Technology support for plant protection campaign in coconut

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Background

Coconut, the most important crop cultivated in Kerala state, occupies about 38% of the net area sown and plays a significant role in the agrarian economy of the state. However, owing to various socio-economic and other reasons productivity and income from coconut farming in the state is on the decline and coconut growers face a variety of challenges to make farming a remunerative enterprise. Crop loss due to incidence of pests and diseases is one of the major constraints experienced by coconut growers. Central Plantation Crops Research Institute (ICAR-CPCRI) has developed a number of viable technologies on palm health management amalgamating integrated pest and disease management with nutritional care of the palm. However, due to various reasons the field level adoption of technologies recommended for the integrated pest and disease management of coconut is very low and as such crop loss due to incidence of pests and diseases continues to incur huge economic loss for the coconut growers. One of the reasons attributed for the low level of adoption of integrated pest and disease management technologies is the lack of awareness/knowledge/skill about the recommended scientific practices. Hence, it is imperative that technology transfer initiatives are to be strengthened to empower coconut growers and other stakeholders with the relevant knowledge and skill for the effective management of technologies.

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Crop loss due to pests and diseases in coconut

In Kerala, the annual crop loss due to pest complex was estimated as 618.50 million nuts. Rhinoceros beetle (*Oryctes rhinoceros L.*), red palm weevil (*Rhynchophorus ferrugineus Olivier*), black headed caterpillar (*Opisina arenosella Wlk.*) and nut infesting eriophyid mite (*Aceria guerreronis Keifer*) are the major pests of coconut widely distributed in all coconut growing tracts of Kerala. White grub (*Leucopholis coneophora Burm.*) and coreid bug (*Paradasynus rostratus*) also cause considerable damage to coconut in localized areas. Root (wilt), leaf rot, bud rot and stem bleeding are the major diseases causing various degrees of crop losses throughout the state. The root (wilt), a slow debilitating disease of coconut is prevalent in all southern districts of Kerala in varying severity. The extent of incidence varied from 48.03% (Alappuzha) to 25.97% (Kollam) and

less than 10% (Thrissur and Thiruvananthapuram). Bud rot disease is mostly prevalent in the hilly terrains of northern districts. Stem bleeding disease is also wide spread in northern Kerala.

In a study conducted by ICAR-CPCRI, it was revealed that the incidence of bud rot and stem bleeding disease in Kasaragod district was 2.38% and 2.27% respectively. In Kerala, major pest problems are prevalent in all the districts with varying intensities. It is estimated that 1% of the palms are attacked by red palm weevil every year in pest endemic zones of the state. Studies by ICAR-CPCRI indicated that the incidence of rhinoceros beetle in coconut in Kasaragod district ranged from 3.03% to 21.67% and the district level overall incidence was assessed to be 8.46%. Eriophyid mite damage has been reported initially ranging from 50-70% during 1998, later surveys carried out in Alappuzha district during 2000 has shown an average loss of 30.94% in terms of copra and 41.74% in husk production. A crop decline extending up to 45% nut yield loss was reported from coconut black headed caterpillar-infested palms in succeeding year of severe pest infestation.

Impact of adoption of IPM/IDM practices in coconut–Experiences of CPCRI

The technical feasibility and economic viability of IPM/IDM technologies were successfully demonstrated in farmers' field at different localities under various action research projects implemented by ICAR-CPCRI ensuring active involvement of coconut farmers and other stakeholders. Root (wilt) disease management demonstrations undertaken by ICAR-CPCRI in farmers' plots recorded an average increase in yield of 32%. A front line demonstration programme implemented during 1999 – 2003 in an area of 25 ha of contiguously cultivated gardens comprising of 208 farmers with almost 5000 adult palms at Kayamkulam indicated improvement of average yield of coconut from 24 to 46 nuts per palm per year (91.4%). The B:C ratio improved from 1.03 to 1.77 proving the economic viability of root (wilt) disease management in coconut gardens. Due to the perennial nature of the crop, attitude of the farmers towards farming and other socio-economic constraints, the linear model of Transfer of Technology could not create the desirable impact. Hence, an innovative Participatory Technology Transfer (PTT) approach was implemented in severely root (wilt) affected area of Alappuzha District. Impact analysis under this project indicated significant improvement in awareness (14 to 32.5%), knowledge (19 to 59.5%), attitude (22.5 to 36.5%) and adoption (16 to 45.5%) of various management practices. Due to project interventions, the yield improvement to the tune of 91% was achieved.

Integrated pest and disease management of coconut in five heavily root (wilt) disease affected districts of Kerala viz., Ernakulam, Kottayam, Pathanamthitta, Alappuzha and Kollam had improved the average yield of palms to 36 nuts per palm /year from 15 nuts/palm/year. Large scale field trials laid out in disease endemic areas of Kasaragod district during 2008 to 2010 by ICAR-CPCRI in 10 ha area comprising 1250 palms had shown about 75% reduction in bud rot incidence with the IDM package. CPCRI had further refined bud rot management strategies through biocontrol agents. Placement of Trichoderma coir pith cake (TCPC) was effectively demonstrated in farmers' plots. Application of TCPC to the crown of coconut palms @ two cakes per palm in the leaf axils adjacent to the spindle leaf just before the onset of south-west monsoon and thereafter at bimonthly interval till December was found to be very effective as a prophylactic treatment in the integrated management of bud rot disease without any other treatment. The disease incidence got reduced to 0 and 8.75% in Manjeswar and West Eleri panchayaths from the initial level of 7.3% and 20% respectively.

Community level technology convergence and large-area adoption of IPM technologies conducted in 2150 ha in Kerala (Bharanikavu, Cheppad), Tamil Nadu (Palladam), Andhra Pradesh (Ambajipet) and Karnataka (Bidramamandi) could reduce the pest incidence to 56.8%. Palms at early stage of infestation were completely recovered (80-85%) after curative treatment. Large scale demonstration of bio management of the pest conducted at Krishnapuram village (Alappuzha, Kerala) and Mogral Puthoor (Kasaragod, Kerala) in 2400 ha reduced O. rhinoceros damage on spear leaf and spathe by 95.8% and 62.5%. Area-wide technology adoption facilitated by ICAR-CPCRI covering 1500 ha in Alappuzha district

indicated 76 to 85% reduction in leaf damage by rhinoceros beetle over a period of three years with yield increase by 13.1% nuts per palm per year due to these interventions. Area-wide field validation of the biosuppression technology of coconut black headed caterpillar taken up by ICAR-CPCRI during 1999-2002 in different geographic locations in coastal Karnataka (Ullal and Jeppinamogru) and Coastal Kerala (Purakkad and Ayiramthengu) comprising a total of 1,400 ha could achieve 93-100 % reduction in O. arenosella population in a period of two years with regular monitoring and release of stage specific parasitoids viz., *G. nephantidis,B. brevicornis, E. nephantidis and B. nosatoi*. Farmer Field School (FFS) was found to be an ideal method for technology transfer in coconut health management system and the average knowledge score on pest management of those farmers attending FFS was 51.69 compared to 32.80 in case of non-FFS farmers.

Large scale demonstration of the IPM strategies for the management of rhinoceros beetle has attracted the attention of the farmers due to its feasibility. It has been realized that in the above demonstrations active involvement of the farming community was ensured through participatory mode approach. The participatory technology transfer (PTT) interventions were effective in terms of improvement in awareness and knowledge on symptoms of root (wilt) disease of coconut, knowledge on various items of the disease management components, attitude towards disease management and adoption of practices in terms of symbolic adoption scores. These factors are relevant in the sustainability of technology utilization along with policy implications including market and price levels of inputs and produces. Sustained surveillance, timely pest detection, sound awareness about the pest and perfect execution of curative management reduced the infestation level significantly. Saving approximately 1% of palms from the pest damage all over the state with complete recovery will be a huge economic turnover.

Scaling up of adoption of IPM/IDM technologies

Even though the technical feasibility and economic viability of IPM/IDM technologies were successfully demonstrated in farmers' field at different localities under various action research projects large scale uptake of such initiatives are limited. The farmer participatory approaches for effective implementation of plant protection interventions in coconut farming are being scaled up by some of the agencies including local bodies through project modes. But the integration of efforts of various agencies involved in coconut development to improve and sustain the technological know-how among the coconut farming community has not been satisfactory. Further, the benefit of these efforts including that of the cluster programmes were confined to certain pockets and further spread of the technologies was limited. Sensitizing palm health management through plant protection campaign is the need of the hour in the context of dwindling farm size and manpower shortage. Correct diagnosis and timely adoption of pest management strategies improves health status of palms especially in root (wilt) disease prone districts of Kerala. Many times pest/disease detection is delayed and management deferred leading to death of palms causing tremendous crop loss. Technological interventions have become inevitable to bridge this gap and to address the challenges faced by the crop.

Project on technology support for plant protection campaign

Understanding key biotic constraints such coconut pests and diseases and adoption of management technologies through community approach and farmer-participatory strategies to address the issues need to be the main focus of any technology transfer initiative for crop protection in coconut. With this background, a project is being implemented by CPCRI with the financial support of State Department of Agriculture, Government of Kerala with an objective to strengthen the technology base and to extend the spread of technologies through creating opportunities for experiential learning, satellite model farms, farmer field schools and other participatory programmes by linking various research and extension programmes.

The project is aimed at developing and strengthening competent technology dissemination mechanisms involving various stakeholders engaged in coconut research, extension and farming through farmer participatory approaches for enhancing productivity of coconut in the state.

- Creating and developing district level partnerships and collaborative linkages with various agriculture development agencies of the state for streamlining the technology delivery of coconut pest and disease management
- To empower the extension officials, coconut farmers, farm women and rural youth through capacity

building at various levels to enhance technology utilization and dissemination.

- To promote community learning on Integrated Pest and Disease Management and preparation of bio-agents through farmer field schools / participatory programmes.
- To provide opportunities for the farmers and extension workers for experiential learning on package of IDPM technologies through satellite model farms, with special emphasis on ecof-riendly/ bio-management strategies as well as fostering bio-resource management for crop protection

The project is implemented with the participation and involvement of all agencies involved in coconut research and development, which can act as a single window system for technology delivery at various levels. The satellite model farms will serve as the nucleus for agriculture development in the area by serving as a training centre for farmers, extension workers and students and as a demonstration farm for providing up-to-date information for the farming community around it. The project will also strengthen the capacities of the coconut farmers and motivate them for effective use of land and other resources through technology literacy programmes, experiential learning and linkage mechanisms, contributing to enhanced adoption of technologies. The competency of extension workers to perform the role of technology facilitation on crop based and allied enterprises will be enhanced through the experiential learning process. At the same time, this will enable the scientists to understand the appropriateness and level of performance of the recommended technologies under a given farming situation.

Area of Project:

Area of operation is state wide except Wayanad and Idukki districts. Under each district, one satellite model farm, four FFS / participatory demonstrations and other programmes like capacity development for extension workers, practicing farmers, farm women and rural youth, interface programmes, awareness campaigns, field days and exhibitions will be arranged. These activities will be arranged through the coordinated efforts of different agencies implementing the coconut development programmes in the districts based on requirements.

Mode of implementation:

Participatory observations through target group discussions, meetings and interface programmes will be recorded on the local problems faced by the coconut farmers, their knowledge and adoption levels of technologies, technology transfer strategies, feedbacks related to technologies and programmes as well as other socio-economic constraints. Capacity development programmes for improving the managerial and technological efficiency of extension workers, practicing farmers, farm women and rural youth are proposed. Training programmes required under various development programmes will be given priority. Farmer field schools and satellite model farms for facilitating experiential learning by the farmers and extension workers will be introduced in selected communities / holdings, where innovators and early adopters will be selected for effective implementation. These will serve as model units for showcasing the technologies for replication. Technology campaigns and field days will be organized for creating public awareness. Pre & Post project situation including improvements in productivity, level of incidence of pests and diseases and socio-economic status of the communities will be documented as indicators of impact assessment.

Information, Education and Communication (IEC) activities

- Capacity Development programmes for strengthening technical and managerial capacities
  Extension officials / Project Assistants
  Practicing coconut farmers/ communities
  Farm women groups and rural youth
- Farmer Field Schools (FFS) and participatory demonstrations for learning through observation and experimentation
- Satellite Model Farms Approach (SMFA) for promoting integrated land use at farm level through experiential learning.
- Interface programmes with people's representatives, mass media etc for information sharing
- Public awareness creation through mass media, exhibition and cyber extension
- Technology campaigns/field days
  Comprehensive package of coconut technologies for satellite model farms
  Production technologies for improving the productivity in root (wilt) affected areas
- Nutritional management involving biomass

recycling, basin management – green manures, other organic manures, bio-fertilizers & balanced application of fertilizers

- Irrigation, Moisture conservation and water harvesting techniques
- Appropriate cropping system models involving diversification of crops and enterprises.
- Mixed and inter cropping
- Production of coir pith compost / vermicompost

Protection technologies

Leaf rot management – IDM involving fungicides and bio-agents

- Control of rhinoceros beetle – IPM involving bioagents, leaf axil filling using botanical /biorational molecules
- Control of red palm weevil – IPM involving phytosanitation and chemical treatment
- Management of Coconut eriophyid mite- package involving botanical pesticides and nutritional management
- Management of other diseases & pests
- Production of bio-agents and utilization

Conclusion

Various interventions including training programmes on various aspects of plant protection in coconut to benefit farmers, extension personnel, rural youth and women, front line demonstration of IPM/IDM technologies, selection of coconut holdings and development of satellite model farms etc. have been implemented in different localities of the state under the project on technology support for plant protection campaign in coconut. Implementation of different interventions under the project will strengthen the technology transfer initiatives for crop protection in coconut in Kerala state, which in turn can substantially contribute for the sustainable development of coconut sector in the state. ■