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Cover Picture
Nata De Coco
Courtesy: Nata Nutrico, Kannur, Kerala

Message from the Chairperson's desk

Dear Readers,

The schemes of the Board target the development of coconut cultivation and industry, since development of both should go hand in hand if farmers are to be benefitted. Coconut is not only consumed in raw form but is used as raw material for various industries starting from the traditional coconut oil industry to other value added products like desiccated coconut, coconut milk, virgin coconut oil, coconut milk powder, tender coconut water, coconut chips, coconut convenience foods etc. Coconut oil though a traditional product has its utilization not only as a cooking oil but goes in as raw material for various industrial products like soaps and toiletries, paints and varnishes, moisturizers, balms etc and holds a strategic position in defining the market.

The realization of fair, steady and remunerative prices for the farmers depend on the extent of value addition undertaken in coconut from better post harvest and primary processing of coconut to processing of finished products. The market now looks ahead to convenience and healthy foods and application oriented products with huge potential. The Board extends support for the establishment of coconut processing units and also supports in market promotion and brand building.

I wish to take this opportunity to urge the coconut farmers and other stakeholders in the sector to utilize the opportunities and undertake value addition and processing of coconut so as to realize remunerative returns.

G Jayalakshmi IAS

Chairperson

Enhancing planting material production in coconut through decentralised community nurseries -

Successful experiences of Farmer Producer Organisations

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Introduction

Rejuvenation of coconut orchards by large scale removal of senile and unproductive palms and replanting with quality seedlings of improved varieties is an important strategy suggested for making coconut farming profitable. Even though a substantial number of improved coconut varieties having high yield potential and other desirable attributes have been released by coconut research institutions in the country, lack of availability of quality seedlings is a major constraint experienced by coconut growers to adopt these varieties. It is estimated that about 14.5 million seedlings are required annually to meet the planting material demand in coconut in India. Coconut seedlings are produced and distributed by ICAR-Central Plantation Crops Research Institute (CPCRI), Coconut Development Board (CDB), State Agriculture/ Horticulture Universities and State Agriculture/ Horticulture Departments from public sector, and a few nurseries from private sector. Public sector contribution is about 4.2 million seedlings only. It is projected that another four million seedlings comes from private nurseries and farmers. Thus, there is a huge gap between demand and supply of coconut seedlings and many unscrupulous elements exploit the situation and cheat the coconut growers in the country by selling inferior quality seedlings which would adversely affect production and productivity of coconut in the long run.

Facilitating decentralised coconut nurseries managed by FPOs

Promoting decentralised coconut nurseries by utilising superior coconut genetic resources available in farmers' gardens is one of the important short term strategies suggested to enhance seedling production to meet the demand for quality coconut seedlings. Decentralised coconut nurseries can be established and managed by Farmer Producer Organisations (FPOs) to produce coconut seedlings by utilising mother palms of locally adapted coconut varieties available in farmers' gardens and seedlings can be made available locally with the active participation of coconut farmers. Technical support is needed to locate and identify mother palms, collect seed nuts, raise nursery and select quality seedlings for supply to the coconut farmers.

Successful experiences under the novel initiative implemented by ICAR-CPCRI with the support of State Department of Agriculture and Farmers' Welfare, Government of Kerala, since the year 2018

clearly indicate that FPOs in coconut sector can be empowered to establish and manage decentralised coconut nurseries to produce coconut seedlings by utilising mother palms of locally adapted coconut varieties available in farmers' gardens so that seedlings can be made available locally with the active participation of coconut farmers.

Awards were given to the best performing decentralised coconut nurseries managed by Farmer Producer Organisations under the project on decentralised coconut nurseries implemented by CPCRI with the financial support of State Department of Agriculture Development & Farmers' Welfare in the programme organised as part of World Coconut Day celebration conducted online on 8th October 2020. The successful experiences of award winning FPOs viz., Kunnamangalam Federation of Coconut Producers Society and Changaroth Federation of Coconut Producers Society from Kozhikode District and Bharanikkavu Panchayat Federation of Coconut Producers Society, from Alappuzha District in managing decentralised coconut nurseries with the active participation of coconut farmers are narrated below.

Kunnamangalam Federation of Coconut Producers Societies

Based on the activities and achievements in production and marketing of coconut seedlings through decentralised coconut nursery, Kunnamangalam Federation of Coconut Producers Societies from Kozhikode district secured first prize and a cash award of Rs 30,000/- sponsored by CDB in the competition conducted as part of World Coconut Day celebration among the decentralised community coconut nurseries established with the support of ICAR-CPCRI and State Department of Agriculture Development & Farmers' Welfare.

Kunnamangalam CPF was formed in the year 2013 and it covers 20 Coconut Producers Societies spread over three gramapanchayats viz., Kunnamangalam, Chathamangalam and Kuruvattur in Kunnamangalam block of Kozhikode district with a total of 2100 coconut growers as members having a total of 95000 coconut palms.

Production and distribution of quality coconut seedlings has been an important activity of Kunnamangalam CPF ever since it started functioning. During the last five years the federation produced and distributed a total of 55,000 seedlings of WCT and 20,000 seedlings of dwarf varieties. For carrying out planting material production and distribution in the initial four years from 2013 to 2017 the CPF availed financial incentives from CDB under the scheme for promotion of coconut nurseries.

The coconut nursery under Kunnamangalam Federation is located at Pilasseri in Kunnamangalam grama panchayat. The CPF very actively participated in the implementation of decentralised coconut nursery project implemented by ICAR-CPCRI. As part of the project they are maintaining about 400 mother palms in farmer's field for seed nut collection and during the period 2018-20, they collected 13600 and 4302 seed nuts of tall and dwarf varieties respectively. During 2019-20 the Federation distributed 4600 WCT seedlings, 1551 COD seedlings and 621 CGD seedlings to the farmers.

During the current year ie 2020-21, Kunnamangalam CPF could collect 10,000 seed nuts of WCT, 3,000 seed nuts of COD and 2,500 seed nuts of CGD varieties of coconut which are sown in the nursery. They have undertaken pollination in 100 WCT palms using COD pollens for the production of Kersankara hybrids. So far, they have harvested 1530 hybrid nuts and sown in the nursery. Through the

planting material production activity, the federation could generate profit of Rs. three lakhs. Members of the federation attended training on coconut planting material production conducted by ICAR-CPCRI. The Federation organized seminars/ workshops in the locality for creating awareness among farmers on the necessity of using quality planting material for coconut cultivation. The office bearers of CPF indicated that through the decentralised nursery activities the Federation was able to make available quality coconut seedlings to the farmers near to their locality besides generating employment opportunities benefitting many rural households.

Office bearers of Kunnamangalam CPF opined that the concept and practice of decentralised coconut nursery is highly beneficial to the coconut growers. After gaining experience from successfully managing the nursery established at Pilasseri and based on the demand from coconut farmers during this year, the CPF has initiated three more coconut nurseries at Kunnamangalam, Kuruvattur and Vadakara in Kozhikode district. Services of two technical personnel who were trained at CPCRI, Kasaragod on hybridization technique in coconut are being utilized by CPF for the maintenance of the newly started three nurseries. For the production of seed nuts of hybrid varieties pollination work is being carried out in 110 selected mother palms of coconut.

It has been observed that success of Kunnamangalam CPF in effectively managing decentralised coconut nursery is mainly due to their efforts to establish and maintain functional linkages with State Department of Agriculture through the local Krishibhavans and also with the Local Self Government Institutions. These agencies helped in marketing of coconut seedlings produced by CPF by linking with the implementation of coconut development schemes. During last year 2000 WCT seedlings, 957 COD seedlings and 621 CGD seedlings were distributed to farmers through Krishibhavans. Under the schemes implemented by LSGIs about 4000 WCT seedlings were distributed to farmers.

The CPF give wide publicity through newspapers and other media about availability of quality seedlings in their nursery. The unique feature about the CPF is that they arrange to supply the seedlings in the farmer's garden if the farmer gives indent for bulk quantity of seedlings. Similarly, the federation facilitate the coconut farmers who purchase seedlings from their nursery to avail financial incentives from CDB under the scheme for rejuvenation of coconut.

Kunnamangalam CPF is implementing various activities to benefit coconut farmers besides planting material production through decentralised nurseries. As a market intervention initiative, the CPF has been procuring coconut from farmers since the last two years through the procurement centres at Kunnamangalam grama panchayat and Perumanna grama panchayat. The federation is also having licence for neera production and marketing. However, neera production has been discontinued due to various constraints. The federation facilitates effective implementation of schemes for distribution of fertilizers to coconut farmers implemented by the

State Department of Agriculture and LSGIs through the CPSs. The federation is actively involved in marketing of coconut oil produced by Kozhikode Coconut Producer Company, in which many coconut farmers under the federation are shareholders, through the CPSs. Kunnamangalam CPF has been organizing various transfer of technology programmes on scientific coconut farming in collaboration with CDB, State Department of Agriculture and ICAR-CPCRI for the benefit of coconut growers.

An executive committee with Shri Chandran Thiruvalath as President, Shri P.P.Rajan as Secretary and Shri Venu Koduvangot as Treasurer provides efficient leadership for all the activities of the federation.

Changaroth Federation of Coconut Producers Societies

Changaroth Federation of Coconut Producers Societies from Kozhikode district secured second prize and a cash award of Rs 20,000/- sponsored by CDB in the competition conducted as part of World Coconut Day celebration among the decentralised community coconut nurseries established with the support of ICAR-CPCRI and State Department of Agriculture Development & Farmers' Welfare. Changaroth CPF started functioning in the year 2014. The federation covers 19 Coconut Producers Societies with a total of 2300 coconut growers as members.

In the year of establishment itself the federation started production and distribution of coconut seedlings under the nursery scheme of CDB. 10000 seednuts of dwarf varieties of coconut were procured from Pollachi and Udumalpet in Tamil Nadu and about 7000 quality seedlings were raised and the federation could gain a net income of two lakh rupees through the nursery activities. In the next year also Changaroth CPF continued nursery activities. However, since demand for seedlings of dwarf varieties was on the decline among the coconut growers in the locality, the federation did not produce any seedlings during 2016-17. But with the support from CDB and demand from coconut growers the nursery activities were restarted in 2017-18. Changaroth CPF very actively participated in the implementation of decentralised coconut nursery project implemented by ICAR-CPCRI. Changaroth is located in the eastern hilly terrain of Kozhikode district where palms of the popular 'Kuttyadi' ecotype of WCT cultivar of coconut are in abundant and procurement of seed nuts of tall variety from farmers' gardens is quite feasible for the federation. State Department of Agriculture also regularly procures coconut seed nuts from the locality.

The federation has identified and geo-tagged

mother palms of dwarf coconut varieties such as Chowghat Organge Dwarf (COD) and Chowghat Green Dwarf (CGD) in farmers' gardens. These mother palms are used for collecting seed nuts for raising seedlings of dwarf varieties and also for pollination to produce seed nuts of hybrid varieties. They are maintaining about 390 mother palms in farmer's field for seed nut collection. During the period 2018-20, they collected 13400 and 4355 seed nuts of tall and dwarf varieties respectively. The federation distributed more than 4600 seedlings of various coconut varieties to the farmers during the period. They have undertaken pollination in 95 WCT palms using COD pollens for the production of Kersankara hybrids. So far, they have harvested 3000 hybrid nuts and sown in the nursery. Through the planting material production activity, the federation could generate income of Rs. five lakhs. Members of the federation attended training on coconut planting material production conducted by ICAR-CPCRI.

Office bearers of the CPF indicated that they get tremendous support from the coconut farmers of the locality and they have already received indent from farmers for the supply of seedlings in the nursery which would be ready in the coming planting season. The federation is planning to utilise about 300 palms for the production of hybrid seed nuts. Identification and geo-tagging of the palms would be done in December.

The community decentralised nursery of CPF is located at Changaroth in 60 cents of leased in land. The office bearers of the federation opined that efforts are to be made by the concerned for the distribution of quality seedlings raised in decentralised nurseries under the coconut development schemes implemented by government departments and Local Self Government Institutions (LSGIs). It would prevent the sales of inferior quality seedlings to coconut growers by the unscrupulous elements which are happening widely throughout the state. It is also important that awareness programmes are organised by agencies such as CDB, state Department of Agriculture and ICAR-CPCRI.

According to the CPF representatives, another area of concern is the lack of availability of skilled workers for pollination in coconut palms required for the production of hybrid seed nuts. Available skilled climbers demand exorbitant amount as wages which the CPF is unable to manage. Two trained pollination workers are there under the Changaroth CPF.

Apart from planting material production Changaroth CPF implements a variety of other coconut development and extension programmes. The CPF is having a copra dryer of capacity 10,000 nuts per day. With the support of CDB the CPF has established the 'Coconut Point' as a sales outlet for coconut products at Paleri town besides creating facilities for the production of value added coconut products. The CPF was procuring coconuts from farmers earlier. But due to paucity of working funds coconut procurement activities have been stopped since the last few months. Changaroth CPF was the leading producer of neera in Kozhikode district. In the beginning even few palm climbers from Assam and Chhattisgargh were employed by the federation in the neera production enterprise. However, due to the huge loss incurred they have discontinued neera production and marketing.

The federation organized seminars/ workshops in the locality for creating awareness among farmers on the necessity of using quality planting material for coconut cultivation and on the disease & pest management.

Changaroth CPF representatives are of the opinion that the decentralised coconut nursery project implemented with the technical support of ICAR-CPCRI and funding support from Department of Agriculture Development and Farmers' Welfare, Govt. of Kerala should continue for at least five years to benefit the coconut growers. During the online programme conducted by CPCRI in connection with the World Coconut Day celebration the CPF representatives raised this demand. An executive committee of nine members including Shri O.T.Rajan Master as President, Shri. M. Aravindakshan as secretary and Shri Santhosh Koshy as treasurer leads the activities of the Changaroth CPF. A separate sub-committee with three members is constituted to oversee the coconut nursery activities.

President of Changaroth CPF Shri Rajan Master

Office bearers of Changaroth CPF are optimistic that the activities of the federation can be further strengthened to better serve the coconut growers

ensuring the active participation of coconut farmers and support from various coconut development agencies.

Bharanickavu Panchayat Federation of Coconut Producers Society

Bharanickavu Panchayat Federation of Coconut Producers Society very actively implemented various interventions for establishing and maintenance of the decentralised coconut nursery and they secured third prize and a cash award of Rs 10,000/- sponsored by CDB in the competition conducted as part of World Coconut Day celebration among the decentralised community coconut nurseries established with the support of ICAR-CPCRI and State Department of Agriculture Development & Farmers' Welfare.

Bharanickavu CPF started functioning in the year 2012. The federation covers 15 Coconut Producers

Societies with a total of 1502 coconut growers as members covering 398 ha. The CPF produced and distributed about 570 coconut seedlings in 2017 under the 'Amma thengu' scheme implemented by ICAR-CPCRI Regional Station, Kayangulam.

Bharanickavu CPF very actively participated in the implementation of decentralised coconut nursery project implemented by ICAR-CPCRI. The federation has identified and geo-tagged 98 mother palms of dwarf coconut varieties in farmers' gardens and

these mother palms are used for collecting seed nuts for raising seedlings of dwarf varieties.

During the period up to May 2018 the CPF collected 570 seed nuts of tall varieties and 6700 seed nuts of dwarf varieties. The federation has so far distributed about 5800 seedlings of dwarf varieties and 570 seedlings of tall varieties. Bharanickavu federation could realise a net income of 4.5 lakh rupees through the nursery activities which they plan to utilise to strengthen planting material production programme in the coming years.

A public meeting was convened by CPF in connection with the first sales of coconut seedlings on 13.12.2018. CPCRI Regional Station, Kayangulam supported the CPF for the marketing of seedlings by giving information to coconut farmers about seedling availability with the CPF nursery. The CPSs under the federation were motivated to distribute coconut seedlings to farmers utilising available funds with them. The CPF participated in the Farm Festival organised by a nearby Farmers' Club and arranged for sales of coconut seedlings to farmers through its pavilion. Local Krishi bhavans also were contacted for support in the sales of coconut seedlings. Federation also supported coconut growers by selling the seedlings at subsidised rate.

According to the leaders of Bharanickavu CPF a major problem in the management of decentralised

coconut nursery is lack of availability of skilled palm climbers and the difficulty due to the fact that the mother palms are identified in farmers' gardens which are located in a scattered manner. They also experienced difficulties for seed nut procurement due to the flood and also due to the present COVID-19 pandemic. Limitations to provide continuous employment to labourers engaged in nursery related activities is also another problem.

The CPF representatives suggests that to sustain the activities of decentralised coconut nurseries efforts need to be made to retain the service of experienced palm climbers of the locality who are quite familiar with the locations of mother palms identified in farmers' gardens. It is also necessary to constantly in touch with the coconut farmers in whose plot mother palms are identified so that seed nut procurement is made easy. Technical support

is required for the CPF for identifying the naturally crossed dwarf seedlings in the nursery and also for locating disease tolerant WCT palms in farmers' gardens. Members of the federation attended training on coconut planting material production conducted by ICAR-CPCRI.

The CPF regularly conducts meetings of the members and discuss about various activities to be implemented besides taking necessary steps for renewal of registration of CPSs with the CDB. The federation also facilitate marketing of coconut oil produced by the Onattukara Coconut Producer Company and also for the procurement of coconut from the farmers for the CPC coconut oil processing unit.

Various activities of Bharanickavu CPF are carried out under the leadership of Shri Thomas M Mathewkutty as President, who is also a member of the Director Board of Onattukara Coconut Producer Company, Shri Augustin Manoharan as the Secretary, Shri Omanakuttan as the Treasurer Shri Hareesh Kumar, Shri K.K.Sivadasan, Shri Hariharan Nair and Shri Gangadharan Nair as members of the executive committee.

Conclusion

The successful experiences under the project on decentralised coconut nurseries implemented by CPCRI with the support of State Department of Agriculture, Government of Kerala, clearly indicate that there is great potential for empowering the FPOs for enhancing planting material production in coconut sector through decentralised community nurseries.Continued support from research institutions, development agencies and Local Self Government Institutions is essential for sustaining the activities of decentralised nurseries managed by FPOs. ■

Onattukara Coconut Producer Company

Genesis and Growth Trajectory

Remany Gopalakrishnan,
CEO, Onattukara Coconut Producer Company, Kattanam, Alappuzha

Introduction

'Onattukara', is an important agroclimatic zone blessed by natural resources and once popularly known as 'Onamoottukara'. 'Odanad', and 'Onad' were other common synonyms. This region is comprised of Mavelikkara and Karthikappilly taluqs of Alappuzha district and Karunagappilly taluq of Kollam district in Kerala. Mavelikkara was its capital, a place closely related to King Mahabali, the historical figure connected with festive Onam, a unique celebration of Keralites and Kerala. Onattukara is a land of rich and diverse traditions in art forms, culture and religion and has registered prosperity in agriculture and trade activities. It has many historical and mythological legacies and is a region well known for its religious harmony. There are many Hindu temples, Christian churches and Muslim mosques and most of the festivals of these worship places are testimonials of mutual faith and harmony of these religions. The Sree Krishna temple Evoor (Onattukara's Guruvayoor), Kandiyoour Shiva temple, Mavelikkara Chettikulangara Devi temple, Ochira Parabrahma temple, Puthiyakavu St. Mary's Cathredral, C.S.I. Christ Church, St. Johns Valiya Palli, Pathichira, the Mosques in Mavelikkara and Karunagappilly are some of the prominent worship centres. The Chariot festivals of some of the temples like Chettikulangara and Ochira are world known. Onattukara is also known as the best Malayalam speaking belt of Kerala.

Agriculture was the mainstay of the people of Onattukara; paddy, sesame and coconut were the major crops extensively cultivated. Now paddy cultivation has considerably reduced; but with the paddy retention programme of the Government, the lost glory is likely to be reinstated. Onattukara gingelly is believed to have considerable medicinal properties. The quality of coconut in Onattukara in size and oil content is also premium. Apart from coconut, paddy and sesame, crops like mango, tapioca and variety of tuber crops are also widely grown. Presence of two major agricultural research stations in Kayamkulam, one of the prominent municipal towns in the region, marks the significance of agriculture in Onattukara.

The Onattukara Agricultural Research Station (OARS), Kayamkulam and the Regional Station of Central Plantation Crops Research Institute (CPCRI) under the Indian Council of Agricultural Research (ICAR) mainly cater to the research on paddy, sesame and coconut. Being an agricultural belt there are several well knit farmers collectives namely, Onattukara Agricultural Vikasana Agency, Onattukara Spices Farmers Producer Company, Onattukara Ethnic Foods Producer Company, Onattukara Coconut Producers Societies and Federations under the Onattukara Coconut Producer Company - all these contribute to the agricultural development of this region. It is true that the plentifulness and splendor of Onattukara in agriculture has slightly faded out, but the prowess is glittering.

2. FPOs in Coconut Sector

One key characteristic of coconut farming in India is the fragmentation of holdings. Around 98 per cent cultivation is small and marginal holdings. This fragmentation creates problems in both supply and demand side. The farmers are highly scattered, unorganized and have little or no bargaining power. They also suffer from market uncertainties. All the above constitute a severe agrarian crisis. Resource poor farmers face problems like inadequate information, lack of strong organized groups, low motivation, lack of access to productive inputs, and are unable to apply knowledge and technologies. Low levels of technological input results in low levels of output, low incomes, and low marketable surplus. To address this, a new thought of aggregation of farmers was mooted by Coconut Development Board (CDB) in around 2005. Smt. Minnie Mathew IAS, the then Chairperson of the Board made it practical to introduce the farmer participatory group approach in the implementation of coconut development programmes which encompass cultivation practices, plant protection, and income generation.

The maiden programme was Laying out of Demonstration Plots (LoDP) in farmers gardens. The farmer participatory mode of implementation paved way for linking them with processing activities. This kick start was the beginning of a revolutionary transition of farmers' mindset in associating with Board and integrating producers and processors into modern value chains. The mobilization of farmer groups helped them enhance productivity through efficient cost effective and sustainable resource use and they realized higher returns through collective action.

Onattukara Coconut Products

In the backdrop of the above initiative, the Board started formation of Farmer Producer Organizations in 2011-12, with the objective of socio-economic development of farmers. To enable this, three tier structures consisting of Coconut Producer Society (CPS), Coconut Producer Federation (CPF), and Coconut Producer Company were formed under the banner of Farmer Producer Organization. The unorganized nature of coconut farmers and their inability to pool their tiny marketable surplus and the dominance of middlemen were tackled to a certain extent. Shri. T.K. Jose IAS, the then Chairman of the Board propelled the whole movement. The farming community received the new step with overwhelming enthusiasm and moved forward with confidence. The aim was to overcome the inherent weakness of the small and marginal famers in order to leverage collective strength and bargaining power which would help bring financial inputs, services and technologies and an overall empowerment. The Board became umbrella for formation of 9766 CPS, 747 CPF and 67 CPCs in the country by now and they have become legal entities of three tier nature.

In the meanwhile, the Government of India issued a National policy in 2013 with its process guidelines for formation of Farmer Produce Organizations (FPOs). This set of guidelines ignited the initiatives of CDB and the FPO formation gained momentum. The FPOs organize collection, processing, storage and marketing of produces at an optimal price. Such organized activities reduced transaction cost. It is a way of commercializing small holder farmers to work together as a recognized legalized entity in order to

strengthen their voice for articulating their needs, for lobbying and taking advantage of economies of scale. Besides, it benefits the members by timely and increased availability of good quality fertilizers, seeds and other inputs at reasonable rate. Higher farm productivity and cost reduction leading to better price realization for the produce is the ultimate gain.

3. Onattukara Coconut Producer Company Ltd. (OCPCL) - The Genesis

Onattukara Coconut Producer Company Ltd (OCPCL) is located at Vettikodu, Kattanam, in the district of Alappuzha, one among the fourteen districts of Kerala. It is an initiative of Onattukara coconut farmers which registered on 3.2.2015 under the provision of Indian Companies act 1956, under the supervision of the Coconut Development Board, Government of India and under the concept of three tier farmers' collectives. It is one among the 18 Companies presently registered with Board. Being a direful and challenging initiative of small and marginal coconut farmers, it aimed at the welfare of more than 25000 farmers in the ambit of the region, of whom, nearly 4000 are share holders. The company is encouraging the coconut farmers to move towards value addition in coconut, thus supporting the endeavor of realizing consistent and higher income for the farmers. Under the jurisdiction of Onattukara Company there are 235 Coconut Producer Societies and 21 Coconut Producer Federations which together work as a cohesive group. Some of the CPS and Federations are very active and are undertaking farm and on-farm activities like coconut nursery raising, establishment of organic manure units, establishment of modern copra dryers, coconut chips making units etc. The Company is procuring raw material from member farmers by paying remunerative price for their produce. This has evoked overwhelming enthusiasm among the farmers. The shareholders and other farmers are thus being benefitted by getting better price for coconut by avoiding middle men.

3.1 Coconut Oil Manufacturing Plant of OCPCL

The Company has established a coconut oil processing plant with a processing capacity of 2400 MT copra per year which in turn yields around 1490 MT coconut oil and 768 MT of oil cake. The venture is financially supported by Coconut Development Board and Small Farmers Agribusiness Consortium (SFAC), Government of India as well as Government of Kerala. The financial resource of the Plant was mainly the term loan of Rs. 116.00 lakhs availed from Kerala Financial Corporation Alappuzha branch, and the share capital mobilized by the Company from farmers to the tune of Rs. 2.50 crores. Apart from this, Government of Kerala had extended 25% equity share of Rs. 40.94 lakhs. The Coconut Development Board sanctioned a back ended credit linked capital subsidy of Rs. 50.00 lakhs under Technology Mission on Coconut(TMOC).Small Farmers Agribusiness Consortium, Government of India sanctioned Rs. 35.22 lakhs as Venture Capital Assistance in 2018. Recently Government of Kerala sanctioned 20 % of credit subsidy to the extent of Rs. 20.00 lakhs under COVID relief scheme through KFC. The Company invested nearly 5.00 Cr for the establishment of the plant. Onattukara Company is presently facing shortage of working capital. Financial help extended by various agencies was fully absorbed in the infrastructure creation, many of which were not included in the original project.

The unit manufacture and market quality coconut

Inauguration of the plant by Shri. Pinarayi Vijayan, Hon'ble Chief Minister, Kerala - *a view*

oil under the brand name 'Onattukara Coconut oil' for the last 3 years. The plant was inaugurated on 28.5.2017 by Shri. Pinarayi Vijayan, Hon'ble Chief Minister of Kerala in the presence of Shri. Oommen Chandi, former Chief Minister (who also laid foundation stone for the Company building in 2015) and Mollywood fame Shri. Bharat Mammooty and many other distinguished guests. Onattukara brand of coconut oil was launched during that splendid function and thereafter the commercial production of coconut oil started in the plant. But it has yet to attain the full production capacity for want of sufficient working capital. The Company is, however, striving hard to increase the production. By now Onattukara coconut oil has established indigenous markets with good consumer acceptance and is about to move to export. Coconut oil is marketed in 500 ml, 1kg, 2kg, 5kg size bottles/cans and food grade pouches. The market enquiry for Onattukara coconut oil is highly encouraging. The Company is confident about the successful marketing of its product in the domestic and international markets. The products are having all quality certificates. Company obtained ISO 9901:2015, ISO 22000:2018, Food Safety Management Systems, and HACCP apart from FSSAI license, AGMARK certification and Barcode. The Company has also obtained Import Export Code and Registration Cum Membership Certificate (RCMC) from CDB. It is hoped that the company will be able to capture niche markets without compromising the quality of the product in edible and non-edible sectors.

Company had recorded a new landmark in 2019 in the marketing of coconut oil. It has entered into an agreement with Kerala State Marketing Federations (Marketfed) for supplying coconut oil in their 'Kerajam' brand without losing the identity of the manufacturer. This has helped boost the production capacity of the plant and the Company could supply nearly 60,000 litres of kerajam brand of oil mainly to Consumerfed, private agencies and for their own outlets in various centers during Onam season.

Adv. Thomas M Mathunni, President, Bharanikkavu Federation, receiving cash prize and certificate from Dr. Kalavati, Head, ICAR-CPCRI, RS

3.2 Confident Entry into Value Addition

The success of Onattukara coconut oil prompted the Company to plunge into value addition in coconut, which is one of the underlined objectives of such farmers' collectives. Value addition ensures more income and opportunity to the enterprise. One of the CPS of the Company has been encouraged for the production of coconut chips, desiccated coconut, ginger mix, vegetable curry mix, coconut cake etc. Company is engaging in preparation of coconut chutney powder, squash etc besides the main edible coconut oil. Of these the acceptance and popularity of some of the products like chutney powder, ginger mix and urukku velichenna crossed the boundaries of Kerala and have created strong footing in the markets. Some Federations have set up copra dryers and are engaged in copra processing. Some are actively involved in raising coconut nurseries. Bharanickavu Coconut Federation located under the vicinity of the Company works closely in association with ICAR-CPCRI Regional Station, Kayamkulam in mother palms selection, collection of seednuts and nursery raising under their research programme

for decentralized nurseries. The nursery programme of Bharanickavu Federation has been adjudged recently as one of the top three best nurseries and bagged cash prize and certificate.

Company is an active participant in the exhibitions and fairs sponsored by the Coconut Development Board in various Metro Cities and international platforms. This involvement aims to showcase the Onattukara products in major domestic and international markets. The Company become platform for graduate and post graduate students of the colleges of Kerala and Mahatma Gandhi Universities for internship and project works on different aspects of coconut based industries, Human Resource Development, Organizational study, Financial Statement Analysis etc. The books of accounts are audited by GSP Associates, Thiruvananthapuram and the Company affairs are entrusted to ABP & Associates, Ernakulam. Both of them together ensure accuracy and transparency in Company matters.

Shri. Srinivasan, popular malayalam film actor & producer in OCPCL

4. Current distress of FPOs

The Producer Organizations in coconut sector are in great distress and in difficult situations. All are facing problems of one nature or the other, may be technical or financial. Some Producer Companies have invested in Neera production; some are in coconut oil manufacturing, and others in integrated processing. Unless they are guided and supported for some more time, efforts of the organizations which were responsible for their existence would become meaningless. The Coconut Development Board which was instrumental for the formation of FPOs is hoped to come forward in understanding the issues and try to help in moving ahead. Once they attain the maturity to fly free, it is the responsibility of the FPOs to run effectively.

Absence of regular Chairmen for the CDB in this critical period impacted its monitoring adversely. Thus the beginning of a revolutionary path breaking strategy in the implementation of programmes and the envisaged small farmers' empowerment in coconut sector stopped half way without fully accomplishing its goal. A Consortium of Coconut Producer Companies has been formed; but the hue and cry of most of these three tier set up is not receiving proper attention from the authorities. They are crippling for want of proper and timely intervention by the Government agencies.

5. Handholding inevitable

The efforts of some of the FPOs in succeeding their endeavors are encouraging. But there are no grounds for complacency and contentment; as most of the FPOs are in panic. It is an open fact that coconut based industries are comparatively novel ventures which have not yet made strong footing. They are in damn need of support and hand holding. Coconut Development Board and Government of India shall ensure the hand holding of these farmers' collectives and see that justice to them become gratified. The fate of these FPOs should not end unpleasantly. There are lot of notifications from State and Central Governments favouring FPOs. They are in pipeline and yet to come out with detailed guidelines. All possible steps are taken by most of the FPOs for sustaining their efforts with lasting splendour. Since there were untiring efforts behind the formation of FPOs in the country with good motives, it is the responsibility of all stakeholders to sustain them. Such group efforts have already demonstrated the potential of value addition in coconut and the immense employment opportunities in coconut sector. Moreover it ensures unadulterated coconut products in the supply chain especially edible oil, which helps ensure a healthy and robust society. It prevents the health hazards due to adulterated edible oils causing many health issues. All these positive factors will collectively empower the small and marginal farmers and thereby the coconut economy. Let us hope for a fruitful future for these farmers collectives which ignites more expectations and enthusiasm.

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Sell the Shells

Opportunities for coconut shell based industrial products and consumer goods

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1. Introduction

Coconut is always eulogized as 'Tree of Life' for its multifarious uses. The crop is cultivated mainly for the fruit which yields kernel and water based products like copra, coconut oil, desiccated coconut, coconut milk, virgin coconut oil, coconut milk cream, coconut milk powder, tender coconut water and other confectionery and beverage products. The fruit of the coconut palm is not a real nut but a fibrous drupe, wherein the kernel with water (endosperm) is covered with a hard shell (3 and 6 mm endocarp) and thick outer fibrous husk (1 to 5 cm epicarp and mesocarp). Shell thickness varies based on the variety and depends on the management practices adopted for cultivation. In general, the average shell weight in a matured coconut in Tall variety is 100-120 grams.

> Coconut shells which were once used for fuel purposes only, is now being used for several industrial purposes. The shell is similar to hard woods in chemical composition, though lignin content is higher & cellulose content is lower. The coconut shell for industrial use is processed into three major forms viz., coconut shell powder, shell charcoal and activated carbon. Coconut shell oil also finds use in several medicinal preparations and industrial products.




Since coconuts are shelled at the factory, in the process of making the above products, shells are collected in large quantities. However, in general the husk and shells are normally used as fuel in the coconut processing units itself for generation of heat at various stages of processing operations and also in the rural households as fuel for cooking.

2. Forms of coconut shell based products and their uses:

The world is full of creators who make innumerous products for countless and fascinating uses. Coconut shells which were once used for fuel purposes only, are now being used for several industrial purposes. The shell is similar to hard woods in chemical composition, though lignin content is higher & cellulose content is lower. The coconut shell for industrial use is processed into three major forms viz., coconut shell powder, shell charcoal and activated carbon. Coconut shell oil also finds use in several medicinal preparations and industrial products. Designer handicrafts and utility items are also made from raw coconut shells.

i. Industrial products:

a) Shell chips:

Coconut shell is made into pieces of various sizes and shapes for compact packing to facilitate convenience in transports. The chips are used for making shell powder and charcoal by the handicraft industry. Coconut shell chips are also being used as mulching material in protected vegetable cultivation in European countries instead of wood chips used earlier. Shell chips last for about three years while wooden chips last for a year, due to constant contact with moisture.

b) Shell powder (flour):

The manufacturing process for coconut shell powder (flour) is not very complicated and resultant product is of high value both as filler and extender for phenolic mulching powder. Shells of matured coconuts, free from contamination of coir pith, kernel testa and other impurities are broken in to small pieces and fed through a pulverizer and cyclone to obtain shell powder. Shells of about 12000 coconuts may be required for manufacturing one tonne of coconut shell powder.

According to the requirements of various end uses, the shell powder is sieved through various mesh sizes to get a powder which is homogeneous in its size and quality. It has good durability characteristics, high toughness and abrasion resistant properties and is suitable for long standing use.

It is extensively used as compound filler in the manufacture of Phenolic moulding powder (Bakelite plastic) as a filler & extender to reduce `ageing'. The product finds extensive use in plywood and laminated boards as a phenolic extruder, as filler in synthetic resin glues and as a flux coating for electric welding rods. Coconut shell powder is considered to be suitable and cheap filler compared to others. Though other alternate materials available in the market such as bark powder, furfural and peanut shell powder, coconut shell powder is preferred to because of its uniformity in quality and chemical composition, better properties in respect of water absorption and resistance to fungal attack.

Coconut shell powder is used successfully with specialized surface finishing liquid products (as an absorbent), mastic adhesives, resin casting and bituminous products. It is also used in manufacturing weather-resistant outdoor emulsion paints. It is used as a mild abrasive in heavy duty hand cleaner pastes, in shot blasting of delicate objects and of historic buildings. It can give a smooth and lustrous finish to moulded articles, and also improve their resistance to moisture and heat. The coconut shell granules are used as a Lost Circulation Material in oil well drilling.

It is widely used as a critical organic additive for the manufacture of insect repellent in the form of mosquito coils and also in Agarbathis (incense sticks) and dhoops (incense extrudes), for its improved

qualities of long and uniform burning. The hollow portions of the gold ornaments are used to be filled with coconut shell powder for firmness.

Keeping in view of the vast industrial uses, the demand for coconut shell powder appears to be promising.

c) Coconut Shell Charcoal

Shell charcoal is obtained by carbonizing the shells of fully matured coconuts with limited supply of air, which is usually carried out in mud-pits, brick kilns and metallic portable kilns. Good quality and yield of charcoal can be obtained by experience and skill. Over-carbonizing results in over-burnt pieces and reduced yield, whereas unburnt brown pieces due to under-carbonizing are undesirable. Good quality charcoal should be uniformly black in colour and should be free from unburnt & over-burnt pieces, dust & dirt, husk and other contaminants. Broken edges should show a shiny black surface and a characteristic sharp fracture. When dropped on a cement floor, well carbonized charcoal lumps give a clear ring.

The yield of charcoal is 25 - 33% of the mass of raw shell. The number of shells required for production of one tonne of charcoal depends on the size of shell. In general, 35 kg of charcoal can be obtained from 1000 whole shells or about 30,000 whole shells yield 1 tonne of charcoal.

Further, shell charcoal powder is a waste product obtained during the processing of charcoal. The powder is bonded with the help of binding materials and moulded in the form of briquettes using moulding machine.

Shell charcoal is one of the purest forms of charcoal, as hardwood charcoal and coal have much higher ash contents. Coconut shell charcoal is of two types, viz., coconut shell charcoal pieces and granulated shell charcoal.

Shell charcoal has been used for blacksmith and goldsmith furnaces, smoothing irons in non-electric areas, bakeries, barbecues, etc.. It is used as reductant in smelting furnaces and for carbon electrodes in dry cells. In Sri Lanka, a limited quantity of 'edible white copra' is made for export as a very high premium product. In this case, coconut shell charcoal is used as fuel in the manufacturing process, which produces an even cleaner direct heat.

From the minor uses, the coconut shell charcoal has become a commercial commodity due to its intrinsic value as a raw material for the manufacture of activated carbon, which is having wider uses.

d) Activated shell charcoal (Activated Carbon)

The coconut shell charcoal is activated by reaction with steam at high temperature under controlled atmosphere in a rotary kiln. The reaction between steam and charcoal takes place at the internal surface area, creating more sites for adsorption. The temperature factor (900°C - 1100°C), in the process of activation is very important. If it is below, the reaction becomes too slow and uneconomical. If it is above, the reaction takes place on the outer surface of the charcoal resulting in loss of charcoal. The different lots of activated carbon manufactured are tested for activity levels and blended as desired, and then sieved for size grading. Each lot is identified by its activity level and particle size range. About 90,000 shells of whole coconut or say three tonnes of shell charcoal are required for production of one tonne of coconut shell activated carbon.

Two types of activated carbon are distinguished. One refers to granular (made of shell charcoal, anthracite etc) activated carbon, mainly far gaseous phase adsorption applications, and the other is powdered activated charcoal (made of wood charcoal) for liquid phase applications.

The sources of activated carbon are mostly coal (anthracite, bituminous, lignite), petroleum based residues and agricultural by products. Production of activated carbon from agricultural by products is preferable since it is more cost effective. There are numerous studies regarding the production of activated carbon from agricultural by products such as coconut shell, oil palm kernel shell, pistachio nut shell, sugar cane bagasse, olive stones, macadamia nut-shell, watermelon peel, banana peel, orange peel, lemon peel, tea, waste tire rubber, durian shell, rambutan, pine cone, grapes, papaya seed, mango stone under physical or chemical activation process.

Coconut shell activated carbon is preferred as it has pores mainly on a micropore scale. Almost 85-90% of the coconut shell surface is made up of these micropores. However, the peat, wood and other activated charcoals are predominantly macro-sized pores that match the size of larger molecules. The superiority of micropores in coconut carbon gives it a denser and more durable structure that provides good mechanical strength and hardness as well as greater resistance to friction wear.

The coconut shell charcoal activated carbon finds many applications in manufacturing military and

Table- 1: India: Export of Major Coconut Products

Item of export from India	2015-16		2016-17		2017-18		2018-19		2019-20		Total		% share of value
	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	
Total coconut and coconut products (other than coir and coir products)		1450.24		2061.70		1764.30		2045.36		1762.17		9083.77	100.00
Activated Carbon	0.72	747.56	0.85	811.17	0.93	951.27	0.97	1344.11	1.03	1184.60	4.51	5038.72	55.47
Shell Charcoal	0.17	40.39	0.39	87.88	0.27	79.28	0.55	54.14	0.10	34.62	1.47	296.31	3.26
Shell products total	0.89	787.95	1.24	899.05	1.20	1030.55	1.52	1398.25	1.13	1219.22	5.98	5335.02	58.73
% of shell products to total coconut products		**54.33**		**43.61**		**58.41**		**68.36**		**69.19**		**58.73**	**58.73**

Q- Quantity in lakh MT, V- value in INR crores, Source: Directorate General of Commercial Intelligence and Statistics, Kolkata

industrial gas masks, solvent recovery plant, recovery of petroleum gas, purifying recycled air in central air-conditioning, air pollution control, cigarette filters, tertiary treatment of water used in the brewery, liquor and pharmaceutical industry for the removal of flavours and odours, dechlorination of municipal water, and gold dust recovery. This could also be used to develop electrodes for super capacitor. The liquid phase applications of powdered grades include decolorizing edible oils and sugar refining.

Coconut shell activated carbon is preferred to remove volatile organic compounds (VOCs) from drinking water purification systems because it is more economical than bituminous coal-based activated carbon. It has higher hardness, less dust, lower ash and is more environmental friendly.

Some of the main features that the drinking water purification industries see as a big advantage in favor of coconut carbon are it adsorbs disinfection by-products, VOCs, pesticides and herbicides; removes halogens from water; improves the appearance and taste of drinking water.

e) Coconut shell oil

Pyrolysis of coconut shells yields coconut shell oil. Traditionally coconut shell oil has been used for the treatment of skin infections.

ii. Consumer goods

a) Cosmetics & toiletries

From the above facts, we cannot come to a

Table - 2: World exports of Coconut Shell Charcoal and Activated Carbon by Selected Countries, 2012 - 2017 (in Lakh MT)

	Country	2012	2013	2014	2015	2016	2017
A	**Shell Charcoal**	**2.62**	**3.09**	**3.61**	**2.51**	**3.20**	**4.00**
	Philippines	0.48	0.93	0.77	0.60	0.25	0.40
	Sri Lanka	0.07	0.06	0.09	0.09	0.05	0.09
	Indonesia	1.81	1.79	2.50	1.06	2.73	3.11
	India	0.26	0.32	0.25	0.76	0.17	0.39
B	**Activated Carbon**	**2.44**	**2.09**	**2.39**	**1.90**	**2.13**	**2.42**
	Philippines	1.28	0.62	0.60	0.55	0.62	0.70
	Sri Lanka	0.30	0.37	0.37	0.32	0.35	0.40
	Indonesia*	0.25	0.20	0.22	0.26	0.23	0.20
	Malaysia	0.16	0.16	0.15	0.15	0.13	0.16
	Thailand	0.05	0.06	0.08	0.08	0.09	0.11
	India	0.39	0.68	0.97	0.54	0.72	0.85
	Total**	**5.06**	**5.18**	**6.00**	**4.41**	**5.33**	**6.41**

* Includes wood/coal based activated carbon
** Aggregate of coconut shell charcoal and activated carbon in shell charcoal basis
Source: ICC Coconut Statistical Yearbook 2017

conclusion that the coconut shell products have confined only for industrial purposes. There are several products now available in retail market for day to day use by the common consumers.

The charcoal and activated carbon based mud packs, face masks, etc. have arrived in market attributing to its cleansing properties. Branded activated coconut charcoal teeth whitening powder/ polish and coconut charcoal whitening toothpaste also claim to whiten the teeth and also strengthen the gums, remove toxins from the mouth and absorb bacteria. Tooth brushes infused with softer charcoal bristles also try to maximize the effectiveness of the charcoal toothpaste.

Due to its amazing moisturizer and purification qualities, coconut charcoal is also used to create soaps, body scrubs, etc. and it is said that these types are sensitive and good for skin also. Coconut shell activated carbon refreshers/ air purifiers/ deodorizers for households/ hotel rooms and cars, etc. are also available in the market.

b) Use in household grills and barbeques

Due to the high heating capacity, it is widely used for barbeque as an alternative for normal

coal. Because of its pleasant smell, most of the food producers in the food industry are now tend to use coconut charcoal to prepare traditional foods and barbeques.

As many people are now trying the restaurant dishes in their kitchens with the mini household appliances including grills and barbeques, the coconut shell charcoal in different shapes and sizes is also now made available in small consumer packs.

c) Food, feed and medicinal uses

The primary health uses of activated coconut charcoal are to treat acute poisoning in people and for gastrointestinal problems. Ayurvedic medicine used this black powder for thousands of years. Food grade charcoal are also manufactured in various parts of the world. Studies for using charcoal in animal feeds are also being undertaken.

d) Clothings

Bed sheets, kitchen towels, dish cloths, etc. with charcoal (not only of coconut) blended with other fabric are now available in the market for their greater cleansing properties.

e) Shell based utility items and handicrafts

For centuries, coconut shells have traditionally been used in producing countries as utility items like spoons and cups for various purposes. The coconut shells are polished, cut, carved and painted and attached to other accessories to make several artifacts. Bowls, tumblers, bird's nests, ice cream cups, etc. are also made. In the rubber plantations, coconut shell cups have been used for several decades to collect latex from tapped rubber trees.

As coconut shells are biodegradable, these can also be used for planting saplings temporarily before they settle in the soil for good rooting. Shell bowls are used in culturing orchids as they resist the fungal growth.

Hair pins, ear rings, necklaces, spice boxes with lids, coin collecting tills, buttons, ladies' handbags, etc. are also made from coconut shells which attract the customer and especially the tourists, as part of the souvenir.

3. Shell trade

The newly emerging products from this byproduct, coconut shell, encourage future commercial applications to increase income from coconut through trade in modern, value-added products. These products from the shell (charcoal, activated carbon, flour) enter international trade.

During the past 5 years, export of coconut shell based activated carbon and shell charcoal from India has increased (Table-1). About 5.98 lakh MT of activated carbon and charcoal valued at Rs. 5335.02 cr. has been exported during the period. It is also pertinent that these two products alone contributed to 68-69 % of export value of coconut and coconut products (other than coir and coir products) during the last couple of years.

The country exported 1,03,071 tonnes of activated carbon made from coconut shell (valued at Rs.1,184 crore) in 2019-20. The export of activated carbon from the country was at 97,050 tonnes (valued at Rs.1,344 crore) during 2018-19. US is the major importer of coconut shell-based activated carbon from India, followed by Japan and the United Kingdom. Nearly 95 per cent of Indian product is exported to different destinations.

It may be observed during the above period the the Indian export of shell charcoal is in the diminishing trend, but the activated carbon export is increasing. This can be considered as higher domestic value addition to activated carbon from shell charcoal.

India's share in global activated carbon and shell charcoal exports has peaked to 29.48 % in 2015 from 12.85 % in 2012, which is now regaining (Table-2).

Coconut shell charcoal (ITC HS Code 44089010) is eligible for 5 % incentive under Merchandise Export from India scheme (MEIS). The few other related ITC HS Codes are 38021000 (activated carbon), 44029090 (Coconut Shell Charcoal Other), 96062910 (Button of coconut shell/ wood), 08011210 (Fresh Endocarp), 08011220 (dried Endocarp) and 08011290 (Other Endocarp).

The global data on import of activated carbon for the years 2012-2017 show an increasing trend, with major buyers in European, American countries (Table - 3).

Table- 3: World imports of Activated Carbon, 2012 - 2017 (in Lakh MT)

Country	2012	2013	2014	2015	2016	2017
European countries	2.41	3.29	3.33	3.46	3.48	3.55
American countries	1.38	1.43	1.53	1.68	1.53	1.93
African countries	0.30	0.26	0.23	0.20	0.25	0.31

Asian countries	2.59	2.89	2.86	2.70	2.68	3.20
India	0.09	0.10	0.11	0.13	0.12	0.16
Pacific countries	0.08	0.11	0.09	0.09	0.09	0.09
Total	**6.76**	**7.98**	**8.04**	**8.13**	**8.03**	**9.08**
Source: ICC Coconut Statistical Yearbook 2017						

It is estimated that the global activated carbon market size reached a value of almost USD 3.93 billion in 2019. The market is expected to reach a value of nearly USD 6.24 billion by 2025, growing at a CAGR of 8% in the forecast period of 2020-2025. The growing demand for water filtration as well as air purification as a measure to improve water and air quality are the leading market trends in the activated carbon industry.

4. Project cost

For setting up of a coconut shell powder unit with a capacity of 10 tonnes per day, about Rs. 150.00 lakh (excluding land and buildings) would be required. Likewise Rs. 100 lakh is the average project cost estimated for a unit producing 5 tonnes shell charcoal per day. For the high end product of activated carbon, an investment of Rs. 700 lakh except land and buildings is required for an output of 3 tonnes per day.

5. Technical and financial support from Coconut Development Board

There are already around 30 such units in the country. Since India being the highest producer of coconut in the world, there will not be any dearth of raw material in the country. There is good scope for setting up more activated carbon units in India in view of the ever-increasing worldwide demand for activated carbon. This is also substantiated by the import of activated carbon to a tune of 70953 MT during 2012-2017.

The Coconut Development Board encourages value addition and extends technical and financial assistance for setting up of processing units for coconut based value added products.

a) Researches, demonstration and setting up of processing units

Under the 'Technology Mission on Coconut', the Coconut Development Board extends technical and financial assistance upto Rs. 75 lakh for 'Development, Demonstration and Adoption of technologies for processing and product diversification' by individuals and various institutions and groups, as below:

Development of technologies

- 100% of the project cost limited to Rs.75 lakh for Govt. institutions & societies.
- 75% of the project cost limited to Rs.35 lakh for NGO's, Individual entrepreneurs and other research organizations

Demonstration of technologies

- 100% of the cost to all the Govt. institutions and cooperative societies.
- 50% of the cost for the NGO's, Individual entrepreneurs and other organizations.

Adoption of technologies

- Back-ended credit capital subsidy limited to 25% of the project cost
- For SC/ST Women farmers, 33.3% of project cost, 50% for HVA in A&N islands & Lakshadweep, not exceeding Rs.50 lakh

Several units for manufacturing coconut shell powder, charcoal and activated carbon are assisted under the TMoC. The interested persons may submit the project proposals to the Coconut Development Board. The application format and other details are available at https://coconutboard.gov.in/TechnologyMission.aspx# AnnexuresAndApplication.

b) Marketing support

The Board organizes buyer seller meets and exhibitions for popularization of coconut products among the targeted groups. For the manufacturers, the Board extends financial support for brand building, domestic/ international market promotion, setting up of sales outlets/ kiosks, etc.

At the capacity of Export Promotion Council for coconut and coconut products (other than coir and

coir products), the Coconut Development Board issues RCMC to the exporters to facilitate export of coconut products. The Board facilitates availing various benefits under the Foreign Trade Policy and duty neutralization schemes of the Department of Revenue, to the exporters registered with CDB.

6. Future thrust

These coconut shell based products provide opportunities for substantial value addition as normally shells are either thrown away or used as a fuel. Activated carbon being a high value added product from charcoal and charcoal being the single raw material required for manufacturing activated carbon, rather than selling the charcoal, scope exists to use it for the production of further value added products.

The aggregation of the shells can be undertaken by the FPOs in coconut sector facilitated by the Coconut Development Board, other farmers' collectives and SHGs in rural area and in urban area can facilitate produce aggregation. From the units making copra and other matured coconut based products, the shells can be collected and supplied to the required industries. The households and hotel/ catering sector who procure raw dehusked coconuts with shells for varied uses may also be tied up for regular collection of coconut shells. Conversion of coconut shells into charcoal and subsequent conversion of the charcoal thus produced into activated carbon opens up avenue for community level processing for value addition of these by-products. Primary processing of cleaning, breaking and upto shell powder can also be taken up by the FPOs. This will benefit the members of the collectives giving them a marginal gross profit from coconut.

More R&D activities can be taken up for exploring the medicinal properties of the shell based products.

ICAR-CPCRI Vision 2050 (2015) estimated that just over 10% of global demand for activated carbon is met from coconut shell. Hence, the uses for which the charcoal and activated carbon from sources other than coconut shell and still to be tested/ applied to this valuable product also have to be attended. The use of nanotechnology in the production of nano-fibres from coconut shell need to be envisaged for its application in food packaging and other related fields to develop nutritive and marketable products. The biofuel production from coconut shell oil may be standardized for commercial utilisation.

Higher awareness about these products is to be created among the chemical industries and the FMCG sector, to boost the trade. Though considerable costs on energy is reduced by the use of coconut shells in the coconut processing units, these alternate options for value addition to high end products expand the opportunities for generating high income for the entrepreneurs and farmers apart from creating employment opportunities, especially in the rural sector.

The contributions of the farmers, researchers, industrialists and others involved in the coconut cultivation, processing and marketing sectors and the end consumers towards the developments so far are duly acknowledged. The author expresses since gratitude to Smt. Deepthi S Nair, Deputy Director (Marketing) and Shri Sreekumar Poduval, Deputy Director (Technology Development & Entrepreneurship) and other colleagues for extending their valuable suggestions for drafting the article. ■

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Coconut based cropping systems developed for different agro- climatic regions

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About 80 per cent of coconut in the world is cultivated by small farmers, and these small holdings are mainly committed to coconut monocrop, which normally occupy the land for about a century. Under such monocropping system, majority of the coconut holdings do not generate adequate income and employment for the dependent families. Considering the availability of coconut areas, rainfall and climatic conditions there is huge scope for intensification and diversification of coconut based farming systems by modification/ realignment of interspaces. Multispecies cropping under coconut particularly during the early growth stage (> 5 yr) and after the age of twenty five years of plantation ensures maximum resource utilization and higher additional income per unit area of soil, water and light. Intercropping results improvement in the soil properties and biological activities in the root region. Overall the soil environment is modified for

Considering the availability of coconut areas, rainfall and climatic conditions there is huge scope for intensification and diversification of coconut based farming systems by modification/realignment of interspaces. Multispecies cropping under coconut particularly during the early growth stage and after the age of twenty five years of plantation ensures maximum resource utilization and higher additional income per unit area of soil, water and light.

Evolving location-specific coconut based farming systems with major emphasis on farm-waste utilization.	
a. Coconut based cropping system comprising of following crops was recommended for different regions:	
Aliyarnagar (TN)	Coconut+banana+turmeric+EFY+pineapple+Tapioca+Bhendi
Veppankulam (TN)	Coconut + black pepper + banana + elephant foot yam + coriander
Mondouri (West Bengal)	Coconut+black pepper+pineapple+banana
Bhubaneshwar (Odisha)	Coconut + banana + tube rose (in young coconut garden)
Jagadalpur (Chhattisgarrah)	Coconut + black pepper + carnation + chrysanthemum
Kahikuchi (Assam)	Coconut + black pepper + turmeric+banana
Konkan region of Maharashtra	Coconut + Turmeric + banana + pineapple + tapioca
Arsikere (Karnataka) -	Intercropping of lemon, drumstick, french bean-ladies finger with adult coconut palms is productive and remunerative.
b. Intercropping with region specific medicinal and aromatic crops in coconut garden was also found to increase income of coconut farmer with the following crops.	
Ambajipeta (A.P.)	Palmarosa, mango ginger, patchouli, Citronella
Aliyarnagar (TN)	Alpinia galanga, Lemon grass, Patchouli
Arsikere (Karnataka)	Lemon grass , garden rue, tulsi , kalmegh , arrow root and makoi
Kahikuchi (Assam)	Pipali, Patchouli, Citronella, Sarpagandha
Mondouri (WB)	Sarpagandha, Aswagandha, Arrowroot
Ratnagiri (MS)	Sathavari, Adulsa, Arrow root, Lemon grass, Citronella
Veppankulam (TN)	Aloe vera, Alpinia galangal, Ocimum sanctum
Jagadalpur (Chhatisgarh)	Stevia, Amahaldi, Sarpagandha,Tikhur,Patchouli

the better crop growth and development. Diversified cropping system could be one of the solutions to realize sustainable productivity and maximum income per unit area of land besides maintaining soil fertility by the recycling of by products of crops.

All India Coordinated Research Project on Palms (AICRPP), has been an important contributor to the region's specific coconut research and development effort. Evaluation of coconut based cropping system for their performance in different agro-climatic regions is one of the priority areas of research under AICRP on Palms. At present, in eight coconut centre. CBCS model has been evaluated and suitable inter crops are listed below.

Coconut based cropping system at Ambajipeta

Alpinia galanga

Coconut based cropping system research highlights from AICRP centers

The Coconut based cropping system model Coconut + Cocoa + Banana + Moringa + Pineapple with integrated nutrient management at AICRP Aliyarnagar revealed that the cropping system with 75% NPK + organic recycling with vermicompost recorded highest nut yield of 182 per palm and highest net income (Rs. 3.80 lakhs per ha) and B:C ratio (2.71) compared to monocrop coconut with recommended NPK + FYM which recorded 150

Patchouli as inter crop in coconut

nuts /palm, Rs. 1.31 lakhs / ha and B:C ratio of 2.00 respectively. In this cropping system, the maximum earth worm population in coconut basin (12 no./ m2), cocoa basin (12 no./m2), banana basin (9 no./ m2) improved with vermicompost, vermi wash, green manuring, coir-pith compost and mulching with coconut leaves, similar pattern was observed with Bacteria (65.4 104 CFU/g), Fungi (103 CFU/g), Actinomycetes (16.3 x 105 CFU/g) and least in mono crop with RD NPK + FYM (46.6;10.1;14.2/g soil respectively) .

Studies at AICRP Ambajipeta in CBCS model cocoa + banana + pineapple + tomato + heliconia revealed that the system provided with 75 % recommended NPK + organic recycling with vermicompost recorded maximum nut yield per palm (124.8) compared to mono-crop with recommended NPK + FYM (108 nuts per palm) . The cropping system comprising of coconut + black pepper + nutmeg + cinnamon + banana + pineapple provided with 50% recommended NPK + organic recycling with vermicompost + bio fertilizer and green manuring reported significantly higher yield of nuts per palm (126), Rs. 6.29 lakhs/ha compared to mono-crop of coconut (102 nuts/palm) and Rs. 1.57 lakhs net returns/ha.

A field experiment conducted at Horticultural Research Station, Kahikuchi of Assam Agricultural University revealed the performance of medicinal and aromatic plants grown as intercrops in 32 year old Assam Green Tall coconut garden. There were three medicinal plants viz., sarpagandha (Rauvolfia serpentina), pipali (Piper longum) and vedailota (Paederia foetida) and two aromatic plants viz., citronella (Cymbopogon winterianus) and patchouli (Pogostemon cablin) in the experiment. The yield of all the medicinal and aromatic plants grown as intercrop in coconut garden were found to be reduced compared to their sole crop yields. Intercropping system of growing with patchouli under coconut recorded the highest net income (178,089 ha-1) and B:C ratio (3.26) followed by sarpagandha (157,484 ha-1 and 3.09), pipali (113,118 ha-1 and 2.62), citronella (107,432 ha-1 and 2.40) and vedailota (100,382 ha-1 and 2.36). Hence, intercropping of patchouli, sarpagandha and pipali with coconut was recommended for Assam condition.

Coconut based intercropping and mixed cropping systems have to be promoted for best owing multiple benefits on the farming community. This will enhance the productivity of natural resources, economic viability of coconut farming as well as the food and nutrition security of the nation. Soil health management practices which play a greater role in increasing the soil carbon sequestration needs to be studied in different locations with different cropping systems. ■

Coconut Based Farming System: A Gandhian harmony of diverse crops, livestock and soil microorganisms

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Gandhian philosophies of living

"Unity in diversity is beauty and test of civilization". Harmony, unity and tolerance among diverse human beings had been a hallmark of Gandhian thought; a basis of giving space to all and allowing co-habiting in peace, equality and dignity. On 02nd October 2020, the 150th birth anniversary of Mahatma Gandhi was celebrated in grand manner in India with the objective to adopt his living tenets at this crucial juncture of Covid-19 pandemic and other challenges faced by humanity. Hunger had been one of the favorite subjects of the Mahatma. He had said "There are people in the world so hungry, that God cannot appear to them except in the form of bread". And it is through means producing nutrition and abundant food through agriculture and farming that one can achieve the zero-hunger status along with other strategies. On his 150th birth anniversary, we expand his principles of living of Mahatma Gandhi to agriculture and farming, particularly coconut farming that has great potential to reduce hunger and poverty of many millions.

Coconut palm is inclusive

Coconut palm, called 'KalpaVriksha' is a model crop that allows other crops and livestock to grow in harmony within its interspaces and helps provide livelihood and nutrition to many millions. This is

Fig.3. Coconut-based cocoa farming system

Fig.1. Coconut-based high density cropping system with black pepper, banana, nutmeg/clove and pineapple in border

because; the coconut itself needs wide spacing (7.5m x 7.5m) for its healthy growth. Also because of its typical phenotype of single unbranched stem, rooting pattern (fibrous root system and majority of roots distributed within 25% of the land area leaving 75 % area underutilized), characteristic phyllotaxy of leaves allowing light penetration to the ground, the coconut palm shares its interspaces by allowing different types of crops to grow. In the initial stage of its life, intercropping is well suited and when the palm grows tall and starts bearing, mixed cropping can be adopted.

The coconut-based High Density Multiple Species Cropping System (HDMCS) is a classic model of shared living, where coconut is grown along with black pepper, banana, nutmeg and pineapple along the border (Fig. 1). The special affinity of coconut palm permitting black pepper to put forth roots within its basin region and allow the spice crop vines grow on its trunk (Fig 1) and yield without any negative allelopathic effect, is a wonderful example of peaceful co-existence in harmony that can be followed by all.

Not only crops, Coconut Based Farming System (CBFS), integrated with fodder grass, is combined with livestock such as milch cows, goats, fisheries and poultry (Fig. 2), allows a circular flow of energy within the system and fetches a very high return to the farmers. In many coconut gardens, it can be seen that the cows freely graze the grasses and weeds that grow in interspaces and then are later tried to the trunk to rest and chew on the food eaten by them is another example of peaceful co-existence. Free range birds (hens and ducks) pecking at the insects and other critters in coconut interspaces and laying farm-fresh eggs cannot be ignored for highlighting harmony of plants and birds. The droppings from the cows and birds enrich the soil with natural manure that benefit the ecosystem services while the milk, eggs and meat from them provide protein-rich nutrition to humans and other living beings. Besides annual crops as intercrops, coconut allows other high value perennial crops such as cocoa (Fig. 3) to be grown in one plot. Several other models for different coconut-based farming system such as i) coconut, banana, pineapple, tuber crops and vegetables, ginger and turmeric and ii) coconut + nutmeg, coconut + pepper, coconut + cocoa, coconut + papaya are widely noticed too.

Fig.2. Coconut-based fodder grass integrated with milch cows, goat, poultry and fishery

The coconut based farming system, thus, embodies Mahatma Gandhi's quote on co-existence: "Relationships are based on four principles: respect, understanding, acceptance and appreciation". The palm allows diverse crops to grow within its interspaces by promoting underground harmony in

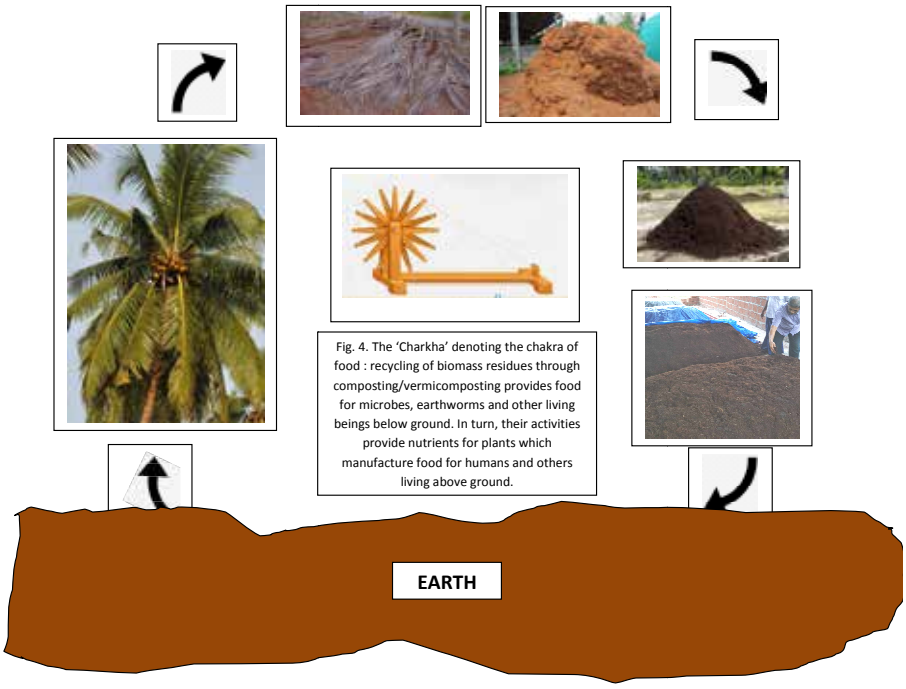


Fig. 4. The 'Charkha' denoting the chakra of food : recycling of biomass residues through composting/vermicomposting provides food for microbes, earthworms and other living beings below ground. In turn, their activities provide nutrients for plants which manufacture food for humans and others living above ground.

terms of root architecture that promotes optimum rather than competitive use of available natural resources such as space, water and nutrients. Above ground, the canopy architecture of coconut palm and each selected intercrop allows optimum exploitation of the solar energy for efficient photosynthesis for production of food for the humans and animals. The system also has enough open ground space for receiving the precipitation and storing the water below ground. The coconut palm respects, understands, accepts and appreciates harmonious living with other crops and animals.

Harmony with nature

Gandhi had quoted "The best way to find yourself is to lose yourself in the service of the others'. Coconut palm is one of the best examples for this quote. The coconut palm serves others through its biomass production. On an average, one hectare of coconut palm generates more than 6-8 tonnes of senescent leaves that can be recycled to good manure by Eudrilus sp. earthworm using CPCRI's coconut leaf vermicomposting technology. The vermicompost, not only returns 50% of nitrogen required for 175 palms grown in one hectare area, but also recalcitrant organic carbon and plant-beneficial microbiome that helps improve the soil health and fertility in an eco-friendly manner. The vermicompost with high organic matter content thus becomes the food for the millions of underground soil microorganisms, earthworms and other subterranean lives, whose activity is central to crop production capacities of the soils. In similar manner, coir-pith, a by-product produced from coir-fibre extraction units can be converted to excellent organic manure using urea-free co-composting technology developed by CPCRI. The application of composted coir-pith also becomes food for the soil microorganisms besides conserving rain water due to its excellent water holding capacity. Thus, even the discards from the coconut palm promote harmony and good growth of the crops, growing above ground, by providing food for the invisible microbes living below ground such as free-living nitrogen fixers, phosphate, zinc, cellulose and silicate solubilizers, siderophore and antibiotic producers, and arbuscular mycorrhizae etc, whose activities recycle the plant-nutrients present in the biomass residues. This is like spinning of the charkha by Mahatma Gandhi, the circular motion of the wheel highlighting the circulation of food to all lives, the unseen microbes below ground and to humans and other living beings above ground (Fig.4). After all, humans or plants or animals or microbes, none can be alive when there is no food, signifying Mahatma's saying "To a man in empty stomach food is God ".

The coconut palm happily provides food for all!

It's truly a 'Tree of life'. ■

Need to empower coconut FPOs to enhance availability of quality seedlings

Representatives of award winning Coconut Producer Federations opined that Farmer Producer Organisations need to be strengthened in coconut sector to enhance availability of quality seedlings through decentralised coconut nurseries. This would greatly help the coconut growers who are exploited by various agencies. Currently many nurseries cheat the farmers by supplying inferior quality seedlings at exorbitant rates. The situation is continuing because of the lack of strict regulatory mechanisms to ensure quality control in coconut nurseries. Representatives of coconut FPOs were giving their feedback in the online function on 8th October 2020 organised by Central Plantation Crops Research Institute (ICAR-CPCRI) in connection with the World Coconut Day.

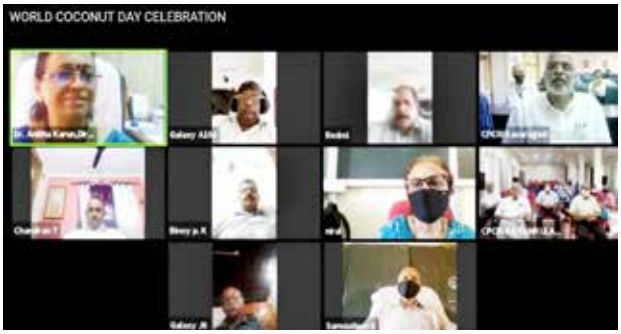
Programme scheduled in connection with World Coconut Day to be held on 2nd September 2020 was postponed to 8th October 2020 due to the demise of former president of India, Dr. Pranab Kumar Mukherjee. The focal theme of World Coconut Day celebration during this year as declared by the 'International Coconut Community', the organisation of coconut producing countries in the world, was 'Invest in coconut to save the world'.

Dr. Anitha Karun, Director, CPCRI inaugurated the programme conducted through video conferencing. In her inaugural address Dr. Anitha Karun reiterated the viewpoint that community nurseries managed by coconut farmer producer organisations is a prudent strategy to enhance availability of quality coconut seedlings.

Awards to the best performing decentralised coconut nurseries managed by Farmer Producer Organisations with the technical support of CPCRI and financial support of State Department of Agriculture Development & Farmers' Welfare was distributed by Dr. Anitha Karun in the online programme.

Cash awards to the winning community coconut nurseries were sponsored by the Coconut Development Board (CDB), Kochi.

Kunnamangalam Federation of Coconut Producers Society from Kozhikode District won the first prize and cash award of Rs 30,000/-, Changaroth Federation of Coconut Producers Society also from Kozhikode District won the second prize and cash



award of Rs20,000/-, and Bharanikkavu panchayat Federation of Coconut Producers Society, from Alappuzha District won the third prize and cash award of Rs 10,000/-.

Shri. Chandran Thiruvalath President of Kunnamangalam Coconut Producer Federation, Sri Rajan Master, President of Changaroth Coconut Producer Federation and Sri Thomas Mathunni, President of Bhranikkavu Coconut Producer Federation presented their experiences of managing decentralised coconut nurseries and gave suggestions for sustaining the activities with more support from state Department of Agriculture and other agencies.

Smt. D. S. Resmi, Assistant Director, Coconut Development Board offered felicitations in the inaugural programme.

Representatives of Bharanikkavu panchayat Federation of Coconut Producers Society who were attending the online function were honoured by Dr S. Kalavathi, Head CPCRI Regional Station, Kayangulam.

Two publications on Coconut Nursery Management and Coconut Plant Protection prepared in Malayalam were released during the inaugural function.

Coconut growers, representatives of Coconut Farmer Producer Organisations and other stakeholders attended the programme through video conferencing. Dr. K. Muralidharan, Head, Division of Social Sciences welcomed the gathering and Dr. Thamban. C., Principal Scientist (Agrl. Extension) and co-ordinator of the programme proposed vote of thanks.

(Report: Dr. Thamban. C, Principal Scientist (Agrl. Extension), ICAR-CPCRI, Kasaragod) ■

Campaign for COVID-19

As a part of intensified campaign to emphasize on Unlock with Precautions and to promote appropriate behavior to contain the spread of COVID 19, Coconut Development Board took part in the Jan Andolan launched by Hon'ble Prime Minister of India. The Campaign commenced with administration of pledge on 12th October 2020

Smt. G.Jayalakshmi IAS, Chairperson, Coconut Development Board, officialns from all Regional Offices, Unit Offices and the Head Office of the Board participated in the ceremony through video conferencing. It was emphasized by the Chairperson that in view of the upcoming festivals and approaching of winter season, public awareness may be created to maintain public health response to COVID-19 to control the spreading of virus.

As part of this campaign, banners and posters were prepared and exhibited in the main entrance of Kerabhavan.

Regional level seminar on coconut cultivation technology

Coconut Development Board, State Centre, Odisha organized one day Webinar on Cultivation Technology on Coconut on 7th October 2020 with 50 CPS farmers of Nimapara block who were connected through video conferencing mode from five locations of Nimapara Block.

Dr.Rajat Kumar Pal, Deputy Director, CDB delivered the welcome address. Dr. K.C. Barik, Dean (Research), OUAT, Dr.S.C.Sahoo, Professor and Officer in Charge, AICRP on Palms, OUAT, Bhubaneswar & Dr. Gobind Ch. Acharya, Head, ICAR-CHES attended the prgramme from CDB, State Centre, Odisha.

Considering the pandemic of COVID-19 all the 50 farmers were connected to the meeting on virtual mode from their respective locations maintaing proper social distancing and obeying COVID-19 protocol.

During the theory session, Dr. S.C. Sahoo, Professor and Officer-in-Charge, AICRP on Palms, OUAT, Bhubaneswar spoke on Scientific coconut cultivation technology like mother palm selection, seed nut selection, nursery management, scientific way of planting, intercultural operations, Integrated Nutrient Management, Integrated Pest Management, and Integrated Disease Management in coconut.

Dr. Gobind Ch. Acharya, Head-CHES spoke on land preparation and planting method of coconut and pest and disease management in coconut.

Dr. Rajat Kumar Pal, Deputy Director, CDB briefed on various schemes of CDB.

The regional level webinar programme helped the farmers in gaining knowledge and farmers raised their queries during the interactive session.

The programme ended with vote of thanks by Smt. Sasmita Pallei, CDB.

Cultivation practices for coconut
November

Irrigation for seedlings

- Seedlings are to be given irrigation either through drip or basin method. If drip irrigation is adopted provide on an average 10 litres of water per seedling per day. Through other methods like basin irrigation 40 litres of water once in four days is sufficient.

Irrigation for adult palms

- Irrigation can be started in coconut gardens, except in localities which receive rain through north east monsoon. Even in localities where rainfall through north east monsoon is not received in adequate quantity (rainless period extending for more than 10 days) irrigation has to be provided to the palms.
- 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. Small pits of 1'x 1' 1' size should be taken 1 m away from the tree trunk at four equidistant points within the basin. The pits are to be filled with coir pith. The drippers/microtubes are to be placed sub surface in these pits through a polythene conduit pipe. The number of dripping points should be six for sandy soils and four for other soil types. 30-45 litres of water per palm per day is to be provided through drip irrigation system.

Drainage

- Ensure adequate drainage facilities in coconut gardens in localities which receive rain through north east monsoon. Depending up on the soil type and water table drainage channels of appropriate size, minimum of 50 cm depth and width, can be taken either manually or mechanically. Drainage channels are to be constructed for every two rows of palms.

Manuring

- Drip fertigation may be started for coconut palms. Water soluble fertilizers like urea and Muriate of potash can be given along with drip irrigation system. For the coconut palms, these fertilizers as per the general recommendation (50% of the recommended dose ie 545 g urea and 1000 g of Muriate of potash per palm per year) can be given in equal splits through monthly fertigation schedule. However, quantity of chemical fertilizers is to be worked out based on soil test results and yield targeted.
- Wherever Boron deficiency is noticed 100 g Borax may be applied in the basin.
- For coconut palms showing yellowing of leaves due to Magnesium deficiency, 0.5 kg of magnesium sulphate can be applied in the basins.

Green manuring

- In regions benefitted by north east monsoon like Tamil Nadu, the green manure plants can be ploughed back in to the interspace of coconut garden if the plants have attained 50 percent flowering. Similarly, green manure plants grown in the coconut basins also can be incorporated into the soil.

Mother palm selection

- Select mother palms for seed nut collection to raise quality planting material.
- In tall varieties, seed nuts should be collected

- from mother palms which should have attained an age of 20 years, yielding constantly more than 80 and 120 nuts per palm per year for rain fed and irrigated conditions respectively with nut weight more than 600 g and copra weight of 150 g and above. Further, the palm should have a minimum of 30 leaves and free of any disease. The trees should have short and strong petioles with wide leaf base firmly attached to the stem. The bunch stalk should be short, stout, strong and should not show any tendency to droop down or buckle. Palms which produce barren nuts or those shedding large number of immature nuts should be discarded. Very old age palms i.e., above 60 years may be avoided and growing in very favourable conditions e.g. trees near manure pits are to be avoided. Palms showing alternate bearing tendency also should be avoided. In dwarf varieties seed nuts can be collected from mother palms which have attained an age of 12 years or more and yielding more than 60 and 100 nuts per year for rain fed and irrigated condition, respectively. Further it should have a minimum of 30 leaves with nut weight more than 400 g.

Nursery management

- Weeding should be done in the nursery.
- Five month old ungerminated nuts and dead sprouts should be removed from the nursery.
- Mulching with coconut leaves or dried grass or live mulch by raising green manure crops can be done in the nursery
- Provide irrigation
- Need based plant protection measures against pests and diseases are to be undertaken. Soil drenching of chlorpyriphos @ 2ml/litre is to be done in the nursery, if termite infestation is observed. Spraying of water on the leaves can be done against white fly infestation in the coconut nursery.

Mulching

- Mulching of palm basins can be undertaken if not done earlier. Fallen dried coconut leaves available in the coconut garden can be used for mulching. In the non traditional areas like Bihar, Madhya Pradesh, Chhattisgarh and North Eastern states, ensure thick mulching in the basin to regulate soil temperature. Irrigation can be started to negate the effect of low temperature in such areas.

Plant protection

Currently, a drastic shift in pest damage level on coconut is being experienced in the event of unprecedented weather vagaries. Gradient outbreak of the invasive rugose spiralling whitefly (*Aleurodicus rugioperculatus* Martin) in Peninsular and North-East India, black headed caterpillar (*Opisina arenosella* Walker) in Karnataka and slug caterpillar (*Darna nararia* Moore) in Andhra Pradesh and Karnataka are classical examples to support this phenomenon. Rhinoceros beetle (*Oryctes rhinoceros* Linn.) and red palm weevil (*Rhynchophorus ferrugineus* Olivier) are cosmopolitan pests recorded predominantly in monsoon and post-monsoon periods in Peninsular India. The most unnoticed and a serious sucking pest observed during North-East monsoon phase is the attack by coreid bug (*Paradasynus rostratus* Distant). At least 2-3 bunches would be affected with complete button shedding leading to barren bunches. Incidence of bud rot disease, nut fall, leaf rot, stem bleeding and Basal Stem Rot/*Ganoderma* wilt also cause damage to coconut. Under the changing weather conditions systematic monitoring is very crucial to

suppress outbreaks of pests and diseases in coconut. Regular observation and monitoring should be done in the coconut garden to identify incidence of pests and diseases and need based and appropriate plant protection measures are to be adopted to avoid crop loss. Recommendations for the management of pests and diseases in coconut for the month of November are furnished below.

Integrated Pest Management

▶ *Rhinoceros beetle*

- Adopt mechanical method of control by extracting beetles with beetle hooks, without causing further injury to the growing point of the palm
- The top most leaf axils may be filled with powdered neem cake/marotti cake (*Hydrocarpus sp/* pongamia) @ 250 g + fine sand (250g) per palm as a prophylactic measure
- Filling the innermost three leaf axils with 4 g each of naphthalene balls covered with sand (12 g/ palm) for juvenile palms
- Placement of two perforated sachets containing chlorantraniliprole a.i. 0.4% (5 g) or fipronil (3 g) or one botanical cake (2 g) developed by ICAR-CPCRI
- Incorporation of the biomass of weed plant *Clerodendron infortunatum* Linn. in the cow dung/ compost pit
- The breeding sites may be treated with green muscardine fungus (*Metarhizium anisopliae*)

▶ *Red Palm Weevil*

- Avoid causing injury to the palms, as they would attract the weevil to lay eggs. Mechanical injury if any, caused should be treated with coal tar
- While cutting fronds, petiole to a length of 120 cm is to be left on the trunk to prevent the entry of weevils into the trunk
- Removal and burning of palm at advanced stage of infestation would aid in destruction of various stages of the pest harboured in the trunk
- Prophylactic leaf axil filling suggested for rhinoceros beetle is very essential as this pest pave way for red palm weevil
- If damage occurs in the crown, the damaged tissue has to be removed and insecticide suspension, imidacloprid (0.02%) @1 ml/L of water may be poured in. In case of entry of weevil through the trunk, the hole in trunk may be plugged with cement/tar and the top most hole is made slanting with the aid of an auger and the insecticide solution is poured through this hole with funnel

▶ *Leaf eating caterpillar*

- Cutting and burning the heavily infested and dried outer most 2 - 3 leaves helps to prevent the spread of the pest.
- Improving soil and infested palm health through balanced dose of chemical fertilizers and organic manures.
- Since a very rich natural enemy fauna is associated with the pest in the field, chemicals are generally not encouraged for management of *O. arenosella.* As this pest is subject to parasitism by a good number of indigenous larval and pupal parasitoids, biological suppression is a feasible and viable approach. Augmentative release of stagespecific parasitoids viz., the larval parasitoids *Goniozus nephantidis* (Bethylidae) @ 20 parasitoids/palm, *Bracon brevicornis* (Braconidae) @ 20 parasitoids/ palm, the prepupal parasitoid, *Elasmus nephantidis* (Elasmidae) @49/100 pre-pupae, and the pupal parasitoid *Brachymeria nosatoi* (Chalcididae) @32/100 pupae at the appropriate time was found effective in the sustainable management of the pest. Combined release of the parasitoids is required in multi-stage prevalence of the pest in the field. Conditioning of parasitoids on larval frass before release enhanced the field level parasitism.

▶ *Eriophyid mite*

- Spraying on the terminal five pollinated coconut bunches with neem oil garlic soap mixture @ 2 per cent concentration (neem oil 200 ml, soap 50 g and garlic 200 g mixed in 10 litres of water)
- or spraying neem formulations containing 1 per cent azadirachtin @ 4 ml per litre of water
- or spraying palm oil (200 ml) and sulphur (5g) emulsion in 800 ml of water
- Root feeding azadirachtin 10,000ppm @ 10 ml + 10 ml water is also effective
- Along with the recommended dose of manures and fertilizers, 5 kg neem cake should be applied

▶ *Coreid bug*

- Spraying of neem oil-soap emulsion (0.5%) on the pollinated bunches. The emulsion can be prepared by adding 5 ml neem oil and 8 g bar soap in one litre water.

▶ *Rugose Spiralling Whitefly*

- No chemical insecticide should be sprayed on

leaves

- Application of 1% starch solution on leaflets to flake out the sooty moulds.
- In severe case, spray neem oil 0.5% and no insecticide is recommended.
- Installation of yellow sticky traps on the palm trunk to trap adult whiteflies.
- Encourage build up of parasitoids (*Encarsia guadeloupae*) and re-introduce parasitized pupae to emerging zones of whitefly outbreak.
- *In situ* habitat conservation of the sooty mould scavenger beetle, *Leiochrinus. nilgirianus.*

Integrated Disease Management

▶ *Bud rot*

- Remove the infected tissues of the spindle completely. Two or three healthy leaves adjacent to the spindle may have to be removed, if necessary, for easy removal of all rotten portions and thorough cleaning. After removing the affected tissues apply 10% Bordeaux paste and cover the wound with a polythene sheet to prevent entry of rain water. The protective covering has to be retained till normal shoot emerges.
- Destroy the infected tissues removed by burning or deep burying in the soil
- Spray 1% Bordeaux mixture to the surrounding palms

▶ *Stem bleeding*

- Avoid burning of trashes near the tree trunk
- Avoid injury to the tree trunk
- The affected tissues should be completely removed using a chisel and smear the wound with 5% hexaconazole (5 ml in 100 ml of water) and drench the basins @ 25 lit. of 0.1% solution
- Smearing paste of talc based formulation of *Trichoderma harzianum* on the bleeding patches on the stem (The paste can be prepared by adding 50 g of *Trichoderma* formulation in 25 ml of water)
- Soil application of *Trichoderma harzianum* enriched neem cake @ 5kg per palm and adopt recommended irrigation/moisture conservation practices.

▶ *Leaf rot*

- Remove rotten portion of the spindle leaf and 2-3 successive leaves and pour fungicide solution containing 2 ml hexaconazole 5 EC in 300 ml water/ palm or talc based formulation of *Pseudomonas fluorescens* or *Bacillus subtilis* @ 50 g in 500 ml water/palm into the well around the base of the spindle leaf
- Undertake prophylactic measures to prevent rhinoceros beetle attack

▶ *Basal Stem Rot/Ganoderma wilt*

- Removal of dead palms, palms in advanced stages of the disease and destruction of the bole and root bits of these palms
- Isolation of diseased palms from healthy palms by digging isolation trenches of 2 feet depth and one feet width around the basin
- Avoiding flood irrigation or ploughing in infected gardens to prevent spread of the inoculum.
- Addition of 50 kg of farmyard manure or green leaves per palm per year.
- Application of *Trichoderma harzianum* enriched neem cake@ 5 kg per palm and irrigating the palm once in 4 days and mulching around the basin
- Raising banana as intercrop wherever irrigation is possible
- Root feeding of hexaconazole @ 2% (100 ml solution per palm) or soil drenching with 0.2% hexaconazole / 1 % Bordeaux mixture @ 40 litre solution per palm. ■

Prepared by : C. Thamban, P. Subramanian, Joseph Rajkumar and S. Jayasekhar, ICAR-Central Plantation Crops Research Institute, Kasaragod

Market Review – September 2020

Domestic Price

Coconut Oil

During the month of September 2020 the price of coconut oil opened at Rs. 17000 per quintal at Kochi and Alappuzha market and Rs. 18500 per quintal at Kozhikode market. The price of coconut oil at these three markets expressed an overall upward trend.

The price of coconut oil closed at Rs. 18300 per quintal at Kochi and Alappuzha market and Rs. 19600 per quintal at Kozhikode market with a net gain of Rs.1300 at Kochi and Alappuzha and Rs.1100 per quintal at Kozhikode market.

The prices of coconut oil at Kangayam market in Tamilnadu, which opened at Rs. 14667 per quintal, closed at Rs.16867 with a net gain of Rs. 2200 per quintal.

Weekly price of coconut oil at major markets Rs/Quintal)				
	Kochi	Alappuzha	Kozhikode	Kangayam
01.09.2020	17000	17000	18500	14667
05.09.2020	17010	17100	18700	15000
12.09.2020	17400	17400	18800	15333
19.09.2020	17700	17700	19100	16333
26.09.2020	18300	18300	19600	17000
30.09.2020	18300	18300	19600	16867

Milling copra

During the month, the price of milling copra opened at Rs.11100 per quintal at Kochi, Rs.11050 per quintal at Alappuzha market and Rs. 11800 per quintal at Kozhikode market. The price of copra at Kochi, Alappuzha and Kozhikode market expressed an overall upward trend during the month.

The prices closed at Rs.12400 per quintal at Kochi market and Rs.12350 per quintal at Alappuzha market Rs. 12500 per quintal at Kozhikode market with a net gain of Rs.1300, Rs.1300 and Rs.700 per quintal respectively.

Weekly price of Milling Copra at major markets (Rs/Quintal)				
	Kochi	Alappuzha (Rasi Copra)	Kozhikode	Kan-gayam
01.09.2020	11100	11050	11800	9800
05.09.2020	11200	11150	11900	10000
12.09.2020	11500	11450	11950	10200
18.09.2020	11800	11750	12200	11000
26.09.2020	12400	12350	12600	11300
30.09.2020	12400	12350	12500	11000

Edible copra

The price of Rajpur copra at Kozhikode market opened at Rs. 11800 per quintal expressed an upward trend during the month and closed at Rs.14000 per quintal with a net gain of Rs.2200 per quintal.

Weekly price of edible copra at Kozhikode market (Rs/Quintal)	
01.09.2020	11800
05.09.2020	11800
12.09.2020	11900
19.09.2020	12300
26.09.2020	13800
30.09.2020	14000

Ball copra

The price of ball copra at Tiptur market which opened at Rs.10100 per quintal expressed an upward trend and closed at Rs.11500 per quintal with a net gain of Rs.1400 per quintal during the month.

Weekly price of Ball copra at major markets in Karnataka (Rs/Quintal)	
01.09.2020	10100
05.09.2020	10000
12.09.2020	10000
19.09.2020	10300
26.09.2020	11000
30.09.2020	11500

*NR-Not reported *NQ - Not Quoted * NT - Not Traded

Dry coconut

At Kozhikode market, the price of dry coconut opened at Rs.13500 per quintal and expressed an overall upward trend during the month. The prices closed at Rs.13900 per quintal with a net gain of Rs.400 per quintal during the month.

Weekly price of Dry Coconut at Kozhikode market (Rs/ Quintal)	
01.09.2020	13500
05.09.2020	13500
12.09.2020	13400
19.09.2020	13700
26.09.2020	13900
30.09.2020	13900

Coconut

At Nedumangad market in Kerala, the price of coconut opened at Rs.16000 per thousand nuts and closed at Rs. 17000 during the month with a net gain of Rs 1000 per thousand nuts.

At Pollachi market in Tamil Nadu, the price of coconut opened at Rs.14000 per thousand nuts and closed at Rs. 17000 during the month with a net gain of Rs 3000 per thousand nuts.

The price of partially dehusked coconut was not reported from Mangalore market during the period from 1st to 19th September 2020. The price of partially dehusked coconut at Mangalore market opened at Rs. 28000 per quintal on 26.09.2020 and closed at Rs. 28000 per quintal respectively.

Weekly price of coconut at major markets (Rs /1000 coconuts)				
	Neduman-gad	Pollachi	Banglore	Mangalore (Grade -1)
01.09.2020	16000	NR	NR	NR
05.09.2020	16000	14000	NR	NR
12.09.2020	16000	15000	13000	NR
19.09.2020	17000	15000	11500	NR
26.09.2020	17000	16000	NR	28000
30.09.2020	17000	17000	NR	28000

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*
05.09.2020	155	176	290	437
12.09.2020	155	180	NQ	457
19.09.2020	155	183	NQ	464
26.09.2020	155	194	NQ	505
				*Pollachi market

Coconut Oil

International price as well as the domestic price of coconut oil in Philippines expressed an upward trend during the month.

The domestic price of coconut oil in Indonesia expressed a downward trend during the month.

The price of coconut oil quoted 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/Indone-sia (CIF Europe)	Philip-pines	Indo-nesia	Sri lanka	India*
05.09.2020	1024	964	960	2349	2046
12.09.2020	1009	960	960	NQ	2091
19.09.2020	1041	965	950	NQ	2228
26.09.2020	1060	980	955	NQ	2319
					* Kangayam

Copra

The domestic price of copra in Philippines and India expressed an overall upward trend and Indonesia expressed a mixed trend during the month. The price of copra quoted at different domestic markets are given below.

Weekly International price of copra in major copra producing countries				
Date	Domestic Price (US$/MT)			
	Philippines	Indonesia	Srilanka	India* * Kangayam
05.09.2020	624	617	1369	1364
12.09.2020	627	592	NQ	1392
19.09.2020	635	620	NQ	1501
26.09.2020	643	590	NQ	1542