Research into use –

The context of coconut technologies

Thamban, C. and Jayasekhar, S.
ICAR-Central Plantation Crops Research Institute, Kasaragod

Introduction

In India, coconut farming is inseparably embedded in the socio-economic and cultural fabric and also represents the ethnic identity. Therefore it is not always possible to view the commercial aspects of coconut farming in isolation. This is exactly the reason for, why the coconut cultivation in the country still sustains overcoming all the topsy-turvy terrains in the past. It is unique that the coconut sector has been evolved through imbibing the scientific excellence for the past 100 years. Hundred years of coconut research has yielded substantial number of technologies pertaining to agro-techniques, farming systems, pest and disease management, and value addition for enhancing yield and income from coconut farming. The focused research efforts to improve productivity and overall profitability to the farmers resulted in the development and release of high yielding varieties and hybrids. Eighteen improved high yielding varieties including twelve selections and six hybrids were released from the ICAR-Central Plantation Crops Research Institute (CPCRI) alone. The coconut based cropping system (CBCS), and coconut based mixed farming system (CMFS) models evolved through systematic research categorically proved the advantages of the system approach. However, it is a matter of grave concern that in spite of all the concerted research efforts in the coconut sector for the past 100 years, the level of technology utilisation by coconut growers is not up to the desired level as revealed by many studies. Therefore, it is very pertinent to look into the existing pattern of technology development and extension process in the coconut sector in the country with a view to identify the inherent structural issues and other major constraints that stand as an obstacle in the path of effective translation of the technology to the farmers' fields.

Field level utilisation of technologies in coconut

Various agencies are involved in the efforts for the development/transfer of technology in coconut as part of the broader innovation system. The ICAR-Central Plantation Crops Research Institute (ICAR-CPCRI)

and State Agricultural/Horticultural Universities are the major actors in the generation of coconut technologies. Besides, they also conduct front-line TOT programmes in coconut. State Agri/Horticultural Universities also organise front line extension activities for the promotion of coconut. Krishi Vigyan Kendras (KVKs) implement interventions for technology assessment and front line extension activities related to coconut which is important in the prevailing cropping systems of the respective districts they are located. Mainstream extension system with Ministry of Agriculture at the centre and State Agriculture/Horticulture Departments at state level implement technology transfer and development schemes for the improvement of coconut. Extension programmes relevant to coconut are also implemented through the Agricultural Technology Management Agency (ATMA) initiative supported by Central and State governments. Coconut Development Board under Ministry of Agriculture is also functioning for the development of coconut. Farmer organisations supported by governmental agencies also involve in the implementation of extension and development interventions in coconut sector. For example, the three tier network of Coconut Producer Societies (CPSs), Coconut Producer Federations (CPFs) and Coconut Producer Companies (CPCs) facilitated by CDB are actively involved in organising extension/development activities. Local Self Governments (LSGs) also implement development interventions in coconut through decentralised planning process.

Though a plethora of agencies and initiatives are involved in implementing research/development/ extension interventions to improve the livelihoods of farmers in coconut sector, the extent of field level utilisation of technologies for realising higher productivity and income from coconut farming has been not at a satisfactory level. Studies conducted by ICAR-CPCRI showed that adoption of coconut hybrid varieties, improved irrigation techniques like microirrigation, IPM, IDM and post harvest processing technologies was very low. A comparison between the best managed gardens and national average of productivity of coconut reveal the fact that there still exists a wide gap between the technologies generated and their utilization by the growers, especially in small holdings. The low level of technology utilisation at farmers' fields calls for formulating effective research and extension strategies suitable to the heterogeneous farming situations in coconut sector.

Coconut sector in India faces a number of challenges to attain economic and ecological sustainability. Price crash/price fluctuation in the market is the most important problem experienced by coconut growers. The risk and uncertainty due to price fluctuation faced by farmers is more serious in the present era of trade liberalization unlike in the past when domestic markets were highly protected from outside competition. The scenario has completely changed resulting in greater integration of the domestic market with the world market necessitating pro-farmer government interventions based on farmer friendly policies and programmes.

Strategies for inclusive growth in India can't overlook coconut sector owing to the significant contribution of plantation crops sector towards the livelihood security of millions of small and marginal farmers as well as plantation workers, especially women. Apart from favourable policy environment and pro-farmer interventions, it is also essential that efficiency of farming is enhanced considerably by the effective utilisation of technologies made available for increased productivity and income from coconut. Effective extension strategies are to be formulated and implemented in tune with the socio-economic and bio-physical environment of cultivation of coconut to ensure better technology uptake for higher efficiency in the sector. Strategies suggested to overcome the difficulties due to low price/ price fluctuation in small holders' crops such as coconut include enhancing productivity and reducing cost of cultivation, adoption of cropping/farming system rather than monocropping and value addition through product diversification. However, conventional TOT strategies focusing mainly on increasing production of crops are not adequate to empower small and marginal farmers to take up interventions including production and marketing

of value added products. Hence, appropriate extension approaches to facilitate formation and sustenance of farmer organisations at grass root level becomes highly relevant.

Predominance of small and marginal holdings is a constraint experienced by the coconut sector in achieving efficiency in production. The inherent problems due to fragmented holdings with low resource endowments result in low level of adoption of improved technologies. Hence, it is imperative that group approaches are facilitated among small and marginal growers in coconut sector for effectively implementing extension and development initiatives. Group approaches enable the growers to reduce cost of cultivation and to enhance productivity through better utilisation of technologies. Community approach is highly relevant in implementing technology interventions for pest/disease management and managing value addition enterprises. Women Self Help Groups can be empowered for managing microenterprises on production and marketing of value added products in crops like coconut. A major constraint perceived by farmers in the adoption of high yielding/ hybrid varieties of crop like coconut is lack of availability of quality planting materials. Farmer organisations and women self help groups can be facilitated to manage decentralised community nurseries for production and distribution of quality planting material to benefit the growers.

One of the reasons attributed to the unsatisfactory technology adoption scenario in plantation crops is low awareness/knowledge level of farmers about the improved technologies. Hence, capacity development initiatives to benefit farmers are to be organised to better equip them for higher level of utilisation of technologies. Need based training programmes, demonstration of proven technologies with the active participation of farmers, effective use of other extension methods including group/mass contact methods are necessary to keep the growers updated on the technologies available for enhancing productivity and income from farming. Lack of availability of labour, especially skilled labour, and high wage rate are major problems experienced by growers. Hence, capacity development programmes for knowledge/skill upgradation of labour community, especially skilled labour, is highly significant for enhancing efficiency in plantation sector. Potential of cyber extension methods also needs to be exploited to reach the farming community. Capacity development initiatives are to be conducted for the benefit of extension personnel.

It is generally an accepted fact that the extent of farmers' participation in research and extension is not at a satisfactory level. Active involvement of farmers

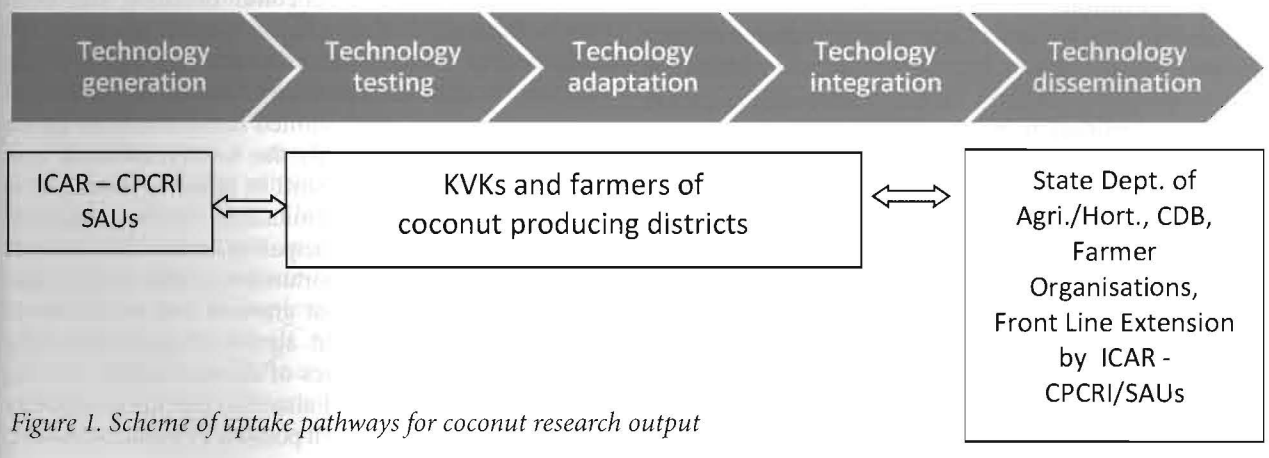

Figure 1. Scheme of uptake pathways for coconut research output

in the process of technology generation, technology assessment and refinement and dissemination of technologies invariably enhances the extent of technology utilisation at farm level. The scope for implementing farmer participatory approaches to enhance effectiveness of research and extension in coconut needs to be fully utilised.

The underpinnings of uptake pathways

The uptake of the research output by the end user/farmer is mainly influenced by the appropriateness of the output/ technology to the farmer. As a matter of fact, the appropriate outputs which are not taken up by farmers are much less common than research projects which produce inappropriate outputs (Garforth, 1998). The instances of inappropriate outputs include technologies that are incompatible with existing production or marketing system, are too expensive, labour intensive, not suitable for resource poor farmer etc. The technology development is a heuristic concept that involves continuous activities, from basic research, technology generation, testing of technology developed, and technology integration into the existing system (Edward and Farrington, 1993; Sen and Garforth, 1996). Even in the case of disseminated technologies, the uptake necessarily requires perfect adaptation to fit production, processing and operating systems. Theoretically, the uptake of research output can be speeded up through revamping the institutional structures ensuring desired participation of end user groups, and also through ensuring the optimal level of involvement of the farmer in the dissemination process.

Figure 1 above depicts the uptake pathway for coconut research output in India. In the technology generation node, Institutions like ICAR-CPCRI, Agricultural universities, and All India Coordinated Research Project (Palms) are the major institutions accountable. It is imperative to analyze, how far the technology generation node has identified the research output according to the felt need and feed back of the end user. Krishi Vigyan Kendra's (KVKs) are the major institutions responsible for technology validation and technology integration. We need to assess the effectiveness of these channels in technology development process, and whether adequate numbers of on farm testing are conducted to convince the merits of the technology to the farmers. The technology dissemination part of the coconut research is carried out mainly through the respective state departments of agriculture. This is the crucial node and the agriculture departments of most of the states are n properly equipped with exclusive tools for technolog dissemination in the coconut sector.

Technology generation

As it was already mentioned, ICAR-CPCRI an SAUs are the major institutions functioning in th domain of technology generation. A quick glance the technology generation streams of these institutio highlights that the research methodologies are skewe and confined mainly to the on-station/experiment conditions. Though the technologies developed a robust with respect to the scientific evaluation criteri the practicability of the same in the field level scenari is a matter to contemplate. The appropriateness technologies to socio-economic resource levels, agr ecological situations, input use level, low price coconut, fragmented holdings and changing agraria relations have become highly debatable.

Research related to coconut breeding has bee mainly focussed on strengthening genetic resources an utilisation of these resources to develop high yieldin varieties. Evaluation of promising lines in multi location trials was possible with limited number mother palm and parents of hybrids only due to constraints in lan availability. A paradigm shift in breeding strategies needed to overcome these limitations. In-situ germplas evaluation and farmer participatory approach in cocon breeding will provide opportunities to take into accou the preferences of coconut growers and suitability the varieties for different agro-ecological situatio and resource characteristics of farmers while evolvin improved varieties. It will also improve the availabili of mother palms and make it possible to produce plantin

material in required quantity for faster spread of new varieties to enhance productivity of coconut.

Developing different models of coconut based cropping/farming systems for higher productivity and income from unit land area has been a major contribution of coconut research which is highly relevant in the present day context of price crash of coconut and also in the coconut farming scenario dominated by small and marginal holdings. The agronomic feasibility and economic viability of adoption of coconut based farming systems have been amply demonstrated in research stations. In spite of the obvious benefits of coconut based farming system over the traditional monoculture, the extent of adoption of the recommended farming system models is not at a satisfactory level. Hence, it is necessary to reorient farming system research in coconut with emphasis on characterisation and assessment of coconut based cropping/farming system adopted by farmers in major coconut growing tracts in the country. This would generate data on various techno-socio-economic aspects of land use pattern and management trends in the coconut gardens in farmers' fields so as to facilitate further research initiatives for enhancing the efficiency of coconut based cropping/farming systems adopted by farmers.

Ensuring farmer participation in research and extension invariably enhances the extent of technology utilisation at farm level. There is scope for participatory technology assessment and refinement in coconut for achieving higher productivity. CPCRI was one of the selected centres to implement the Indian Council of Agricultural Research (ICAR) project for Technology Assessment and Refinement through Institution-Village Linkage Programme (TAR-IVLP) under National Agricultural Technology Project (NATP). Implementation of the project revealed the effectiveness of participatory approach in the performance assessment of various technologies related to intercropping, nutrient management, crop protection and value addition in coconut. However, the participatory approach for technology assessment and refinement was not sustained/ institutionalised subsequently.

Technology testing, adaptation and integration through KVK system

The study conducted among 20 KVKs in south India which are functioning in the major coconut producing districts revealed that many of the KVKs have not taken up on farm testing or front line demonstration of technologies evolved at either ICAR-CPCRI or SAUs/ AICRPs which are the major technology generating centres for coconut. Only five per cent of KVKs have conducted OFT/FLDs on technologies related to improved varieties and product diversification. The vital role of KVK system as an intermediary agency between research and extension systems in the agricultural technology development process has been well recognised (Sajeev and Venkatasubramanian, 2010). The inadequate efforts for testing, adaptation and integration of coconut technologies through KVK system adversely affects the process of technology assessment and refinement essential for better technology uptake in farmers' field.

Table 1. On Farm Testing /Front Line Demonstrations of coconut technologies conducted through KVKs

Technology	No of KVKs conducting OFTs/FLDs on coconut technologies	Percentage of KVKs
Improved varieties, hybrids etc	1	5
Agrotechniques like INM, irrigation and water management etc	5	25
Cropping/farming system	4	20
IPM/IDM	6	30
Value addition through product diversification	1	5

It is necessary to facilitate the KVKs in the major coconut producing districts in the country for including relevant interventions for on farm testing and frontline demonstrations of coconut technologies so that upscaling of technologies can be ensured through appropriate technology dissemination initiatives by the coconut extension system represented mainly by the state department of agriculture/horticulture and other agencies. Due to the perennial nature of coconut, there

are many constraints/limitations for formulating and implementing interventions for on farm testing and front line demonstrations of technologies pertaining to coconut compared to technologies in field crops/short duration crops. Specific methodologies/protocol for conducting OFTs and /FLDs are to be evolved and KVK personnel are to be trained on the same to ensure testing, adaptation and integration of coconut technologies through KVK system to facilitate better technology uptake at farm level.

Technology dissemination

Technology dissemination system in coconut in India is mainly represented by State Department of Agriculture/Horticulture and Coconut Development Board (CDB). A large number of development/extension programmes are implemented by CDB for promotion of coconut farming in the country. These programmes are implemented in collaboration with state government agencies, farmer co-operatives and farmer producer organisations. The fact that CDB does not have network of field staff/extension personnel reduces the quality of implementation of the extension programmes to promote field level utilisation of coconut technologies. Though farmer participatory technology transfer approaches have been evolved and validated in coconut by CPCRI especially for technologies pertaining to IPM, IDM etc scaling up of the same through extension programmes of State Department of Agriculture/Horticulture to improve technology uptake in coconut farming has been very limited. The potential for implementing extension/development interventions by LSGs under the decentralised planning programme for promoting effective utilisation of available technologies for enhancing productivity and income from coconut farming has also not been fully utilised. There is also a vast potential to utilise the recently formed three-tier farmer producer organisation system (of CPSs, CPFs, CPCs) facilitated by CDB for enhancing field level utilisation of coconut technologies.

Conclusion

Coconut research over the last one hundred years has yielded substantial number of technologies pertaining to agro-techniques, farming systems, pest and disease management, and value addition for enhancing yield and income from coconut farming. Though large number of technologies has been generated for the improvement of coconut and various agencies are involved in the dissemination of technologies, the extent of utilization of the available technologies in farmers' field is not at a satisfactory level. The present scenario of technology adoption calls for a paradigm shift in the technology generation and dissemination process in coconut. Ensuring farmers' participation in research and extension strengthening functional linkages among different research and extension agencies and farming community are important for enhancing technology utilisation for higher productivity and income from coconut farming.■

References *- Edwards, D.T. and Farrington, J. 1993. Review of the Factors Influencing Uptake and Impact of a Sample of 21 UK-Supported Renewable Natural Research Projects. ODI Agricultural Research and Extension Network Paper 43. London: Overseas Development Institute.*

Garforth, C. 1998. Dissemination pathways for RNR research. Socio-Economic Methodologies. Best practice guidelines. Chatham, UK: Natural Resource Institute.

Sajeev, M.V. and Venkatasubramanian, V. 2010. Technology application through Krishi Vigyan Kendras: Conceptual paradigm. International Journal of Extension Education. Vol.6: 45-54

Sen, C.K. and Garforth, C. 1996. An Effective Method of Technology Transfer in the Western Hills of Nepal. Rural Extension and Education Research Report No. 5. Reading, UK: Agricultural Extension and Rural Development Department, The University of Reading.