Index

From the desk of Chairman

Dear Coconut farmers,

Coconut is a crop that promotes other intercrops. As a monocrop, coconut utilizes 25% of the soil and 30% of sunlight. The active root zone of coconut is confined to 25 per cent of the available land area and the remaining area can be profitably used for raising subsidiary crops. In addition, coconut as a monocrop provides employment only for about 135 man days/ha and consequently the family labour remains unemployed for larger parts of the year. Hence coconut gardens are ideal for adopting Coconut Based Farming System (CBFS) with inter/mixed cropping. In a CBFS, coconut trees are planted as base crops and all the other crops are intercropped using the vertical and horizontal spaces between coconut trees. A high efficiency in the use of available soil moisture and nutrients can be achieved by growing intercrops outside 2m radius around the base of palms. CBFS, involving cultivation of compatible crops in the interspaces of coconut offer considerable scope for increasing production and productivity per unit area, time and inputs by more efficient utilization of resources like sunlight, soil, water and labour.

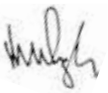
Studies conducted at CPCRI and elsewhere indicated that CBFS approach is the best adaptation strategy to overcome the effect of climate change. Coconut plantations can also be used to mitigate climate change which is an environment service by absorbing CO_2 from the atmosphere and control global warming while giving additional income to the growers. Coconut farming systems have dramatic powers to stabilize eroding farmland, especially in sloping lands.

Coconut is a crop which comes up well in the agro climatic zones of North Eastern states where there is lot of untapped potential for coconut cultivation. Waste lands available in the North Eastern States can be converted to coconut gardens along with intercrops and thereby can increase the income of farmers from unit area. Coconut Development Board is promoting CBFS under the scheme, integrated farming in coconut holdings for productivity improvement and establishment of coconut orchards along with intercrops in tribal areas by extending financial and technical support. This will generate employment opportunity, income from unit area and rural prosperity particularly to the tribal community. Under the scheme, integrated farming for productivity improvement, Coconut Development Board is extending financial assistance and technical support for demonstrating scientific management practices including coconut based farming system. Coconut gardens can be established by tribal populations of North Eastern states and the disturbed areas of Jharkhand and Chhattisgarh. Tribal areas in a block consisting of 25 to 50 farmers will be planted with coconut initially engaging beneficiaries as wage earners. They will also be linked with MGNREGS and Tribal Sub-plan (TSP) Schemes. Technical support will be extended by the Board for taking up coconut planting and management for establishment of coconut orchard by the farmers.

I request all farmers to sincerely utilize the facilities offered by the Board under these schemes for the development of coconut based farming system and to improve the quality of the environment.

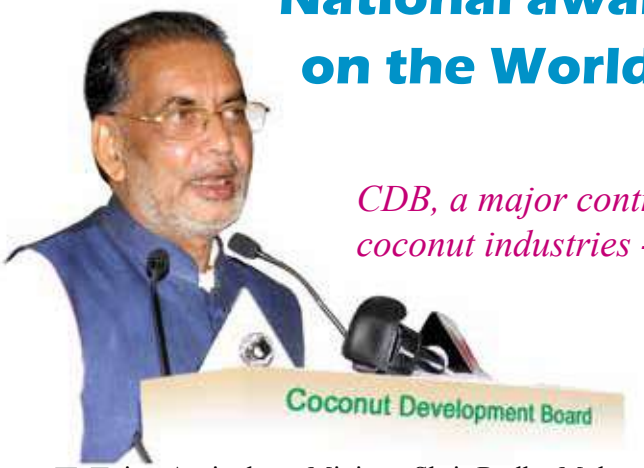
With warm regards,

A K Singh



Chairman

National awards distributed on the World Coconut Day



CDB, a major contributor of the achievement in coconut industries - Radha Mohan Singh

Union Agriculture Minister Shri. Radha Mohan Singh said that the Coconut Development Board has a major contribution towards the achievements made in coconut industry in the country. Coconut farmers can be lead towards prosperity only through value addition. For accelerating value addition in coconut sector, Coconut Development Board through the Technology Mission on Coconut programme is extending financial assistance to coconut based entrepreneurs. 402 coconut processing units having the capacity to process 242 crore coconut per year are established in the country. Shri.Radha Mohan Singh was delivering the inaugural address at the World Coconut Day Celebrations organized by Coconut Development Board on 2nd September 2016 at Bhubaneswar, Odisha. The Minister also distributed the National Awards instituted by the Board.

The Hon'ble Minister in his inaugural address stressed on the new initiatives of Coconut Development Board. 9272 Coconut Producer Societies, 716 Coconut Producer Federations and 65 Coconut Producer Companies are formed across the country. He hoped that through these Farmer Producer Organizations, Board's plan would be operationalized in processing, marketing and export of coconut products. The skill development programmes of coconut sector,viz,Friends of Coconut Tree and Neera Technician Training Program are the other commendable efforts of the Board. Under the scheme, training is already given to 52,000 unemployed youths to undertake harvesting and plant protection operations and 2805 persons are trained as Neera Technicians.

The Minister said that India is the global leader in coconut production and productivity. India's annual coconut productivity per hectare is 10,345. The contribution of coconut to the country's GDP is around

Shri. Radha Mohan Singh, Union Agriculture Minister inaugurating the programme.

Rs. 20,000 crore. Coconut products worth value of Rs. 1450 crore have been exported from the country during 2015-16. He also said that over one crore people in our country are dependent on coconut crop for their livelihood.

The National Horticulture Mission is operational in Odisha under the Integrated Development of Horticulture Mission (MIDH). The main objective of the mission is to promote the overall development of bamboo and coconut plantation sector through area based regional strategies. Govt. of India has alloted Rs. 54.45 crore for 2015-16 and Rs. 26.83 crore for 2016-17 for the Horticulture Mission in Odisha. The Minister hoped that this year the entire amount received from Govt. of India would be spent by the state's Horticulture Mission. He called upon the farmers to utilize a portion of the mission's budget for post-harvest infrastructure management, especially to build the cold supply chain and to link farmers' produces directly to market. In the last 2 years, National Horticulture Board has provided assistance

A view of the World Coconut Day celebration. Seen are (from left) Dr. P. Chawdappa, Director, CPCRI, Dr. A.K.Singh, Chairman, CDB, Shri. S.K. Pattanayak IAS, Secretary, Agriculture, Shri. Dharmendra Pradhan, Union Minister of State for Petrolium and Natural Gas, Shri. Raju Narayana Swamy, Secretary Agriculture, Kerala & Member, CDB and Shri. Johar Khan, Member CDB.

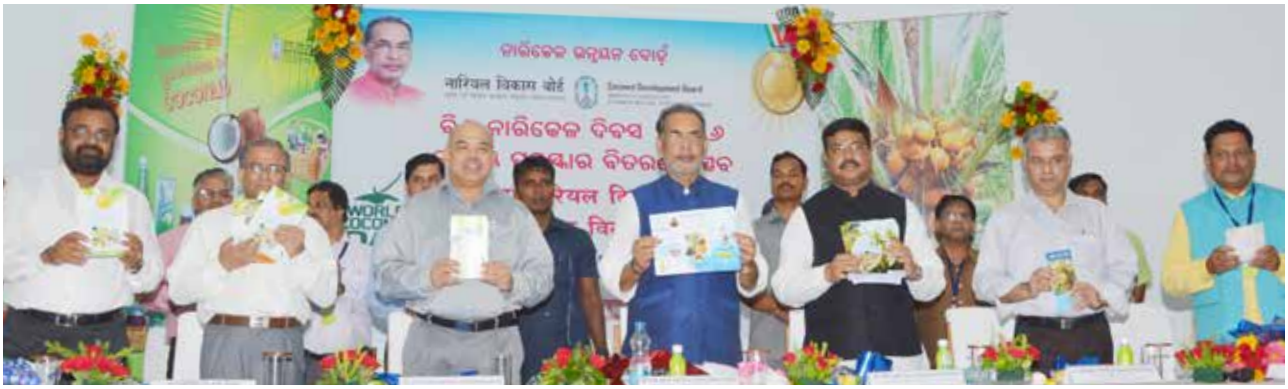
Shri. Dharmendra Pradhan, Union Minister of State for Petrolium and Natural Gas

Shri. S.K. Pattanayak IAS, Secretary, Agriculture

of Rs. 6.50 crore to develop horticulture in the state, which includes greenhouse, poly house, cold storage etc. Several cashew promotion units have been established in Odisha's Koraput and Gunjm district. At the same time, assistance for the development of quality plant to create modern nursery seedlings has been provided. National Horticulture Board has recently organized a pan-India Horticulture Association (Horti Sangam), in Bargarh district of Odisha state participated by farmers from different states with their quality products, who had received assistance from National Horticulture Board and lakhs of farmers have visited the Horti Sangam and expressed their interest in agricultural technology and in various government schemes. Coconut is a major crop of Odisha state and the crop is cultivated in 50679 hectares and coconut production of the state is 32.4 crore.

The Minister further spoke on the health benefits of coconut. The medium chain fatty acids in coconut oil protect human body from deadly germs and is safe for our heart and the virgin coconut oil prevents premature ageing. In researches, coconut oil has been found beneficial in preventing diabetes, cancer and Alzheimers disease. Speaking about the efforts of the central government for the betterment of coconut farmers, Agriculture Minister said that the minimum support price of milling copra has been increased from Rs. 5550 to Rs. 5950 for milling copra and from Rs. 5830 to Rs. 6240 for edible copra for the season 2016. Government has also increased the import duty of crude palm oil from 7.5% to 12.5% and from 15% to 20% for RBD palm oil which is expected to increase the price of palm oil in the domestic market which in turn will increase the demand for coconut oil. Moreover, the central government's new foreign trade policy for 2015-20 aims at promoting the export of coconut products. The export of coconut products is likely to rise in the future since the price is becoming extremely competitive. From the beginning of this financial year, India, Malaysia, Indonesia and Sri Lanka are exporting coconut oil, whereas in the previous years coconut oil was being imported from these countries. Desiccated coconut export to US and Europe in large quantities is also being done from India for the first time.

The Minister congratulated the national award winners of Coconut Development Board. He hoped that the awards will speed up the progress and development of coconut sector and coconut farmers will get inspiration



Release of CDB publications.

Dr. A.K.Singh, Chairman, CDB

Shri. Raju Narayana Swamy, Secretary Agriculture, Kerala & Member, CDB

Dr. T.I Mathewkutty, Director, CDB.

and better income from farming. The Minister concluded that India will become the world leader not only in production and productivity of coconut, but also in export and processing of coconut and in the health sector.

Union Minister of State for Petrolium and Natural Gas, Shri. Dharmendra Pradhan who spoke on the occasion urged farmers, entrepreneurs and policy makers to tap the potential of opportunities of coconut sector in Odisha. The Minister assured to extend the assistance of the central government to the state, if the state attempt to explore the possibility of using coconut waste products in biofuel production and in establishing such industries.

Dr. A K Singh, Chairman, Coconut Development Board delivered the welcome address and Dr. T I Mathewkutty, Director, CDB proposed a vote of thanks.

Shri. S K Pattanayak IAS, Secretary, Agriculture, Department of Agriculture & Co operation and Shri. Raju Narayana Swamy, Secretary Agriculture & Member, CDB spoke during the occasion.

Hon'ble Union Minister for Agriculture distributed the national award of Coconut Development Board. 14 persons/organizations excelled in various fields received the awards from the Minister. Special issue of Indian Coconut Journal, Bharathiya Naariyal Patrika and leaflets on coconut were released during the occasion.

Inaugural session was followed by a technical session wherein technical experts spoke on coconut cultivation technology, integrated management of pests and diseases and Technology Mission on Coconut. Dr. P Chowdappa, Director, CPCRI chaired the session and Dr. G R Singh, Chief Coconut Development Officer co chaired the session.Dr. G C Acharya, Principal Scientist,IIHR, Dr.S C Sahoo, Associate Professor, OUAT and Shri. Sardar Singh Choyal, Deputy Director, CDB were the technical experts of the session. Shri. R. Jnanadevan, Deputy Director, CDB proposed a vote of thanks. The award winners and farmers interacted during the session. An exhibition showcasing various coconut based products was held as part of the programme. Around 300 farmers from across the country took part in the programme. ■

World Ccoconut Day celebration of Coconut Development Board held on 2nd September 2016 at KIIT Campus, Odisha.


ART CRAFTS


DEMONSTRATION OF
COIR PITH COMPOSTING

A view of the technical session

Dr. P. Chawdappa, Director, CPCRI

Dr. G. C. Acharya, CPCRI

Dr. M.C. Sahoo, OUAT

Shri. Sardar Singh Choyal, CDB

Shri. R. Jnanadevan, CDB

A view of the audience

The CDB Awardees

Shri. Dominic M M from Kozhikode, Kerala received the national award for the the best coconut farmer from Shri. Radha Mohan Singh, the Hon'ble Minister for Agriculture, Govt. of India. Shri. James Jacob from Mysore, Karnataka received the award for the best coconut farmer, south west region and Shri. Pranaya Kumar Maharathy, Puri, Odisha received the award for the best coconut farmer north & north east region. M/s. Anthiyoor Coconut Producer Society, Thiruvananthapuram received the award for the best coconut conventional products and M/s.Vittal Agro Industries, Kanhangad, Kerala received the award for the best coconut processor, non conventional products.

Dr. C Mohankumar, SCMS institute of Bioscience & Biotechnology Research & Development, Kochi was the recipient of the Best Research Worker, award under Product Development and Dr. U. Jaikumaran & team, Agricultural Research Station, Kerala Agricultural University are the recipient of the Best Research Worker, award under Machinery Development. Shri. S. Jeya Cruz from, Kanyakumari received the award for the best master craftsman small scale and Shri. Sudhi Kumar S from Thiruvanathapuram received the award for the best master craftsman under large scale category. M/s. United Carbon Solutions Pvt. Ltd from Kangeyam received the award for the best exporter of coconut products. Shri. Muraleedharan Thazhakkara, Senior Programme Executive, All India Radio, Thiruvanthapuram recieved the award for the best extension worker. Shri. Steephen D from Thiruvananthapuram, Kerala is the recepient of the award for the best plam climber under FoCT category and Shri. Praveen P from Quilon, Kerala is the recepient of the award for the best neera technician. Kerasuraksha Federation of Coconut Producers Societies from Malappuram bagged the award for the Best Coconut Producers Federation. ■

Dominic M.M - Best Coconut Farmer (National)

Shri. Dominic M.M, from Kozhikode district owns nine acres of land of which seven acres are planted with 325 WCT coconut varieties and 25 TxD varieties. The average annual yield is 70,000 nuts. Shri. Dominic has adopted coconut based multi storied cropping system with various intercrops like nutmeg, pepper, clove, cocoa, banana, tuber crops like colocasia, yams, vegetables, fodder grass, various fruit plants, ornamental plants like anthurium, tree crops like teak, mahagony, wild jack, jack fruit and animal husbandry which includes goat rearing, poultry, kennel, love birds etc.

Shri. Dominic has adopted organic farming methods in his garden. The technologies introduced for sustaining the production of different crop combinations include efficient recycling of organic wastes, proper mulching and water conservation, controlled weeding and regulated use of on-farm generated microbial cultures, cattle manure, vermin compost etc. The farm yard manure, poultry manure, biogas slurry, vermin compost, groundnut cake, neem cake, green manure and tea waste are used as organic manure for maintaining the soil fertility.

Shri.Dominic is having a biogas unit. Good quality planting materials are produced in the farm. As part of mechanization of the farm, he uses tree cutting machines, palm climbing machine, power sprayers etc.Shri. Dominic the is the recepient of Kera Kersari Award 2011 and Karshakothama Award 2014-15.

James Jacob - Best Coconut Farmer (South West Region)

Shri. James Jacob, an innovative farmer from Mysore, Karnataka, is cultivating 2500 palms in his 15 hectare land. The annual average yield of his farm is 2, 60,000 nuts. Shri. James has adopted coconut based inter/ mixed cropping system with various crops like cocoa, banana, drumstick, lemon, chilly, passion fruit, guava, sapota, custard apple, mango, jackfruit. Parthenium and glyricidia are cultivated as as mulch crop in the garden. Drip method of irrigation is adopted in the garden. He is carrying out farm level processing and marketing. Shri. James Jacob is practicing zero budget natural farming of Shri. Subash Palekar for the last five years

Pranaya Kumar Maharathy - Best Coconut Farmer (North & North East Region)

Shri.Pranaya Kumar Maharathy from Odisha belongs to an ancient agrarian family. After taking his graduation in Political Science he ventured into farming. He started a 13 acre coconut farm in Nimapara in 1994 with an investment of Rs.20, 000.

Shri.Pranaya Kumar is having 420 bearing coconut palms and is getting 120-180 nuts/palm/year. Nearly 50,000 nuts are being harvested from his farm annually. Canals and two bore wells are utilized as water source for irrigation. He is cultivating intercrops like mango, sapota, banana, guava, arecanut and vegetables in his coconut farm. Pranayakumar Maharathy is also having a cattle farm attached to his coconut farm. He is having pisciculture in five acre and is getting around 10 tonne fish per year.

Shri.Pranaya Kumar is running a poultry farm in his land which spreads over one acre. He is selling nearly 52,000 broilers per year. The annual income of Pranaya Kumar is around 20 lakhs.

M/s. Anthiyoor Coconut Producer Society - Coconut Processor (Conventional Products)

M/s. Anthiyoor Coconut Producer Society was formed in 2011 in Thiruvananthapuram district, Kerala. The society is a registered body and is undertaking promotional activities on coconut farming which includes value addition and production of diversified products under hygienic conditions. Virgin coconut oil, coconut soft drink concentrate, coconut pickle, chutney, theeyal mix, kuruma mix, coconut oil, laddu, bindiya and ginger curry mix are some of the products being manufactured by the unit. The Society regularly participates in various exhibitions. Anthiyoor CPS was the recipient of Best Performing Unit Award of ATMA. The Society is giving training to farmers in the manufacturing of value added products.

M/s Vittal Agro Industries - Coconut Processor (Non Conventional Products)

M/s Vittal Agro Industries located in Kasargod district, in the northern tip of Kerala in India was established in the year 2007 as a partnership firm. Vittal is having a manufacturing plant to process one lakh coconuts per day and is following strict quality standards. Vittal Agro Industries is also having an in house testing lab where routine microbiological, chemical and physical analysis is performed as per internationally accepted standards. The company has provided employment opportunity to 200 skilled workers.

The unit has adopted the latest technology and installed equipments to deliver the best quality desiccated coconut powder. M/s. Vittal is the first ISO 22000:2005 FSMS certified desiccated coconut manufacturer in the country and supplies premium quality coconut powder in both the domestic and international markets. Mr. H. Satish Kamath, Mr. H. Gokuldas Kamath, Mr. H. Santhosh Kamath, Mr.H. Ganesh Kamath and Mr. H. Guruprasad Kamath are the partners of the unit.

M/s. United Carbon Solutions Private Ltd - Best Best Exporter of Coconut Product (Large scale)

M/s. United Carbon Solutions Private Ltd (UCSPL), Tirupur, Tamil Nadu is one of the largest manufacturers and exporters of coconut shell based activated carbon from India. UCSPL is the only activated carbon manufacturer who produces 100% of their charcoal in an environmental friendly way. United Carbon Solutions Pvt Ltd has more than 15 years of experience in manufacturing coconut-shell based activated carbon. UCSPL's activated carbon filters have been effectively used worldwide to adsorb organic compounds from contaminated water and air stream. The company is currently exporting its products to US, South Africa, Japan, and Korea. UCSPL is an ISO 9001 and NSF 61 certified company. UCSPL's activated carbon factory situated in Kangeyam in India has the capacity to generate 6500 MT activated carbon per annum.

Kerasuraksha Federation of Coconut Producers Societies - Best Coconut Producers Federation

Kerasuraksha Federation of Coconut Producers Societies from Malappuram district in Kerala lies in an area of 634 hectares with 1,16,782 palms under its operational area. The Federation is having 24 Coconut Producer Societies as members. The CPF has given training to 220 Friends of Coconut Trees and has implemented R & R scheme and LoDP progarmmes of the Board in areas under its jurisdiction. Kerasuraksha CPF is having a copra dryer unit, tender coconut parlour and coconut nursery. Value added products like virgin coconut oil, chutney powder, coconut pudding etc are being produced by the women's micro group under the Federation.

Muraleedharan Thazhakara - Best Extension Worker

Shri.Muraleedharan Thazhakara, a graduate in Agricultural Science and Post Graduate Diploma holder in Journalism is working as Sr. Programme Executive in Agriculture and Rural Development Section of All India Radio, Thiruvananthapuram. He is providing constant support for agricultural initiatives across the state by taking the lead in broadcasting various agricultural programmes and has interviewed more than 1000 successful farmers and agricultural entrepreneurs.

Apart from audio medium, he has been disseminating knowledge on farming and rural development through his publications in various journals and newspapers. He has published eight books on traditional agricultural practices of Kerala, environment conservation through traditional knowledge and contribution of agriculture to culture and language. He is the recipient of Akashvani's National Award for Best Agricultural Programme, Kerala Government's Best Farm Journalist Award, Kerala Sangeet Natak Academy's Gurupooja Award, Kerala Governments B.R. Ambedkar Award and State Governments Harithamudhra Award for Best Farm Journalist. Shri.Muraleedharan Thazhakkara is a promoter of diverse activities of Coconut Development Board among the coconut farmers, especially in Kerala through the Farm and Home programme of All India Radio.

Dr. C.Mohankumar - Best Research Worker (Product Development)

Dr.C.Mohankumar is the Director of SCMS Institute of Bioscience & Biotechnology, Research & Development, Kochi since 2007. His main research areas are: post harvest processing of oleaginous crops, oil palm and coconut, enzyme mediated pathways of cell metabolism at molecular level and production of transgenic crops. Dr.Mohankumar has undertaken several sponsored research projects in processing technologies, Biochemistry and molecular biology. He was the recipient of excellence award in Biotechnology and Bioscience twice and has more than 50 research publications and 6 patents (Indian, US and Australian). The technology and products developed by him are; (1) Coconut Neera Technology a hygienic harvesting and processing technology developed for the production of a perfect health drink with a shelf life of three months at room temperature without fermentation. (2) Tender coconut cream technology a processing protocol for the development of delicious low fat tender coconut cream. (3) KeraNutrivita a complete nutrient rich food from the haustorium of germinating coconut by a novel processing protocol. (4) Coconut Biofuel, an eco-friendly coconut biofuel from coconut. Dr.Mohankumar has formulated an integrated approach of producing coconut bio fuel from mature coconuts. A protocol for enriching mature coconut water as a vital drink compared to tender coconut water is also standardized by him.

Dr. U. Jaikumaran - Best Research Worker (Machinery / Equipment Development)

Dr. U. Jaikumaran, and team from Agricultural Research Station, Mannuthy has contributed mostly in agricultural mechanization extension services. Dr.Shyla Joseph, Associate Professor, C.Unnikrishnan, R &D Co-ordinator of FSA and C.J. Joseph, Technical Supervisor are the team members. The team has developed a modified sitting type coconut climbing device and a tiller which can open up a basin around palms. The modified climbing device consists of two units: upper and lower unit. It is made of mild steel and weights 8.5 kg. In the modified model, girth adjustment can be done while climbing palm. The total time taken by the operator to climb a 12 m height palm using this device is 3.16 minutes. The device can be easily operated by any unskilled person and safety of the operator is assured during climbing. The tiller to open up the basin around coconut palm is another improvisation by this team. The machinery with its two/ three rotations open a basin of 1.8 m radius around the palm in 10 minutes. The team has also conceptualized the Food Security Army for motivating and bringing more and more youngsters to farming sector. This concept was institutionalized and implemented in Kerala Agricultural University. Around 4660 persons are trained as Food Security Army.

Sudhi Kumar - Best Master Craftsman (Large scale)

Shri.Sudhi Kumar S, an artisan from Thiruvanathapuram, Kerala is designing various handicraft items from coconut husk, wood, shell and inflorescence. His annual turnover is Rs. 5, 48,000. Sudhi Kumar is conducting demonstration in manufacturing of various coconut based handicraft items. Shri.Sudhi kumar is the recipient of Best Craftsman award from Department of Agriculture, Kerala and Grama Panchayath award in 2012 & 13. Shri. Sudhikumar regularly participates in India International Trade Fair and various agricultural exhibitions.

S. Jeya Cruz - Best Master Craftsman (Small scale)

Shri. S. Jeya Cruz (54), is an accomplished master craft person engaged in the manufacture of coconut based handicrafts. Coconut shell jewellery is a unique craft developed by him. He is utilizing modern techniques, tools & equipments in designing coconut shell craft by keeping its traditional values and aesthetic sense. A variety of utility items from coconut shell are also manufactured by him. He has imparted training to many persons with the financial assistance of the Office of the Development Commissioner (Handicrafts), Govt. of India & District Rural Development Agency, Nagercoil. Shri.Jeya Cruz is the recipient of Tamil Nadu state award in 2000, Chalbengar award in 2004 and Kalesri award in 2006 for his outstanding craftsmanship in coconut shell jewellery designing.

Steephen D Malamchuttu, Best Palm Climber (FOCT)

Shri.Steephen D Malamchuttu (35), a native of Parasuvaikal of Thiruvananthapuram district has attended Board's FOCT training, hybridization training and neera technician training programme. This traditional climber started using palm climbing device after attending the FoCT training programme. He climbs 65 trees per day and his average monthly income is Rs. 25,000. He is undertaking the plant protection activities as well. Shri.Steephen is a master trainer of FOCT programme.

Praveen P - Best Palm Climber (Neera Technician)

Shri. Praveen P (35), from Kollam district, Kerala is extracting neera from 15 palms per day and earns a daily income of Rs.2000. He attended Neera technician training programme organized by Kaipuzha Coconut Producer Company Limited with the support of Coconut Development Board.

CDB, Vijayawada celebrated World Coconut Day

Coconut Development Board, Vijayawada organized the World Coconut Day-2016 Celebration on 2nd September at Tadepalligudem, West Godavari district in association with Department of Horticulture, Andhra Pradesh, Dr. Y.S. R. Horticultural University & M/s Sri Ramakrishna CPC. Shri. Chiranjiv Choudhary IFS, Commissioner of Horticulture, AP was the chief guest of the programme. In his inaugural address, Shri. Chiranjiv Choudhary, IFS emphasized the need for more targeted efforts by the CPCs in commencing value addition so that farmers will get remunerative price. He conveyed the whole hearted support of the Department of Horticulture in all future ventures of FPOs. Dr. B. M. C. Reddy, Vice Chancellor, Dr. Y.S.R. Horticultural University, presided over the meeting. He advised the FPOs to go for processing & marketing to overcome the crisis of price crash. The issue of Bharathiya Kobbari Pathrika was released by Dr. B. M. C. Reddy. Chairmen of various CPCs addressed the farmers. Shri. Bonam Nageswara Rao, Board Member, Dr. Y.S.R. Horticultural University also spoke during the occasion. Shri. R Jayanath, DD i/c delivered the welcome address. Inaugural session was followed by a technical session. Dr. N.B.V. Chalapathi Rao, Senior Scientist (Entomology), HRS, Ambajipeta made a detailed presentation on coconut pest, diseases and its management practices. Shri. Shankar Narayan, Manager, spoke on Coconut Palm Insurance Scheme-Application Procedures and Mode of Implementation. More than 450 farmers representing various FPOs, Senior officials from Department of Horticulture & Senior Scientists from Dr. Y. S. R Horticultural University attended the meeting. Shri. Ch. A. R. K. Varma, Chairman, M/s Sri Ramakrishna CPC, WG proposed a vote of thanks.

An exhibition was arranged as part of the programme. CDB, State Centre, AP displayed various posters on FPO, FoCT & Neera Technician training and coconut value added products. Coconut based food products, handicrafts, Neera products like neera chocolates, biscuits, jaggery, honey, squash etc, seedlings and bunches of coconut varieties like COD, MYD, Gangabondam, ECT, CGD & DxT were also displayed.

Technology Mission on Coconut- an overview

● **Dr. G R Singh**, Chief Coconut Development Officer & **Mridula K,** Technical Officer, CDB, Kochi-11

Government of India has been treating coconut as an oil seed of tree origin and has been fixing Minimum Support Price (MSP) since 1986 to protect the interest of coconut growers. Consequent on the globalization of the Indian economy, the coconut industry has been facing various problems due to the liberalized import of cheaper substitute oils and also due to the sudden outbreak of various pests and diseases and resultant problems. In this context, the Government of India launched Technology Mission on Coconut to make coconut cultivation and industry globally competitive and to ensure reasonable returns to the farmers.

The goals of the Mission are to establish convergence and synergy among ongoing programmes to bring in vertical and horizontal integration, to ensure adequate, appropriate, timely and concurrent attention to all the links in production, processing, product diversification and consumption chain, to maximize economic, ecological and social benefits from existing investment and infrastructure and to promote economically desirable diversification and value addition to generate skillful employment and to disseminate technologies using participatory approach through demonstration and promotion to address the gaps in a mission mode.

Coconut Development Board is implementing this Central Sector Scheme, Technology Mission on Coconut since 2001-02 as part of the ongoing programmes for the integrated development of coconut industry in India and to address serious problems faced by the coconut industry in a strategic manner. The objectives of the scheme are development of new value added coconut products and by-products by research, bring these value added product to commercial production by assistance to promising entrepreneurs adopting these technologies, providing assistance for controlling of specific disease/pest in any specific area including development of technology for controlling of such diseases/pests to ensure undisrupted supply of raw materials to the coconut industry for the production of value added products and by-products and developing and promoting market for such newly developed value added products and by-products including traditional products (ball copra, copra and oil) by research, surveys and brand promotion.

The Mission aims at diverting the use of raw coconuts (mature/tender) from traditional products (ball copra, copra and oil) to new value added coconut products so that these new value added coconut products could compete with the traditional products (ball copra, copra and oil) in controlling and stabilizing the prices of raw coconuts (mature/tender) for providing the competitive and remunerative prices to the farmers.

Development and adoption of technologies for processing and product diversification

The programme includes development of new products through research, import of technology, their demonstration and support to industry. Technology can be developed through any institute having capability in both public and private sectors. For development of technologies, 100% of the project cost limited to Rs.75 lakhs for Government institutions and co-operative societies and 75% of the project cost limited to Rs.35 lakhs for NGOs, individual entrepreneurs and other private research organizations will be provided by the Board. For acquisition, training and demonstration of technologies, 100% of the project cost limited to Rs 25 lakhs for all Government institutions and co-operative societies and 50% of the project cost limited to Rs 10.00 lakhs for NGOs, individual entrepreneurs and other organizations will be extended and for adoption of technologies back-ended credit capital subsidy limited to 25% of the project cost not exceeding Rs.50 lakhs for NGOs, individual entrepreneurs and other organizations would be provided by the Board.

Market Promotion

Under TMOC, financial assistance is extended to the tune of 100% of the cost limited to Rs.25.00 lakhs for government agencies and cooperative societies and 50% of the cost limited to Rs.6.00 lakhs to Federation of CPS(FPOs) and Rs. 15.00 lakhs for NGO's and private institutes for the market promotional activities

So far, 687 projects received from various institutions / enterprises were sanctioned with a total financial assistance of Rs.235.94 crores. Against this, an amount of Rs. 122.522 crores has been released to various State Governments, Research Institutions, Co-operative Societies, entrepreneurs, etc. for development of technologies for new products, adoption of these technologies for product diversification and by-product utilization, productivity improvement through management of pests and diseases and market research and market promotion.

Under the TMOC scheme 377 coconut processing units with infrastructure facilities worth Rs. 47625.52 lakhs for processing 2391.2 million nuts per year and 8,48,172 metric tones shells per year have been established by providing a financial assistance of Rs. 5818.71 lakhs as detailed in the table:

Sl. No.	Name of the Coconut Products	Number of Units established	Capacity
1.	Tender Coconut Water Preserving and Packing Units	25	Processing of 138.6 million nuts per year
2.	Desiccated Coconut Powder Making units	91	Processing of 909.45 million nuts per year
3.	Virgin Coconut Oil Production units	44	Processing of 161.85 million nuts per year
4.	Coconut Chips Making Units	5	Processing of 1.41 million nuts per year
5.	Vinegar Making Units (raw material mature coconut water – a waste in copra making)	6	Processing of 19860 kilo litre per year
6.	Coconut Milk and Spray Dried Coconut Milk Powder Making Units	2	Processing of 16.5 million nuts per year
7.	Coconut Shell Powder Making units	17	Processing of 60960 metric tones Shell powder per year
8.	Coconut Shell Charcoal units	21	Processing of 39204 metric tones Shell Charcoal per year
9.	Activated Carbon Making units (raw material coconut Shell Charcoal)	29	Processing of 74,400 metric tones Activated Carbon per year
10.	Neera & Neera products	6	Processing of 11,400 kilo litre per year
11	Flavored Coconut Juice	1	1.5 Million Nuts per year
12	Packing of coconut water	1	900 kilo litre per year
13	Other Traditional Products making Units (Ball Copra / Copra / Oil)	126	Processing of 1161.86 million nuts per year
14	Coconut shell ice cream cup	2	Processing of 6.5 million cups per year
15	Coconut Wood Products	1	Processing 520 coconuts per year
	Total	377	

All these products have helped in enhancing the market potential for coconut products both in domestic and international markets and in controlling and stabilizing market prices of raw coconuts for providing competitive and remunerative prices to the farmers.

Allocation and Expenditure		
YEAR	TARGET	ACHIEVEMENT
2001-02	400	267.05
Xth plan		
2002-03	2000	474.01
2003-04	1075	481.69
2004-05	475.79	524.39
2005-06	1129.1	1153.989
2006-07	1000	746.733
Total	5679.89	3380.812

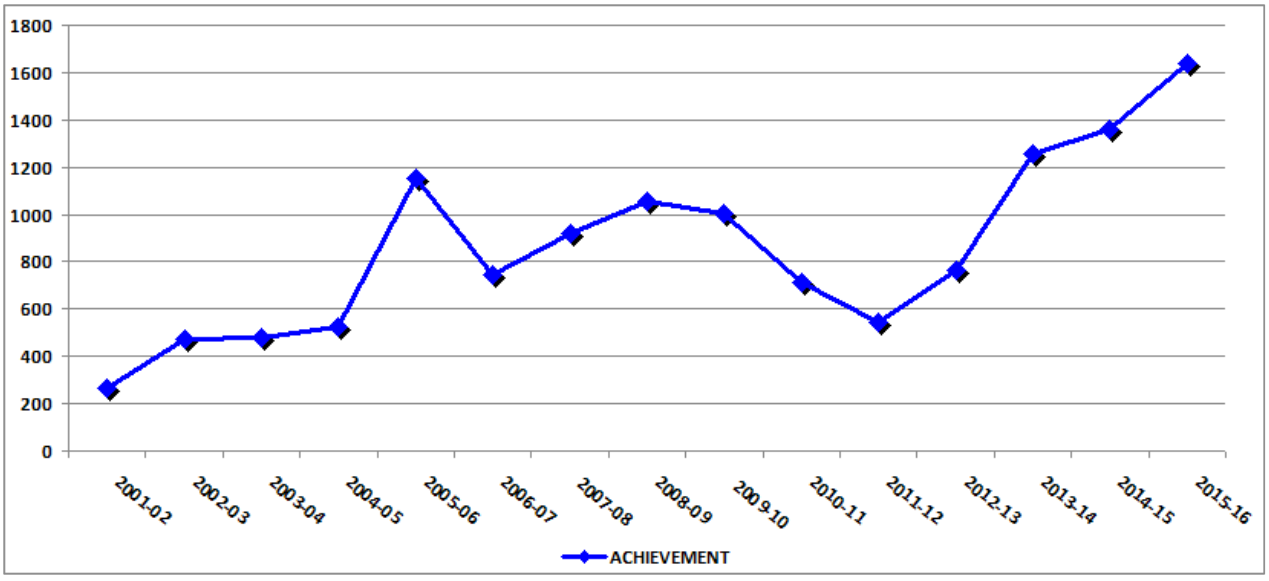
XI th Plan		
2007-08	1000	920.474
2008-09	1000	1052.563
2009-10	1000	1001.972
2010-11	1000	713.978
2011-12	500	543.637
Total	4500	4232.624
XII th Plan		
2012-13	635	764.577
2013-14	1000	1254.605
2014-15	1300	1359.64
2015-16	1400	1640.41
G. TOTAL	14914.89	12899.718

From the table it can be seen that during the 12th plan period the allocation of fund is on an increasing trend and the expenditure also is increasing. From the last five years, the schemes are being implemented in almost all the states and more units are being set up in different parts of the country. Efforts made by the Board with focused attention on awareness creation and market promotion increased the demand and consumption of coconut and value added products. During the initial periods, thrust was mainly on pest and disease management due to sudden outbreak of various pests and diseases and resultant problems. But at present, there is a paradigm shift to product diversification and establishment of more coconut based processing units. Since the coconut by products have attained high demand recently, the scope for establishment of units for coconut products

especially desiccated coconut, virgin coconut oil, spray dried milk powder, preserved and packed tender coconut water as well as shell charcoal and activated carbon have increased considerably.

In addition to coconut processing units, the projects assisted for disease/pest management and market promotion, development and other emergent needs are summarized in the table below:

Sl. No.	Details	Number of Projects
1.	Project for Development of Technology/ Adoption of Technology for Processing and Product Diversification	64
2.	Projects for Market Promotion and Market Development	80
3.	Project for Technical Support, External Evaluation and Emergent Requirement	1



The implementation of TMOC programmes have helped in achieving the objective of price controlling and stabilizing of raw coconuts produced by the farmers on one hand and on the other hand the TMOC programmes have boosted the production of numerous values added products and by-products from coconut earning valuable foreign exchange to the country. The disease /pest management programmes of TMOC have also helped in keeping the production unaffected due to attack of disease/pests.

With the establishment of Coconut Development Board in 1981, R & D efforts in the post harvest processing of coconut are also on the rise. The following technologies have been developed and commercialized under sponsored research projects of the Board.

Sl. No.	Name of Technology	Technology developed by the Board in association with
1	Processing and packing of coconut cream	Regional Research Laboratory, Trivandrum
2	Low fat Tender Coconut Cream	SCMS Institute of Biotechnology Research and Development, Kochi
3	Spray Dried Coconut Milk	Central Food Technological Research Institute, Mysore
4	Preservation and Packing of Tender Coconut Water	Defence Food Research Laboratory, Mysore
5	Automation of tender coconut water processing system	Defence Food Research Laboratory, Mysore
6	Coconut Vinegar Production from Matured Coconut Water	Central Food Technological Research Institute, Mysore
7	Coconut oil as alternate automobile lubricant	Cochin University of Science & Technology, Cochin
8	Dietary fibre from coconut residue	Central Food Technological Research Institute, Mysore
9	Production of Virgin Coconut Oil through cold process of centrifugal separation	Central Food Technological Research Institute, Mysore
10	Coconut jelly	College of Home Science, Tamil Nadu Agricultural University, Madurai
11	Nata-de-coco (as by product of coconut Vinegar)	Technology Development Centre, Coconut Development Board
12	Coconut chips	Central Plantation Crops Research Institute, (ICAR), Kasargod, Kerala
13	Technology for Production of Cheaper and Healthier Blends of Coconut oil with other Vegetable oils	Central Food Technological Research Institute, Mysore

14	Preservation and Packaging of Coconut Neera and its value added products	Technology Development Centre, Coconut Development Board
15	Designing a hygienic harvesting process & an appropriate process technology for sustaining quality of coconut neera as nutritive drink	SCMS Institute of Bioscience and Biotechnology Research and Development, Kochi, Kerala
16	Formulation of health mixes with Coconut Milk powder and coconut flour	PSG College of arts and science, Coimbatore, Tamil Nadu
17	Development of Low fat Nutritionally Rich Delicious Fresh Tender Coconut Cream	SCMS Institute of Bioscience and Biotechnology Research and Development, Kochi, Kerala

Coconut on conversion as an industrial raw material, will be able to demand price and also exploit the immense potential that the domestic and export markets offer for coconut and its products. Through the TMoC the farmers, entrepreneurs and Coconut Producer Companies can come forward and avail the opportunity to set up more units. This will definitely add on to product diversification and value addition which in turn can withstand the price fall to some extent. Through TMOC, the Board is also giving avenues to entrepreneurs, industrialists and artisans to showcase their products in national and international exhibitions and fairs which help them get better access to the open market networking and market tie ups with prospective buyers. Products like tender coconut water, desiccated coconut powder, milk powder and activated carbon produced in India have clicked well in the upcountry markets. ■

The best is yet to come to coconut sector

● **Dr. Remany Gopalakrishnan**

Rtd. Director i/c, Coconut Development Board, Kochi

Introduction

Agriculture sector in India is at a cross road with rising the population and the increasing demand for food items. The fact that coconut provides food and nutritional security reinforce the need to encourage coconut cultivation to feed the growing population. Despite the interest shown to plant and nourish coconut, uncertainty or fluctuation in prices for coconut and coconut products has been a major concern to farmers. Whenever the prices of coconut products, especially that of coconut oil moves in reverse direction, the price of coconut also slips down. This correlation of coconut oil price and coconut price has been in vogue from the very beginning of price fixation of coconut oil by the oil merchants associations. Major strategy suggested to overcome the close linkage of coconut oil price and coconut price is product diversification and value addition in coconut.

When product development under the auspices of Coconut Development Board gained momentum through the setting up of coconut based industries, prices picked up on several occasions; but signs of dropping down have also been witnessed from time to time. From September 2013, prices of coconut oil picked up unprecedently and the trend continued till the middle of 2015. The reverse behaviour witnessed thereafter put farmers in panic. But to their surprise and satisfaction coconut oil price has improved from July 2016 and the tempo is continuing without any drastic crash. This improvement in prices was in tune with the prediction of Coconut Development Board which undertakes concurrent estimation of production and productivity and forecast production and price behavior concurrently. This attempt was initiated due to the delayed release of statistical data behind the schedule by the concerned Government Departments. With the present trend in price improvement we cannot be complacent as the prices may fluctuate in accordance with market demand, availability, or due to many other factors.

Strategic measures that have been suggested for preventing the price fall always do not come to the rescue of farmers as has been experienced. This article discusses the scope for sustaining the good price for coconut and reinforces the hope that there are

tremendous opportunities to foresee a better prospect for coconut sector and coconut farming community. There is definitely a better tomorrow than we have ever seen.

Farmer Producer Organizations in Coconut sector – a timely move guiding the Way Forward

The inherent limitation of coconut cultivation is the fragmented holding size and the unorganized nature of coconut farmers. This makes the small farmers difficult to pool their tiny marketable surplus of produce and make them unfit to bargain for better price. The scattered nature weakens their bargaining power and middlemen are active in the sale of produce leaving them voiceless in the bargaining Moreover, they do not have any participation in the policy making or implementation of development programmes of any government agencies. It is estimated that there are six lakh holdings in the country and 98% of them are less than 2 ha size. It was therefore felt imperative to mobilize the farmers into active groups and to empower them.

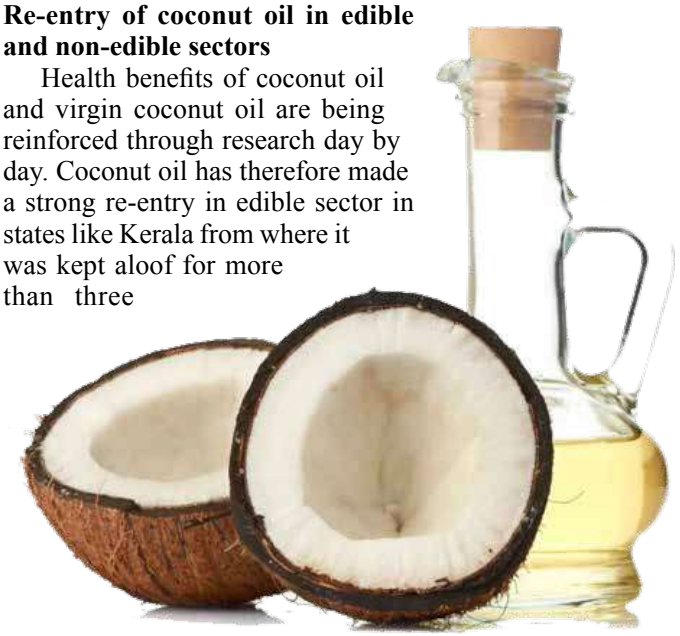
In this background, Coconut Development Board, under the leadership of Smt. Minnie Mathew, the first IAS Chairperson of the Board initiated its maiden attempt in 2005 in implementing programmes in a farmer participatory mode. Implementation of a productivity improvement programme viz., ' Integrated farming in coconut holdings' was entrusted to farmer groups. The responsibility of success or failure of the programmes was vested on clusters of farmer groups, reminding their prime role in the project implementation. This new initiative inculcated confidence and pride to farming community. They themselves felt empowered for being a part and parcel of government programmes and the result was overwhelming. This attempt marked the beginning of formation of farmers collectives group organizations in coconut sector and culminated in formation of three tier farmer collectives under the dynamic leadership of Shri. T.K. Jose, IAS who was instrumental for the Kudumbasree Mission in Kerala. The three tier structure was designed consisting of Coconut Producers Society (CPS), Coconut Producers Federation (CPF) and Coconut Producers Company (CPC). There are at present 9272 CPS, 716 CPF and 65 CPCs functioning in the country. This endeavor of aggregation of farmers enabled to bring the coconut farmers under one umbrella. More over value addition and product development started gaining momentum in the country.

Formation of Farmer Producer Organizations (FPO) by collectivization of farmers was thus initiated with the main objective of socio economic development of farmers through productivity improvement, cost reduction, efficient aggregation of produce, processing for value addition, better by-product utilization and efficient marketing of the produce. It aims at providing a fair, steady and reasonable income to farmers. Farmer

Producer Organization provides a platform for the overall empowerment of farming community. Most of the FPOs express unparelled feats of excellence and have made strong footing in value addition of coconut. Many Companies have started manufacturing products like neera, neera sugar, branded coconut oil, coconut cream and various convenience food items. These products are capturing the domestic and international markets. With the result, positive sign of delinking the coconut price from that of coconut oil price has also started experiencing in the market, as basically aimed. FPOs, however are in infant stage and they need technical, financial and more over moral support to overcome their infancy crisis. The team work will no doubt, remain as the pillar of their success.

Re-entry of coconut oil in edible and non-edible sectors

Health benefits of coconut oil and virgin coconut oil are being reinforced through research day by day. Coconut oil has therefore made a strong re-entry in edible sector in states like Kerala from where it was kept aloof for more than three



decades. The misconception that it causes Coronary Artery Disease (CAD) has almost been thrown out from the minds of public. Now coconut is proved to be beneficial against many life style diseases as well as bacterial/ viral diseases. Diabetes, alzheimers', autism, HIV, psoriasis, cancer - all these disorders and diseases are coming under this category.

The effort behind the coming back of coconut oil cannot be undervalued. Sustained multimedia campaign of the Board in association with doctors, sports persons, and all other stakeholders coupled with the study results of the sponsored research helped a lot to bring about this sea change. Mere statement that coconut oil is harmless or beneficial for consumption was not readily accepted by public as the allegation was strongly reinforced in their minds. It necessitated to disprove the allegation and hence Board took the responsibility of undertaking research studies to find out the truth. This paved way for a clinical research, for the first of its kind in India or elsewhere, through Amrita Institute of Medical Sciences(AIMS), Kochi, Kerala. The study was to prove the effect of coconut oil and sunflower oil in cardiac patients receiving medication. Sunflower oil was believed to be harmless for patients suffering from heart disease. Hence a study was undertaken by the Institute. The two year study was concluded with the findings that there was no difference of effect between two oils and sunflower is not in any way safer or better than coconut oil in heart patients. Moreover, it was also revealed that in certain parameters coconut oil was better than the other oil. This study result was published in the 68(2016) issue of Indian Heart Journal.

This study paved way for another clinical study on the effect of consumption of virgin coconut oil on serum lipid profile of cardiac patients. The study is progressing in the Cardiology department of Amrita under the guidance of Dr. M.Vijayakumar, who guided the first study. When more beneficial effects of coconut oil are revealed through clinical research, demand for coconut oil will be sky rocketing.

The studies in India have drawn attention of medical fraternity at international level. Asian Pacific Coconut Community (APCC), the intergovernmental organization, located at Jakarta, Indonesia has started international collaboration to carry out research on coconut oil to find out more facts. An advisory body under the Chairmanship of Dr. Vijayakumar is understood to have constituted which will take the course forward. These studies will definitely bring out more health and nutritional benefits of coconut oil which will be instrumental in increasing the demand of coconut oil.

Neera, a raw material for multiple products

All coconut products possess medicinal properties of various nature. Nutritive value of tender coconut water has already been established and globally accepted. The latest wonderful product added to this list is neera, the coconut inflorescence sap which has since been received accolades as a refreshing health drink. In countries like Indonesia, Philippines, Sri Lanka and Thailand, neera products are manufactured from raw neera; but neera as a health drink is not common in these countries. May be non-availability of technology for packing and preservation of neera prevents to do so. In India eight Coconut Product Companies have established neera processing plants. Another three are nearing completion. The processing capacity of these plants is 4000 litre per day. Number of palms though presently utilized for neera production is only 3500, the actual requirement is one lakh to meet the full processing capacity of these plants. The present weekly production of neera is around 40,000 litre. worth Rs. 16.25 lakh. The benefit of neera tapping may go up to 1.5 lakh when technicians are trained in full swing. But there are around seven lakh farmers under the ambit of FPOs in Kerala alone. Since tapping license is given only to Federations, more Federations can come to the sector to reap the benefits of production and marketing of neera and its downstream products like neera sugar, honey, jaggery, syrup etc.

Growing domestic and export markets

Market demand for coconut products is growing in domestic and international markets for various products. Creating demand for products and adopting proper marketing strategy is a solution to improve and sustain coconut price. In the domestic front, there is growing demand in commensuration with the population increase. Urban India comes ahead of USA in the order of populous nations. The population of urban India is about 36 crores which is above the total population

of USA. Population of USA is only 31.5 crores. Our domestic market is bigger than that of USA if 75 % urban population is taken into account. More than 78% of India's urban population is concentrated in the 63 major cities. FPOs can aim at introducing, making available and marketing their products in these cities through new marketing strategies.

Till recently, India was lagging behind countries like Philippines, Indonesia, Thailand and Sri Lanka in export of coconut products, despite its number one position in production of coconut. Products of Sri Lanka and Thailand are now available in plenty in Indian markets. If their products could penetrate in the nook and corner of Indian markets, Indian products can be easily marketed in other countries.In 2013-14, when India earned only US $ 175 M, from the export of coconut products, Philippines and Indonesia earned US $ 1518M and 1030 M respectively. But apparently our export earnings are picking up with the establishment of coconut based industries like virgin coconut oil, activated carbon, shell charcoal etc. Advancement in technology development and the technical and financial support extended by Board through Technology Mission on Coconut for starting coconut based industries have been instrumental for this success. Added to these, the Board has been designated as Export Promotion Council (EPC) for various products other than coir based products from 2009-10 which also has contributed to a perceptible improvement in export. No doubt, quality of products is very important to get entry into international markets. Export value of coconut products from India grew from Rs. 330 Cr. in 2008-09 to Rs. 1450 Cr. in 2015-16. Our products are moving to US, UK, Germany, France, Middle East, and African countries. Therefore we need not look back for opportunities in export. Niche markets for various pharmaceutical, nutraceutical, and cosmecuetical products are also emerging, giving further boost to our opportunities. No doubt, quality is very important and we need to produce best quality products with attractive packaging for eyeing the abroad markets. When Indian coconut products are gaining acceptance in other countries we have to work for sustaining these markets. FPOs, product manufacturers and entrepreneurs can take the advantage of this opportunity as a measure to avoid frequent price fall.

The state of affairs outlined are avid proof of the potential opportunities opened before India to make a rising coconut industry, FPOs have to work in competition mode to reap the opportunities. Yes, the best is yet to come in coconut sector. ■

Karnataka to allow neera tapping

The Karnataka Excise Act will be amended for the purpose

With a sharp fall in the prices of coconut, the Karnataka government has decided to allow the tapping of neera, the sweet sap tapped from coconut tree, by amending the Karnataka Excise Act. This has been a long-pending demand of coconut growers and farmers' groups.

A State Cabinet meeting presided over by Chief Minister Siddaramaiah decided to allow coconut growers to tap neera, which is considered a 'health drink' on account of its high nutrition and medicinal value. In his Budget for 2015-16, Mr. Siddaramiah had said that the Excise Act would be amended to permit members of coconut growers' federation to tap neera in limited quantities.

Addressing presspersons after the Cabinet meeting, Law and Parliamentary Affairs Minister T.B. Jayachandra said that the decision would help increase the income of coconut growers. Various products such as chocolate, syrup, cookies, cakes etc would be manufactured using neera. Kerala came out with a policy to encourage the production of neera through coconut producers' societies.

The Minister said that thousands of coconut growers in the State, who have been severely affected by pest attacks and drought in recent years, have been demanding that the government allow tapping of neera. Freshly tapped neera, if not stored under controlled temperature or consumed within a couple of hours, turns into toddy with about four per cent alcohol on account of fermentation. As the sale of toddy was within the ambit of the excise laws, they would be amended to help growers. Though a draft neera policy was formulated way back in 2007, it remained largely on paper. The government would restrict the tapping of neera to some organisations and some per cent of the trees in the State.

Source: The Hindu,22nd September 2016

Impact of changing rainfall pattern on coconut - Need to adopt mitigating measures

● **Subramanian P, Thamban C, Surekha R, Ravi Bhat and Mathew A.C.**
(ICAR-Central Plantation Crops Research Institute, Kasaragod)

Millions of families in India depend on coconut for their livelihood either directly or indirectly. As per the latest statistics available (2014 15), the annual coconut production in India is 20.44 billion nuts from an area of 1.98 million ha with an average productivity of 10345 nuts/ha. The four southern states viz., Kerala, Tamil Nadu, Karnataka and Andhra Pradesh are the major coconut producing states in India accounting for more than 90 per cent of area and production. Though economic life of coconut is considered to be around 60 years, it can survive in field for about 100 years. Hence, it is essential to provide congenial growth conditions to maintain the life of the palm for sustainable production. Coconut produces on an average one leaf and one inflorescence in every month when maintained under normal management practices. It takes about 44 months for an inflorescence bud to grow and develop to produce mature nuts. Since a palm produces an inflorescence every month, its crown has inflorescences at different stages of development throughout the year. The perennial nature of coconut and continuous production of leaves and inflorescences throughout the year requires maintenance of optimum soil moisture and adequate nutrient availability throughout the year to ensure survival of palms and sustainable yield. It has been observed that changing patterns in climatic variables like rainfall and temperature result in the decline in yield and at times death of palms.

Rain fall distribution pattern in West coast region

In west coast regions coconut is grown mostly as rain fed crop compared to east coast regions where it is grown predominantly under irrigated conditions. Thus, in west coast regions, among the meteorological variables rain fall is considered as one of the important parameters which determine the survival of coconut palm and its productivity. Coconut prefers a well-distributed rainfall of 2000 mm/year. West coast region though receives high rain fall (>3000mm), its distribution is highly skewed. Analysis of rain fall data of 30 years (1985-2015) of Kudlu meterological station, Kasaragod (west-coast high rainfall zone) revealed that 92% (3425.7mm) of the total rain fall is received during south west monsoon (June to September) and north east monsoon (October to December) and the remaining period January-April receive very small amount of rainfall (monthly average rainfall of 3, 5.6, 16.0 and 38 mm during January, February, March and April respectively). The month of May receives an average rainfall of 220 mm as pre-monsoon showers (Table1).

The rain fall distribution pattern indicates that

Table1. Weather data of west coast high rain fall region as recorded at Kudlu, Kasaragod

Month	Wind speed (km/hr)			No of rainy days			Rain fall (mm)			
	Average (1985 to 2015)	Actual (June 2015 to May 2016)	Difference	Average (1985 to 2015)	Actual (June 2015 to May 2016)	Differ-ence	Average (1985 to 2015)	Actual (June 2015 to May 2016)	Difference	% differ-ence
June	3.69	3.1	-0.59	24	24	0	997.3	643.8	-353.5	35.5
July	3.02	1.7	-1.32	27	25	-2	897.2	806	-91.2	10.2
Aug	2.36	1.3	-1.06	24	20	-4	630.1	437.6	-192.5	30.6
Sept	2.33	1.6	-0.73	13	12	-1	279	224.4	-54.6	19.6
Oct	2.28	2	-0.28	11	13	2	221.4	357.2	135.8	61.3
Nov	2.13	1.5	-0.63	4	6	2	105.3	127.3	22	20.9
Dec	2.23	1.7	-0.53	1	2	1	11.99	22.2	10.21	85.2
Jan	2.43	1.8	-0.63	0	1	1	2.993	5.7	2.71	90.6
Feb	2.73	2	-0.73	0	0	0	5.643	0	-5.64	100
Mar	3.09	2.5	-0.59	1	0	-1	16.09	0	-16.09	100
Apr	3.31	2.6	-0.71	1	0	-1	38.81	0.2	-38.61	99.5
May	3.19	2.3	-0.89	7	8	1	219.9	154.2	-65.7	29.9

optimum soil moisture content is available for coconut growth from June to November and from there on wards the available soil moisture declines rapidly because of no rain or insignificant amount of rain received during the period from January to February. However, the rain received during March and April helps in the survival of palms grown under rain fed condition. From May onwards sufficient amount of pre monsoon showers are recieved which helps in survival of palms and improving the productivity of palms. Changes in rainfall distribution pattern at times results in reduction of amount of rainfall received during the south west and north east monsoons coupled with total failure of rain during summer months, especially during March and April. This kind of changes in the rainfall pattern adversely affects coconut palms and there were reports of widespread crop loss during current year from many localities in North Kerala.

Changes in rainfall pattern and impact of moisture stress on coconut

In response to the reports received from coconut farmers and extension personnel of State Department of Agriculture, a team of scientists from ICAR-CPCRI Kasaragod conducted diagnostic field visits to different localities in Kozhikode, Kannur and Kasaragod districts. The damage to coconut palms was attributed to unknown diseases. However, after the careful examination of damaged palms, the reason for drying and mortality of coconut palms was diagnosed as severe moisture stress prevailed during March, April and May. Some of the palms affected by moisture stress also succumbed to Ganoderma /Thanjavur wilt. In the affected localities yellowing of lower leaves of coconut palms was observed during the first fortnight of February. Subsequently the leaves dried and their petioles were broken. By the first

fortnight of March all these dried leaves had fallen leaving few green leaves on the crown. These symptoms were initially perceived to be due to the incidence of Ganoderma wilt disease. But in majority of the palms the petiole was broken which is the symptom of moisture stress. Further, in these palms the lower dried leaves fell off and subsequently the top leaves also fell off even in the event of low wind velocity.

The analysis of rain fall data recorded at Kasaragod, the northern most district of Kerala, for the period June 2015 to May 2016, revealed that out of 2800 mm rain received during the period, 2111.8 mm of rain was received from south west monsoon from June to September and 506.7 mm during the post monsoon season from October to December. The period from January to May 15th received only 4.8 mm of rain that too on a single day i.e 23rd January 2016. Afterwards there were no rains till May 15th 2016. The data on rainfall distribution clearly indicated that the palms were subjected to severe moisture stress during the long dry spell. This stress situation adversely affected the palms which lead to the yellowing followed by drying and shedding of leaves (Fig. 1). The rainfall data for the region also brought out the fact that there was a deficiency of 19 per cent in the total rainfall received during the season from June to December in 2015 when compared to the 30 years average of rainfall for the same season. From February to May 15th there was no rain, and the coconut palms exposed to water stress also experienced severe nutrient stress as nutrient uptake was also affected badly. It was also observed that majority of coconut growers have not adopted the integrated nutrient management practices required for coconut. Most of them applied only organic manures and that too not in sufficient quantity and frequency. Deficiency of potassium in the soil is known to make palms more susceptible to moisture stress, diseases and pest attack. It is clear that survival of coconut palms under rain fed situation heavily depends on the receipt of normal monsoon along with receipt of summer showers especially during the months of March and April in the west coast region.

Fig- 2

To mitigate the adverse impact of change in the rainfall pattern in the west coast region, especially in localities where coconut palms are maintained under rain fed situation, coconut growers are to be informed about the importance of adopting appropriate mitigating measures. Emphasis should be on conserving the soil moisture in coconut garden with suitable agro techniques. Further, in the water scarce localities, adoption of water saving techniques such as drip irrigation is highly recommended.

Table 2. Weather data of west coast high rain fall region as recorded at Kudlu, Kasaragod during current monsoon season (June 2016 to August 2016)

Month	Wind speed (km/hr)			No of rainy days			Rain fall (mm)			
	Average (1985 to 2015)	2016	Difference	Average (1985 to 2015)	2016	Difference	Average (1985 to 2015)	2016	Difference	% difference
June	3.69	2.2	-1.49	24	25	+1	997.3	976.6	-20.7	2.1
July	3.02	1.8	1.22	27	29	+2	897.2	724	-173.2	19.3
Aug	2.36	1.4	0.96	24	26	+2	630.1	470.8	-159.3	25.3

In case of non receipt of rain during January to March, at least one life saving irrigation has to be provided to the palms by March 15th to save the palms. If the lack of rain continues, probably one or more life saving irrigation has to be provided at any cost to save the palms. Apart from soil and water conservation measures, integrated nutrient management practices also should be adopted to maintain palm health to overcome the adverse situations of moisture and nutrient stress.

Further analysis of rain fall data for the current monsoon season revealed that there was a deficit of rain fall starting from June 2016 to August 2016 (Table 2) and the deficit ranges from 2.1% to 25.3 %. This will further aggravate the problems of the survival of coconut palm. Hence, it is necessary to adopt mitigation measures for the survival of the coconut palm.

ICAR-CPCRI has evolved various simple and cost effective soil and moisture conservation and water harvesting techniques for coconut. The effectiveness of such measures has been amply demonstrated by CPCRI, Kasaragod in farmers' coconut gardens in north Kerala under Farmers Participatory Research Programme (FPARP) sponsored by Ministry of Water Resources, Govt. of India and NAIP project on value chain sponsored by ICAR.

Soil and moisture conservation measures in coconut

Mulching coconut basins with leaves, coir pith etc.

In order to conserve soil moisture in the coconut plantation, mulching with various types of organic materials viz., coconut leaves, husk and coir pith can be practiced which helps to reduce soil temperature and evaporation from soil surface and create conditions for proper root growth and proliferation of soil flora and fauna (Fig 2). The best time for mulching is before the end of the monsoon and before the top soil dries up.

For mulching, cut coconut leaves into two or three pieces. To cover 1.8 m radius of coconut basin, 15 to 25 fallen coconut leaves are required and can be spread in two to three layers. Leaf mulch prevents the top soil from getting heated up and this reduces the evaporation from the basin area. Mulching with coir pith to 10 cm thickness (approximately 50 kg/palm) around coconut basin is also ideal method to conserve moisture. Due to its fibrous and loose nature, incorporation of coir pith considerably improves the physical properties and water holding capacity of soil and thereby increases the coconut productivity.

Coconut husks and coir pith can hold moisture to the tune of three to five times of its weight. Approximately 250 to 300 husks are required for one coconut basin. Mulching is usually done upto a radius of 2 m. Besides conserving soil moisture, coconut husk is an important

Fig - 3

organic material and a good source of plant nutrients. On dry weight basis, the average composition of material is 0.23% N, 0.04 % P2O5 0.78% K20, 0.08 % Ca and 0.05% MgO. On an average, husk constitutes 45% of the weight of nut and on this basis, a nut weighing 1,000 g will have 450 g of husk with 20% moisture. Decomposition of the mulches after a period of time results in enrichment of soil organic matter pool.

Mulching of coconut basin could also be done with other organic wastes as completely dried weeded material etc.

Fig - 4

Coconut husk burial in the interspaces of coconut garden

Trenches of 50 cm width x 50 cm depth and convenient length would be made in between two rows of coconut palms. These trenches would then be filled with coconut husk. Coconut husks need to be filled in layers with the bottom layers facing up and top layer facing down.

Half-moon bund around coconut basin reinforced with pineapple

This measure is to be taken up where there is mild slope (15-20%). Here a flat basin with a slight inward slope towards upstream is made by excavating soil from the upstream side and filling the excavated soil at the downstream side (Fig. 3). After making the basin a bund of 30 cm height and >50 cm width is made at the downstream side of the coconut using the excavated soil. Two layers of pineapple plants would be planted with a spacing of 20 cm row to row and 20 cm plant to plant on the bund. The bund prevents runoff and water gets collected within the basin and percolates down. Pineapple would help to protect the bund and stabilize the same in addition to giving fruit yield.

Trench filled with coconut husk

This measure is to be taken up where the land slope is high. Trenches of 50 cm width x 50 cm depth and convenient length would be made in between two rows of coconut palms (Fig. 4). These trenches would then be filled with coconut husk. Coconut husks need to be filled in layers with the bottom layers facing up and top layer facing down. A bund stabilized with crops like pineapple can also be made at the downstream as mentioned in case of half moon bund.

Catch pits with pineapple border

Catch pits with a dimension of 1.5 m length x 0.5 m width x 0.5 m depth can be constructed at all slopes to conserve soil and water. A bund is to be made at the downstream using the excavated soil and pineapple plants planted on it. This pit also may or may not be filled with coconut husk.

Fig - 5

Cover crops as green manure and to reduce soil erosion

Crops like calopogonium, pueraria, cowpea etc. can be grown as cover crops in coconut gardens where mild to steep slopes are prevalent. Growing of cover crops protect the soil from the beating effect of rain especially during high intensity of rainfall thus helping in the percolation of the rainwater. This also helps in preventing the soil as well as nutrient loss.

Conclision

Survival of coconut palms under rain fed situation heavily depends on the receipt of normal monsoon along with receipt of summer showers especially during the months of March and April in the west coast region. Deficit of rainfall during monsoon seasons and lack of summer showers adversely affect coconut production. To mitigate the adverse impact of change in the rainfall pattern in the west coast region, especially in localities where coconut palms are maintained under rain fed situation, adoption of technologies for conserving soil and moisture is essential. Integrated nutrient management should also be a part of the strategies for mitigation of problems related to climate changes. ■

Digital troubleshooting – an efficient handy tool to increase coconut productivity

● **Kumaravel S,** Development Officer, CDB, DSP Farm, Palghar, Maharashtra

We all know that 'proper diagnosis is half way to cure'. The Integrated Nutrient Management (INM), Integrated Pest Management (IPM) and Integrated Disease Management (IDM) measures are being recommended to the students and trainees, as part of the package of practices to be adopted for a particular crop. The set pattern is name of the crop, botanical name and classification, planting material, seed rate, land preparation, planting systems, manuring and nutrition, pests, diseases, others, yield, storage and post harvest processing, etc.

As of 2014-15, in India, coconut is cultivated in 1.976 million ha with a production of 20439.60 million nuts. Incidence of pest and diseases and ill maintained gardens are the major weaknesses in coconut sector in India. It may be noted that severe and ill/unmanaged incidence of some pests (like red palm weevil) and diseases (bud rot) are lethal to the palm.

As per the APCC Statistical Year Book 2013, India ranks first in production with 22680.03 million nuts followed by Indonesia (16463.00 m nuts) and Phillipines (15353.00 m nuts). India holds second position in productivity with 10615 nuts/ ha. next to Brazil (11923 nuts/ ha).

Though India ranks first in production, the nuts are small and the out turn of product components like kernel, shell, etc. from coconut is also low, compared to the nuts in other countries. For example, when 6800 nuts are required for making one ton of copra, 4500-5000 nuts are required in other countries. Likewise the figures are 30000 whole shells vis a vis 20000-25000 whole shells for production of one ton charcoal. When 1000 Indian coconuts could fetch 250 kg coconut milk, the Thai and Samoan coconuts yield about 320 kg milk. About 85 % of the coconut area is occupied by WCT and ECT. Superior exotic/ indigenous varieties/ hybrids are not cultivated in large scale.

Several steps are being taken up to increase the production levels by concentrating on bringing out improved varieties, increasing the area under cultivation

with high yielding varieties, creating awareness on adopting INM, IPM and IDM practices, etc. The proportion of losses in yield due to pests/ diseases/ nutritional deficiencies is more which may be evident from the gap between the yield expected by the research institutes and the actual yield obtained by the farmers. 24% of yield gap in coconut was observed between demonstration plot and actual farmers plot yield in Karnataka.

Majority of the farmers do not practice regular manuring and pest & disease management measures. Even if they adopt, they follow the blanket recommendations irrespective of the soil physical and chemical properties/ plant nutrient levels in case of fertilizers and the causal organism and intensity in case of pesticides and fungicides.

It may be observed that in many print/ web publications about the pests and diseases of each crop, the set pattern of name of the disease-causal organism-severity-symptoms-management measures is followed. The symptoms like yellowing of leaves, necrosis in leaves/ inflorescences, reduction in size of leaves/ inflorescence/ seed/fruit/nut, etc. for many diseases, nutritional disorders, other abiotic stresses are apparently more similar. The proper diagnosis of the abnormality observed in the plant part can be done only on detailed study of the characteristic symptoms with reference to the pest/ disease/ nutrient disorder/ other abiotic stresses.

Hence, there is a need to facilitate the farmers and other stakeholders to diagnose the abnormality observed by them in their plants by a 'Symptomatic approach' rather than the 'academic approach'. For example, yellowing of leaves in coconut may be a symptom of wilting, nutritional (one or many elements) deficiency or a symptom of prolonged water accumulation in the basin. The deficiency of one nutrient may be observed with the yellowing of leaflets initially from margins and proceeds to the midrib and for the other nutrient may be from midrib to margins. For some it may be in older leaves, for some in younger leaves and for some in all the leaves.

In this digital era, with many internet facilities, the farmer oriented websites should have developed a user friendly 'Diagnose your palm' with interactive trouble shoot module in html.

As per a press release of TRAI, 1017.97 million wireless telephone subscribers and 140.10 million broadband subscribers are there in India, as on 31.01.2016. The Hindu, a leading daily, reported in February 2016 that active unique smart phone users in India crossed 220 million, according to a report by Counterpoint Research. According to a survey by Kissan Sanchar, a joint venture of IFFCO, Bharti Airtel and Star Global Resources Ltd, 9 % of the Indian farmers have smart phones. By now this would have grown to manifolds. Farmers are using features such as SMS, Voice Messaging, Helpline, Whatsapp, Facebook and group meetings to get information about weather and rain forecast, wind speed alert, weather, agronomy, insect pest management, market rates, career counseling for young members of farming families, agribusiness opportunities and networking among the farmers.

Suitable apps may also be developed for each crop so that the farmer can operate the apps in the plantation itself, on every 'Next' in the trouble shoot mode till he reaches the appropriate diagnosis. Once the diagnosis is conclusive the next click can lead him to the curriculum approach of the etiology, management measures, steps for avoiding in future, etc.

Educating the farmers with proper diagnosing techniques instantly at the time of noticing the abnormality will certainly encourage them to take necessary corrective measures. This will increase the productivity of the crop. The higher production achieved though this effective management will cater additional inputs to the coconut processing sector, which are booming in the past few years through the Three Tier Farmers' Collectives viz., CPSs, CPFs and CPCs being set up on the best interventions of the Coconut Development Board.

Necessary provisions in the trouble shoot module should be given so that the region of plantation can be fed into the module for accessing location specific information. Once the disease or disorder is properly diagnosed, the link with all the authentic sources of recommended management measures are to be listed based on the priority ranking, but the option should be left with the user.

It means that if a coconut farmer from Assam diagnoses a disease though his smart phone, there may be fields for entering the State & District of the location of the coconut garden. If these fields are filled, the links for 'recommended management practices' should be prioritized in the order of the nearest research/ educational/ government agencies, which may be more location specific. In this case, the link of the CPCRI, Kahikuchi, SAU, State Agri/ Horti Department, CPCRI, Mohit nagar, SAU, WB, WB Agri/ hort Dept. & so on.

A corresponding clear high quality picture beside each and every option in the trouble shoot windows should preferably be placed to facilitate nearing accuracy in diagnosis.

Adequate definitions should be provided, preferably right below, for the botanical terms as many people may not know them. For example, many people may not be familiar with spadix (the botanical term of the coconut inflorescence), fronds (leaves), leaflets, trunk, peduncle, necrosis, etc.

Few sample windows of the html/ android app are given below to take a lead.

Location of the coconut garden	
State*	District*

Total No. of coconut palms		
Variety	No. of palms	Source of planting material
Total		

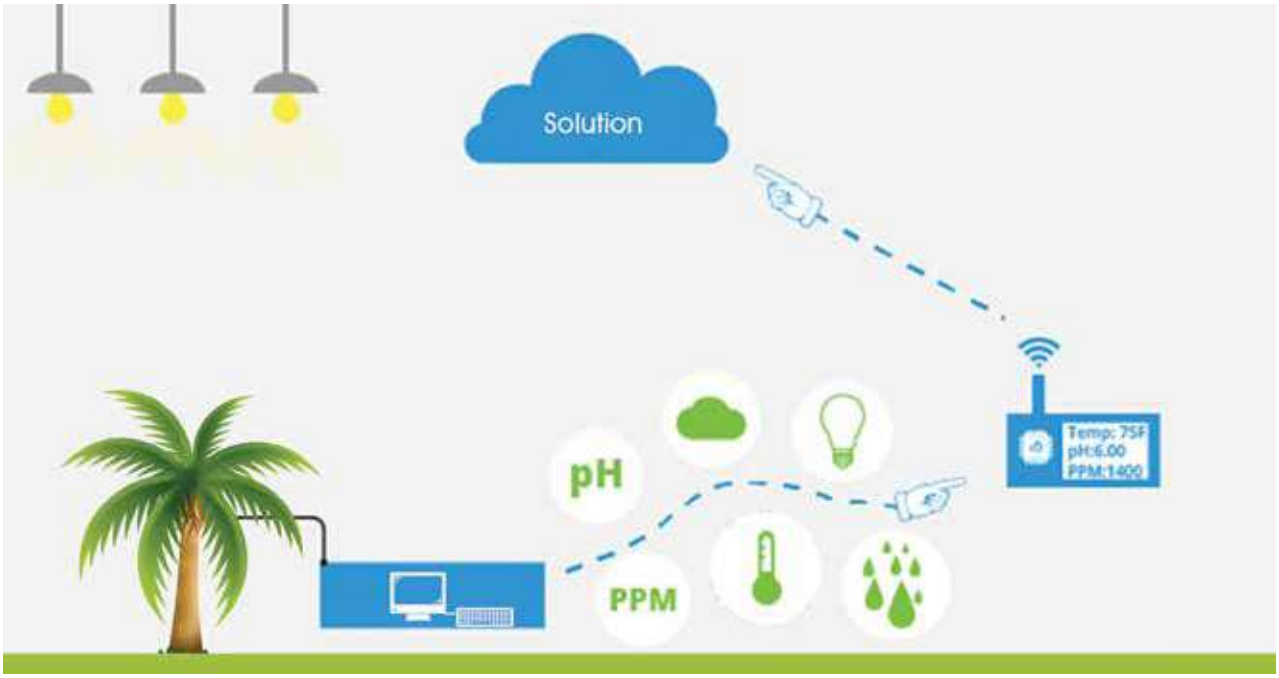
For example, if '**Leaflet**' is clicked

If '**Spots**' is clicked,

If '**Small Holes**' is clicked,

If '**Management Measures**' is clicked,

Institute	Recommendation	Weblink
CPCRI		
Tamil Nadu agricultural University	Soil application of lime based on lime requirement and root feeding of 1% calcium nitrate	http://agritech.tnau.ac.in/horticulture/horti_pcrops_coconut_phy_dis_minor.html
BCKV, West Bengal		
Kerala Agricultural University		
Dept. of Agriculture, Govt. of Karnataka		
Dept. of Agriculture, Govt. of Tripura		
CPCRI, RS, Kahikuchi, Assam		



While describing the symptoms and the management measures in this trouble shoot module utmost care should be taken. Any minor error may lead to improper diagnosis of the problem and consequently a wrong management measure which would be a waste of time, energy, money and damage (even lethal to) the palm.

If the user is not conclusive about the diagnosis with this module, an 'online help' link may be provided which can be replied by experts after getting indicative information from the user.

Currently the farmers can get adequate information related to package of practices including INM, IPM & IDM, availability of planting materials, marketing prospects, etc. through Kisan Call Centres across the country by toll free no. 1551, direct phone call to the live programmes in the recently unveiled 'DD Kisan' television channel and in other agriculture related programmes telecasted by many government/ private channels through direct telephonic interaction. Though it is very helpful to the farmers, many farmers could not express the symptoms and problems they observed in the field mainly due to linguistic dialects and regional differences in terminologies which often hinders the expert to guide the caller (farmer) properly.

This hurdle can be better overcome by this module. Frequent updation of the apps is a must so that the accuracy level in diagnosis and management measures are improved.

Once the farmer habituates to this user friendly module, he may make regular observations as per the menu and take appropriate remedial measures in time. This will also facilitate the farmers in explaining the problems to experts and the experts clearly understand the problems and suggest appropriate corrective measures. Such diagnostic tools are available in few websites like NC State University (Blackberry Diagnostic Tool), University of Minnesota (What's Wrong With My Plant?), Sorghum,

At the first instance, this would be of immense help to the coconut farmer members of the 9272 odd Coconut Producers' Societies who are conglomerated to more than 716 Coconut Producer Federations and 65 Coconut Producer Companies in the States of Kerala, Tamilnadu, Karnataka, Andhra Pradesh, Odisha, West Bengal, Maharashtra and about 52,000 Friends of Coconut Trees in 11 States and 2 Union Territories. Further, it may be of much beneficial to the technical staff of the central, State Departments, Universities, KVKs and other stakeholders. The coconut farmer can make the maximum benefit on his own from the module at his palm top (smart phone/ tablet PC) and can count more nuts in the 'palm top' (yield).

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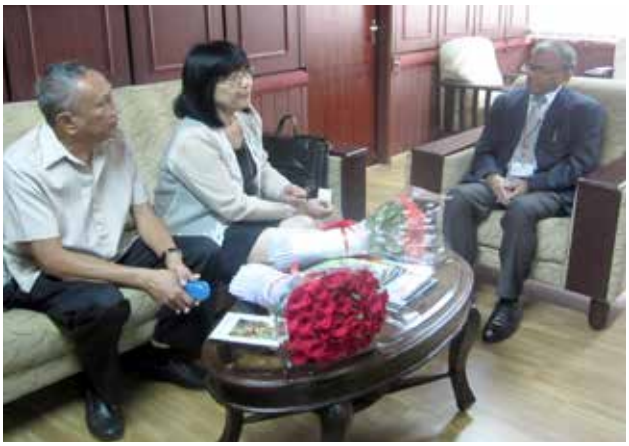
Philippines Ambassador visited CDB



H. E. Ma. Teresita C. Daza, Philippines Ambassador visited Coconut Development Board, Kochi on 29th August 2016. Dr.A.K. Sinch, Chairman and senior officials of CDB recieved the Ambassador and had discussions on the current status of coconut industry in India and Philippines. She expressed her desire to have collaborations with Coconut Development Board.

Shri. Deepak Kersarkar, Minister for Finance, Planning and RD, Government of Maharashtra visited Coconut Development Board

Shri. Deepak Kersarkar, Minister for Finance, Planning and RD, Government of Maharashtra visited Coconut Development Board, Kochi on 20th September 2016 and held discussions with the officials of Coconut Development Board(CDB) and Directorate of Cashew nut and Cocoa Development (DCCD). The Minister reviewed the activities of CDB and DCCD for the development of coconut plantation with suitable high value intercrops in the coastal belts of Maharashtra especially in Sindhudurg district where congenial climate is available for coconut plantations. The Hon'ble Minister was accompanied by the officials of the Department of Horticulture, Maharashtra. Dr. T I Mathewkutty, Director, CDB briefed the activities of CDB and Shr. R Jnanadevan, Deputy Director made a presentation on the status of implementation of CDB schemes in Maharashtra. Shri. Venkatesh Hubbli, Director, DCCD also took part in the meeting.

The meeting discussed the possibilities of bringing in more area under coconut in Maharashtra, especially in Sindhudurg district. CDB offered to extend support for the same to the maximum extent possible under the Area Expansion Programme of the Board. It was also decided that the state department of Horticulture may avail the financial assistance of DCCD for quality cocoa seedling production. Coconut based farming system with cocoa as intercrop can be undertaken in the area with financial assistance of DCCD for which suitable proposals may be prepared and submitted by the Department of Horticulture, Government of Maharashtra. The Minister requested the Board to extend technical and financial support for establishing more coconut based processing units in Sindhudurg district and he called upon for the integrated support of all related agencies for sustainable development of the coconut farming and industry in Maharashtra.

Indian Coconut products export recorded 28% growth

K.S. Sebastian, Assistant Director, Export Promotion, CDB.

Export of coconut products during the first five months of the financial year 2016-17 touched Rs. 765.49 crores recording a growth of 27.66% compared to the export during the corresponding period of the previous year. Significant increase was recorded in the export of desiccated coconut, coconut oil, fresh coconut, copra and coconut shell charcoal. Export of coconut products from India during the first five months of the financial year 2016-17 is given in table 1.

Table1

Export of coconut products from India during April to August 2016

		August 2015		August 2016		2015 (April to August)		2016 (April to August)	
		Qty (in MT)	Value (Rs. In lakhs)	Qty (in MT)	Value (Rs. In lakhs)	Cum. Qty (in MT)	Cum. Value (Rs. In lakhs)	Cum. Qty (in MT)	Cum.Value (Rs. In lakhs)
1	Activated Carbon	5483.46	5831.81	6420.48	6234.52	27124.85	28513.78	27441.86	27959.30
2	Coconut Fatty Soap		297.46		203.45		1247.84		1321.94
3	Hair Cream		127.73		15.02		430.86		190.18
4	Coconut Oil	426.25	1470.63	6583.26	6193.62	2997.63	6925.33	11801.43	12575.72
5	Coconut Hair Oil				176.54				960.35
6	Coconut Water		40.11		64.92		240.77		208.01
7	Copra	146.86	125.35	1681.67	1078.34	1442.39	1273.46	8732.61	5720.67
8	Desiccated Coconut	130.97	178.71	1421.07	1384.53	1052.69	1580.54	6686.02	6720.16
9	Dry coconut	628.10	683.98	308.32	250.99	7700.17	7974.97	5217.04	5035.60
10	Fresh coconut	2051.21	846.67	8593.51	1858.69	13402.03	5032.34	31905.16	7665.02
11	Grated/sliced coconut	219.97	322.04	148.43	249.29	858.27	1697.79	826.02	1468.93
12	Oval coconut shell	427.57	69.21		139.09	886.63	393.41	0.00	573.67
13	Shell charcoal	634.30	221.52	2982.26	759.23	3089.29	1053.89	8916.32	2302.38
14	VCO	36.77	172.79	27.69	126.66	430.76	1473.05	218.86	729.97
15	Misc coconut products		454.59		540.00		2123.07		3116.87
	Total		10842.59		19274.89		59961.09		76548.76

Activated Carbon

The export of activated carbon from India during April to August 2016 was 27441.86 MT. United States was the leading importer of Indian Activated Carbon, followed by United Kingdom. Details of export of Activated Carbon from India during April to August 2016 is given in table 2

Country wise export of Activated Carbon during April to August 2016

Sl. No.	Country	Qty (in MT)	Value (Rs in lakhs)
1	United States	5805.11	6091.61
2	United Kingdom	2052.62	2048.47
3	South Korea	1858.50	2063.64
4	Germany	1577.05	1645.09
5	Sri Lanka	1537.58	1328.15
6	Russia	1411.34	1410.90
7	Turkey	1092.83	881.68
8	Netherlands	1067.66	1045.21
9	Canada	1014.14	1023.54
10	Belgium	915.21	851.06

11	South Africa	669.00	683.50
12	China	664.74	937.36
13	Italy	627.40	516.89
14	Philippines	607.31	617.84
15	Estonia	572.00	574.57
16	Tanzania	457.40	493.37
17	France	433.60	475.30
18	Japan	424.02	580.07
19	Ghana	421.60	490.45
20	Thailand	401.76	413.33
21	Taiwan	394.90	344.30
22	Latvia	236.00	238.46
23	Australia	227.00	224.83
24	Finland	178.60	125.56
25	Senegal	178.20	196.28
26	Peru	164.20	153.92
27	Sudan	162.00	161.49
28	Sweden	160.80	159.31
29	Brazil	159.36	160.92
30	Papua New Guinea	132.00	139.51
31	Surinam	132.00	136.98
32	Georgia	132.00	137.72
33	Malaysia	107.15	134.51
34	Saudi Arabia	99.36	118.21
35	Dominican Republic	94.80	97.22
36	Singapore	67.72	65.13
37	Argentina	60.00	58.08
38	Iran	57.20	58.16
39	Others	1087.70	1076.68
	Total	27441.86	27959.30

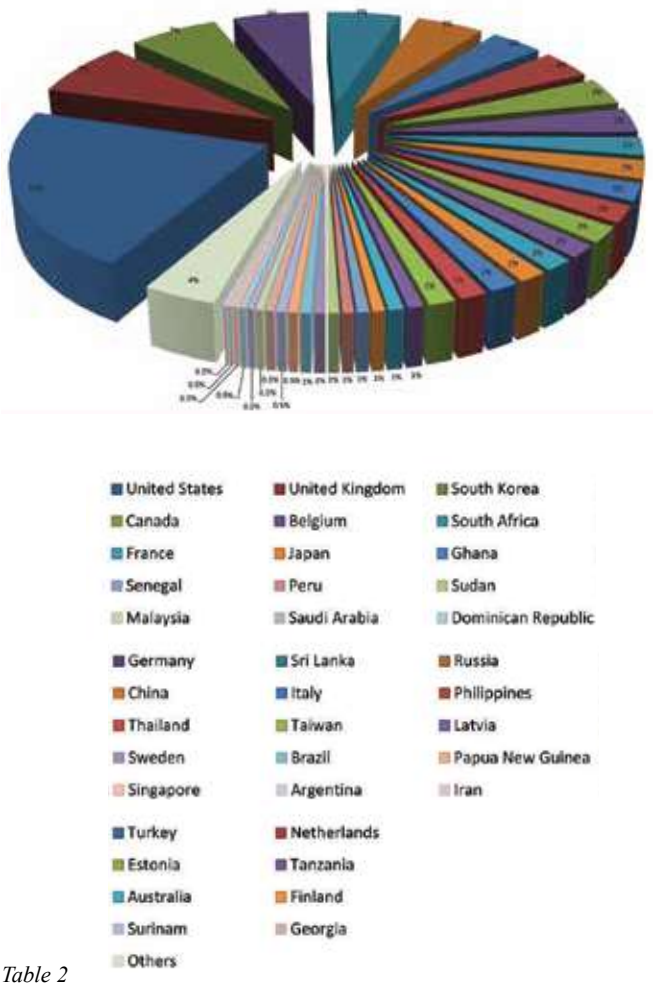


Table 2

Coconut Oil

Export of coconut oil from India during the first five months of the financial year 2016-17 was 11801.43 MT, which was 294% higher compared to 2997.63 MT recorded during the corresponding period of last year.

Malaysia, Indonesia, UAE, Srilanka, Myanmar and Saudi Arabia are the major countries exporting coconut oil from India. Export of coconut oil from India during the month of April to August 2016 is given in table 3.

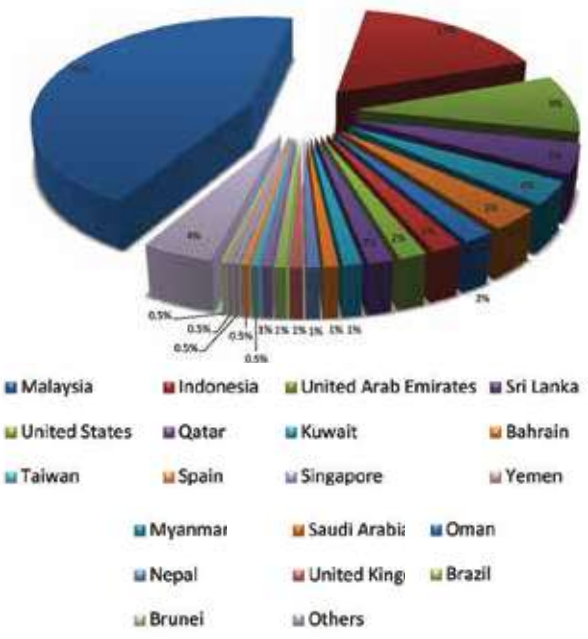


Table 3

Export of coconut oil during April to August 2016		
Country	Qty (in MT)	Value (Rs in lakhs)
Malaysia	5262.49	4684.82
Indonesia	1955.68	1695.36
United Arab Emirates	1055.18	1355.45
Sri Lanka	540.23	547.99
Myanmar	423.34	542.23
Saudi Arabia	387.89	521.02
Oman	227.75	287.09
Pakistan	224.46	323.90
United States	203.22	482.03
Qatar	183.23	268.68
Kuwait	139.16	183.64
Bahrain	105.52	140.78
Nepal	96.07	123.27
United Kingdom	93.11	185.93
Brazil	84.00	156.89
Ireland	70.17	121.88
Taiwan	58.74	69.09
Spain	58.31	58.21
Singapore	44.44	93.46
Yemen	32.90	62.59
Brunei	32.45	40.80
Others	523.09	630.62
Total	11801.43	12575.72

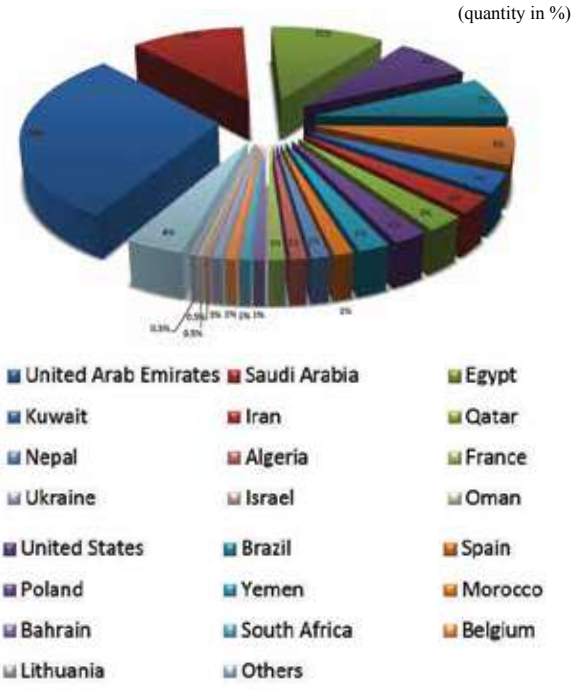
Desiccated Coconut

Export of desiccated coconut powder during the first five months of the financial year 2016-17 was 6686.02 MT which was 535.14% more than the desiccated coconut export during the corresponding period of last year. Country wise export of desiccated coconut powder during the period April to August 2016 is given in table 4.

Table 4

Export of DC from India during April to August 2016		
Country	Qty(in MT)	Value(Rs in lakhs)
United Arab Emirates	1990.86	1977.11
Saudi Arabia	743.97	761.40
Egypt	743.00	728.15
United States	503.42	491.71
Brazil	492.00	532.33
Spain	431.00	425.73
Kuwait	223.18	237.66
Iran	188.00	165.34
Qatar	183.37	195.71
Poland	162.00	161.52
Yemen	144.98	142.82
Morocco	89.00	90.70
Nepal	83.19	91.07

(quantity in %)



Algeria	77.00	75.79
France	77.00	86.28
Bahrain	52.59	59.73
South Africa	51.00	50.26
Belgium	50.00	53.99
Ukraine	48.00	51.51
Israel	26.00	26.45
Oman	26.00	24.15
Lithuania	25.00	26.39
Others	275.47	264.36
Total	6686.02	6720.16

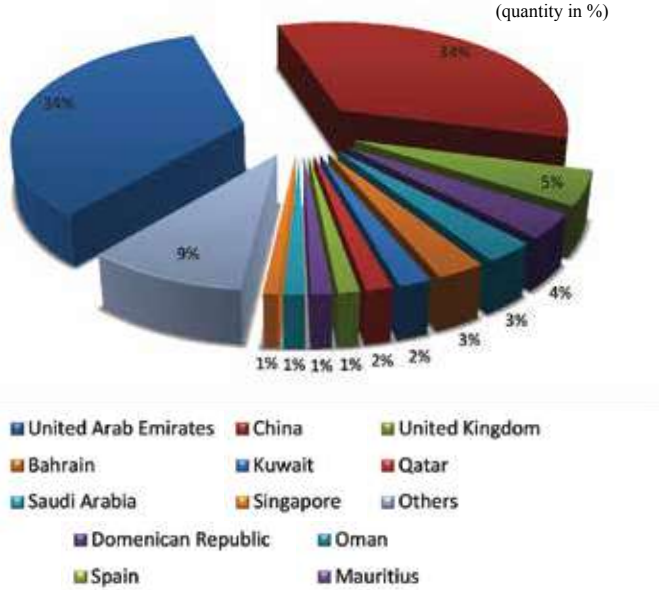
Fresh Coconut

Export of dehusked coconut from India during the period April to August 2016 was 31905.16 MT. Countrywise export of fresh coconut from India during this period is given in table 5. Export of fresh coconut during the corresponding period of last year was only 13402.03 MT.

Table 5

Export of fresh coconut April - August 2016		
Country	Quantity (in MT)	Value (Rs in lakhs)
United Arab Emirates	10914.66	2989.37
China	10813.74	2098.78
United Kingdom	1607.24	556.72
Domenican Republic	1159.64	232.13
Oman	959.11	305.87
Bahrain	915.71	248.36
Kuwait	602.79	188.29
Qatar	492.58	169.81
Spain	397.96	186.02
Mauritius	392.25	107.19
Saudi Arabia	389.68	172.74
Singapore	280.14	57.28
Others	2979.67	352.46
Total	31905.16	7665.02

(quantity in %)



Copra

Export of copra from India from April to August 2016 was 8732.61 MT which was 505 percent higher than the export of the corresponding period of the previous year. Countrywise export of copra from India during the period is given in table 6.

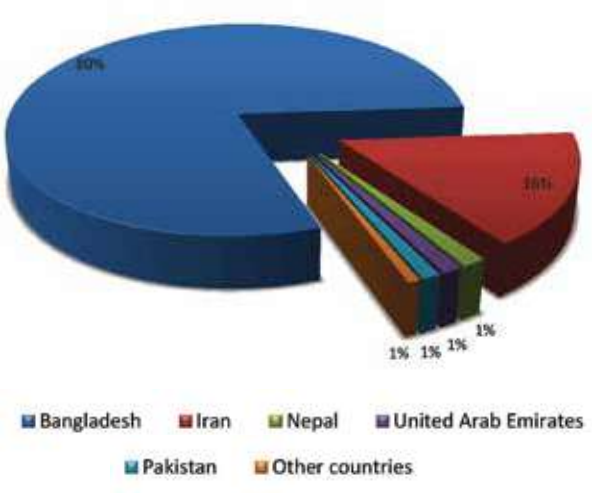


Table 6

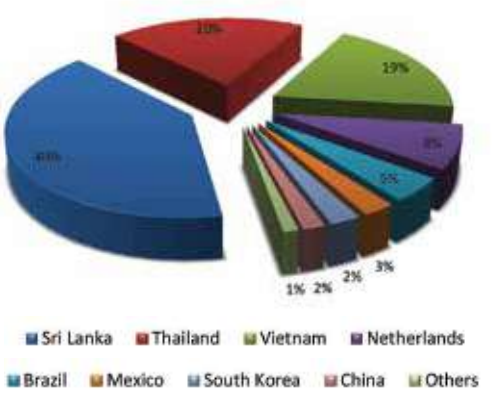
Export of Copra April - August 2016		
Country	Quantity (in MT)	Value (Rs in lakhs)
Bangladesh	6936.32	4540.25
Iran	1417.05	882.51
Nepal	122.38	102.74
United Arab Emirates	100.00	63.32
Pakistan	94.00	57.06
Other countries	62.87	74.79
Total	8732.61	5720.67

Coconut Shell Charcoal

Export of coconut shell charcoal from India during the first five months of the financial year 2016-17 was 8916.32 MT which is 188.62% higher than the export during the corresponding period of the previous year. Since the domestinc price of coconut shell charcoal is very competitive and the product is covered under Merchandise Export Incentive Scheme (MEIS), the export is expected to increase in the coming months also. Countrywise export of coconut shell charcoal during the period is given in table 7.

Export of Coconut shell charcoal April - August 2016		
Country	Quantity (in MT)	Value (Rs in lakhs)
Sri Lanka	3593.78	968.23
Thailand	1820.00	393.01
Vietnam	1696.00	388.49
Netherlands	729.90	239.46
Brazil	399.00	87.87
Mexico	220.00	74.44
South Korea	207.00	64.97
China	149.00	36.27
Others	101.64	49.62
Total	8916.32	2302.38

Table 7



During the first five months of the financial year 2016-17, India imported Rs. 172.03 crores worth coconut products. Copra expeller cake and coconut fatty acid were the major items imported during this period. Details of import of coconut products into India during the period from April to August 2016 is given in table 8.

Table 8

Import of coconut products to India during the period April to August 2016								
Item	August 2015		August 2016		April to August 2015		April to August 2016	
	Quantity (in MT)	Value (Rs. In lakhs)	Quantity (in MT)	Value (Rs. In lakhs)	Cum. Quantity (in MT)	Cum. Value (Rs. In lakhs)	Cum. Quantity (in MT)	Cum. Value (Rs. In lakhs)
Coconut fatty acid	709.67	536.43	1712.56	1662.01	3389.50	2857.13	4595.04	4255.20
coconut oil	4.28	6.65	0.03	0.14	1318.18	1219.74	0.07	0.37
Copra oil cake	51.26	10.34	14354.04	2525.59	41423.53	6512.85	69021.01	10939.73
Coconut shell charcoal	1905.32	589.81		0.16	7591.02	2359.34	324.62	96.83
Cream-milk-powder		70.38	86.52	107.70		557.37	86.52	1304.32
Copra	0.00	0.00		0.00	123.27	92.79	0.00	0.00
Misc coconut products		125.51		201.79		661.83	0.00	606.95
Total		1339.12		4497.39		14261.05	0.00	17203.40

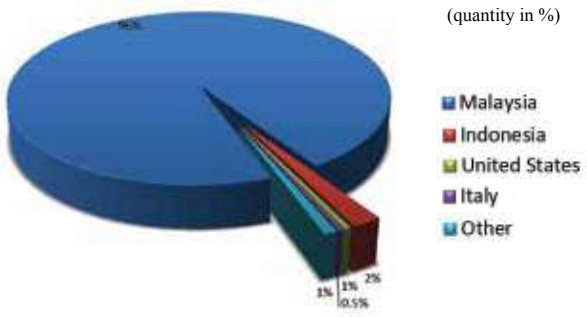
Coconut Fatty Acid

Import of coconut fatty acid into India during the first five months of the financial year 2016-17 was 4595.04 MT, out of which 4419.90 MT was from Malaysia. Import of coconut fatty acid during the corresponding period of last year was 3389.50 MT. Details of import of coconut fatty acid to india from April to August 2016 is given in table 9.

Import of coconut fatty acid during April to August 2016		
Country	Qty (in MT)	Value (Rs. In lakhs)
Malaysia	4419.90	4108.44
Indonesia	94.40	77.21
United States	23.00	15.11
Italy	15.00	29.97
Other	42.74	24.48
Total	4595.04	4255.20

Table 9

(quantity in %)



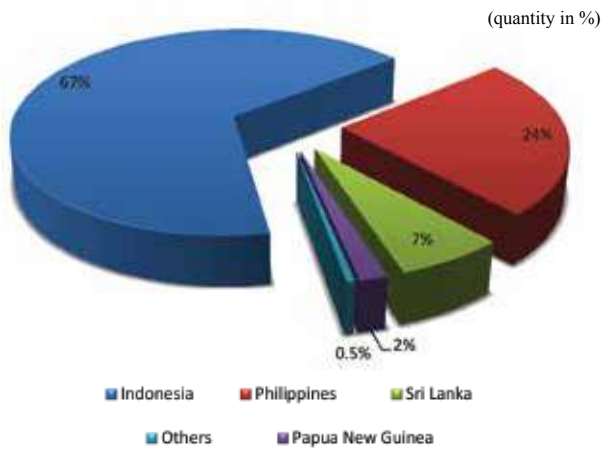
Copra expeller cake

In terms of quantity and value, copra expeller cake is the major coconut product imported to India. During the first five months of the financial year 2016-17, the quantity of import of this product was 69021.01 MT of which 46150.00 MT was from Indonesia. Details of import during the period April to August 2016 is given in table 10.

Import of coconutoil cake during April to August 2016		
Country	Qty (in MT)	Value (Rs. In lakhs)
Indonesia	46150.00	6981.18
Philippines	16750.00	2822.83
Sri Lanka	4594.93	870.25
Papua New Guinea	1168.73	208.36
Others	357.35	57.11
Total	69021.01	10939.73

Table 10

(quantity in %)



Market review – August 2016

Domestic price

Coconut Oil

The price of coconut oil in Kochi, Alappuzha and Kozhikode market expressed a uniform trend during August. The prices showed an upward trend during the first three weeks of August and in the last week the prices expressed a downward trend. The monthly average price of coconut oil at Kochi market was Rs.9327 per quintal and at Alappuzha market was Rs.9277 during the month of August. At Kozhikode market the monthly average price of coconut oil was Rs.9465 per quintal. But at Kangeyam market in Tamil Nadu, a fluctuation in price was more pronounced with a monthly average of Rs.8463 per quintal. In all the markets, prices closed with a slight downward trend.

Table1: The weekly average of price of coconut oil at major markets Rs/Quintal)

	Kochi	Alappuzha	Kozhikode	Kangayam
07.08.2016	8683	8633	8850	7817
14.08.2016	8933	8850	9117	8100
21.08.2016	9640	9500	9740	9022
28.08.2016	9883	9900	9983	8845
31.08.2016	9767	9800	9900	8589
Average	9327	9277	9465	8463

The prices at Kochi, Alappuzha and Kozhikode market were 14 percent more than that of the previous month and 21-27% lower than the prices prevalent in August 2015.

Milling copra

The prices of milling copra at major markets moved in tune with the prices of coconut oil. The prices expressed an upward trend during the first three weeks but declined slightly from the fourth week onwards. At Kochi market, the monthly average price of FAQ copra was Rs.6113 per quintal. The monthly average prices of copra at Alappuzha market was Rs.5860 per quintal and at Kozhikode market was Rs.5963 per quintal. The prices of Kochi, Alappuzha and Kozhikode market 14-17 percent more than that of the previous month and 28-30 percent lower than the prices prevalent in August 2015.

At Kangayam Market in Tamil Nadu, fluctuation in the price was more pronounced. The monthly average price was Rs.5754 per quintal which was 16 percent more than the previous month and 24 percent lower than corresponding month last year.

Table2: Weekly average price of Milling Copra at major markets (Rs/Quintal)

	Kochi	Alappuzha (Rasi Copra)	Kozhikode	Kan-gayam
07.08.2016	5642	5417	5583	5333
14.08.2016	5767	5567	5783	5517
21.08.2016	6400	6000	6220	6170
28.08.2016	6567	6317	6292	6042
31.08.2016	6367	6183	6000	5800
Average	6113	5860	5963	5754

Edible copra

The price of Rajapur copra at Kozhikode market also expressed an upward trend during the last four weeks, but declined slightly by the end of the month. The monthly average price of Rs.6612 per quintal was 16 percent more compared to the previous month price and 44 percent lower compared to the price prevalant in the corresponding month last year.

Table3 : The weekly average of price of edible copra at Kozhikode market (Rs/Quintal)	
07.08.2016	6700
14.08.2016	7048
21.08.2016	8080
28.08.2016	8325
31.08.2016	7700
Average	7619

Ball copra

The price of ball copra at Tiptur market expressed a fluctuating trend. The monthly average price of ball copra at this market was Rs.7405 per quintal which was marginally lower compared to previous month price and 44 percent lower compared to price prevalent in August 2015.

At Arsikere APMC market in Karnataka, the monthly average price of ball copra was Rs.7061 per quintal. This was marginally lower compared to the previous month's average price and 39 percent lower compared to price prevalent in August 2015.

Table 4 : The weekly average of price of Ball copra at major markets in Karnataka (Rs/Quintal)		
	Tiptur	Arsikere
07.08.2016	7458	7058
14.08.2016	7400	7025
21.08.2016	7523	7090
28.08.2016	7415	7142
31.08.2016	7137	7004
Average	7405	7061

Dry coconut

At Kozhikode market the price of dry coconut were steady during the first two weeks, increased slightly by the end of third week and then declined slightly during the last week. The monthly average price of Rs.5500 per quintal was marginally higher compared to previous month price and 51 percent lower compared to the previous year price.

Table5 : The weekly average of price of Dry Coconut at Kozhikode market (Rs/1000 coconuts)	
07.08.2016	5400
14.08.2016	5400
21.08.2016	5440
28.08.2016	5750
31.08.2016	5500
Average	5500

Coconut

The price of coconut at Nedumangad market remained same at Rs.7500 per thousand nuts throughout the month which was 7 percent higher when compared to previous month and 33 percent lower compared to the price prevalent in August 2015.

The market price of partially dehusked coconut at Arisikere market expressed a fluctuating trend throughout the month. The monthly average price at this market was Rs.8310 per thousand nuts.

At Bangalore APMC market the price of coconut expressed a slight upward trend during the first 3 weeks, but declined slightly during the last week of the month. The monthly average price at this market was Rs.8780 per thousand nuts which was 6 percent higher than that of the previous month and about 44 percent lower than that of corresponding month last year.

At Manglore APMC market the price remained same throughout the month at Rs.13000. The monthly average price at this market at Rs.13000 per thousand nuts was same as that of the previous month and about 22 percent lower than that of the corresponding month last year.

Table 6: The weekly average of price of coconut at major markets (Rs /1000 coconuts)				
	Nedumangad	Arsikere	Banglore	Mangalore (Grade-1)
07.08.2016	7000	7400	7750	13000
14.08.2016	7000	9667	9250	13000
21.08.2016	7800	8590	9500	13000
28.08.2016	8000	8310	9083	13000
31.08.2016	8000	7850	8250	13000
Average	7500	8310	8780	13000

Tender coconut

The price of tender coconut at Maddur market expressed an erratic trend during the month. The modal price of tender coconut at Maddur APMC market in Karnataka was Rs.10,000 per thousand nuts, which was marginally higher than that of the previous month.

Table7 : The weekly average of price of tender coconut at Maddur market (Rs/1000 coconuts)	
07.08.2016	9500
14.08.2016	10000
21.08.2016	10000
28.08.2016	10000
31.08.2016	9500
Average	9833

International price

Coconut oil

The price of coconut oil at different international markets also expressed a slight fluctuating trend during the month. The domestic price of coconut oil in India was competitive compared to the prices quoted at all other international markets. The domestic price of coconut oil opened at US$ 1300 and closed at US$1475 per MT. The price of coconut oil quoted at different international markets is given below.

Table 8: Weekly average Price coconut oil in major coconut oil producing countries August 2016				
	International Price(US$/MT)	Domestic Price(US$/MT)		
	Philippines/ Indonesia (CIF Europe)	Philippines	Indonesia Indonesia	India*
05.08.2016	1475	1432	1471	1300
12.08.2016	1520	1422	1483	1325
19.08.2016	1590	1425	1584	1420
26.08.2016	1560	1533	1572	1475
Average	1536	1453	1527	1380
* Kochi Market				

Copra

Price of copra in major copra producing countries also expressed a similar trend as that of coconut oil during the month. The price of copra in India expressed an upward trend. Price of copra in Srilanka market was highest among all the markets.

Table 9: Weekly average Price of copra in major copra producing countries August 2016				
	Domestic Price(US$/MT)			
	Philippines	Indonesia	Srilanka	India*
05.08.2016	907	807	1300	845
12.08.2016	875	785	1322	857
19.08.2016	872	779	1300	935
26.08.2016	888	831	1300	983
Average	886	801	1306	905
* Kochi Market				

Desiccated coconut

The FOB price of desiccated coconut in India during the month of August was very competitive compared to the international prices and FOB prices of major DC exporting countries. Price of desiccated coconut in Philippines market appears to be much higher than the other major desiccated coconut manufacturing countries.

Table 10: Weekly average price of desiccated coconut in August 2016

	Domestic Price (US$/MT)			
	Philippines	Indonesia	Srilanka	India*
05.08.2016	2458	2120	2041	1517
12.08.2016	2458	2100	2030	1442
19.08.2016	2458	2050	2000	1432
26.08.2016	2458	2050	2078	1458
Average	2458	2080	2037	1462

*FOB

Coconut

The price of dehusked coconut in Philippines and Indonesia showed a declining trend during the month, whereas in India and Srilanka market the prices expressed a slight upward trend. The domestic price of dehusked coconut in India was higher compared to all other markets.

Table 11: Weekly average price of dehusked coconut with water during August 2016

Date	Domestic Price (US$/MT)			
	Philippines	Indonesia	Srilanka	India*
05.08.2016	189	190	190	231
12.08.2016	187	190	190	238
19.08.2016	179	175	190	259
26.08.2016	190	174	192	266
Average	186	182	191	248

*Kozhikode market

Coconut shell charcoal

The FOB price of coconut shell charcoal in India expressed a fluctuating trend during the month. Philippines quoted the lowest price compared to all other markets. Prices quoted by Srilanka market was the highest among all other markets.

Table 12: weekly average price of coconut shell charcoal during August 2016

Date	Domestic Price(US$/MT)			
	Philippines	Indonesia	Srilanka	India
05.08.2016	338	370	553	413
12.08.2016	338	370	460	364
19.08.2016	338	370	460	395
26.08.2016	340	380	460	349
Average	339	373	483	380

*FOB

Monthly operations in coconut gardens - October

Andaman & Nicobar Islands: Apply organic manures like dried compost /cow dung@ 40 kg or poultry manure @ 5 kg/palm in the basin taken at a distance of two m away from the bole of the palm in a depth of 2-3 inch. Cover it with soil. New planting of quality seedlings can be undertaken with a density of 150 seedlings per hectare. Prevent accumulation of rain water in the pits. Plant perennial intercrops such as clove, nutmeg, cinnamon, pepper and banana. Control rhinoceros beetle by releasing baculovirus treated beetles @ 15 beetles/ha. Remove the affected bark tissues on the stem and apply five per cent calixin on the wound and also apply warm coal tar if stem bleeding is noticed. Monitor the prevalence of bud rot disease and cut and remove all the affected tissues of the crown and apply 10 per cent bordeaux mixture and cover with polythene to protect it from rain water till normal shoot emerges in case of bud rot disease affected palms. Remove the weeds from the plantation.

Andhra Pradesh: Plant one year old seedlings in the main field. Apply the second dose of fertilizers i.e. 750 g urea, 1300g single superphosphate and 1250 g muriate of potash per adult palm.

Assam: Apply the second dose of fertilizers if not applied during September. Start the post monsoon prophylactic spraying of the palms with one per cent bordeaux mixture in areas where bud rot disease is noticed. Incorporate the weed plant Clerodendron infortunatum in the breeding grounds to destroy the grubs and eggs of rhinoceros beetle. Fill the youngest three leaf axils with a mixture of 250 g powdered marotti/ neem cake with equal volume of sand or place naphthalene balls (12 g/ palm) and cover them with sand thrice a year. Keep the nursery free of weeds. Irrigate the nursery if necessary. If stem bleeding is noticed, remove the affected tissues on the stem and apply five per cent calixin on the wound followed by coal tar. Tie or prop up bunches to prevent buckling.

Bihar / Madhya Pradesh: Remove weeds from the garden. Apply the second dose of fertilizers after the monsoon @ 250 g Urea, 500 g Single Super Phosphate and 500 g Muriate of Potash per palm if applied in 3 splits. Apply fertilizer in basin taken around the palm at a radius of 1.8 m and cover with top soil. Fertilizer application should be followed by irrigation. Crown cleaning should be done to avoid infections during winter season. Apply Blitox @ 5 g/ litre and Dithane M 45 @ 2 g/litre on the crown and bunches alternatively to avoid secondary infections during winter and continue upto February. Sow horse gram or cow pea in coconut basins during mid October after fertilizer application as mulch crops which will help the maintenance of micro climate, moisture conservation and nitrogen fixation in the soil.

Karnataka: Prepare land for new planting. Discard seedlings which have not attained proper growth in the nursery. Application of second dose of fertilizer may be taken up. Clean the crowns of the palms by removing dried and old spathes. As a control measure of rhinoceros beetle, incorporate the weed plant Clerodendron infortunatum in the breeding grounds to destroy the grubs and eggs of the beetle. Fill the youngest three leaf

axils with a mixture of 250 g powdered marotti/ neem cake with equal volume of sand or place naphthalene balls (12 g/ palm) and cover them with sand thrice a year. Treat manure pits and other possible breeding sites with carbaryl 0.1 per cent which is to be repeated every three months. As a prophylactic measure, spray bordeaux mixture to avoid the infestation of bud rot.

Kerala/Lakshadweep: Check for the incidence of stem bleeding. If found infected, remove the affected bark tissues on the stem and apply 5 percent calixin on the wound. When this is dry apply warm coal tar. Apply 5 kg neem cake per palm per year along with the second dose of fertilizer. If the attack of the mite is noticed, spray neem oil - garlic - soap emulsion 2 percent (20 ml neem oil + 20 g garlic emulsion + 5 g soap in 1 litre water) or commercial botanical pesticides containing azadirachtin 0.004 per cent @ 4ml per litre of water on bunches, especially on the perianth region of buttons and affected nuts or root feed neem formulations containing azadirachtin 5 per cent @ 7.5 ml with equal volume of water.

Maharashtra/Goa/Gujarat: Plough the garden and make channels for irrigating the palms. Pile up mounds in sandy soils. Remove ungerminated and dead sprouts from the nursery.

Orissa: Initiate sowing of green manure crop seeds in the coconut basins. Incorporate green leaf manures in the coconut basins. Plant/sow intercrops like seasonal intercrops and vegetables. Keep the nursery free of weeds. If the attack of pests and diseases are noticed apply plant protection chemicals. Clean the crown and apply organic manures. Other maintenance operations to coconut as well as the intercrops also may be initiated.

Tamil Nadu / Puducherry: Apply the second dose of fertilizers, i.e. 500g urea, 800g single superphosphate and 800g muriate of potash per adult palm (under rain fed conditions). Incorporate it well in the soil and cover with soil immediately after the application of fertilizers. Check for the incidence of stem bleeding. If found infected, remove the affected bark tissues on the stem and apply 5 percent calixin on the wound. When this is dry apply warm coal tar. Apply 5 kg. neem cake per palm per year along with the second dose of fertilizer. If the attack of the mite is noticed, spray neem oil - garlic soap emulsion 2 percent (20 ml neem oil + 20 g garlic emulsion + 5 g soap in 1 litre water) or commercial botanical pesticides containing azadirachtin 0.004 per cent @ 4ml per litre of water on bunches, especially on the perianth region of buttons and affected nuts or root feed neem formulations containing azadirachtin 5 per cent @ 7.5 ml with equal volume of water.

Tripura: Clean the crown if not done in the earlier month. Application of plant protection chemicals and fertilizer should be followed if not done last month.

West Bengal: Incorporate green manure crop in the soil. Apply organic manure such as dried cow dung/ dried compost@ 40 kg or vermi compost @ 20 kg/tree if not applied during the previous month in the basin at a distance between 1.5m and 2 m away from the bole of the tree in a depth of 2-3 inch. Cover it with soil. Plough the inter space and plant early varieties of winter vegetables, oil seeds or pulses. Look for crown chocking especially in north Bengal. If noticed, apply borax@ 100 g per palm. Hand weed the nursery and provide partial shade to young seedlings. Support newly planted seedlings with suitable props. Tie or prop up bunches to prevent buckling. Start harvesting of matured nuts. Look for insect damage and disease symptoms. Hook out the rhinoceros beetles and fill the top three leaf axils with a mixture of 250 g powdered marotti/ neem cake with equal volume of sand or place naphthalene balls(12 g/ palm) and cover them with sand thrice a year. Check the palms for bud rot. If bud rot is found, remove the affected parts, apply bordeaux paste and cover with polythene sheet or plastic bucket. Spray the neighbouring palms/ seedlings with 1.0 per cent bordeaux mixture. If stem bleeding is noticed, remove the affected bark, apply 5 per cent calixin on the wound and the next day apply coal tar. Root feed 5 per cent calixin (5 ml in 100 ml water) once in every three months and apply 5 kg neem cake per palm per year along with second dose of fertilizers. If the attack of the mite is noticed, spray neem oil - garlic - soap emulsion 2 percent (20 ml neem oil + 20 gm garlic emulsion + 5 gm soap in 1 litre water) or commercial botanical pesticides containing azadirachtin 0.004 per cent @ 4ml per litre of water on bunches, especially on the perianth region of buttons and affected nuts or root feed neem formulations containing azadirachtin 5 per cent @ 7.5 ml ■