Clustering coconut farmers - A successful extension approach for enhancing adoption and income from marginal and small holdings

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The clustering farmers of contiguous area enables participation and involvement of women. The scaling up of the cluster model by various extension agencies, resulted in improvement of coconut yield by 90-100 per cent and intercropped area by 2-4 times.

Abstract

The study was conducted to document the process of cluster approach among the coconut farmers, impact of adoption of integrated practices for root (wilt) affected area, on income, yield and health of palms as well as improvement in intercropping and allied farm enterprises. The results indicated that clustering farmers of contiguous area enables participation and involvement of women. The scaling up of the cluster model by various extension agencies, resulted in improvement of coconut yield by 90-100 per cent and intercropped area by 2-4 times. The self perpetuating income generating activities among the farmers were vermicomposting/coconut basin management with green manure crops, crop diversification, backyard poultry by the women farmers and farm level coconut value addition among women self help groups.

Introduction

Coconut cultivation continues to be the main livelihood option as well as food and nutritional security to a large number of farm families. But the challenges of root (wilt) disease, pests such as red palm weevil, sucking pests, low level of productivity and of scientific practices adoption along with fluctuating price of coconut are the major obstacles faced by the farming community. There are no therapeutic control measures so far for coconut root (wilt) disease but research efforts of CPCRI resulted in evolving viable integrated management technologies for enhancing productivity and health of the palms. The effectiveness and feasibility of the recommended technologies were established in farmers' field of root (wilt) disease but research efforts of CPCRI resulted in evolving viable integrated management technologies for enhancing productivity and health of the palms. The effectiveness and feasibility of the recommended technologies were established in farmers' fields of root (wilt) affected areas (Anithakumari and Kalavathi, 2001. Anithakumari *et al.,* 2004); it was felt that more participatory efforts are needed for

sustainable adoption and improving the income. Demonstration of technologies with stakeholder participation provides opportunities for seeing, doing, experiencing and responding effectively about the recommended technologies in local field conditions.

The observability of the results of technologies adopted and the time span for realizing the yield in coconut demands farmer participatory extension efforts for sustainability of adoption. Bunch (1999) observed that the most important reason for non adoption is that farmers do not see clearly visible economic returns deriving from the technologies and difficult to perceive or measure.

Based on the participatory technology transfer efforts and experiences of CPCRI over the years, it was documented that 98 per cent of the coconut farmers are marginal and small farmers. In the present scenario farmers are facing the pressure of competitiveness due to opening up of markets. They require capacity building for making right choices of technology adoption, efficient utilization of internal inputs and improving productivity through grouping together for better resource management.

The very low level of participation, integration and inclusion of the women farmers, in spite of their active and silent involvement in coconut farming could be improved through appropriate extension efforts.

It is important to recognize that the degree of participation provided by the stakeholders vary depending on the decided outcome. The collaborative programme was both farmer led and designed to evolve through scientific scrutiny.

Therefore keeping these points the present investigation was planned and implemented with the following objectives:

- To document the process of clustering farm families practicing coconut based farming systems.
- To assess the adoption of recommended technologies in coconut root (wilt) affected area in coconut farming system.
- To improve income through farmer participatory efforts.

Materials and methods

The research site was the Nambaruvikala village of Karunagappally block, Kollam district, Kerala, India. A contiguous area of 25 ha of coconut holdings, wherein 106 of arm are families clustered together through participatory efforts. The period of research was 2003 to 2006 July. The Participatory Rural Appraisal (PRA) conducted indicated that all the farmers of the area had margingal land holdings with limited resources, use small quantity or no chemical fertilizers to coconut, low level of knowledge or adoption and lack planned production cycles.

The cluster approach of extension among coconut farmers / families

a) *Selection of the cluster area* - The area under each cluster could be selected based on operational convenience, which includes 50-125 farm families.

b) *Cluster initiation and management* - Relevant stakeholders including farmers, women, youth, people's representatives, extension officials, research institutions, NGOs of the area and farmer-leaders could be involved through series of group meetings, dialogues and maintaining transparency. PRA tools like transect walk and social mapping proved to be very useful for taking stock of present situations, analyzing the problems and constraints, bringing out the need for being together and to know each other.

c) *Social mapping* - The social mapping of the project area was done by the key informant farmers with the facilitation of the project team members. The key informants were facilitated to map the area with roads, canals, cropping situations, position of households, social units for health, education, religious institutions, markets and other landmarks. The social mapping was done devoting full three days for the mapping exercise. The largest or smallest plots in the locality could be located in the map. (Fig. 1) This exercise enables the project team as well as the participating farmers in understanding the existing situations, the infrastructure facilities, topography, constraints and to familiarize with the area.

The utility and feasibility of cluster extension approach is that, homogenous households usually do not exist. Hence, difference in the socio economic situations of households make technology unfit on individual household needs or it is unlikely to be adopted. The

individual farmer needs to be encouraged to adopt technologies chosen from different options. This is very much applicable and relevant to marginal and small holdings of coconut based farming systems. The resources, potential, felt needs, problems; interest and constraints will be varying from location to location or farmer to farmer. The interventions in the extension approach discussed in this paper are based on these field level situations. (Table 1).

Table 1. Implementation of interventions based on the extension methodology

1	Analysis of existing situations	PRA/Survey/secondary sources
2.	Assessing problems/solutions, resources, etc with farmers participation	Group discussion, small group meetings, PRA, Knowledge/ adoption/skill (KAS) gap analysis, group analysis on coconut cultivation
3.	Educating farmers	Training, personal communications, method demonstrations, regular field visits/interaction, helping them to identify field problems and solving it
4.	Communication approach	Extension literature, direct interaction with scientists, skill upgradation, involving farmers groups/women SHG/rural youth etc.
5.	Deciding technologies to be demonstrated/adopted	Group/collective decision based on resources available and need/ feedback/support/participation
6.	Technology implementation/ management/assessment	Facilitation by project implementing team, group formation or women/men/youth for specific activities like organic recycling and utilization of internal resources, organic vegetable cultivation, farm level coconut processing and value addition, marketing etc.
7.	Entrepreneurship development	Technology back stop by project team, investment and implementations by individuals/groups
8.	Triangulations/linkages	Coconut Development Board, India, CPCRI, Department of Agriculture, Other farmers groups, Farmers of other area
9.	Approach derived through intense dialogue/field work	Group/cluster approach in technology management/ demonstration, technology adoption, taking into effect the gender factors, group activities for income generation
10.	Participatory Monitoring and evaluation	Concurrent by the team/participant farmers/CDB/Extension officials, PRA/Formal scientific methods

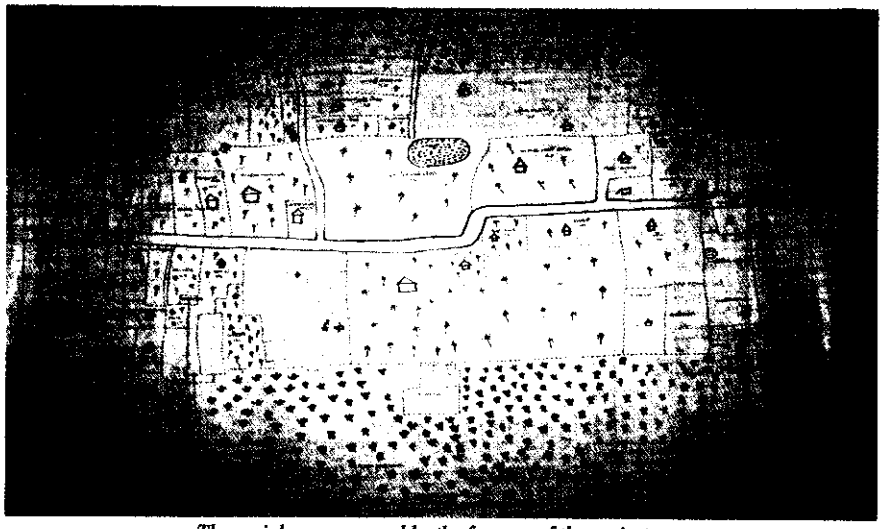
The interventions mainly were

- Documentation of farm profile of all farmers of the project area (socio-economic variable, knowledge, adoption, etc.) and palm profile (age, incidence of pests/diseases, yield etc) through structured proforma and PRA.
- Bridging knowledge or skill gaps through need based farmer participatory demonstrations, intensive on-farm trainings, follow up activities - not only for coconut but also on components of the farming system.
- Encouraging use of internal inputs or human resources.
- Documentation of all activities and results by the farmers and the field team.
- Promotion of self-perpetuating practices like maintaining and improving soil health and regeneration through low cost green manuring (e.g. Cowpea) in coconut basins and coir pith compost, organic recycling through low cost vermicompost techniques, backyard poultry, azolla or mushroom cultivation, intensification of inter/mixed cropping through participation/ cost sharing, coconut product diversification or value addition through women self help groups and thus improving income/ employment generation also.
- After training support in terms of technical services for micro enterprises
- Facilitating linkages with other agencies like Kerala Poultry Development Corporation, Kerala Agricultural University, Department of Agriculture, State Poverty Alleviation Programmes (Kudumbasree), Krishi Vigyan Kendra (KVK), Mass media etc.

Measurement of variables

The socio-personal variables of farmers documented like age (number of completed years), education status (literate, primary education, secondary education, high school, plus two, degree or above), occupation (quantified in terms of farming only, farming along with government service, pension, small shops, caste based jobs etc), knowledge on scientific coconut cultivation practices (teacher made knowledge test developed), income from farming (actual yearly income).

The palm profile in terms of incidence/levels of root (wilt) diseases index developed by Nambiar and Pillai (1985), average annual yield of coconut calculated as per the methodology of Jacob Mathew *et al.*, (2001), leaf rot disease (actual incidence on spindle and other leaves recorded), Rhinoceros beetle (beetle cut symptoms in spindle leaves), red



The social map prepared by the farmers of the project area

palm weevil (actual incidence) and eriophyid mite incidence were rated in the palms as low, medium and high level if the affected nuts in all the bunches falls one third or below, two third and above two third respectively. Management levels of gardens documented using the methodology adopted by Ngutu and Recke (2006) with slight modifications.

Results and Discussions

The results on the farmers profile and livelihood assets were furnished in details. These data provides the basis for the designing and planning of the interventions in more meaningful and scientific way, since farming is location/farmer specific.

Farmers Profile : Majority of the farmers (60.19%) were in the middle age group of 31-50 years and only 2.9% of the practicing farmers were of the young age group of below 30 years. This indicates the widespread attitude of non-attractiveness of young generation towards farming as a livelihood option due to the low and fluctuating income levels.

majority (80-100%) know techniques of field planting, intercultural operations and organic manuring for which adoption level was also high. Low level of knowledge and adoption was indicated in the case of organic manure application, plant protection aspects and product diversification activities.

The resources available to the coconut farm families in the project area indicates low land holding size, coconut productivity and dependence on off farm options also for livelihood. (Table 2).

Table 2. Assets of the coconut farmers of project area

Items	Range	Remarks
Land holding size	3-200 cents (0.12.81 ha)	32.53 (0.132 ha)
Number of coconut palms/holdings	3-200 palm/plot	30 palms/holding
Average yield of coconut	15-65 nuts/palm/annum	24 nuts/palm/annum
Family size	1-10 members/household	3-6 members/household
Common on farm enterprises	Poultry/livestock/goat rearing/banana/farm/labor/ intercropping	Scope for more Diversification
Off farm options	Government service/pensioners/ small shops/skilled works	Scope for Intensification
CBOs in the area	Women SHG/Rural youth clubs/ farmers groups/religious groups	Majority of the household opt for off farm income sources also

Source : Field survey 2003

All farmers including women were literate and 17.8% depend on farming and allied activities for their livelihood. All others depend on other non farm income also like retirement pension (8.22%), government jobs (13.69%), caste related jobs (16.44%) and shops/ other skilled works (32.0%). This indicates the need for more income generation either from farm, off farm or non farm income avenues.

Majority of the farm families (64.4%) derive an income of Rs. 25,000 to 50,000 per annum. Regarding the knowledge level

Impact of the technical interventions

The technical interventions adopted were basin management with cowpea (*Vigna unguiculata*), balanced dose of chemical fertilizers (N(500g): P_2O_5(300g) : K_2O) (1000 g) pr palm per year with 500 g $MgSO_4$ based on soil testing, application of organic manures (vermicompost/FYM/coir pith compost/leaf loppings etc), pouring Hexaconazole 5EC 2ml or Dithane-M-45 3g dissolved in 300ml of water in the cavity of spindle base after removing rotten portions for leaf rot

affected palms and IPM strategies for pests.

The average yield of coconut in the root (wilt) affected area improved by 100 per cent. The leaf rot incidence reduced to 1.3 percent from 13 percent, rhinoceros beetle incidence managed to 5 per cent from 56 per cent and eriophyid mite was absent in three fourth of the palms and severity of infestation was low in all palms due to integrated management of the pests.

The Table 3 clearly indicates the impact/effectiveness of the recommended technologies in managing the root (wilt) affected palms. Even though the root (wilt) disease index score has not been changed significantly, the visual appearance, health and yield of the palms improved significantly. The yield improvement was 100 per cent from 24.22 to 50 nuts/palm/year. The results were in conformity with the results of the impact of adoption of integrated root (wilt) disease management practices in farmers plots reported by Rajagopal *et al.*, (1987) (yield improvement of 64-200%), Muralidharan *et al.*, (1986) (yield improvement of 36-60%), and Rethinam *et al.*, (1991) (yield improvement of 82.14%). The management of leaf rot disease paves the way for improving the yield, health and photosynthetic area of the disease affected palms. The integrated plant protection done prophylactically resulted in the reduction of rhinoceros beetle attack. The incorporation of *Clerodendron infortunatum*, a weed plant in farm yard manure / compost pits also helped in reducing the beetle incidence. The impact of the integrated management in reducing the ill effects of eriophyid mite infestation is being convinced among the farmers. The build up of natural pest/predators of eriophyid mite would have been played an important role. Based on their indigenous know how farmers opined that application of marotti (*Hydnocarpus sp*) cake/neem cake regularly in the spindles had good effect in controlling the mite. After the interventions participant farmers of the project opined that rejection of eriophyid mite infested nuts by the local merchants was minimal (below 5 nuts/100 marketed nuts) compared to pre project period (20-40/100 marketed nuts).

Incidence of red palm weevil (*Rhynchophorus ferrugineus*) was rated as the major problem among the coconut cultivators of the project area. The preliminary data collection showed that due to red palm weevil infestation there were 83 dead palms in the area which showed the lack of awareness as well as the intensity of the pest problem. The farmers were made aware about the importance of eradication of breeding substrate (the dead palms), constant monitoring of palms and detection of palms with red weevil incidence, as well as pesticide application methodologies. The participation and involvement of the farmers were very valid in the removal of dead palms without any economic assistance to them. The measures taken for controling the red weevil infestation in the area was given as follows :

- Removal of red palm weevil infested dead palms (palms beyond manageable level and dead) in a week long campaign.
- Pesticide application for infested palms with farmers participation based on the regular observations.
- Regular monitoring of palms particularly near the already infested palms and identifying the infestations and adopting control measures.
- Non-bearing palms could be effectively managed through root feeding of pesticides, adopted by the women farmers.

Table 3. Impact of recommended technologies in managing the coconut pest/disease

Items	Before implementation (2003)	After implementation (2006)
Root (wilt) disease	AH (apparently healthy - 12 %	AH (apparently healthy - 10%
	DE (disease early) - 32%	DE (disease early) - 34 %
	DM (disease middle) - 34 %	DM (disease middle) - 36 %
	DA (disease advance) - 22%	DA (disease advance) - 20 %
Leaf rot	13.1 %	1.3 %
Rhinoceros beetle	56.2%	5.1 %
Red palm weevil	10.2 %	No fresh incidence
Eriophyid mite	M0 - Nil - 50.5%	M0 - Nil - 75%
	M1 - Low - 16.82 %	M1 - Low - 17%
	M2 - Medium-24.24 %	M2 - Medium - 8%
	M3 - High - 8.21 %	M3 - High-0%
Yield	24.22 nuts/palm/annum	50 nuts/palm/annum

Source : Field sruvey 2003 & 2006

- The incidence of the red weevil could be managed to the satisfaction of the farmers during the project period.

Comparative analysis of pests/ disease incidence in coconut palms under different crop management levels in farmers fields

The observations on the pests and diseases of coconut palms in three different areas, viz. project area under good management, outside area under medium and low management levels were compared using different statistical techniques. The number of palms affected by different pests and diseases using a chi-square statistic for multiple proportions. The null hypothesis is Ho: P_1, P_2, P_3 ...., Pk where P_1 was the proportion of palms affected by the pest or disease. The test statistic for testing such hypothesis was given by

$$\chi^2 = \Sigma \frac{(Oi - nip)^2}{nipq}, \text{ for } i = 1,2,3, ..., k$$

Here, Oi = the observed frequency for the i^{th} sample.

ni = the sample size for the i^{th} sample.

The degrees of freedom associated with the $\chi^2 = k - 1$, where $p = \frac{\Sigma Oi}{\Sigma ni}$ and $q = 1-p$

From the data presented in Table 4 it was clear that the proportion of palms affected by leaf rot disease, rotting in spindle and rhinoceros beetle were significantly different. A higher proportion of palms were affected by leaf rot disease, rotting in spindle and rhinoceros beetle were significantly different. A higher proportion of palms were affected by leaf rot, rotting in spindle and rhinoceros beetle in the low management area. The root (wilt) disease incidence could be seen in all management levels. No statistically significant difference was observed between the proportions of palms. The highest proportion of palms with higher disease intensity (disease middle stage and advanced stage) was observed in the area of average management. Here also we could observe that the proportion of palms with maximum index was comparatively low in the technology adopted area.

A significant difference was observed in the yield characters (table 5). The highest yield was recorded in the well managed area and the lowest yield in the poorly managed area.

Table 4. Comparative analysis of proportion of coconut palms affected by pests and diseases under different management levels

Pests/Diseases	Project area integrated management	Farmers' fields with low management outside project area	Farmers' fields with average management outside project area	Chi square statistic
Leaf rot	4	32	27	22.999**
Leaf Rot in spindle	6	24	18	10.145**
Rhinoceros beetle	5	28	7	25.573**
Eriophyid mite	24	24	15	4.53
Coried Bug	9	17	9	3.437
Root (Wilt) disease	43	58	62	3.411

***Significant at 1% level All figures in numbers (Source : Field survey 2006)*

Other impacts

Intercropping intensity enhanced to 4-5 folds compared to the pre-project area. The improvement in intercrops was noticed among those farmers with landholding of less than 01. ha recording an improvement of 120 percentage and among farmers with landholding of less than 0.1 ha recording an improvement of 120 percentage and among farmers with landholding between 0.20 - 0.30 ha recording an improvement of 430 percent. The intercrops were banana, vegetables, tubers (elephant foot yam, colocasia), spices (ginger/ pepper/turmeric) etc. The diversification of the homestead also increased significantly i.e., coconut + intercrops + poultry/duck improved from 12.5 - 70 percentages after project implementation.

The products made available in the market by rural women groups from farm level coconut processing were virgin coconut oil (traditional method), coconut food products and coconut chutney powder. The group could realize four fold increase in their income through value addition.

Vermicomposting techniques were made popular in the area as well as in the adjacent areas through farmer to farmer dissemination of knowledge and earthworms for organic recycling, cost reduction and soil health maintenance. Eighty percent of the households adopted low cost vermicomposting units.

Knowledge and adoption of the

Table 5. Average yield of palms under different management levels

Mean yield	Recommended management	Low management	Average management	F-ratio
Below Fist size	26.42	8.55	20.04	27.38**
Above Fist size	36.76	17.01	24.89	24.17**
Mean yield	49.97	21.285	34.91	

***Significant at 1% level All figures in numbers (Source : Field survey 2006)*

technologies significantly improved through extension interventions and training programmes. The knowledge score improved to 62.5% (organic manure), 81% (vermicompost technique), 81.25% (basin management with cowpea), 55.5% (identification of root (wilt) disease symptoms), 60.5% (borax application for deficient palms) and 57.5% (post harvest/processing). A total of 27 training programmes were organized in the area generating training intensity of 3.2 per individual of the project area.

Improvement of Income

The income from the coconut homestead plots improved due to the increase in productivity of coconut as well as from the intercrops/ poultry/cattle. The Table 6 clearly indicate the impact of technological and extension interventions in the improvement of income. The improvement in income from coconut (71.3%) and from farming system components (138.6%) was higher in the case of landholdings size up to 0.1 ha due to efficient use of resources by the family members and management of the crops. The income from other crops / enterprises was almost doubled compared to coconut in the case of landholdings of more than 0.2 ha where as it is almost similar among the landholding size of 0.11 - 0.2 ha. This indicates need for pooling resources for productivity improvement.

The marginal farmers could improve their income through group activities and collective action (Table 7) thus pooling their human/ economic resources to realize maximum benefits. The group efforts realized in this programmes were as follows.

1. Procurement of planting materials/fertilizers/chemicals by the group leaders.
2. Pooling the vermicompost produced for using in the farm enterprises and coconuts for coconut processing.
3. Sharing labor by the members (skilled labor to packing / marketing).
4. Sharing income through group consensus and keeping apart a portion for the group development also.

Table 6. Improvement in average income from coconut based homesteads per annum

Landholding size	Average income from coconut (Rs.)			Average income from intercrops/ poultry/livestock in coconut holdings (Rs.)		
	Before	After	Improvement (%)	Before	After	Improvement (%)
Up to 25 cents (0.1a)	687.00	1117.00	71.30%	728.00	1737.00	138.60%
26-50 cents 0.11 to 0.2 ha)	3272.00	4998.00	52.75%	4319.00	6584.00	51.74%
Above 50 cents (above 0.20 ha)	9043.00	14317.00	58.00%	10519.00	22247.00	112.00%

Source : Field survey 2003 & 2006

Farmer to farmer technology/ information dissemination

Farmer to farmer technology dissemination is one of the simple, cheap, fast and effective modes in actual field situation. The project team observed that participation in the project activities, acquiring knowledge and skill, actual practice, solving field problems through technology backup, realizing income or improving productivity through technology adoption paves the way for capacity building in disseminating knowledge/skill/ information to other farmers also. They were proud of being a partner in the project. An analysis showed that 20.57% disseminated technologies to the relatives, 23.33% to friends, 34.20% to other farmers and 8.80% were not interested in technology dissemination. The approach was scaled up by various agencies like Department of Agriculture, Coconut Development Board and other local self-government agencies.

Conclusion

There is tremendous potential for yield and income improvement in the root (wilt) affected area, which in turn

Table 7. Income generated through group activities per annum

Group activity	Number	Net income	Profit
Banana as intercrop (women/rural youth self help groups)	3000 plants	Rs. 1,45,000.00	Rs. 1,17,000.00 @Rs. 39/banana
Coconut products (women SHG)	2500 coconuts	Rs. 38470.00	Rs. 18754.00 Rs. 9.4/nut value addition
Vegetable cultivation in interspaces	0.40 ha	Rs. 11,000.00	Rs. 6500.00

(Source : Field survey 2006)

improves the consumption, income and production surplus for value addition. The yield improvement reflects the importance of balanced nutrition and combating the yield loss from pest and disease incidence, especially leaf rot. Regular adoption not only manages the plant protection problems, but also cumulatively reduces the investment for plant protection. Further more the need for appropriate extension strategies, capacity building of farm families in choosing technology components and combinations along with adoption of recommended practices with modifications is emphasized through this study. Constant interaction with farmers has to become the norm, so that extension/research staff can become aware of current and emerging problems in cultivation and transmit these to the agencies devoted to agricultural research and other relevant policy makers.

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Source : Cord, 2008, 24(2)

Coconut helps to maintain a lean figure

One of the key components in Sri Lankan cookery is the coconut. Except for most fish and meat curries, for almost every other curry coconut is used. Coconut is not only used as a milk extract, but also as freshly grated and as oil. In recent times, because of certain misconceptions, Sri Lankans have begun to discard the coconut, especially its oil in favor of its substitutes such as sunflower oil and palm oil. The coconut is however not unhealthy as it is made out to be. In fact, the carbon medium length chain of the coconut, which is longer than the other oils, helps the active body to maintain a lean figure. This was discovered by accident in the early part of last century by American farmers. To fatten their cattle they began to include coconut in cattle feed. However, instead of fattening the cattle, the cattle actually became leaner. It is only upon closer inspection that this unique molecular composition was discovered. Yet, the propaganda against coconut continued to help promote other substitutes Coconut and its products have been in Sri Lankan cookery as far as memory stretches.

Source : The Cocommunity