farming community and the societal influence.

The above data indicates the socio economic profile of the coconut growers and their knowledge and adoption regarding the scientific coconut cultivation practices.

**Diversification of farms by the small /marginal holders**

The most common types of farming systems observed in the study area among the farmers were coconut as monocrop and coconut with intercrops, dairy and poultry in diversified farm.

The project was implemented from 2003 onwards as a participatory action research. Diversification and intensification was found to be the most needed strategy for improving the productivity and income from that area. The general gaps felt by farmers attaining their objective and the interventions planned in consultation were as follows.

Table 1 shows the extension interventions facilitated among farmers with their participation in the diversification of coconut based homesteads. The farm families

agreed to make the economic investment in case of backyard poultry and coconut product diversification as a group enterprise. Regarding the adoption of intercrops, availability of quality planting materials was the major constraint. Hence, it was decided that the nucleus planting material will be provided and the farmers have to multiply them for intensification of area under intercrops as well as for exchanging between them. The most successful farmer to farmer extension approach was established in the case of vermicomposting. Only three farmers were supplied with 25 earthworms each; which they multiplied, and as a chain process the exchange of worms and technology spread among 47 farm families. The impact proved the interventions to be successful. Before the project implementation, maximum three combinations of diversification were seen among the homesteads. But after the project implementation it improved to 4-5 combinations per homestead which is indicated in Table 2.

**Impact of interventions in homestead farming system of the root (wilt) affected area**

The general impact was assessed in terms of the additional enterprises added for diversification and the units which were intensified in terms of area and scientific management. The income realized due to the interventions was also assessed with the participation of the farmers/ family members.

The participatory observations/ documentation while implementation of the project indicated that farmers were willing to include additional components for reducing the risks and improving income/employment. The participatory activities helped in the following derivations regarding diversification.

1. Farmers depending on farming for their livelihood were found to adopt maximum diversification.
2. More diversified farm utilized maximum family labour and high level of organic recycling.
3. Even small/marginal land holding

*Table 1. Strategies adopted for strengthening the diversification of the farms/plots*

Status of intensification/diversification	Mutually agreed upon extension interventions
Intercropping, though adopted sparsely, was declining sharply.	Quality nuclear seed materials for multiplication and further intensification and related trainings were provided. Investment on other inputs was done by the farm families themselves.
Recycling of organic wastes, available in plenty in homesteads, found to be absent, except for using FYM by those having cattle rearing. Hence cost of organic was very high.	Vermicomposting is one of the best options for value addition of organic wastes in homesteads. Knowledge /skill was transferred to farmers through training programmes. Farmer to farmer exchange of worms and rearing techniques were encouraged. This component was also done without any financial investment from the project.
Poultry component was very low among homesteads (less than 15%), since they were not having access to quality breeds.	Linkage with approved agencies for supplying of good quality chicks and training was developed. Farmers themselves made the needed economic investment.
Product diversification / value addition, other enterprises were not popular among farm families.	Training and after training technology back stoppings were provided. Women and rural youth groups etc to be involved.
Paddy and vegetable cultivation was on the decline	Group cultivation was encouraged among women and rural youth with regular field visit, trainings, interaction and technical services for field problem solving.

Table 2. Details of diversification/intensification after the interventions

	Before	After
Component	Coconut alone	C +P+IC+CM, C + CPD, C +M+AZ +CPD, C+M+IC+CM, C+CPD+IC, C+IC+CM, C+CPD+CM
Components	Coconut + intercrops	C+IC+M+CM+D, C+CM+P+AZ+IC, C+CPD+P+IC+CM, C+IC+CM+P+M.
Components	Coconut + dairy, Coconut + poultry	C+P+IC+CM, C+P+CM+IC, C+IC+CM+M
Components	Coconut + dairy + intercrops	C+IC+CPD+CM+P+M+AZ, C+IC+CM+P+M, C+IC+CM+M+P+D.
Components	Coconut + poultry + dairy	C+D+CM+IC+CPD, C+IC+M+D+CM
Components	Coconut + dairy + poultry + intercrops	D+P+IC+CM+AZ+ M+CM

P - Poultry (backyard), IC - Intercrops, CPD - Coconut product diversification, CM - Vermicompost, AZ - Azolla, M - Mushroom, D - Dairy

farmers were willing to invest in all scale enterprises like poultry, mushroom etc.

Maximum intensification was adopted by farmers in backyard poultry (number of birds increased in existing units) and intercropping (area under intercropping improved by 4 times).

Men and farm women involved in group activities for sharing/pooling resources, labour and profit.

Diversification feasibility was high at individual and group levels.

In addition to diversification activities, vermicomposting, poultry, mushroom and coconut product diversification.

Complementary and supplementary effects of component enterprises supported the livelihood of the family.

Integration of enterprises and efficient utilization of inputs in the farm could be increased by providing proper training to farmers and planning of different enterprises in the farm. Pushpa and Singh (2004) also reported that integration of various enterprises in the diversification of farming

system lead to increased income, employment and recycling of resources between and among the components.

Almost two to four fold increase in the area under cultivation of intercrops like amorphophallus, tapioca, banana and ginger was observed and documented. The number of backyard poultry units increased from 9 to 38 after the project through trainings and supply of quality breeds for which the investment was done by the participating families. The poultry units (number of birds ranged from 4-45) not only provided nutritional support but also a daily income to the households (Rs. 600-5800/annum). A group micro enterprise on coconut product diversification was initiated among 15 women and they were earning an income of Rs. 100-200/member/week by the preparation and sale of products like virgin coconut oil, chutney powder and bakery products. They already expanded their unit through availing credit of Rs. 50,000 for infrastructure development. Small vermicomposting units were established in 37 farm households after the programme and already produced and utilized 5-7 tons of vermicompost in their plots. Azolla units and mushroom cultivation were started in four and

eleven households respectively, for effective resource utilization. The major share of income was found to be met from the dairy units (1-3 cows) by the farm families depending on farming for their livelihood i.e. Rs. 17,500 - 45,000 /year.

The Table 3 shows that there is a scope for improving the income from coconut based homesteads by adopting intercrops/enterprises despite the landholding size. The enterprises mostly adopted by marginal landholdings below 50 cents were backyard poultry (5-15 birds) and one cow besides intercrops like tubers, banana, vegetables (amaranthus for sale), ginger etc. for family needs also. But it was evident that maximum income could be realized for livelihood by those farmers having landholdings of more than 0.4 ha size. The units adopted in these landholdings were backyard poultry (10-40 birds), cows (2-4) and intercrops mostly tubers, ginger and banana with good market potential. The Table 3 also indicates that those farmers with landholding size of 0.1 ha and above could also improve their income through better extension facilitation for including enterprises which require lesser space and have scope for family labour utilization eg. amaranthus cultivation, poultry etc. Earning a livelihood through proper

combination of diversification/intensification could be achieved by farmers with 0.4 ha or above, whereas, those below 0.4 ha could earn additional income and meet the family consumption/nutritional needs as evident in the Table 3.

cropping system, allied enterprises, low external input use for maximizing efficiency and recycling/reusing of resources. This calls for stronger extension and research support in providing farming system options for marginal holdings for

less holding size could distribute their time/family labour in more mutually complementary diversified units.

Education level was positively and significantly correlated with land holding size. It was evident that they opt for other highly paid jobs than farming, which depends on the vagaries of monsoon and price situations of the produces.

Table 3. Improvement in income (Rs.) through intercrops/allied enterprises

Category	Average income from intercrops/allied enterprises (before intervention)	Average income from intercrops/allied enterprises (after intervention)	Improvement (%)
Below 0.1 ha	334	2451	633
0.1 to 0.2 ha	3005	4698	57.7
0.2 to 0.4 ha	12785	20421	56.4

**Relationship of socio personal characteristics with diversification**

The analysis of the relationship between socio personal variables with diversification adopted in the farming system indicated positive significant relationship with landholding size and knowledge of the farmers and negative correlation with the occupation of the farmers. The inter correlation is furnished in Table 4.

knowledge/skill upgradation and infrastructure support. Correct knowledge enables them to take viable decisions for quality production and increased productivity from unit area. Diversification of the farming system was found to be negatively and significantly related with land holding and occupation of the farmers. Those engaged in other occupations could not spend time or manual labour in diversified farming and also they may not be depending on farming for their livelihood. Similarly farmers with more landholding may adopt intensification rather than adding more units of diversification to improve income, whereas those with

Table 4 indicates that positive significant relationship was seen between diversification and knowledge of the farmer. The farmer has to acquire a wide range of knowledge/skill regarding the

**Impact on yield of coconut**

In the project area the integrated root (wilt) management practices were adopted (balanced nutrition, basin management with green manure, integrated plant protection) along with the integrated farming. The average yield of coconut palm improved from 33 nuts to 53 nuts per year after three years of management. The leaf rot incidence reduced from 13 to 1.3 per cent and the incidence of rhinoceros beetle was managed to 5 per cent from 56 per cent. This indicates that small and marginal coconut farmers could improve the yield performance of coconut along with appropriate diversification/intensification of farming including the recycling of organic residues available in the homesteads, thus contributing to value addition at initial stages. Root (wilt) disease intensity was reduced (disease middle reduced to 30 per cent from 34 per cent, disease advanced

Table 4. Inter correlation among variables

Variables	Age	Diversification	Education	Land holding	Occupation	Family size	Knowledge
Age	1.00						
Diversification	0.2064	1.00					
Education	-0.30581**	0.2404	1.00				
Land Holding	0.15573	-0.4613**	0.3385**	1.00			
Occupation	0.00176	-0.3389**	0.1910	-0.2684*	1.00		
Family size	-0.3894**	-0.1247	-0.0875	-0.1710	0.2658*	1.00	
Knowledge	0.13732	0.3815**	0.2077	-0.1792	0.6108	-0.09242	1.00

\*\* Significant at 0.01 level of probability \*Significant at 0.05 level of probability

ed to 17 per cent from 22 per cent (whereas disease early improved to 17 per cent from 32 per cent) compared to the pre-project data. This indicates a further augmentation to the disease intensity.

### Conclusion

The study indicates that diversification is a proven choice for the marginal land holders in increasing the productivity and income from the holdings. The most commonly agreed choices were to be backyard poultry, cropping in coconut holdings, composting units for value addition of the organic wastes available in their homesteads, product diversification as a activity and dairying. The diversification intensity of the land holdings were found to be significantly and negatively related to occupation level of the land and land holding size and a significant relationship with knowledge level of the farmers. The participatory research and extension system

could meaningfully cater to the needs of the farmers by providing technology/enterprises choices through participatory extension approaches to up scale farming systems along with locating and validating farming system options adopted by the farmers and disseminating them.

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## PCA set to expand coco sugar production and export

The Philippine Coconut Authority-Zamboanga Research Center (PCA-ZRC) plans to increase coco-sugar exports as more and more coconut farmers have learned to produce sugar from "tuba" or coconut sap. At present coco sugar is exported to the United States, where it is consumed by diabetics and health-conscious individuals, and will soon be shipped to Japan and the Middle East. PCA-ZRC Division Chief Director Ramon Rivera said he expects demand to rise proportionately as coco sugar is now being used by thousands of people suffering from diabetes.

Research results have shown that diabetics who use coco sugars are able to stabilize their blood sugar. This is because the glycemic index of coco sugar is very low at 35, a level that is good for the control of diabetes mellitus. Coco sugar is also rich in nutrients and high in potassium, phosphorus, calcium, sulfur, calcium and Vitamin C. Rivera said the Philippines has the potential to become a major player in the coco sugar market since it is the top coconut exporting country in the world. At present, coco sugar is sold exclusively at PCA offers nationwide at P180 per kilo. PCA-ZRC alone produces thousands of tons of coco sugar per week.

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