Higher Productivity and Income from Coconut Based Farming Systems - Experiences of Shri. R. Nanda Gopal

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Shri. R. Nanda Gopal from Pavaikalam, Anamalai near Pollachi in Tamil Nadu is a full time farmer who depends on coconut farming as the sole source of income for his livelihood. A BBM graduate, Sri Nanda Gopal took up farming as his full time occupation nearly 25 years ago. He is now 50 years old. Mrs. Sabitha, wife of Nanda Gopal is supporting him and she is actively involved in all the activities of their farm.

There are 650 coconut palms, mostly West Coast Tall variety, in their 11 acre coconut garden. The average age of coconut palms is 30 years. Besides coconut, 550 nutmeg trees and 2400 arecanut palms are cultivated as mixed crops in the coconut garden. The nutmeg trees are 13 years old but all trees are not currently yielding since Nanda Gopal did top working on the seedlings raised trees to rejuvenate them.

Nanda Gopal is quite aware of the fact that arecanut is not a recommended crop for intercropping in coconut garden. But price fluctuation of coconut in the market prompted him to plant arecanut along with coconut in his garden. Presently he is having 2400 areca palms mixed cropped in the coconut garden out of which only 350 are bearing. Age of arecanut trees ranges from two to seven years. Pepper is also intercropped with coconut in his farm though not in large numbers. They also cultivate many vegetable crops and fruits like papaya, though in small extent, in their farm.

Integrated farming

Nanda Gopal opines that farming in his 11 acre plot is economically viable mainly because of the integration of animal husbandry with coconut cultivation. The mixed farming unit in his farm has six cows, of Sahiwal cross, out of which three are

in milking stage at present. Fodder grass, Co5, intercropped in his coconut garden is the main feed. Cow dung obtained, also helps the farmer to meet partially his organic input requirement.

Nutrient Management

Integrated nutrient management has been effectively adopted to maintain soil fertility and plant nutrient supply at an optimum level for sustaining the desired productivity of all crops in the coconut based cropping system in Nanda Gopal's farm.

The farmer achieved it from sources of organic, inorganic and biological components in an integrated manner. Inorganic fertilizers and biological components are applied along with drip irrigation, and fertigation, where as organic manures are applied near to coconut basin.

Poultry manure, 30kg/coconut palm/year, cow dung, 30kg/coconut palm/year and goat manure20kg/coconut palm/year are the organic inputs applied. Coconut basins are opened during the first week of June and the organic fertilizers are applied near to the basin.

Organic recycling, mainly by mulching and vermiculturing using the organic matter available in the farm, also has been effectively practiced by the farmer to meet the organic input requirement. He has constructed a vermicomposting tank, with a dimension of 9m length,1.2m width and 90cm depth, protected with an overhead roofing utilizing the incentives received under the development scheme implemented by Coconut Development Board.

Chemical fertilizers are applied in six split dozes ie, once in 60 days, through fertigation to coconut, nutmeg and arecanut. Chemical fertilizers applied through fertigation include Factomphos, Muriate of Potash, and Urea. Magnesium sulphate is also applied through fertigation. Total quantity of chemical fertilizers applied once in 60 days through fertigation to 650 coconut palms, 550 nutmeg trees and 2400 arecanut palms is 400 kg Factomphos, 400 kg Muriate of Potash and 200 kg urea. Besides the above, micronutrient mixture is also supplied to the crops through fertigation.

Irrigation and water management

Coconut and the component crops viz., nutmeg and arecanut in Nanda Gopal's farm are irrigated through drip irrigation system. An open well and a tube well are the water sources in the farm. The farmer depends mainly on the open well for irrigating his entire farm. The tube well is mostly used for domestic purpose and as a standby arrangement for irrigation. Since the open well is situated adjacent to a stream the farmer does not face water shortage even in summer season.

Water is drawn from the open well using an electrical centrifugal pump of 7.5 HP. It is then filtered first using a pair of sand filters and screen filters, both connected parallel in the main pipe line. Irrigation system is attached with a fertigation unit also to provide fertilizer along with irrigation water.

The 11ha farm is split in to two halves for convenience of irrigation. The main pipe coming from the pump and filters is connected to two sub

mains with a control valve, ball valve, each at the beginning of the sub mains. The PVC sub mains laid underground then take water to the respective fields. 16mm laterals are connected to the sub mains and drawn to the individual plants for irrigation. Two laterals each are drawn for each row of coconut and other crops. The laterals are drawn at the opposite sides of the coconut basin. Drippers with eight litre per hour discharge rate, are connected to the laterals within the basin of each crop for irrigation. Coconut palms are provided with six dripping points, three each on each lateral at the opposite sides of the basin. In a similar fashion nutmeg is provided with four dripping points and bearing arecanut palms are provided with two dripping points. Young arecanut palms are irrigated using a single dripping point. Crops beyond the reach of the lateral are irrigated using a micro tube connected to a dripper fitted to the lateral at the nearest point.

It is by varying the number of dripping points for each crop the farmer is adjusting the water requirement of the particular crop. He provides irrigation for 1 to 1 ½ hours. Thus, coconut palms get 48 to 72 litres and nutmeg trees get 32 to 48 litres and yielding arecanut palms get 16 to 24 litres of water per day. Though the irrigation water is well filtered before using for irrigation, the drippers occasionally gets clogged and the farmer needs to remove it and clean it.

The farmer applies chemical fertilizers also along with irrigation water. A venturi type fertigation unit is provided in the main line at pump outlet for this purpose. However, the farmer was not satisfied with the operation of the venturi system. According to him flow regulation in the venturi system was not easy and by regulating the flow the outlet pressure also would come down thereby reducing the discharge rate of drippers. To overcome the situation the farmer made an innovative method for providing fertilizer along with irrigation water. The farmer is having a series of 200 litre capacity fibre tanks to prepare chemical fertilizer solution for irrigation and rearing different microbial consortia.

A one inch flexible pipe is drawn from the fertilizer tank and is connected to the inlet of the irrigation pump. When the pump is operated it draws fertilizer solution also along with irrigation water. The same system is being used to apply the microbial consortia also along with irrigation water. Irrigation is continued for some more time after each fertigation to flush out any fertilizer remaining in the pipeline. The sand and screen filters are back washed periodically to provide clean irrigation water thereby minimizing clogging of drippers.

The pump used by the farmer is a centrifugal pump. In order to enhance the efficiency of the centrifugal pump, the pump is always kept near to the water table in the open well. A rope and pulley arrangement is made by which the pump is raised or lowered according to the prevailing water table

Basins of all coconut palms are covered with thick mulch using coconut leaves and other farm waste to ensure high irrigation water use efficiency.

Plant protection

White fly infestation is the main concern of the farmer for the last two years. Coconut yield reduction in the current year is mainly because of white fly infestation, according to the farmer. However, he has not taken up any remedial measures so far. Besides, few coconut palms in the garden shows root (wilt) disease symptoms.

The symptoms started seven years back and is spreading slowly, according to him. 'COCOCON', a microbial consortium developed by Tamil Nadu Agricultural University is applied, through the fertigation unit twice a month against root (wilt)

disease symptoms. Health of few trees have started improving after the application of the microbial consortium, the farmer stated. According to the farmer it also improves the soil fertility and thereby improving the plant health. Nanda Gopal also regularly applies Trichoderma to coconut palms as part of plant protection measures.

Harvesting and yield

Coconut is harvested once in 60 days. On an average Nanda Gopal used to get 150 nuts/coconut tree per year. However, the yield has reduced to 125 nuts/tree recently. According to the farmer, the yield reduction is mainly due to white fly infestation. According to him, the cost of production of one coconut is Rs.12/nut. Though the farmer is having 550 nutmeg plants, all the trees have not started bearing with full potential since the nutmeg trees were top worked for rejuvenation 3-4 years back. He gets 560kg nuts and 170kg mace from his nutmeg trees. Majority of arecanut palms are still in juvenile stage and not started yielding. From the small quantity of arecanut he gets approximately Rs 200per kg unhusked nuts.

Sri Nanda Gopal opined that the major constraint in coconut farming is the low market price for coconuts. According to him, he is able to overcome the difficulties due to the price crash/price fluctuation of coconut because he is adopting coconut based multiple cropping and integrated farming system in his farm. He is very much involved in the activities of 'KalpakaVriksham Coconut Producers Company', Anamalai.He maintains close contact with the local extension personnel of the Department of Agriculture and also co-operates with the scientists of TNAU in implementing the field trials on use of microbial consortium for the management of root (wilt) disease of coconut.According to Sri Nanda Gopal, co-ordinated efforts involving research institutions like ICAR-CPCRI, TNAU,development agencies like CDB, State Department of Agriculture and FPOs in coconut sector are needed to effectively manage problems experienced by coconut growers including the recent incidence of root (wilt) disease and white fly infestation in coconut gardens. ■

Cafeteria of intercrops in Coconut gardens

Women farmers' community based success story

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Coconut gardens are ecological units of integrated systems providing environmental and livelihood opportunities. Most of the coconut gardens in general are small and marginal holdings, following homestead patterns customized to the farm family, food preferences, major income sources and resource base of the farmer. Research and extension interventions warrant refinement and adaptations for effective delivery of results in achieving desired impact.

ICAR CPCRI Farmer FIRST Program (FFP) started in 2016 is being implemented at Pathiyoor panchayat, Alappuzha district, Kerala state. The major objectives were interventions for participatory technology integration to empower and ensure livelihood security of farmers/farm women. The major problems identified in the location were:

- Poor or average management of coconut and other crops in homesteads
- Non awareness and non adoption of HYV of inter crops in coconut homesteads
- Lack of access to advisory services and extension support
- Absence of processing and value addition of farm produces
- Poor extension advisory support and field services
- Very low level of knowledge and skills on technologies
- Absence of farmer organizations or groups active in the panchayat

ICAR CPCRI Farmer FIRST Program (FFP)

Farmer FIRST Program is a national flagship program of Indian Council of Agricultural Research (ICAR) in various states. Farmer FIRST (farm/farmer, Innovation, Resources, Science and Technology) program deals with participatory research and extension interventions in six modules. Technologies are generally recommended for crop based adoption by the farmers. But in the process of adoption umpteen factors are directly and indirectly related

along with extraneous variables as indicated in several reports and studies. This warrants for appropriate refinements and adaptations of the technology *per se* with research based support and process documentation models from social science researchers and field functionaries. These will be influenced by the farmers' choices of crops, resources and inputs, attitudes, social compulsions and consequences, field experiences, situational attributes and cultural factors. The scope for integration of innovations with recommended technologies improves the ownership and acceptance among farming community. The modules are Crop, Horticulture, Livestock, Natural Resource Management (NRM), Entrepreneurship development and Value addition and Integrated Farming Systems (IFS). The modules can be selected as per the location specific objectives. The FFP is fully funded by ICAR and ICAR CPCRI initiated interventions in Pathiyoor panchayat since 2016 onwards and is continuing.

Coconut homesteads and cropping system- Overview before FFP interventions

The Farmer FIRST Program (FFP) pre project survey in Pathiyoor grama panchayat, indicated that majority of the land holdings were 25-100 cents (0.1 –0.4 ha category). The study involved 740 sample farmers. Farmers having landholding size of 10 cents and below were 16.1% , 11 – 25 cents (29 %), 26 – 50 cents (24.8%), 51- 100 cent (20.6%), above 1 acre (8.7 %). This scenario indicated the appropriateness of group or cluster farming in overcoming the probable low level market surplus in production. The results also showed that rain fed cultivation rules the farming situation with very low adoption of irrigation methods. Location specific farm planning and situation specific, decentralized policy making may have to look into and evolve strategies for community and area based water conservation and irrigation methodologies. One of the notable points of homestead gardens was the adoption of small vegetable gardens. It is encouraging to note that 71 percentage of the sample farmers adopted vegetable gardens for their own home consumption, which guaranteed fresh and organic vegetables to the family. Almost 11 per cent of the farmers were reported to produce, marketable surplus besides home consumption. Only 18 per cent of farmers are not adopting homestead vegetable gardens, as per the sample survey. The data showed the need for extension advisory services to adopt scientific interventions for better output from unit area. The inter cropping in coconut gardens are constrained with climate change problems of untimely and heavy rains, flooding and long spells of summer season. The major pest and disease problems were rhizome rot of ginger, fungal diseases in turmeric and colocasia, severe nematode problems in amorphophallus, stem borer in ginger and turmeric, aphids in pulses, rat and crab attacks in vegetables of low lying areas, white rust and leaf spot in amaranthus, fruit fly in cucurbitaceous vegetables etc. Other general problems were labour shortage and high cost of laborers, lack of social mechanisms for equitable distribution and information on government projects and support system, reduced soil-fertility, low profitability in farming and acute water scarcity during summer seasons. The major intercrops in Pathiyoor panchayat were tubers, vegetables, turmeric/ginger, and banana in very small plots for home consumption mainly.

Field visits and survey in Bharanikkavu grama panchayat, Alappuzha district also indicated similar status regarding intercrops in coconut gardens. The major inter crops were tubers, spices, banana and vegetables in small scale mostly for home purpose with modest market surplus in some gardens. The selection criteria for inter crops were mainly family preferences, food consumption behaviour of family members and interest in involvement and economic conditions. Approximately one fourth of the farmers only adopt inter cropping in their coconut gardens. This requires serious interventions, since diet diversity, ecological factors and food production are major concerns. Coconut based homesteads are classic models in achieving goals of eliminating hunger and hidden hunger, as well. Generally the coconut based homesteads of root (wilt) disease affected areas are varied widely in terms of age of palms, resource base, management adoption and requirements.

Extension strategies in FFP for improving inter crops in coconut gardens

Extension support needs social process documentation and evolving workable models through action research for crossing the chasm in technology adoption and improving the use and impact of research in farmers' fields. The participatory strategies evolved through field level action research involving peoples' representatives, progressive and small/marginal farmers, women farmers groups and other stakeholders. The points of successful action in the FFP were as follows:

1. Convergence with MGNREGS in the panchayat as an innovation in technology dissemination and area wide adoption.

MGNREGS can be effectively integrated with local resource based agricultural plan and implementation as demonstrated successfully in the Farmer FIRST Program since 2016 onwards. The land consolidation process was necessitated as a responsible extension intervention for promoting women MGNREGS participants, of whom 88.44 percent had less than 0.08 hectares of land. Through the land consolidation approach, 354 acres of fallow land were brought under cultivation each year, during 2017-20 under various crops. The fallow land as inter-spaces in coconut gardens were consolidated contiguously in discussion and consent of coconut farmers and convergence farming plans were submitted to Rural Development Department through Grama panchayat MGNREGS section. The planting/ seed materials of HYV procured linking with various Agricultural Universities and provided by ICAR CPCRI FFP free of cost initially. The varieties were screened for suitability in the area and acceptance among farmers through participatory evaluation process.

4. Area spread of HYV through convergence interventions

The area spread and adoption of HYV of intercrops were achieved through the joint identification of contiguous area of minimum one acre for each crop in ward basis. The joint effort of peoples representatives, women SHG farmers, other farmers and stakeholders was through discussion with land owners, obtained their mutual consent and identified contiguous areas for crops and technologies like High Yielding Varieties (HYV) of inter crops. The cultural management of the perennial base crop, coconut in the consolidated lands, was also included under the interventions by women labourers voluntarily. A crop calendar was prepared after personal field visits by a team of experts from ICAR-CPCRI, Regional Station, Kayamkulam, in consultation with farmers. Hence an action plan for the area to be cultivated, HYV varieties to be introduced from institutes/ Universities, human and other resources needed for technology adoption, and interventions for rapid area spread, were documented for MGNREGS and FFP convergence. The action plans were vetted with the concerned administrative units.

The farming community demanded that participatory micro planning of agricultural schemes or interventions be developed based on the diverse local problems or situations. We have learned that the 19 wards of Pathiyoor panchayat had different problems – land-based issues (flood prone, soil nutrient status, and fragmented land holding size), and other concerns such as crop suitability, integration choices under the integrated farming system (IFS), very low income from farming, lack of a value chain, socio economic variables – and low involvement/ leadership of local people's representatives. Agricultural extension interventions in FFP, can lead

to holistic and broader empowerment of the lower most farmers or labourers through participatory micro planning of activities in the panchayat. This called for sequential extension interventions based on emerging needs, facilitating specific problems, equitable and transparent transactions/critical input provision, addressing failures and sustaining successful models, in a proactive and farmer-driven mode.

5. Breaking barriers of potential yield attainment in niche crops

The farmers were not aware of or aspiring for obtaining potential yield of intercrops or any crop they cultivate. The farm planning must include the potential yield to be realized as per the soil type and fertility status, knowledge and adoption potential of individual and group of farmers, resilient approaches, extension advisory services, competence and field orientation of extension field functionaries and the decentralized vision of grama panchayats in food production and conservation and management of natural/human resources efficiently sustainable. The potential yield of varieties of crops in coconut based inter-cropping system varies with locations and deviates from research results as observed in FFP cases. Hence demonstrations among small and marginal coconut farmers needs to be farmers participatory in a contiguous area, mutually observed and evaluated by experts and farmers. The breaking barriers in achieving potential yield can thus be demonstrated and learning occurs across farmers. This approach critically enables them in adopting technology combinations to economically integrate and profitably sustain.

6. Procurement mechanisms for surplus production

The production of intercrops improved due to group cultivation and adoption of HYV under scientific management. The readily edible produces could get neighbourhood markets, since the sources of production are known and consumers prefer farm fresh. Procurement plans and processing mechanisms were in need for turmeric, coconut and sesamum in the first phase. This intervention was enabled through Odanadu Farmer Producer Company (OFPC) with ICAR CPCRI as the Producer Organization promoting Institution (POPI) with NABARD support.

▶ *Problems prioritized for women SHG for adopting inter cropping*

1. Access to land for farming is very low or nil

for landless /women

2. Technology based agricultural activities in MGNREGS was absent

3. Access to knowledge on farming and farming skills were only traditional based.

4. Linkage or communication with scientists / researchers was absent

5. Income enhancement through technology adoption, skill / knowledge empowerment in agriculture got feasible potential

Social approaches in FFP

1. Land consolidation for farming by the women SHGs in MGNREGS for crop / horticulture/ NRM modules of FFP interventions. The fallow inter spaces in coconut gardens of farmers of respective wards were shared free of cost on a mutual social agreement facilitated by ward members (people's representatives) and women SHG leaders.

2. Training programmes, linkage with MGNREGS units of the panchayat, regular and frequent visits, whatsapp group for problem solving, method demonstration of each farming unit, support with HYV crop varieties / critical inputs.

3. Women SHGs were made partners in participatory evaluation/ experimentation of various modules.

The impact of the convergence process is not only reflected in the area spread of HYV but also in income enhancement and creation of technical assets.

- A total of 354 acres of farm land were consolidated for FFP intervention in convergence with MGNREGS across 19 wards of Pathiyoor panchayat. The panchayat was declared as 'fallow free' by the Haritha Keralam initiative of Kerala State indicating success of the interventions.
- Technical impact of women MGNREGS beneficiaries from FFP convergence were mainly in the form of access and participation in agricultural training programmes.
- In spite of the efforts, all the women participants could not attend the training sessions. This gap was filled by key farmer experts and mutual exchange of information within and among the women groups. It was observed that overall 64.33 percent of participants gained practical knowledge and skill in farming. Almost 70 per cent of the women farmers could attend training programs in off campus mode in their fields. The maximum number of training programs they could attend was 21 by 1.38 percent and 44.44 per cent attended more than 5 trainings in a year.
- Technologies identified for imparting training are on: cultivation of high yielding varieties (various crops), appropriate spacing, bed preparation, application of chemical fertilizers, cultural operations, plant protection measures, harvesting and post-harvest, and value addition, use of ICT, climate resilient practices, skills in small machinery use and marketing;
- The training programs were scheduled as on-farm sessions, at the respective work sites, apart from off-farm sessions for group leaders for developing them as key farmer experts. This change in training mode enabled modifying the curriculum as per emerging needs at the field level.
- Almost 97 percent of the beneficiary women farmers adopted more than three technologies, viz., high yielding varieties, spacing, chemical fertilizers and organic inputs for plant protection.
- The productivity or yield improvement as perceived by women farmers indicated that, even though 5.56 percent perceived lower yield, majority (94.44%) could get 30-50 percent more yield due to adoption of good agricultural practices and high yielding varieties after the interventions.
- Indirect impact was on improved diet diversity among the families of the beneficiaries as a result of growing diverse crops, including millets and vegetables, and sharing of excess production equally by all the group members. This also improved the willingness and involvement of family members in farming activities of the groups.
- The most visible impact was the value addition units for coconut, turmeric and finger millet in the panchayat so as to utilize surplus production. Five rural youths established small enterprises for processing and marketing of turmeric powder, sesamum oil and coconut oil under the 'Pathiyoor Farmers' brand.

Ensuring additional investment in agricultural interventions

ICAR-CPCRI FFP faced constraints in getting adequate quantity of HYV to be introduced. The suitability of the varieties or crops in the location was also a question begging answers. Participatory evaluation of HYV/crops introduced were planned and executed with participation of 25 percent of selected women MGNREGS groups. The supervision and monitoring of this important step was entrusted

to a sub-committee of women group leaders, people's representative of the location, scientist and retired technical persons from Department of Agriculture, Rural Development, and farm clubs of the locality. The first batch of planting materials/seeds of released HYV were procured directly from the relevant research institutes and provided free of cost to 25 percent of groups as a starter quantity. Sharing of additional investment was agreed upon among group members and between groups besides sharing of quality planting materials. Chemical fertilizers and plant protection chemicals were provided from FFP on a 60:40 ratio, 60 per cent by FFP and 40 percent shared by women's groups. Organic manure (FYM) was collected locally from farm families. Burning of cleared weeds and organic residues were positively converted to recycling, mulching materials and composted, through method demonstrations and trainings, thus reducing the costs of organic inputs

Lessons learned

The Responsible Extension Approach (REA) evolved for quality planting material production facilitation by scientists can achieve area spread of new varieties in the following steps.

- Forming social responsible groups comprising agricultural experts, local people representatives, women SHGs for cultivating, progressive farmers and representatives of general public is necessary for REA interventions.
- Cultivation in identified contiguous area through land consolidation and convergence with MGNREGS can expand the farming area with effective labour
- Technical facilitation by concerned ICAR Institute and FFP team, supervising is mandatory and regular field visits, training programmes before and during the activities.
- The groups initially formed for the further production of planting material also have to agree with the memorandum of understanding (MoU) and the varieties could be spread to all the 19 wards of the panchayat in a responsible and rapid way.
- The responsible extension strategy enabled knowledge and skill on the varieties and the planting materials among women farmers and coconut farmers is inevitable. This can effectively surpass the usual technology demonstration and OFT through social consensus and conviction.
- The percentage increase in yield of the crops compared to the check varieties can be easily achieved when the coordinated works in the field level is systematic and timely. ■

Activities of the three tier FPOs in coconut sector commendable:

Dr.Abhilaksh Likhi IAS Additional Secretary, Agriculture, Government of India

In order to review and to have firsthand knowledge on the activities of the Farmer Producer Organizations (FPOs)in coconut sector, Dr.Abhilaksh Likhi IAS, Additional Secretary, Agriculture, Government of India visited Theeradesa Nalikera Utpadaka Federation, Ezhupunna in Alapuzha District, Kerala and interacted with farmers at the farmers filed. He also interacted with the Friends of Coconut Tree (FoCT) trainees who were trained with the support of Coconut Development Board for ensuring timely harvesting and plant protection operations of the coconut trees. Dr.Abhilaksh Likhi appreciated the functioning of the three tier Farmer Producer Organizations in coconut sector which are innovative good models that can be replicated in other sectors too. Dr.Likhi was appraised that the Federation has organized training programmes for various coconut farmer groups on intercrop cultivation of turmeric and ginger.

Dr. Likhi interacted with the coconut farmers regarding the implementation of schemes and programmes of various central government agencies under the Ministry of Agriculture and Farmers Welfare. The office bearers of the Federation informed that they are planning to scale up the Federation into a Company and requested for the support of the Board and Government of India to form a Producer Company. Dr. LIkhi assured the necessary cooperation to form a Company and to include the same under the new FPO concept of the Government of India.

Theeradesa Nalikera Utpadaka Federation is a consortium of eight Coconut Producer Societies

which is taking up various activities as envisaged in the three tier system. The various schemes of the Coconut Development Board are implemented through the Federation which is having 761 member farmers. 41722 palms under the purview of the Federation. The Federation is taking up activities like the establishment of coconut nursery and the production of quality planting material. The Friends of Coconut Tree (FOCT) training programme of CDB is also being organized by the Federation.

Dr. Likhi later had a review meeting of Centrally Sponsored Schemes of the Ministry of Agriculture & Farmers Welfare at Coconut Development Board, Kochi, Kerala. The officials from Coconut Development Board, Directorate of Cocoa and Cashew Development (DCCD), Directorate of Marketing& Inspection (DMI) Mission Director,

Mission for Integrated Development of Horticulture (MIDH) Kerala, Director, Rashtriya Krishi Vikas Yojana (RKVY), Director (Seeds), ADC, Mechanization and Technology (M&T) and Directorate of Plant Protection, Quarantine & Storage (DPPQS) participated in the meeting.

Agri Vision

Agri Vision 2022, an international conference on Agriculture for Sustainable Future was organized at Ravenshaw University, Cuttack from 6th to 8th March 2022 in collaboration with Evation business solution and other agricultural Institution. Coconut Development Board, State Centre, Pittappilli, Odisha participated in the programme.

Agri Vision-2022 was inaugurated by Dr. Trilochan Mohapatra, Secretary & Director General, ICAR, New Delhi on 6th March 2022 in the presence of other dignitaries Dr. J.K Jena, DDG (Fisheries Science), Dr. P.K. Agrawal, Vice- Chancellor, OUAT, Bhubaneswar and Dr. Sanjay K Nayak, Vice-Chancellor, Ravenshaw University.

Agri Vision-2022 showcased different coconut based value added products. Around 600 visitors including students and farmers visited the stall of Coconut Development Board.

Board's officials interacted and briefed on coconut cultivation technology, value added products and different ongoing schemes of the Board. In addition, various value added coconut products, leaflets, booklets and publication were displayed in the Board's stall.

Farmers and visitors raised queries mostly on the varieties of coconut. Also queries were raised on the varieties of palms suitable for tender nuts and mature nuts which is suitable in Odisha condition.

Panel discussion was held with all the coconut stakeholders and farmers wherein farmers raised various questions on coconut cultivation. Dr. Rajat Kumar Pal, Deputy Director, CDB replied to the queries.

Krishi Vigyan Mela

Coconut Development Board, MDIC, Delhi participated in Krishi Vigyan Mela from 9th to 11th March 2022 held at IARI, mela ground , New Delhi. Various value added products, handicraft items and leaflet on schemes of the Board were displayed in CDB stall.

Handicraft Training programme

Coconut Development Board, Regional Office, Patna, Bihar conducted six days handicraft training programme at Coconut Development Board, Regional Office, Patna Campus from 24th February to 1st March 2022. Shri Manishankar was the master trainer of the programme and 15 trainees attended the programme.

Farmers' training programme on intercropping of cinnamon in coconut garden

A training programme for farmers on Intercropping of cinnamon in coconut garden was organized at Pathiri in Mullankolli grama panchayat, Wayanad, Kerala on 4th March 2022. The programme was conducted by ICAR-Central Plantation Crops Research Institute (CPCRI) Kasaragod in collaboration with Regional Agricultural Research Station (RARS) Ambalavayal, Wayanad as part of the project Cinnamon intercropping in coconut gardens funded by Directorate of Arecanut and Spices Development (DASD), Kozhikode. The training program was inaugurated by Dr. K Ajith Kumar, Associate Director of Research, RARS, Ambalavayal. In his inaugural address Dr Ajithkumar highlighted the importance of promoting spices as intercrop in coconut garden to enhance income and employment opportunities. He also stressed the need to make available quality planting material of cinnamon for successfully raising it as intercrop. As part of agro-techniques, farmers should give adequate attention for adopting soil and water conservation measures in coconut gardens for sustainable production of coconut and intercrops, Dr Ajithkumar added. Mr. Vijayakumar, Secretary, Farmers Group, Pathiri presided over the inaugural session. Dr. C Thamban, Principal Scientist, CPCRI, Kasaragod and Mr. P Bhasi, President, Farmers group, Pathiri offered felicitations. Dr. Sreeram V, Asst. Professor, RARS Ambalavayal welcomed the gathering and Dr. Najeeb Naduthodi, Asst. Professor,

RARS, Ambalavayal proposed vote of thanks in the inaugural session of the training programme. In the technical section, Dr. P. Subramanian, Principal scientist, handled the session on agro-techniques for cinnamon intercropping in coconut garden. A demonstration session on cinnamon peeling was also conducted as part of the programme.

Friends of Coconut Tree Training programme

As part of creating more employment opportunities and equipping the sector with more trained workforce in harvesting and plant protection operations, Coconut Development Board conducted 12 Friends of Coconut Tree (FoCT) training programmes across the country during March 2022. 240 persons were given training through the programmes organised by the various offices of the Board through various organisations. Two batches each of the programme was conducted in Kerala, Tamil Nadu, Karnataka, Maharashtra, Odisha and Assam.

CDB organized Farmers Field Day Training Programmes

DSP Farm, Hichachera, Tripura organized Farmers Field Day Training Programme for SC/ST farmers from Kalachara to acquaint them on scientific coconut cultivation, processing and value addition at DSP Farm, Tripura. Another programme was organized for SC/ST farmers from South Jolaibari on 3rd March 2022 and Sakbari on 4th March 2022. Each participant farmer received two coconut seedlings as part of promotion of coconut in North East.

Coconut Development Board , Regional Office, Guwahati, Assam in association with Udjal Coconut Producers Society, Nalbari District ,Assam conducted a Farmer's Field day programme at Ghorathal, Nalbari District, on 4th March 2022. Thirty farmers belonging to SC category attended the programme. Shri Simanta Das, Farm Manager (Horticulture),KVK, Nalbari, Shri Mirzapur Rahman Agriculture Extension Assistant (AEA), Mukalmua, Nalbari and Shri Rajak Ali, Agricultural extension Assistant(AEA), Ghorathal, Nalbari were the Resource Persons in the programme.

Cultivation practices for coconut - April

Collection and storage of seed nuts

Continue seed nut collection from the identified mother palms. Seed nuts should be carefully harvested and properly stored to prevent drying of nut water. Wherever the ground surface is hard, harvested bunch should be lowered to the ground using a rope.

Nursery management

Continue irrigation for the seedlings in the nursery. Weeding has to be done wherever necessary. If termite infestation is noted in the nursery drenching with chlorpyriphos (2ml chlorpyriphos in one litre of water) should be done. Spiralling white fly infestation is observed in coconut nurseries in many localities. Spraying of water on the lower surface of leaves of seedlings can be done against spiralling white fly attack.

Fertilizer application

In irrigated coconut gardens, apply one fourth of the recommended dose of chemical fertilizers to the coconut palms, if not applied during March.

Irrigation

Irrigation has to be continued in coconut gardens. If basin irrigation method is adopted, provide irrigation once in four days @ 200 litres per palm. Drip irrigation is the ideal method of irrigation for coconut, especially under water scarce situation. The number of dripping points should be six for sandy soils and four for other soil types.

Moisture conservation

Hot dry weather continues in most of the coconut growing tracts and scarcity of water for irrigation is going to be a major problem in coconut farming. Hence, coconut growers need to judiciously use water for irrigation. Drip irrigation has to be adopted to save water. Thick mulch need to be provided in the palm basin within two metre radius. In water scarce

areas, wherever feasible, life saving/protective irrigation has to be provided to coconut palms. Mulched materials are to be removed in the basin before giving such life saving/protective irrigation and immediately after providing irrigation the basin should be covered again with the mulching materials.

Shading

Shade has to be provided for the newly planted seedlings, if not already provided.

Management of pests and diseases

As the dry hot summer continued in this month, the pest population is all on the rise especially the weather sensitive pests such as black headed caterpillar, rugose spiralling whitefly and nesting whiteflies. Moisture deficit, diminishing relative humidity and rise in temperature favours the outbreak of these aforesaid pests. Coconut palm needs continuous moisture and nutrition for sustaining production and withstanding pressure from pest outbreak. Once the month accelerates population build up of pest coupled with moisture deficit situation would lead to palm ill health thereby reducing yield. Sustenance of palm itself would become very difficult under reduced humidity and rise in temperature. Nut setting gets reduced and palm health would divert for mere survival mechanism than for enhancing yield. Henceforth, the strategies outlined under soil and water management would turn more crucial in the general upkeep of palm health. Palm health management is therefore very crucial for the bio-suppression of black headed caterpillar and rugose spiralling whitefly.

Black headed caterpillar, *Opisina arenosella*

The coconut black headed caterpillar, *Opisina arenosella*, is a major pest prevalent in almost all coconut growing tracts across the country especially along the water bodies during winter. The infested portions get dried and form conspicuous grey patches on the upper surface of the lower fronds. Severe pest damage results in complete drying of middle to inner whorl of fronds leaving a burnt appearance. Presence of black headed caterpillars, webbing of leaflets and occurrence of dried faecal matter on the leaflets are the characteristic features of pest incidence. In the absence of natural enemies in the new area of emergence, the outbreak becomes faster and expands at high speed. Damage results in tremendous reduction in photosynthetic area, decline in rate of production of spikes, increased premature nut fall and retarded growth. Extensive feeding of caterpillars causes a crop loss of 45.4%

Pest infested field

Black headed caterpillar

Goniozus nephantidis

in terms of nut yield in addition to rendering the fronds unsuitable for thatching and other purposes. Farmers need not panic and this approach is one of the classical examples of successful augmentative biological control suppressed by natural enemies.

▶ Management

- Regular monitoring of palm fronds for pest occurrence in endemic zones.
- Removal and destruction of 2-3 older and dried leaves harbouring various stages of the pest. The leaflets could be burnt to reduce the caterpillar/ pupal population.
- Domestic quarantine should be strengthened by not transporting coconut fronds from pest-infested zone to pest free zone.
- Augmentative release of the larval parasitoids viz., *Goniozus nephantidis* (20 parasitoids per palm) and Bracon brevicornis(30 parasitoids per palm) if the pest stages is at third-instar larvae and above. The pre-pupal parasitoid (*Elasmus nephantidis*) and pupal parasitoid (*Brachymeria nosatoi*) are equally effective in pest suppression and are released at the rates of 49% and 32%, respectively for every 100 pre-pupae and pupae estimated.
- Before releasing, the parasitoids are adequately fed with honey and exposed to host odours (gallery volatiles) for enhancing host searching ability.
- Ensure adequate irrigation and recommended application of nutrients for improvement of palm health.

Rugose Spiralling Whitefly *(Aleurodicus rugioperculatus)*

This period could also witness the establishment of the invasive rugose spiralling whitefly (*Aleurodicus rugioperculatus*) in new areas as well as re-emergence in already reported areas. Presence of whitefly colonies on the lower surface of palm leaflets and appearance of black coloured sooty mould deposits on the upper surface of palm leaflets are characteristic visual symptoms of pest attack. In severe cases, advancement in senescence and drying of old leaflets was observed. Leaflets, petioles and nuts were also attacked by the whitefly pest and a wide array of host plants including banana, bird of paradise, Heliconia sp. were also reported.

▶ Management

- In juvenile palms, spraying of water with jet speed could dislodge the whitefly and reduce the feeding as well as breeding potential of the pest.

Rugose spiralling whitefly Parasitized pupae

Encarsia guadeloupae

Sooty mould scavenger beetle

- Ensure good nutrition and adequate watering to improve the health of juvenile and adult palms
- No insecticide should be used as this causes resurgence of the pest and complete kill of the natural aphelinid parasitoid, *Encarsia guadeloupae.* A pesticide holiday approach is advocated for the build up of the parasitoid.
- Installation of yellow sticky traps and conservatory biological control using *E. guadeloupae* could reduce the pest incidence by 70% and enhance parasitism by 80%.
- Habitat preservation of the sooty mould scavenger beetle, *Leiochrinus nilgirianus* could eat away all the sooty moulds deposited on palm leaflets and cleanse them reviving the photosynthetic efficiency of palms.
- A close scrutiny should be made for the presence of other whiteflies including the nesting whiteflies on coconut system.

Nesting whiteflies (Paraleyrodes bondari and Paraleyrodes minei)

In addition to the rugose spiralling whitefly, two more nesting whiteflies (*Paraleyrodes bondari and Paraleyrodes minei*) are found associated with palm leaflets. Nesting whiteflies are smaller in size (1.1 mm) than rugose spiralling whitefly (2.5 mm). The nymphs are flatter with fibreglass like strands emerging form dorsum whereas the nymphs of rugose spiralling whitefly are convex in shape. Adult

P. bondari

P minei

Cybocephalus sp.

nesting whiteflies construct bird's nest like brooding chamber and sustains in the chamber. *P. bondari* had X-shaped oblique black marking on wings with two minute projections on rod shaped male genitalia whereas *P.minei* is devoid of black markings on wings and possesses cock-head like genitalia.

▶ *Management*

- In juvenile palms, spraying of water with jet speed could dislodge the whitefly and reduce the feeding as well as breeding potential of the pest.
- Ensure good nutrition and adequate watering to improve the health of juvenile and adult palms
- Effective nitidulid predators belonging to *Cybocephalus sp.* were observed on the palm system and pesticide holiday is advised for conservation biological control.

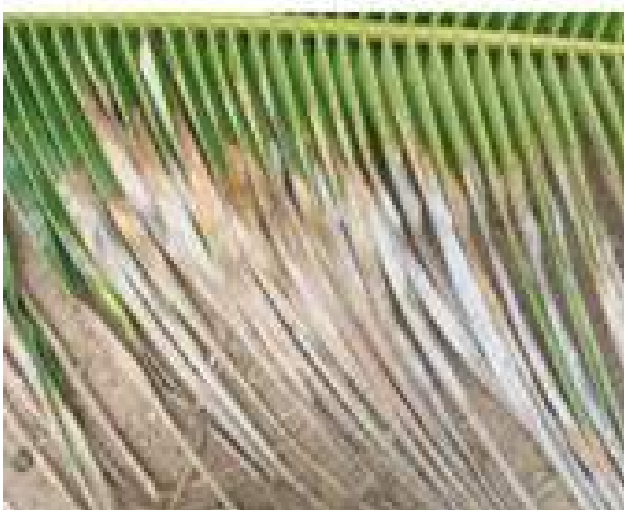
Disease

Leaf blight of coconut *(Lasiodiplodia theobromae)*

Leaf blight is an emerging disease in Coimbatore, Erode, Dindigul, Tirunelveli and Kanyakumari districts of Tamil Nadu. The pathogen causes damage in leaf and nuts. Affected leaflets start drying from the tip downwards and exhibit a charred or burnt appearance. The leaves in lower 3 to 4 whorls are affected. Leaf blight causes apical necrosis of lower leaves with an inverted "V" shape, and symptoms similar to those induced by drought (water deficit) and other stresses. The leaflets have extensive necrotic lesions with defined edges and without transition areas between the necrotic and healthy tissues. The pathogen can internally colonize the rachis, inducing internal necrosis that moves upward towards the stem (systemic invasion). The necrotic tissues develop exposed cracks that release gums under the leaf rachis and at petiole insertion. On coconuts, small black sunken region appear near the perianth of immature nuts.When nearly mature /mature nuts were infected, the infection spread internally into mesocarp without any external symptoms. The affected nuts are desiccated, shrunk, deformed and drop prematurely causing 10% to 25 % loss in nut yield.

▶ *Management*

- Improving the palm health by application of 5 kg neem cake enriched with Trichoderma harzianum and soil test based nutrition.
- Adequate irrigation and adoption of soil and water conservation measures is advised.
- Root feeding of hexaconazole @ 2% (100 ml solution per palm) thrice a year.



The dynamics of insect pests and diseases in coconut system vis-à-vis weather change pattern is so critical in population build up. Timely prophylactic measures to safeguard palms and enhancing palm health through need-based nutrition is very essential to withstand the pressure exerted by pests and diseases in outbreak situation. ■

(Prepared by: Thamban, C. and Subramanian, P., ICAR-CPCRI Kasaragod and Joseph Rajkumar ICAR-CPCRI Regional Station, Kayamkulam)

Market Review – February 2022

Domestic Price

Coconut Oil

During the month of February 2022 the price of coconut oil opened at Rs. 15700 per quintal at Kochi, Alappuzha and Kozhikode market. The price closed with a net loss of Rs. 300 per quintal at Kochi and Alappuzha market and a net gain of Rs.100 per quintal at Kozhikode market.

The price of coconut oil closed at Rs. 15400 per quintal at Kochi and Alappuzha market and Rs. 15800 per quintal at Kozhikode market.

During the month, the price of coconut oil at Kangayam market opened at Rs. 13200 per quintal and closed at Rs. 13533 per quintal with a net gain of Rs. 333 per quintal.

Weekly price of coconut oil at major markets Rs/Quintal)				
	Kochi	Alappuzha	Kozhikode	Kangayam
01.02.2022	15700	15700	15700	13200
05.02.2022	15700	15700	15700	12867
12.02.2022	15700	15700	15800	12800
19.02.2022	15600	15700	15800	12933
26.02.2022	15400	15400	15800	13067
28.02.2022	15400	15400	15800	13533

Milling copra

During the month, the price of milling copra opened at Rs.9300 per quintal at Kochi and Rs.9250 per quintal at Alappuzha market and Rs. 9600 per quintal at Kozhikode market.

The prices of milling copra closed at Rs. 9200 per quintal at Kochi market, Rs. 9100 per quintal at Alappuzha market and Rs. 9350 per quintal at Kozhikode market with a net loss of Rs.100 at Kochi, Rs. 150 per quintal at Alappuzha market and Rs. 250 per quintal at Kozhikode market.

During the month the price of milling copra at Kangayam market opened at Rs.9000 and closed at Rs.8900 per quintal with a net loss of Rs.100 per quintal.

Weekly price of Milling Copra at major markets (Rs/Quintal)				
	Kochi	Alappuzha (Rasi Copra)	Kozhikode	Kangayam
01.02.2022	9300	9250	9600	9000
05.02.2022	9300	9250	9500	8800
12.02.2022	9300	9250	9500	8600
19.02.2022	9200	9250	9400	8700
26.02.2022	9200	9100	9350	8600
28.02.2022	9200	9100	9350	8900

Edible copra

During the month the price of Rajpur copra at Kozhikode market opened at Rs. 16700 per quintal and closed at Rs. 16800 per quintal with a net gain of Rs. 100 per quintal.

Weekly price of edible copra at Kozhikode market (Rs/Quintal)	
01.02.2022	16700
05.02.2022	16800
12.02.2022	17100
19.02.2022	16650
26.02.2022	16700
28.02.2022	16800

Ball copra

The price of ball copra at Tiptur market opened at Rs. 17200 per quintal and the price was not reported from 19.02.2022 to 28.02.2022.

Weekly price of Ball copra at major markets in Karnataka (Rs/Quintal) (Sorce: Krishimarata vahini)	
01.02.2022	17200
05.02.2022	17200
12.02.2022	17300
19.02.2022	NR
26.02.2022	NR
28.02.2022	NR

*NR-Not reported

Dry coconut

At Kozhikode market, the price of dry coconut opened at Rs.14900 per quintal and closed at Rs.13000 per quintal with a net loss of Rs.1900 per quintal.

Weekly price of Dry Coconut at Kozhikode market (Rs/Quintal)	
01.02.2022	14900
05.02.2022	14900
12.02.2022	14900
19.02.2022	14900
26.02.2022	13000
28.02.2022	13000

Coconut

At Nedumangad market in Kerala, the price of coconut opened and closed at the same price during the month.

At Pollachi market in Tamilnadu, the price of coconut opened Rs. 27000 per tonne and closed at Rs.26500 per tonne during the month with a net loss of Rs. 500 per tonne.

At Bangalore market in Karnataka, the price of coconut opened at Rs. 20000 and closed at Rs. 17500 per thousand nuts during the month with a net loss of Rs. 2500 per thousand nuts.

At Mangalore market in Karnataka, the price of coconut opened and closed at the same price during the month.

Weekly price of coconut at major markets				
	Nedumangad (Rs./1000 coconuts)#	Pollachi (Rs./MT) ##	Bangalore Grade-1 coconut,(Rs./ 1000 coconuts) ##	Mangalore Black coconut (1 ton) ##
01.02.2022	16000	27000	20000	32000
05.02.2022	16000	26500	20000	32000
12.02.2022	16000	26000	17500	30000
19.02.2022	16000	26500	17500	30000
26.02.2022	16000	26500	17500	32000
28.02.2022	16000	26500	17500	32000

International price

Coconut

The price of coconut quoted at different domestic markets in Philippines, Indonesia, Srilanka and India are given below.

Weekly price of dehusked coconut with water				
Date	Domestic Price (US$/MT)			
	Philippines	Indonesia	Srilanka	India*
05.02.2022	236	222	296	351
12.02.2022	237	209	NR	344
19.02.2022	236	225	NR	351
26.02.2022	NR	270	NR	351
				*Pollachi market

Coconut Oil

International price and domestic price of coconut oil at different international/ domestic markets are given below.

Weekly price of coconut oil in major coconut oil producing countries					
	International Price(US$/MT)	Domestic Price(US$/MT)			
	Philippines/ Indonesia (CIF Europe)	Philippines	Indonesia	Sri lanka	India*
05.02.2022	2166	NR	NR	3111	1704
12.02.2022	2228	NR	NR	NR	1696
19.02.2022	2077	NR	NR	NR	1713
26.02.2022	NR	NR	NR	NR	1731
					*Kangayam

Copra

The price of copra quoted at different domestic markets in Philippines, Srilanka, Indonesia, and India are given below.

Weekly International price of copra in major copra producing countries				
Date	Domestic Price (US$/MT)			
	Philippines	Indonesia	Srilanka	India* * Kangayam
05.02.2022	1142	1031	1618	1166
12.02.2022	1127	1075	NR	1139
19.02.2022	1134	1081	NR	1153
26.02.2022	NR	1091	NR	1139
				* Kangayam

#(Source: Epaper,Kerala Kaumudi),
##(Source: Star market bulletin)

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