

Participatory approaches for enhancing technology utilization in coconut

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Introduction

India is one of the major producers of coconut in the world and about 12 million people are dependent on coconut farming and its allied activities. India produced 20,439 million nuts in the year 2015 from an area of 1.97 million ha (Coconut Development Board, 2015). In India, the palm is cultivated in 18 states and 3 Union Territories and supports the livelihood of over twelve million people. It is of greater importance in the agrarian economy of the four southern states of Kerala, Tamil Nadu, Karnataka and Andhra Pradesh, which account for 90% of the coconut cultivation in India. In the recent past, coconut sector suffers from price fluctuations, pests and diseases, moisture stress, lack of value addition etc. Hence, technological innovations and diffusion of new technologies are the key drivers to enhance the productivity and profitability of coconut farming. Through the systematic research conducted at Central Plantation Crops Research Institute and State Agricultural Universities (SAUs) during the last few decades, a substantial number of viable technologies related to crop improvement, production, protection and pre & post harvest processing have been evolved for enhancing coconut productivity and profitability.

Various programmes are implemented by research and development agencies on a regular basis as part of the efforts to disseminate the research results among the coconut cultivators.

In spite of the efforts made by coconut research and development/extension agencies farmers are not able to exploit the production potential from the improved technologies to the desirable extent. Studies have found that the extent of adoption of technologies recommended for higher yield and income from coconut farming is comparatively low due to various constraints including socio-economic, technological, management or infrastructure. Low and fluctuating price of coconut is the most important problem faced by coconut growers. Lack of sufficient labour for climbing palms and high wage rate also create much problem to farmers. Incidence of pests and diseases is another important problem experienced by coconut farmers. Predominance of senile and unproductive palms, high cost of inputs, lack of availability of quality planting materials, low availability and utilization of organic manure due to reduced adoption of livestock integrated farming, lack of irrigation/drainage facilities etc are also often reported as constraints in adopting the recommended practices

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of coconut cultivation. Majority of the coconut growers belong to small and marginal holding categories and the uneconomic holding size limits the adoption of recommended technologies for higher productivity and income from coconut farming.

The low level of technology utilization at farmers' fields' demands for innovative extension approaches suitable to the heterogeneous farming situations in coconut cultivation. Hence, participatory extension approaches have been attempted through action research with farmers' participation by CPCRI for enhancing technology utilization by coconut farmers.

Technologies on coconut

Technologies are generated mainly at the research institutes which include Central Plantation Crops Research Institute (CPCRI) under the Indian Council of Agricultural Research (ICAR) and the State Agricultural/Horticultural Universities. Central Plantation Crops Research Institute (CPCRI) is the pioneering research organization in India conducting research on different aspects of coconut cultivation. CPCRI also coordinates research on coconut within the country and execute the research programmes under the All India Coordinated Research Project on Palms. Technologies for enhancing productivity and profitability from coconut farming can be broadly categorized as follows.

- Improved varieties and hybrids suitable for different agro climatic regions with specific traits and high yielding potential
- Agronomic practices viz., planting, spacing, irrigation, mulching etc for optimum use of resources
- Cropping system/farming system models suitable for different agro climatic regions for enhancing resource use efficiency
- Organic farming technologies/ organic recycling for sustainable production of coconut
- Soil and water conservation measures
- Integrated Pest and disease management
- Pre and post harvest gadgets and machineries
- Value added products

It has been demonstrated that an increase in yield by four folds can be achieved by adopting proper cultivation practices for coconut as compared to the poor managed palms. Various organizations involved in the research and development of coconut are streamlining their activities to enable the farmers to make use of the technologies for enhancing the production and productivity.

Technology utilization in coconut

The process of research could be considered as successful only when the results reach the ultimate user. A substantial quantum of technologies has been evolved at research stations for the improvement of coconut. But the extent of adoption of these technologies at the

cultivators' level is not that satisfactory. Based on the review of studies, the adoption of technologies in the farmers fields could be classified as follows (Thamban, 2010).

Table 1 : Technologies on coconut	Adoption (%)
Hybrids, fertilizer application in split doses, green manure, irrigation, systematic intercropping/mixed cropping, plant protection measures, application of lime, biological control of pests, post harvest technologies.	< 25
Regular planting with adequate spacing, application of organic manures, application of salt, moisture conservation techniques, magnesium sulphate application, Eriophyid mite control.	26-50
Planting of own seedlings, selection of seedlings, mulching	51-75
Local WCT variety, planting method, rainfed farming, mother palm selection, basin opening.	>75

Need for participatory extension approaches

Technologies on coconut is mainly disseminated through different extension approaches by ICAR-CPCRI, AICRP (Palms) centres, Coconut Development Board, State agricultural/horticultural universities, State department of agriculture/horticulture, Krishi Vigyan Kendras(KVKs), NGOs, farmers' organizations, mass media etc. Front line extension activities are organized by ICAR-CPCRI and SAUs. On farm testing, front line demonstration, training and extension activities are carried out by KVKs. Mainstream extension programmes in coconut are mostly organized by Coconut Development Board (CDB), State Department of Agriculture/Horticulture and farmers organizations.

Participatory extension approaches are gaining importance due to various reasons and these approaches are based on effective participation of rural communities. The focus is to promote greater involvement of farmers in planning and implementing technologies. Farmers are encouraged to take initiative and work with extension staff on equal terms, for testing and implementing technologies. Capacity building, social mobilization, experiential learning and empowerment are major elements in this approach.

The comparison of conventional extension with participatory extension is given in Table 1 for better understanding of the two approaches (Scoones & Thompson 1994). The focus of extension changes from teaching to learning; from hierarchical, top-down to participatory bottom-up approaches; from centralized to decentralized decision making.

Feature	Conventional	Participatory
Main objective	Transfer of technology	Empowerment of farmers
Analysis of needs and priorities set by	Outsiders (extension agents, researchers)	Farmers facilitated by outsiders
Primary R&D location	Research station	
	Farmers' fields and conditions	
Menu of technologies	Fixed (blanket recommendations)	Baskets of options (flexible recommendations)
Dissemination process	Linear transfer of precepts, messages and technological packages.	Dynamic process based on joint analysis and farmers' choices
Farmers behaviour	Taught about the message: adopt or reject	Use methods, choose from basket and experiment
Outsiders desired outcome	Widespread adoption	Wider choice for farmers and enhanced adaptability
Main mode of diffusion	Extension workers to farmers	Farmer to farmer
Role of extension agent	Provider of information, technical supervisor, teacher	Facilitator, catalyst, advisor

Extension approaches for enhancing technology utilization in coconut need to consider the following factors for successful implementation with the active participation of the stakeholders.

- Long gestation period and perennial nature
- Size of the holdings
- Agro climatic conditions
- Availability of know how
- Availability of natural resources
- Availability of planting materials/inputs
- Cropping/ farming system
- Pests and diseases
- Government schemes/ projects/subsidies
- Development/Policy initiatives both at national and international levels
- Availability of skilled labour
- Gender involvement
- Socio economic conditions
- Market access
- Demand/price of the produce

Refinement of extension approaches pave way for reaching out to the relevant stakeholders more efficiently

and effectively. Farming is not an isolated activity by any means. It has the foundations in culture, heritage, experiences, tacit knowledge, knowledge innovations, innovation systems and social process. Hence, participatory extension approaches are the need of the hour for enhancing technology utilization at the grass root level for doubling income of the farmers and its role in technology innovation system.

In view of the above discussion, participatory extension approaches have been attempted through action research with farmers' participation by CPCRI for enhancing technology utilization by farmers which are described below in brief.

1. Community Based Organizations (CBOs) for sustainable income enhancement

i. Project: Developing sustainable coconut based income generating technologies sponsored by International Plant Genetic Resources Institute (IPGRI)

Objectives: To augment the production and productivity of small and marginal holdings and Management of farmers' resources to reduce cost of cultivation and to increase productivity through integration of technologies

Interventions: Implemented in two selected coconut communities at Pallikkara in West Coast region and Ariyankuppam in East Coast region. The three-pronged strategy routed through CBOs included i) growing suitable inter/mixed crops in coconut gardens and integrating animal husbandry and other subsidiary enterprises ii) cultivating high yielding cultivars to enhance the yield and income and iii) promote the diversification of coconut products

Impact: Sustainable income, employment generation and conservation of natural resources.

ii. Project: Overcoming Poverty in Coconut Growing Communities: Coconut Genetic Resources for Sustaining Livelihoods in India sponsored by IFAD

Objectives: To improve the food and nutritional security and to enhance the income from coconut cultivation

Interventions: Participatory planning and implementation of intercropping and off-farm activities in small and marginal coconut homesteads in Pathiyoor, Thodiyoor and Devikulangara panchayats through registered Community Based Organizations (CBOs) along with nutrition education

Impact: Tremendous increase in income from intercrops, livestock and household level processing and the total annual income per homestead enhanced from Rs.25,617 to Rs.59,017. Improvement in productivity and efficiency of coconut-based farming systems was attained through intercropping of cash, food and nutritional security crops and genetic resource management.



Demonstration on coconut based cropping/farming system

iii. Project: Value chain in coconut sponsored by NAIP

Objectives: To integrate production and processing technologies in coconut holdings for higher income

Interventions: Technological interventions on soil and water conservation, soil health management, integrated nutrient management, inter/mixed cropping, integrated pest and disease management were implemented in 10 CBOs comprising of 534 farmers in clusters of 25 ha each. Four women SHGs were facilitated to take up microenterprises on production and marketing of coconut value added products.

Impact: Enhancement of farm income and livelihood security. Approach is being scaled up by Coconut Development Board, State Department of Agriculture and Local Self Governments

iv. Project: Community based bio-resource management for sustaining production and livelihood security under coconut based farming systems

Objective: Management of bio resources for sustaining the productivity and livelihood security

Interventions: Awareness programmes, training-cum-demonstrations, small group discussions, farmer field schools and household level trainings on bioresource management and integrated nutrient management were organized. One organic manure production unit with 20 women members and Community bioprimered coconut nursery were established.

Impact: Improvement (89.7%) in farm income from coconut and other intercrops

2. Participatory technology assessment/transfer

i. Project: Technology Assessment and Refinement through Institution-Village Linkage Programme (IVLP).

Objective: To improve participation of farmers in research and extension

Interventions: Implemented in three villages, viz., Pady, Edneer and Nekraje of Kasaragod with coconut as one of the important crops in the production system of the villages. Agro-ecosystem analysis, diagnosing and prioritizing the problems, identification of technological

interventions, development of action plans, detailed socio-economic evaluation including farmers' reactions and perceptions about the interventions were done using various PRA tools and techniques.

Impact: Increased effectiveness of participatory approach in the performance assessment of various technologies related to high yielding varieties, intercropping, nutrient management and crop protection in coconut.

ii. Project: Management of coconut root (wilt) disease in coconut

Objective: For technology assessment in coconut root (wilt) diseased areas

Interventions: Farm families of manageable contiguous area (50-100 ha) were the participating farmers and participatory rural appraisal tools were used. Multidisciplinary team of scientists, extension officials, farmer representatives, local village representatives, women and youth were involved.

Impact: Awareness, knowledge, attitude and adoption of farmers towards the technology for the integrated root (wilt) disease management were improved by 40-85 per cent

iii. Project: Evolving Climate-Smart Adaptations in the management of coconut based farming systems under coastal sandy soil conditions of South Kerala

Objectives: Identification of ideal crops and income enhancement from coconut and intercrops

Interventions: Modified method of husk burial for pine apple, shifting of planting time, planting of 4-5 months old suckers and earthing up with silt and coconut husk, green manure, coir pith compost and husk for banana, planting of short duration varieties and shifting of planting time for tuber crops were done.

Impact: Employment generation and enhancement of income from coconut and intercrops

3. Farmer field schools (FFS)

Project: FFS for the management of rhinoceros beetle in coconut

Objective: To enhance the knowledge of the farmers for managing the pest

Interventions: Formation of FFS in 15 locations of Aleppy district and regular meetings, field visits, focus group discussions etc. for the identification and management of the pest.

Impact: Awareness and knowledge of farmers were improved by 100 per cent over pre FFS level.

4. Self Help Groups

Project: Developing sustainable coconut based income generating technologies in poor rural communities in India' sponsored by IPGRI

Objective: To develop women entrepreneurs through SHGs by entrepreneurship development programme

Interventions: Product diversification in coconut,



R- E-F interface at Manjeswar, Kasaragod



Honouring winners in Quiz competition

production of quality copra using copra dryers, coconut kernel based food products, preparation of coconut candies, production of Snow Ball Tender Nut, production of coconut chips, Oyster mushroom cultivation on coconut wastes and production of vermicompost using coconut leaves etc were included.

Impact: Improvement in income of resource-poor coconut farmers and socio-economically disadvantaged rural women

5. Research-extension-farmer interface

Technology dissemination process will be accelerated if concerted efforts are made by the different agencies having proper co-ordination among them. In this approach, researchers, extension personnel and farmers are brought together on a common platform to streamline the activities for the sustainable development of coconut (Rajagopal et al., 2004). In this context, ICAR- CPCRI had organized research-farmer-extension interface programmes on coconut in 12 districts of Kerala during 2002-03 and 13 districts of Karnataka during 2013 to create awareness about the technological options and developmental opportunities available to address the problems and enhance the profitability of farming. These programmes were organized as a collaborative effort with SAHUs, KVKs and Department of Horticulture. Thematic sessions related to crop improvement, crop production, crop protection and value addition were covered in the interface programmes, in which scientists from CPCRI, SAUs/SHUs and KVKs, extension personnel from Department of Horticulture and farmers had participated. Innovative quiz programmes for the farmers were also organized in collaboration with Department of Agriculture and All India Radio, Kannur.

Impact: Useful for decentralized planning for implementing various schemes at the grass root level. Improvement in adoption of technologies ultimately leading to coconut growers' own benefit.

6. Area wide community extension approach (AWCA)

Project: Area wide community extension approach (AWCA) for management of coconut pests

Objective: To manage coconut pest through community extension for sustainable production of coconut

Interventions: Strengthened linkages with peoples' representatives, farmer organizations, farmer leaders, co-operative societies of farmers and co-ordination with various extension departments and research institutions. Capacity building of women farmer groups as master trainers and farm level producers of Green Muscardine Fungus (GMF) and targeting the 'potential and critical adopters' of the bio control technology against rhinoceros beetle management.

Impact: More than 90 per cent of the potential adopters were reached within two months and post intervention data indicated 75.8% reduction of fresh pest infestation

7. Cyber extension

CPCRI has been implementing various cyber extension activities in collaboration with other agencies on a participatory mode as part of strengthening the technology transfer programmes for coconut.

Videoconferencing: A video conferencing system through ISDN was installed to facilitate interaction between various stakeholders for enhancing technology utilization in coconut. Effective linkages are established with various agencies such as ICAR institutes, Coconut Development Board, State Department of Agriculture/ Horticulture, State IT Mission, NGOs like MSSRF, people's representatives and farmers' organizations for the effective conduct of the interactive videoconferencing programmes.

E kalpa: An Android based mobile Application 'e-kalpa' developed for reaching the farming communities in multilingual formats. The Mobile App consists of Knowledge base (coconut), farmers' field problems/ issue management system (multi mode farm reporting of field problems and receiving advisories), online farmers diary, Synchronized farming (for new farmers and FLD/ PTD farmers) and Notifications (Meetings/ trainings/ announcements). The App is widely used by many farmers since its launching in October 2016. An e-Plantation Survey App was also developed for accurate GPS tagged data collection for research projects and extension activities. The Survey app could be used for any survey enabling paperless, time saving and real time data documentation in any of the csv formats for analysis without any manual data entry.

8. Harvesting wisdom of coconut growers

Progressive farmers in various parts of the country made significant achievements in coconut farming by adoption of scientific cultivation. Such farmers have amply demonstrated the impact of utilizing scientific technologies for enhancing productivity and income from coconut farming. Further, many of them have evolved innovative farming practices appropriate to the agro-ecological situation for sustainable coconut production. Coconut Development Board, State Agriculture/Horticulture Departments and other agencies including Local Self Governments have been implementing schemes to promote such coconut farmers by giving awards and recognitions for their achievements. Hence, efforts were made by the institute for documenting experiences of innovative coconut growers across major coconut growing tracts viz., Kerala, Tamil Nadu, Andhra Pradesh, Karnataka, Goa, Maharashtra, Gujarat, Odisha, West Bengal, Assam, Andaman & Nicobar Islands and Lakshadweep and Minicoy Islands in 2016 (Thamban et al., 2016a). Selection of farmers was made in consultation with the concerned State Agriculture/Horticulture Departments, Coconut Development Board, All India Co-ordinated Research Project (Palms) Centres functioning under CPCRI and Krishi Vigyan Kendras. A team of scientists from ICAR-CPCRI visited the identified farmers' gardens and documented their successful experiences on a participatory mode. Socio-personal profile characteristics, details of the coconut garden, extent of adoption of improved farming practices including improved varieties and quality planting materials, effective water management and irrigation techniques, integrated nutrient management, multiple cropping and integrated farming, integrated pest and disease management, value addition through product diversification, innovative farming practices evolved, economics of coconut farming, marketing practices, efforts made for disseminating improved coconut production technologies among other farmers and linkages with research, development and extension institutions were documented as part of the programme. The successful experiences of innovative coconut growers were documented, analyzed and honored for motivating farmers for adoption of improved technologies.

9. Friends of coconut Tree (FoCT)

Coconut Development Board has initiated an innovative training programme viz., 'Friends of Coconut Trees (FoCT)' to develop a professional group of youth for harvesting and plant protection operations in coconut. The training targeted the group of unemployed youth in developing technical skills, entrepreneurship capacity, leadership qualities and communication skills to address the needs of the coconut growers. KVKs functioning



Video conferencing system at CPCRI

under CPCRI at Kasaragod and Kayamkulam organize the training programme on participatory mode to benefit the rural youth. Trained youth including farm women are getting employment by doing hybridization, neera tapping, plant protection and harvesting operations.

10. Farmers participatory research cum demonstration

CPCRI has been organizing farmers' participatory research cum demonstrations in farmers' fields on different coconut cultivation technologies such as coconut based farming systems, soil and water conservation, management of root (wilt) affected coconut gardens, cocoa as a profitable intercrop in coconut gardens etc in different states of the country. Such demonstration programmes have proved to be effective in convincing the farmers about the technical feasibility and economic viability of the technologies.

All the participatory approaches discussed above were successfully implemented on project mode by following the principles of participatory extension. Many of the approaches implemented by CPCRI are being upscaled by Coconut Development Board, State Department of Agriculture, Farmers' organizations etc. for the benefit of farming community. Advantages and disadvantages of participatory approaches as perceived by stakeholders are given below.

Advantages

- Consultation and access to information for the local people about the intentions of outsiders
- Freedom of choice for local people to engage in a process of technology transfer.
- Empowerment through redistribution of power on the basis of equity and compatibility.
- Mutual trust and respect
- Distribution of benefits to partners equally.
- Adaptability and flexibility of outside institutions to changing and sometimes unforeseen circumstances.
- Strengthens the link between indigenous and scientific knowledge
- Builds human capacity for self reliance
- Interactive and participatory in nature
- Farm family approach with gender concerns



Honoring Innovative farmers at CPCRI



Demonstration on soil and water conservation measures



Training for Friends of Coconut Trees (FoCTs)

- Inclusive of weaker sections
 - Area wide interventions
 - Integration of extension techniques and methods
 - Focused technology interventions for improving the impact
 - Utilizing the digital literacy to reach the unreached
- Disadvantages**
- Demands patience
 - Time consuming

Conclusion

Coconut research institutes have developed a number of technologies by the use of which remarkable improvements in the coconut productivity levels have been achieved. However, the wide gap that exists between the recommended practices and their actual level of adoption in various holdings indicates the presence of major barriers in improving the productivity levels. In order to break these barriers, the development efforts

being implemented by various research and development organizations are needed to be strengthened and should form one of the primary tasks towards achieving the targets of improving the coconut productivity and profitability levels. Effective linkage is to be established among different research, extension agencies and coconut farmers through well co-ordinated participatory research/extension.

It is strongly believed that participatory approaches are the need of the hour to make the farming profitable and sustainable. But at the same time, participatory approaches are not a substitute for conventional extension. It is a complementary process which does link the power and capacities of research, extension workers and development departments with the priorities and capacities of farming communities in order to develop productive and sustainable farming systems. ■

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