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Krishi Unnati Mela 2018

Mini Mathew, Publicity Officer, CDB, Kochi -11

Hon'ble Prime Minister of India, Shri Narendra Modi informed that the Union Government has decided to ensure MSP for all notified crops to at least one and a half times the cost of production . The cost will include elements such as labour, rent for machinery, cost of seeds and fertilizers, revenue being given to State Government, interest on working capital and rent of leased land. He was addressing the gathering of 3rd Krishi Unnati Mela organized at the sprawling campus of ICAR-Indian Agricultural Research Institute, Pusa, New Delhi in association with Agriculture Research Institutes and organizations under the Ministry of Agriculture and Farmers Welfare from 16 -19th March, 2018 with the theme 'Doubling of Farmer's Income by 2022'.

Shri Radha Mohan Singh, Union Minister for Agriculture and Farmers' Welfare Govt of India, Shri. Parshottam Rupala and Smt. Krishna Raj, Minister of State for Agriculture & Farmers Welfare; Shri. Shivaraj Singh Chouhan, Chief Minister, Madhya Pradesh, Shir. Gajendra Singh Shekhawat, Minister of State for Agriculture & Farmers Welfare and Panchayathi Raj; Shri. Sarbananda Sonowal, Chief Minister of Assam; Shri Surya Pratap Shahi, Agriculture Minister of Uttar Pradesh; Shri S.K. Pattanayak, Secretary, Ministry of Agriculture and Farmers Welfare; Dr. Trilochan Mohapatra, Secretary (DARE) & Director General (ICAR); Dr. A.K. Singh, Director (ICAR-IARI) & DDG (Agriculture Extension); Dr BNS Murthy, Horticulture Commissioner and Chairman, CDB and Dr. J.P. Sharma, Joint Director-Extension (ICAR-IARI) were the dignitaries present on the occasion.

The Prime Minister emphasized the importance of Farmer Producer Organizations. He said that Farmer Producer Organizations, would be given relief on income tax, on the lines of cooperative societies. A new chapter in Agriculture Marketing Reform is being added in this programme, with the e-marketing portal for organic products. Comprehensive steps are being taken for Agriculture Marketing Reforms. It is important to connect Rural Retail Markets with wholesale and global markets. In the recent Union Budget, Grameen Retail Agriculture Markets have been envisaged. 22,000 rural hats will be upgraded with necessary infrastructure, and integrated with APMC and the e-NAM platform. The Prime Minister specially mentioned that the State of Meghalaya,

Hon'ble Prime Minister of India, Shri Narendra Modi and Shri Radha Mohan Singh, Union Minister for Agriculture and Farmers' Welfare Govt of India addressing the farmers in Krishi Unnati Mela

which received an award for its achievements in agriculture, in the period under review.

The Prime Minister inaugurated the Jaivik Khethi(organic farming) and laid the Foundation Stone for 25 Krishi Vigyan Kendras taking the total centers to 700 in India. He also launched an e-marketing portal for organic products. He gave away the Krishi Karman Awards and the Pandit Deen Dayal Upadhyaya Krishi Protsahan Puraskar. . During the occasion 6 farmers with IARI-Fellow Farmer Award' and 46 progressive farmers including women farmers with 'IARI-Innovative Farmers Award' were felicitated.

Shri Radha Mohan Singh, Union Minister for Agriculture and Farmers' Welfare launched a new mobile app called PUSA KRISHI for farmers in order to take the technology to farm fields. "With the use of this mobile app, farmers can get easy solutions to their problems. The app will provide farmers with information related to weather, new crop varieties, resource conserving cultivation practices as well as farm machinery and its implementation which will help in increasing returns to farmers".

In his address, he congratulated all the awardee farmers by Pusa Institute and said that these farmers are inspiration to others. Minister also congratulated farmers and scientists for record production of agricultural and horticultural crops this year. He asked farmers not to be impatient and the government is with them. "The government and scientists will support from time to time with new technologies," he added. He reiterated the central role of new and innovative farm technologies in doubling the income of farmers. Modern technologies and crop varieties must reach the farmers without any time lag and must be demonstrated on farmers' fields for winning the confidence of farmers. The government is working towards increasing the usage of technology at the hands of the farmers under various schemes like Pradhan Mantri Krishi Sinchayee Yojana, Soil Health Card Scheme and Traditional Agriculture Development Scheme (Paramparagat Krishi Vikas Yojana) in the light of doubling farmer's income by 2022" Shri. Singh said.

More than 800 stalls were set up by the Central and State Governments, various organizations, etc.

Main pavilion of Krishi Unnati Mela


COCONUT DEVELOPMENT BOARD

CDB officials along with Dr. B.N.S. Murthy, Chairman, CDB at the venue of main pavilion

in this fair. Ways to enhance farmers' income were showcased through theme pavilions like micro irrigation, neem-coated urea, soil check/Soil Health Card, reducing costs through less use of fertilizer, effectiveness of crop insurance scheme and new dimensions of income generation, such as animal husbandry, bee keeping, poultry farming, value addition in coconut etc. Theme Pavilions also highlighted the Start-up initiatives being implemented.

Coconut Development Board in Krishi Unnathi Mela

Coconut Development Board participated in Krishi Unnathi Mela in a grand scale by reserving 40 numbers of stalls along with CDB theme pavilion in Horti-18 Pavilion of MIDH. The objective of the mela was to create widespread awareness about the latest technological developments in agriculture and to receive feedback from the agricultural farming community, which would ultimately help in designing and shaping the future strategy in agricultural research sector.

Board has showcased value added products of coconut at the major theme Pavilion of Ministry of Agriculture wherein Hon'ble Prime Minister of India Shri. Narendra Modi visited CDB stall and gone through the various schemes and activities being implemented by the Board in development of coconut industry. Dr. B. N. S. Murthy Horticulture Commissioner & Chairman CDB, explained to the Hon'ble Prime Minister about the latest progress in coconut processing sector especially latest technologies for promoting value addition in coconut.

National Horticulture Board, National Bee Board, & other development agencies under horticulture division participated along with CDB in Horti-18 pavilion. In theme pavilion, Coconut Board had displayed various value added products manufactured from different parts of coconut - Coconut inflorescence based food products viz Neera, Neera Sugar, Neera honey, Neera Jaggery, Neera Halwa, Neera Syrup etc. Kernel based products, viz Virgin coconut oil, coconut oil, desiccated coconut, copra, Coconut Chips, Spray dried coconut milk powder, Coconut Cream, health and beauty care products, Coconut Convenience food products viz coconut biscuits, coconut candy, coconut Chocolate, coconut burfi etc. Coconut Water based products viz tender coconut water, vinegar,

Particip
entrepren
and FPOs
Krishi Unnathi M












Nata - de - coco, coconut squash etc Coconut shell based products such as coconut shell charcoal, activated carbon and coconut handicrafts. Varieties of bunches, seedlings, inflorescences etc were also displayed at CDB's pavilion which attracted visitors from North Indian States especially from Punjab, Rajasthan, Bihar, Haryana, UP, Madhya Pradesh etc. Enquiries related to availability of coconut products and seedlings etc were received from almost all the visitors. Nearly one lakh people visited Krishi Unnathi Mela pavilion. Video screening of CDB activities, free distribution of leaflets on coconut also provided information on coconut to the public. 8 Coconut Producer Companies (CPCs) had showcased their farm fresh, quality products in their stall and the Mela provided an opportunity to find out markets in North India. Coconut product manufacturers across the country participated in the mela. Potential


enquiries were received by participant manufacturers of coconut which could lead to businesses. Lady entrepreneurs Smt. Sudha Mohan from Karnataka & Smt. Sunitha Kasba from Kashmir displayed and sold their branded tender coconut water. Manufacturers of Tender coconut water has decided to formulate a consortium of manufacturers of their wing.

Entrepreneurs Meet

An entrepreneurs meet was convened by Dr. BNS Murthy Horticulture Commissioner on 17th March at Relax inn Hotel, Patel Nagar, New Delhi. 32 Entrepreneurs including FPOs participated in the discussions. On the occasion entrepreneurs who are involved in shaping the coconut industry in India raised reasonable issues being faced by them. Item wise issues were resolved by Chairman and Team members of CDB including Shri. Saradindu Das, CCDO, CDB, Shri. Sardar Singh Choyal, Deputy Director, Shri. Sreekumar Poduval, Processing Engineer, Smt. Deepthi Nair, Assistant Director, (Marketing) and Smt. Mini Mathew Publicity Officer, CDB.

Key issues and problems in coconut processing sector raised by the entrepreneurs

1. They have sought more support from CDB for promoting coconut water based health drinks especially tender coconut water and neera.

2. More technical support was sought from CDB for improving the quality of value added products such as neera, coconut milk/flavoured coconut milk.

3. Due to enhancement of 5% VAT of tender coconut water to 12% in GST, entrepreneurs were facing difficulties for selling their products. Hence they requested the Board to take necessary steps to reinstate the earlier status in tax structure.

4. More efforts should be taken for generic promotion of value added products of coconut.

5. Necessary steps need to be taken to provide subsidy for machinery manufacturers under TMOC project.

6. A few coconut entrepreneurs had complained that KFC was the only financial institution charging interest on the back ended subsidy sanctioned by CDB under TMOC. They had sought the support of the Board in taking appropriate action in this regard for solving this issue at the earliest.

7. Due to adulteration in DC industry, those manufacturers producing quality DC product are facing difficulties to get real price for their genuine product. They have requested for maintaining stringent action on adulteration as per the food safety standard. Besides, whenever processing units are established, subsidy also should be given for laboratory equipments.

8. Maximum promotion need to be given about Goodness of coconut products through Board's web portal.

Solutions offered by CDB in addressing the key issues in coconut processing sector

1. Dr. B. N. S. Murthy, Chairman informed that Coconut Board is taking necessary steps for the generic promotion of natural health drinks Neera and tender coconut water. Board has already written letter to Railway Ministry and Civil Aviation Ministry for getting permission for the sale of tender coconut water and neera through IRCTC stalls of Railway and also in various flights and also at Airport. Due to the adoption of different technologies for processing of neera by the Coconut Producer Companies in Kerala, there are chances of experiencing taste differences. Whenever bulk orders are coming, we can adopt common brand for meeting the export demand. At the same time, in Indian market we can continue individual brand for a healthy competition in the market.

2. Entrepreneurs are free to visit CDB Institute of Technology at Aluva in Kerala for getting technical knowhow for production of value added products and also for ensuring the quality of coconut products.

3. Board will take efforts regarding the issue of 12% GST and will try to reduce it to 5%.

4. Board has not included subsidy for Machinery manufacturers in its guidelines. Those who are functioning under coconut processing can only avail financial assistance under TMOC.

5. As part of generic promotion of coconut, Coconut Board is carrying out intensive media campaign across the country through print and electronic media on basket of coconut products viz coconut oil, virgin coconut oil, coconut milk, coconut milk powder tender coconut water, neera and neera products, coconut chips etc. During the current year Board has conducted generic promotion of coconut products at New Delhi Air Port (Domestic terminal) by erecting 63 digital display hoardings of value added products, display of banner advertisement through railway broadcasting channel in various Railway Stations across the country, Bus Q shelter hoardings in New Delhi, promotion of CDB programmes through All India Radio, Radio Mirchi, Community Radio, website and digital marketing campaign at different parts of the country. By conducting competitions among school children about goodness of coconut Board could create awareness on coconut among student community.

6. The Chairman had assured that the Board will take up the issue raised by the Entrepreneurs about KFC charging interest on the subsidy sanctioned by CDB and solve this issue by arranging a discussion with KFC as early as possible.

7. Board will take up stringent action against those who are doing adulteration in DC industry. Besides, the Board will also issue a warning letter to the malpractitioners in this sector.

8. Board is taking up initiatives for promoting value added products through website of CDB. Legality for endorsing Board's website for sale also will be verified .

Dr BNS Murthy, Chairman, CDB informed that during next financial year Board will carry out one buyer seller meet in each metro city. Accordingly minimum four numbers of meets will be organized across the country.

Participant entrepreneurs and FPOs of Krishi Unnathi Mela 2018

M/S. Keratech Coconut Oil Manufacturing Company (P) Ltd, 1/332 B, P.O. Engandiyur, Trichur. Ph. 0487-229415, 2296393
E Mail: Info@Keratechindia.Com, Products : VCO and based products, coconut chips

M/S. Pamposh Foods India Pvt Ltd, Reg. Office – B1, B2, B3, Basement, 09, Locak Shopping Centre, Allied Bhawan,Madangiri,
New Delhi- 110 062 Ph – 09810332829, 9268320523, 9810707999, Peoindia@Yahoo.In, Pamposhinternational@Rediff.Com, Products : TCW

Novel Food Products, Lospet, Pondicherry, 605 5008. India. Ph. 091050207073, novelfizz@gmail.com Product : TCW powder

Teakrafts, Kumar Suresh, Coimbatore, Ph: 9443708415, Culcutta, Ph. 03300833613, 30283626
sales@tiglobal.Com, Marketing@Tiglobal.Com, Product : Machinery

M/S. Agricoles Natural Foods Pvt Ltd, 62, Gitanjali, Heavently Villas, Kuttur – Post, Thrissur, Kerala – 680 013,
Ph. 04872304862, 9846233638, Contact@Agricolesnaturel.Com, Product : TCW

M/S. Yogic Foods Pvt. Ltd, U-101, Anupam Appartment, East Arjun Nagar, Delhi – 110 032,
Ph: 08800227742, 09810595214, Yogicfoods@Yahoo.Com, Product : TCW

Dinesh Foods Dinesh Bhavan, Payyambalam, Kannur- 670 001, India, Dineshltd@Gmail.Com, Ph: 0497 2701699
Product : Coconut Milk , VCO, DC, Coconut Chips, Fortified coconut milk cream, Hair oil, Baby oil, Coconut oil

M/S Nata Nutrico Coconut Food Products, Mundapuram, Narath Post, Kannur Dist, Kerala – 670 601, Ph: 9895198315, 94495058315
Natanutrico@Gmail.Com, Product : Nata de Coco, honey etc

De Alben, Lourde Avenue, K.Pungampalayam, Karamadai - 641004, Dealbenproduct@Gmail.Com, Ph: 9489652652
dealbenproduct@gmailo.com, ahilanfernando1616@gmail.Com Product : Coconut sugar, coconut honey, coconut milk powder

Shri Shridhareshwara Coconut Productst, Shri. Suresh Bhat, No 269/D. Hebbal Industrial Area., Belawadi Post. Mysore. Karnataka. 570018,
Ph: 09341117525, 9481788625 Shridhareshwara@Gmail.Com, Product : VCO, Coconut chips, Coconut vinegar, pickle

M. S. Cocopani, 12, 5th Cross, 4th Block, Kumarapark Western Bengaluru – 560020, Ph: 9844455757,
sudhamohan003@gmail.com, Product : TCW

Vijayanagar Biotech Ltd., 403, 4th Floor, Vijaya Jyothi Arcade, Opp. Nahi Office, Hanumanthawaka, Visakhapatnam – 530 040. Andhra Pradesh
Ph: 8912731634, Info@Vfnpl.Com Products: various value added products

Vadakara Coconut Producer Company, 2nd Floor, 19/408 K M & L, Al-Diyafa Complex, Co-Operative Hospital Road, Karimbana Palam, Vatakara, 673101, Kerala, Ph: 9446522107, vcfpcompany@gmail.Com,
Product : Neera, coconut oil, vinegar. VCO, Soap, jaggery, hair oil, honey, chocolate, vegwash, baby oil

Onattukara CPC, Kattanam, Near South Indian Bank, Pallikal , P.O-670503, Alappuzha, Ph: 9447365824
onattukaracpc@gmail.com, Product : Coconut Oil, VCO

M/S. KLF Nirmal Industries (P) Ltd. Thrissur, Ph: 0480 2826704,7 Klfgroup@Klfnirmal.Com, Product : Coconut Oil, VCO, TCW, Coconut soap

M/S. Super Coco Company , N.12, Sakthi Co-Op Industrial Estate Udumalai Road, Pollachi-642 003 Coimbatore Dt., (T.N.)
Ph: 04259236947, 9443032386, 9443010954 Supercococompany12@Gmail.Com, Product : DC

Lakshadweep Coconut Industries , Androth Island Lakshadweep – 682551, Ph: 9447697503, Product : Organic coconut oil

Palakkad Coconut Producer Company , 10/728a, Little Tree Urukulam, Govindapuram Po Muthalamada, Palakkad-678507,
Ph: 9946565243, chairman@keralacoconut.com, Product : Coconut oil, Vinegar, Coconut sugar, Neera chocolate. Coconut nectar, honey

Tejaswini CPC, C.P.li-376/K7 ,I Thattassery Building , Cherupuzha P.O, Kannur-670511 , Ph: 9495492600,
Product : Coconut oil, soap, organic manure

Thirukochi CPC, Thirumaradi Po, Koothattukulam, Ernakulam, Kerala , Ph: 9072588806, thirukochicpcl@gmail.com Product : Neera

Kadathanad CPC, Mokeri. Po, Kakkattil.Via, 673507 Calicut Dt, Ph: 9400219144 georgepg2@gmail.Com, kadathanadcfpc@gmail.com, Product : Neera, Neera vinegar, Neera honey, Neera jaggery, coconut chutney powder, coconut pickle, coconut oil, VCO, neera chocolate, vermi compost

Kuttiady CPC, Room No. Iv-, 2145, River Road, Kuttiady P.O, Kozhikode District, Kerala-67350 Ph: 9846153749 Product : Coconut Oil

Kozhikode CPC P.G Complex, 3rd floor, Bank Road, Kozhikode District-673571, Kerala, Ph: 9447846140,Product : Coconut Oil

Marico, Subi, Ph: 9626262085, subin@maricoindia.Net Product : Coconut Oil

Cocosath health products, Pranathmaka, Kerala Ph: 8086448631, 9446912804 dsm.chp@gmail.com,Product : VCO and based products

Habitat wellness pvt ltd, Mojoco, Ph: 9324278542, rohit.m.bagari@gmail.com Product : TCW

V.V. Industries, Tamilnadu, Ph: 7299998199, vvindustriesgobi@gmail.com Product : High fat DC

Arable biotech private limited, New Delhi, sudha@arablebiotech.com, arabletech@gmail.com Product : Various coconut products

Cocorush beverages private limited, New Delhi ayush@cocorush.in, ayush.cocorush@gmail.com Product : Various coconut products

NGO Products nitinpawangoyal@yahoo.com Product : Various coconut products

Tenco Foods Private Limited Katha # 183. Kathanur, Oppt.To Sai Sumuka Nest , Behind Meenakshi Mall, B.G.Road Bengaluru — 560 076
Ph: 09886731232, Manigtencofoods.Com Product : TCW

Tengu Mane # 487, 5th Main, 11th Cross, Mahalakshmipuram Bengaluru — 560 086 Ph: 9513399326,
thengumane@gmail.com Product : TC machine, VCO, jelly souffle

Chocolate Tree

an intercrop in coconut garden for doubling farmers income

Jnanadevan.R, Deputy Director, CDB, Kochi -11

Cocoa (*Theobroma cacao*) is one of the commercial plantation crops of the world and it is largely grown as a mixed crop in coconut garden in major coconut growing countries. Cocoa is now grown in 58 countries in more than 10.369 million ha. worldwide with a production of 4.434 million tonnes (Table I). Cultivation of cocoa is gaining momentum in India and is presently cultivated in an area of 87, 440 ha. (Table 2). However the productive area estimated is around 60,000 ha. Of these 29205 ha. is in Tamilnadu followed by 28656 in Andhra Pradesh. The country produces 19,866 MT cocoa annually with an average productivity of 580 kg per ha .

In India, production is too low (0.35%) when compared to the world production. Earlier the price of cocoa beans fluctuated widely, but now the position has changed and the price is ruling between Rs. 150/- and Rs. 160/- per kg for dry beans depending upon the quality of the produce. This has provided an encouraging incentive to the farmers. The country is importing about 50% of the demand for cocoa and the demand is increasing in the country by 15% annually. At present, more than eight industrial enterprises and companies existing in the field are demanding nearly 50,000 MT of cocoa beans while the present production is only 19866 MT ie., hardly 40%. Netherlands and USA are the major consumers of cocoa and cocoa products. The other consuming countries are Ivory Coast, Germany, Brazil, UK and France. The world cocoa consumption is around 0.53 kg per head. However wide variations in consumption levels are observed between the regions. Europeans consume on an average 1.73 kg per head, Americans

Table -1 : World Area and Production of Cocoa -2014			
Country	Area (Ha)	Production(MT)	Prodty. (Kg/Ha)
Brazil	14185	7164	505
Bolivia	704122	273793	389
Cameroon	670000	269902	403
Colombia	160276	47732	298
Coted Ivoire	2748357	1434077	522
Dominican Rep	150943	69633	461
Ecuador	372637	156216	419
Ghana	1683765	858720	510
Guatemala	4403	13109	2977
Guinea	20000	9439	472
Haiti	29862	14633	490
India	71000	15000	211
Indonesia	1727400	728400	422
Liberia	52900	7500	1020
Malaysia	16102	2665	166
Mexico	59624	26969	452
Madagascar	10204	8818	864
Nigeria	1374399	248000	180
Papua New Guinea	110371	45019	408
Peru	106635	81651	766
Philippines	12035	5428	451
Sierra Leone	44000	15879	361
Sao Tome and Principe	23033	3200	139
Togo	32813	30516	930
Uganda	51914	20979	404
Venezuela	63025	21735	345
Solomon Islands	12200	4825	395
Congo	26102	5000	192
United Rep. of Tanzania	7900	5645	715
Dem. Rep. of Congo	9549	2500	262
Total	**1,03,69,756**	**44,34,147**	**428**

Source: FAOSTAT(14.07.2017)

1.3 kg, Asians 0.1 kg and Africans 0.15 kg. In India the per capita chocolate consumption is low (about 200g per person) and is mainly consumed in urban areas. Cocoa products are being exported and India gains a foreign exchange of nearly Rs. 1089 crores during 2016-17.

Coconut monocropping is an inefficient land management system of low productivity and poor economic returns. Coconut is highly suited for crop mixing and is amenable for different types of coconut based farming system models with various crop combinations in inter cropping, mixed cropping, multi storied cropping etc. Intercropping is an intensive land use system in which one or more compatible crops are grown together with coconut, providing complementary benefits. It has proven as a best option for maximizing land use in coconut plantations.

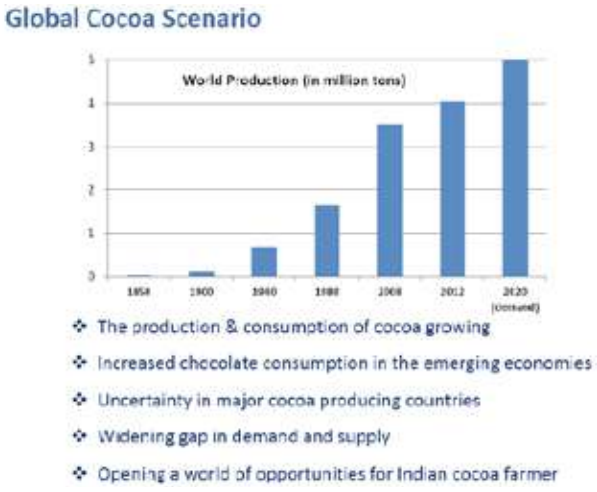
Agro climatic preferences

Coconut and cocoa require tropical climate. Coconut requires an equal climate with high humidity. The ideal mean annual temperature is 27^{o}C with a well distributed rainfall of 1000 mm to 3000 mm per annum. Cocoa requires moderate climate with a temperature range of 15-39^{o}C with optimum of 25^{o}C and annual rainfall of 1000 to 2500 mm. Both coconut and cocoa thrive well in a wide range of soil like laterite, coastal sandy or sandy loam soils rich in organic matter. Both the crops are sensitive to water stress and water logging.

The ideal soil requirement of cocoa is humus rich forest soil. The natural habitat of cocoa is the dense shade of the warm rain forests. The soil should allow easy penetration of roots and capable of retaining moisture during summer. Clay loams, loams and sandy loams are suitable for cocoa. Shallow soils should be avoided. Cocoa is grown on soils with a wide range of PH from 6-7.5 where major nutrients and trace elements will be available. Cocoa doest not come up in coastal sandy soils where coconut flourish.

Cocoa is hardly grown as a mono crop. Its imminent capacity to share the alley spaces of tall growing coconut and arecanut palms and its combining ability with the microclimatic conditions available in such

Table 2 : 1st Advance estimates of Area and Production for 2017-18			
	COCOA		
State	Area (ha)	Production (MT)	Prodty (Kg/ha)
Kerala	15894	7507	750.00
Karnataka	13685	2541	450.00
Tamil Nadu	29205	1733	320.00
Andhra Pradesh	28656	8085	800.00
Total	**87440**	**19866**	**580**



perennial gardens helps its cultivation in utilizing such areas without exacting for an independent growing climate of its own. In any groves of tall growing palms where 40-50% sunlight penetration is possible, cocoa stands first to absorb such solar energy, remaining symbiotic to the main crop and generating additional income as well, besides helping the amelioration of the soil conditions making beneficial not only for its own growth but also for the benefit of the main crop under which it takes its shelter. The light infiltration through the coconut canopy is in the range of 30 to 80% depending on the age of palms, spacing and the extent of canopy development and this shade is suitable for cocoa. Cocoa is biologically compatible and physiologically adaptive in coconut gardens. There is no competition for water and nutrients as these two crops are having different types of root system spread in varying depth of soil.

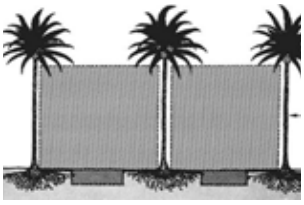
Coconut and Cocoa – Suitability for integration

Coconut is highly suited for crop mixing and is amenable for different types of coconut based farming system models with various crop combinations in inter cropping, mixed cropping, multi storied cropping etc. As a mono crop, coconut does not fully utilize the basic resources like soil and sun light available in the garden. In a coconut garden, with a spacing of 7.5 m X 7.5 m , 75% of the planted area remains unutilized due to the specific distribution pattern of the root system of the crop. The active root zone of coconut is confined within 25 % of the available area since the growing region of the root system is concentrated within a radius of 2 meter around the base. The space utilization of coconut is very low and plenty of sunlight infiltrates and falls on the ground. As much as 56% of the sunlight is transmitted through the canopy of coconut crown of 15 year old palms. Therefore any crop, either seasonal or perennial which does not affect the growth of the palm can be integrated in coconut garden for maximum returns from unit holding.

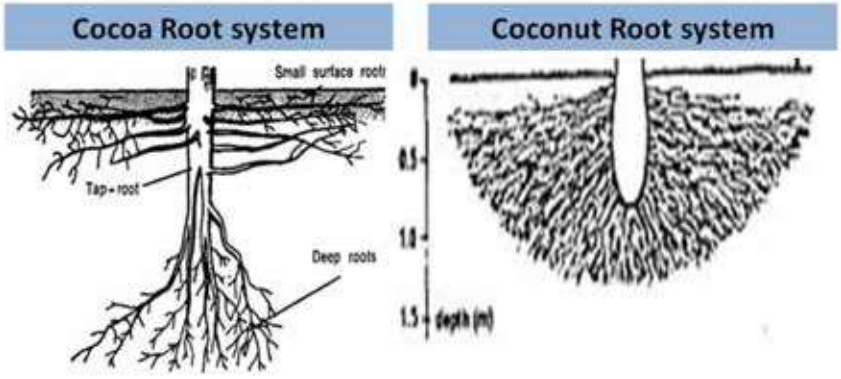
Cocoa has been found biologically compatible and physiologically adaptive in coconut gardens. Coconut provides shade to cocoa which is a shade tolerant crop requiring 40-70 % light for better yield. The diffused sunlight in coconut garden is ideal for growing cocoa. As cocoa is mainly cultivated under irrigated coconut gardens, availability of such areas in the states like Kerala, Karnataka, parts of Maharashtra, Pondicherry, Tamilnadu, Andhra Pradesh and West Bengal will offer considerable scope for its cultivation and its development as these areas are coastal belts where coconut is grown. Of the 2.04 million ha of coconut gardens in India, coconut growing belts in Karnataka, Pondicherry, Tamilnadu and Andhra Pradesh are irrigated in nature. In respect of other states, around 30-40% is under irrigation. Therefore not less than 4 lakh ha of available coconut gardens will be definitely suitable for cocoa as an intercrop besides the vast potential available in the North east region.

25% of total land only utilized by coconut

Maximum utilization of available land



Rooting pattern of coconut



Potential cocoa production from the irrigated coconut area in India	
Total coconut area in the cocoa belt	21 lakh ha.
Irrigated coconut area excluding coastal area (30%)	6.3 lakh ha.
Potential for cocoa production @ 500 kg/ha.	3.15 lakh MT/year.
Present area	87440 ha.
Present production	19866 MT.
World production	44.3 MT.

In a coconut garden of about 10 years with a spacing of 7.5X 7.5 m, cocoa can be planted at a spacing of 3 meter, between two palms in a single row system in the middle of two rows of coconut. In between each coconut palm in a row, one more coconut palm can be accommodated. Thus in one ha. of coconut garden, about 500 cocoa plants can be planted. Six month old F1 hybrid seedlings or graft is the recommended variety for planting in pit size of 50 cm x 50 cm x 50cm.

There is a symbiotic association between coconut and cocoa. The organic matter added by cocoa by way of leaf litter enriches the soil fertility status of coconut garden. Cocoa adds 5.3 tonnes of leaf litter per ha. per annum. Cocoa leaves contain 2.84% nitrogen, 0.26% phosphorus and 1.73% potassium which on an average supply 66.72 kg nitrogen , 4.97 kg P2O5 and 59.72 kg K2O per ha per year. It also provides 14.27 kg magnesium oxide and 2.5 tonnes of pod husk which is rich in potassium (2.5 to 5.3%). The leaf litter that falls on the ground helps in conservation of moisture, regulation of soil temperature and control of soil erosion by carpeting the soil. It also improves soil micro climate and increases the microbial activity in the soil and controls weed growth by casting more shade.

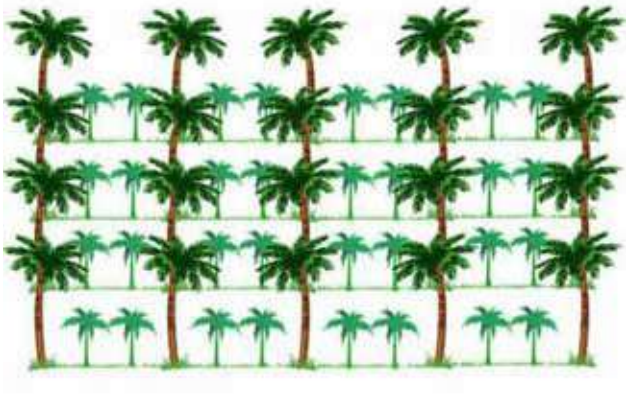
Benefits

The crop combination of coconut and cocoa provides a buffering effect against drastic diurnal variation in its ecoclimate. Differences between the average daily values of maximum and minimum temperature and relative humidity were considerably less in the ecoclimate of the crop combination, while evaporation was only about 30% of that from the open area. Of the 56% sunlight available for cocoa as a mixed crop with coconut, the crop was able to intercept 63% when it was planted in a single hedge only(single rows of cocoa alternating with rows of coconuts) and at least 76% when planted in a double hedge (2 rows of cocoa + 2 rows of coconuts). However light available for cocoa on a per plant basis was less in a double hedge, which resulted in less yield in the double hedge system.

The NPK requirement of coconut can be reduced to a greater extent by growing cocoa as inter crop in coconut garden. The requirement of NPK in one acre of coconut garden is estimated at 35 tonnes, 22 tonnes and 84 tonnes respectively. Therefore the NPK addition from cocoa bio mass reduces the manure requirement. Deficiency of potassium and magnesium is now commonly noticed in most of the coconut gardens especially in the root wilt affected areas. Introduction of cocoa as a companion crop in coconut gardens improves the soil health and thereby the productivity of coconut on a sustainable basis. The feeding roots of cocoa grow laterally from the tap root up to 1.2 to 1.5 meter around the plant at a depth of 15-20 cm. This prevents any sort of competition for nutrients. Thus cocoa is a suitable crop which can be profitably grown in the inter space of coconut.

Economic analysis

Coconut bears fruit throughout the year after crossing its juvenile period. Traditional tall varieties are found to start bearing in 6-7 years while dwarf and hybrid varieties start bearing in 3-4 years. In the case of cocoa, where the climate and soil allow a continuous growth, the first crop can be obtained towards the end of 2nd year or in 3rd year. Cocoa also produces pods throughout the year enabling the



farmers to fetch regular monthly income like coconut. Experience of farmers reveal that average net income per ha. comes to Rs. 2,31000 per year at a spacing of 3mX3m accommodating nearly 500 cococo plants and 160 coconut palms.

On an average, minimum 30 fresh pods per tree are obtained annually from a cocoa plant from the third year onwards. 10 pods will give 1 kg wet beans and 3 kg wet beans give one kg dry beans. The yield potential of a well managed cocoa is 100- 200 pods per tree. Average production per tree is 2-3 kg dry beans or 90 pods per tree. There are trees which produce up to 150 pods per year. As per the present price @ Rs. 40 per kg for wet beans and Rs. 160 per kg for dry beans, the minimum average additional income per hectare of coconut garden after four to five years of planting of cocoa is Rs. 85,000 per year. This is in addition to the income from coconut which is Rs. 3,20,000@ 100 nuts per palm per year (16000 nuts per hectare)@ Rs. 20 at the present price of coconut.

Economics of Coconut- cocoa farming system (CCFS)
Yield of coconut and cocoa

Crops	Plants/ ha (No)	Yield (nuts/ha/kg/ ha)	
		Per plant	Per ha
Coconut (nuts no.)	160	100	16000
Cocoa (dry bean)(Kg.)	500	1.00	500

Economics (Rs./ha)	
Cost of production	174000 [144000(Coconut)+30000(Cocoa)]
Gross income	405000 [320000(Ccoconut)+85000(Cocoa)]
Net income	231000 [176000 (Coconut) +55000 (Cocoa)]

These are average income and with scientific management, significant increase is possible in the net income of farmers. Coconut garden offers tremendous scope for intercropping with cocoa, the chocolate tree, which possesses sustained demand. The irrigated coconut gardens in Kerala, Tamil Nadu, Punducherry, Andhra Pradesh, Orrisa and West Bengal can be effectively utilized for cocoa planting. Hitherto cocoa cultivation has been mostly the mono poly of the south. North east is now all set to embark on massive cocoa cultivation. Agro climatic condition congenial for coconut - cocoa cultivation is vastly available in north and north eastern areas of the country.

States like Assam and Meghalaya are all set

to become the coconut cocoa farming center under MGNREGA, ensuring 100 days work for the marginalized families. Assam having a higher coconut productivity than Kerala, can perform well in cocoa cultivation as well, taking the advantage of congenial agro climatic and other conditions suited both for coconut and cocoa. CDB is promoting the convergence of activities of various Central and State schemes for the sustained development of the coconut sector and is holding hands with various programmes in the different states.

Conclusion

Introducing food crops like coconut and cocoa would in the long run benefit to bring in livelihood security as well as food security in the disturbed and economically backward areas of the country. Ten prominent cocoa consuming companies in India require 60,000 MT of dry cocoa bean per year and it is growing at a rate of 15% per annum in domestic market. Current production is only 19000 MT per year, which shows that there is tremendous scope for introducing cocoa as a viable intercrop in coconut gardens. If cocoa cultivation is taken up in 10 % of coconut area, the production will surpass the demand. This crop combination can become a regular source of income for the small and marginal coconut farmers in the country. ■

A new lethal disease of coconut with unknown etiology in Tamil Nadu

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Introduction

Coconut (*Cocos nucifera L.*), is grown in more than 90 countries around the world, mostly in coastal tropical areas, by the estimated 11 million farmers across 12 million hectares with over 80% of production in Asia. Coconut provides a staple food and serves as a cash crop in many developing countries; copra being one of the few sources of cash income for many households. In India, coconut is cultivated mainly in the coastal tracts of Kerala, Tamil Nadu, Karnataka, Andhra Pradesh, Odisha, West Bengal, Pondicherry, and Maharashtra and in the islands of Lakshadweep, Andaman and Nicobar.

Coconut palm is affected by many lethal and debilitating diseases viz., basal stem rot (BSR) (*Ganoderma spp.*), bud rot (*Phytophthora palmivora*), stem bleeding (*Thielaviopsis paradoxa*), leaf blight (*Lasiodiplodia theobromae*), grey leaf spot (*Pestalotiopsis palmnarum*) and root wilt (*Phytoplasma*). Basal stem rot or Thanjavur wilt is the major lethal disease of coconut and it is distributed in all the major coconut growing areas of Tamil Nadu. During 2007, Bhaskaran and his co-workers at Coconut Research Station, Veppankulam have reported a new lethal disease of coconut in Thanjavur district (Bhaskaran *et al.,* 2007). The first prominent symptom of new disease was the abnormal shedding of all buttons and nuts of all stages of the tree within a period of 3-5 days. The symptom is followed by yellowing and browning of lower whorl of leaves and spreads to upper whorl of leaves. These leaves also droop and fall off. Another characteristic symptom of the disease is the necrosis and rotting of spindle leaves, tip of the spadix and the whole unopened inflorescence. There is no bleeding patch on the stem and there is no rotting or discolorations in internal tissue of the affected stem. Infected palms usually die within 3 to 5 months after the first appearance of symptoms.

During 2016-17, a survey was conducted after the report of the disease by farmers of different villages of three districts in Tamil Nadu viz., Thanjavur, Thiruvarur and Pudukkottai to assess the incidence of new lethal (like) disease, which was reported by the farmers of three districts with unknown etiology. The survey results are presented in Table 1.

(Fig. 1).

Table 1. Incidence (%) of new disease in Tamil Nadu during 2016-17								
S. No.	District/ Taluk	Village	Soil type	Variety/ Hybrid	Age of palm	Total No. of Palms observed	No. of infected Palms	Per cent infection (%)
A.	Thanjavur							
1.	Pattukkottai	Veppankulam	Sandy loam	Hybrid (T x D)	9	75	1	1.33
		Vattakudi	sandy loam	ECT	25	225	2	0.8
		Moothakkuruchi	Sandy clay loam	ECT	25	225	2	0.8
		Silambavelenkadu	Sandy loam	ECT	15	150	1	0.6
		Athivetti	Sandy loam	ECT	20	75	1	1.33
		Madukkur	Sandy loam	ECT	13	475	5	1.33
		Nadankad	Sandy loam	ECT	35	75	1	1.33
		Punal vasal	Sandy loam	ECT	25	300	7	2.33
		Alathur	Red sandy loam	Hybrid (T x D)	15	475	5	1.33
		Thittakudi	Sandy loam	Hybrid (T x D)	12	300	3	1.33
		Kasankadu	Sandy loam	ECT	35	150	1	0.6
		Kalathur	Red sandy loam	ECT	22	150	2	1.33
2.	Orathanad	Thondrampattu	Sandy loam	ECT	25	225	6	2.66
		Ambalapattu	Sandy loam	ECT	18	150	2	1.33
		Thirmangalakottai west	Sandy loam	ECT	12	376	6	1.59
		Kothaiyakad	Sandy loam	ECT	22	225	7	3.11
		Thirumangalak-kottai keelaiyur	Sandy loam	ECT	30	150	1	0.66
		Ooranipuram	Red sandy loam	ECT	8	525	7	1.33
		Kakkarai	Sandy clay loam	ECT	22	1500	4	0.26
3.	Peravurani	Kallankadu	Sandy clay loam	ECT	22	675	5	0.74
		Kallooranikadu	Red sandy loam	ECT	18	975	6	0.62
					Total	7476	75	1.00
B.	Thiruvarur							
1.	Mannargudi	Ullikkottai	Sandy clay loam	ECT	15	225	9	4.00
		Mankottai natham	Sandy loam	ECT	22	2250	67	2.97
		Paravakkottai	Sandy loam	ECT		185	6	3.24
		Palayakkottai	Sandy loam	ECT	25	225	3	1.33
Total						2885	85	2.94
C.	Pudukkottai							
1.	Aranthangi	Poovai managar	Red sandy loam	ECT	32	225	5	2.22
		Periyalur	Red sandy loam	ECT	25	450	10	2.22
		Avanathankottai	Red sandy loam	ECT	9	1350	12	0.88
2.	Alangudi	Vadakadu	Red sandy loam	ECT	10	225	2	0.88
		Avanam	Red sandy loam	ECT		12	600	2
						Total	2850	31
						Grand Total	13211	191

Out of 13,211 palms inspected in the three districts, 191 palms were infected by the new disease. Of which 75, 85 and 31 palms were infected at Thanjavur, Thiruvarur and Pudukkottai districts respectively. Maximum incidence of new disease with unknown etiology was recorded (2.94%) at Mannargudi taluk of Thiruvarur district and the per cent disease incidence ranged from 0.6 to 4.0 per cent.

During 2016-17, 75 farmers from various villages have reported the same type of symptoms as observed by Bhaskaran et al. (2007) in East Coast Tall variety and T x D hybrids in the age group of 8 to 35 years growing in various types of soil viz., sandy loam, sandy clay loam and red sandy loam from the villages of Thanjavur, Thiruvarur and Pudukkottai districts of Tamil Nadu. Only one or two trees in the entire coconut garden and in some gardens nearly 5-12 palms were affected by this disease which is increasing rapidly. In Mankottainatham village, Mannargudi Taluk, Thiruvarur district, Mr.S.Ganasekaran is having 2250 coconut palms aged about 20 years. He reported this wilt symptom in 20 coconut palms during February, 2017 and suddenly it rose to 67 palms within a period of 3 months.

Symptoms

The symptom of unknown disease in coconut palms consist of essentially four stages

First stage: Shedding of nuts (Nut or fruit fall)

In adult coconut palms, the first prominent visual symptom of the disease is the abnormal shedding of all buttons and both unmatured and matured nuts within a period of 3-5 days (Fig. 1). Aborted nuts often develop a brown-black calyx-end rot reducing seed viability. But in immature palms or non-fruit bearing palms the first symptom is foliar discolouration (Fig. 2).

(Fig. 2).

Second stage: Necrosis of inflorescence

Inflorescence-necrosis is the next symptom which is readily observed as newly mature inflorescences (unopened) emerge from the unsheathing spathe wherein, male flowers abscise and no fruit is set (Fig. 3).

(Fig. 3).

Third stage: Yellowing of leaves

Yellowing of the leaves usually starts once necrosis is developed on two or more inflorescences and discoloration is more rapid than that associated with normal leaf senescence, starting with the older (lowermost) leaves, yellowing progresses upward to the entire crown (Fig. 4). Another characteristic of the symptom is necrosis and rotting of spear leaves at crown region (Fig. 5).

(Fig. 4).

(Fig. 5).

(Fig. 6).

(Fig. 7).

Fourth stage: Complete defoliation

Typically, yellowed leaves remain turgid, but eventually turn brown, desiccate and hang down to form a skirt around the trunk for several weeks before falling. As leaf yellowing advances, the spear (youngest) leaf collapses and hangs down in the crown (Fig. 6). Death of the apical meristem (bud) usually occurs when one-half to two-thirds of the crown is yellowed. Eventually, the entire crown of the palm withers and topples, leaving a bare trunk. Infected palms usually die within 3 to 5 months after the first appearance of the symptoms.

Initially, in the affected palms root system is not damaged much whereas in advance stage, 70 percentage of root system is damaged (Fig. 7). There is no bleeding patch on the stem. Internal tissues of the stem are also healthy and there is no rotting or discolouration.

How the disease differs from other known coconut diseases ?

Basal Stem Rot (BSR) - Ganoderma lucidum

In basal stem rot (BSR) disease caused by Ganoderma lucidum death of spear leaf and drooping of leaves leading to mortality of the palm is observed as in the new disease. But in BSR, the first prominent symptoms are bleeding patches on the basal stem and rotting of root tissue will take at least 1½ to 2 years for the death of the palm (Bhaskaran et al., 1990). But in the new disease, root rot is observed during advanced stage and there is no bleeding patch on the stem and the affected trees dies within 3-5 months of the first appearance of the symptom. Thus, this new disease differs from BSR.

Bud rot - Phytophthora palmivora

Rotting of central spear leaf is observed in the bud rot disease caused by *Phytophthora palmivora* also as in the new disease. In bud rot disease, the first prominent symptom is the rotting of spear leaf, but in the new disease, bud rot occurr during advanced stage of the disease.

Root (Wilt) - Phytoplasma

Yellowing of leaflets, necrosis of spathe and spadix are the symptoms associated with root (wilt) disease of coconut caused by Phytoplasma. This is a slow debilitating disease and the palms rarely succumb to the disease. But in the new disease reported in this article, there is quick mortality of the infected palms. The affected palms usually die with in 3 to 5 months after the first appearance of symptoms.

Further Research

Though the new coconut disease resulted in sudden mortality of the palm, observations made so far indicate that the disease is not spreading to the adjacent palms. But in Mankottainatham village, the disease is spreading to the adjacent palms also in few places with a distance of 25 to 75 m within a garden. Research work is in progress at Coconut Research Station, Veppankulam in collaboration with ICAR-Central Plantation Crops Research Institute, Regional Station, Kayamkulam, Kerala to find out the etiology of disease and the integrated practices to manage the disease.

Farmers who observe coconut palms with symptoms described in this article are requested to inform the Professor and Head, Coconut Research Station, Veppankulam - 614 906, Thanjavur District, Tamil Nadu, Phone Number: 04373 – 260 205, 260 124.

References: *Bhaskaran, R., Vaithilingam, R., Ramanathan, A., Natarajan, C., Marimuthu, R. and Subramanian, K.V. 2007. A new lethal disease of coconut in Tamil Nadu. Indian Coconut Journal, 38 (July 2007): 2-4.* *Acknowledgment Authors are thankful to Dr. P. Chowdappa, Director, and Dr. H.P. Maheswarappa, PC (Palms), ICAR-CPCRI, Kasaragod, for their valuable guidance and support. We thank coconut farmers who have reported and cooperated during the period.* **Corresponding Author: E-mail: thangeshagri@yahoo.co.in* ■

Coconut Fiber: A high Dietary Fiber Source

Coconut is a unique fruit as it contains a number of vitamins and minerals and is a rich source of dietary fiber. Coconut fiber or coco fiber contains more dietary fiber than many other sources. Fiber plays an important role in the digestive process and can meaningfully positively boost human health.

Health benefits of fiber
Regulates bowel activity
Absorbs carcinogens and other toxic chemicals
Acts as food for beneficial gut bacteria
Aids in filling the stomach and producing a feeling of fullness
Helps regulate blood sugar
Protects against heart attacks and strokes

Fiber plays an important role in digestion, adds bulk to stool and prevents constipation. It also promotes healthy cholesterol levels and is linked to a decreased risk of heart disease.

The fiber content of coconut flour is definitely the highest of all types of flours. A 100-g serving of coconut flour contains almost 39 g of fiber, which is above the fiber content of whole grain, wheat flour or all-purpose flour, which contain 11 g and 3 g of fiber, respectively. Fiber is part of the total carbohydrates, which means that 60 percent of the carbohydrates in coconut flour is fiber. This means that a 1/4 cup of coconut flour provides 12 g of fiber and 1 tbsp. contains about 3 g of fiber.

Coconut dietary fiber is particularly important as it is reported to produce high amount of butyric acid in stomach, which helps in inhibiting tumor formation. Coconut flour incorporated foods show low glycemic index, which is good for proper control and management of diabetes mellitus and in the maintenance of weight. It can reduce total cholesterol, LDL cholesterol and triglycerides in moderately raised serum cholesterol levels of human (Trinidad, 2001). Coconut controls cholesterol and sugar levels in blood and prevent colon cancer. Studies revealed that consumption of high fiber coconut flour increases faecal bulk (Arancon, 2009).

A study titled Formulation and storage stability of coconut flour and dietary fibre isolate was conducted by Manikandan Arumugam *et al* of Department of Food and Nutrition, RVS college of Arts and Science, Coimbatore, Tamil Nadu, India with the objective of formulating high percentage dietary fibre isolate from coconut flakes, as a functional food. Formulating

coconut flour from coconut flakes, determining the proximate composition and microbial analysis of coconut flakes, coconut flour and dietary fibre isolate and to analyse the storage stability of coconut flour and dietary fibre isolate were the specific objectives of the study. The coconut fibre isolate was prepared by hydrolysis with $CaOH_2$ as per the established protocol.

The study found that the dietary fibre content of dietary fibre isolation was 72.25% and further it was found to be 42% and 48% in coconut flakes and coconut flour respectively. With respect to $CaOH_2$ to hydrolysis, 0.3M and 0.4M concentrations were found to be very ideal in suppressing the dominant coconut taste. With water holding, retention and swelling capacities, isolate was found to be the best (8.27, 7.42, 21.33 ml water/g samples,). According to BIS (Bureau of Indian Standards), the microbial load and peroxide value were within safe limits in isolate (up to 10 months).

The study concludes coconut fibre isolate is a rich source of dietary fibre, when it was treated with calcium hydroxide hydrolysis and found that coconut flakes lost their coconut taste and produced highest percentage of dietary fibre (72.5%) than any other cereals. Dietary fibre isolate stored up to 10 months ambient conditions, did not produce any rancid odour and the microbial load was also within the safe limits. Dietary fiber isolate administration substantially brought down the blood glucose level and reduced the lipid parameters. Hence, dietary fiber isolate prepared from coconut flakes renders as a safe, odourless therapeutic functional food. As dietary fiber isolate potentially ameliorates glucose and lipid levels, this may be used as a functional food for human beings. Further, a systematic human study may be carried out using dietary fiber isolate in order to explore its impact in humans.

*Courtesy: International Journal of Pharmacy and Pharmaceutical Sciences. ISSN- 0975-1491 Vol 7, Issue 3, 2015, Formulation and storage stability of coconut flour and dietary fibre isolate: Manikandan Arumugam*1, Meera Raman1, Kannan Eagappan, Department of Food and Nutrition, RVS college of Arts and Science, Coimbatore, Tamil Nadu, India, 2Department of Clinical Nutrition, PSG college of Arts and Science, Coimbatore, Tamil Nadu, India.*

Statement of ownership and other particulars about
INDIAN COCONUT JOURNAL
FORM IV
(See Rule 8)

1.	Place of Publication	:	Kochi - 11
2.	Periodicity of Publication	:	Monthly
3.	Printer's Name	:	Mini Mathew
	Nationality	:	Indian
	Address	:	Publicity Officer Coconut Development Board, Kochi - 11, Kerala.
4.	Publisher's Name	:	Mini Mathew
	Nationality	:	Indian
	Address	:	Publicity Officer Coconut Development Board, Kochi - 11, Kerala
5.	Editor's Name	:	R Jnanadevan
	Nationality	:	Indian
	Address	:	Deputy Director Coconut Development Board, Kochi - 11, Kerala
6.	Names and addresses of individuals who own the newspaper and partners or shareholders holding more than one percent of the total capital	:	The periodical is owned by the Coconut Development Board which is a body corporate set up by the Government of India under the Coconut Development Board Act, 1979.

I, Mini Mathew, hereby declare that the particulars given above are true to the best of my knowledge and belief.

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Date : 01-03-2018

(Mini Mathew)

FSSAI issues gazette notification on revision of standards for coconut oil

The FSSAI standards of coconut oil have been improved by adding a new parameter called Fatty Acid Composition. FSSAI had published a draft Food safety and Standards Amendment Regulations, 2017 on 19th June 2017 in the Gazette of India inviting objections and suggestions from the persons likely to be affected thereby, before the expiry of the period of thirty days from the date on which the copies of the Gazette containing the notification were made available to the public ie on 22nd June, 2017

After considering the objections and suggestions received from the public in respect of the draft regulations by the Food Safety and Standards Authority of India, certain amendments have been made in the Food Safety and Standards Regulations, 2011

Regulations

- These regulations may be called the Food Safety and Standards (Food Products Standards and Food Additives) First Amendment Regulations, 2018
- They shall come into force on the date of their publication in the official Gazette.
- In the Food Safety and Standards (Food Products Standards and Food Additives) Regulations, 2011, in regulation 2.2, after sub-regulation 2.2.6, the following sub-regulation shall be inserted, namely :-

2.2.7 Fatty Acid Composition

Coconut oil shall comply with the fatty acid composition specified below:-

Fatty acid composition of coconut oil as determined by gas liquid chromatography (expressed as percentage of total fatty acids)

The percentage fatty acid composition is the most important parameter used to differentiate the various vegetable oils. Adulteration with other vegetable oil in coconut oil can be easily detected by analyzing the fatty acid composition except for palm kernel oil which has only small differences in the FAC of the coconut oil. FAC is also very important factor in the determination of stability of oil and to define main applications of oils. The factor is also associated to the impact in the human health.

Fatty acid		Range
Caproic acid	C 6:0	ND -1.0
Caprylic acid	C 8:0	– 10
Capric acid	C 10:0	5.0 – 10
Lauric acid	C 12:0	44.0 – 53.2
Myristic acid	C14:0	13.0 –21.9
Palmitic acid	C 16:0	7.5 – 11.0
Stearic acid	C 18:0	1.0 – 4.9
Oleic acid	C 18:1	5.0 – 10.0
Linoleic acid	C 18:2	1.0 – 2.5
Linolenic acid	C 18:3	ND – 0.2
Eicosanoic acid	C 20:0	ND – 0.2
Eicosanoic acid	C 20:1	ND – 0.2
ND – non detectable or ≤ 0.05%		
Source: CDB Institute of Technology		

Philippines - Reigning the global coconut market

Deepthi Nair S, Assistant Director, Marketing, CDB, Kochi-11

Coconut is a crop with innumerable descriptors - the Tree of life; a wonder crop; a crop which protects, feeds and heals; a natural package that provides a high-calorie food, potable water, fiber that can be spun into rope and a hard shell that can be turned into charcoal. Concentrated mainly in the countries in the tropical equatorial belt, coconut is an integral part of the tradition, culture and lives of the communities in the region. And the country of the Philippines leads in the production and export of diversified value added products from coconut. The Philippines is the leading exporter of coconut products in the global market and stands second in area under coconut behind Indonesia and third in production.

> **Philippines is the global leader in production and export of coconut products. The country occupies the second position in area under coconut and third position in coconut production.**

Crop on compulsion becomes crop of trade

Coconut was introduced in the Philippines by immigrants from the Indo-Malayan archipelago in the early twelfth and thirteenth centuries. Coconut has been used by Filipinos for food, wine, vinegar and oil when the Spaniards came. The history of commercial coconut cultivation in the Philippines could be traced back to the Spanish colonial era. Coconut started as a colonial crop forced on the natives by gubernatorial edict in 1642 and later began to be an important commercial agricultural crop by the turn of the 20th century. Since 1840, coconut products in the Philippines were traded in small quantities with Chinese/Malay traders. Coconut fibers and coconut oil were likewise used by the Spaniards in rigging the Galleon and as food for sailors plying the Manila-Acapulco Galleon trade.

Historical evidences show that in 1898, with the increasing demand for soap and the invention of margarine, copra and coconut oil were exported to Europe as raw material ingredient of the said products. Margarine was also a cheaper substitute for butter. By then, copra export comprised 5% of the total commodity export of the Philippines. The US market came in after the transfer of the Philippines from Spain. By 1926, more than 90% of US demand for desiccated coconut was supplied by the Philippines. During and after World War II, the US continued to buy more copra and coconut oil to extract glycerin needed in the production of explosives. Various fractions of oleo chemicals were also derived for the manufacture of cosmetics, pharmaceuticals, emulsifiers, propellants, paints and insecticides. The heightened demand for copra and coconut oil established the foundation of the coconut manufacturing and export economy as it stood by during the early golden years of industrialization in the Philippines, after its independence in 1946.

Philippines has one of the strongest coconut sectors globally. In spite of the fact that the country has faced constant typhoons, cyclones and pest and disease incidences during the past decade (the most devastating ones like Pablo in 2012 and Haiyan and Yolanda in 2013), coconut has thrived successfully and is still one of the main economic sectors of the country contributing a large share to total national output and being the main provider of jobs in the country. There are also multiple manufacturing and service enterprises that rely heavily on the coconut industry as a source of raw materials and manufacturing inputs. The Governments have been continuously committed to help improve the economic welfare of millions of coconut farmers. Development efforts and socioeconomic policies are geared towards ensuring a balance between the farming sector and the manufacturing sectors of the coconut industry.

Coconut Production

Philippines stand second in area under coconut behind Indonesia and third in production of coconut behind India and Indonesia. The total area under coconut is 3.57 million hectares which is estimated to be around 36% of the total agricultural land in the country. The major coconut producing regions are Calabarzon, Bicol region, Zamboanga Peninsula and Davao region. The total number of bearing palms in the country is estimated to be around 338.7 million in comparison to the 42 million palm population estimated in 1905. Of the total palm population, around 30.4% are below 10 years of age and 62.3% fall in the category of 10 years of age. The palms above 60 years of age come to around 7.3%. There are around 3 million coconut farmers and farm workers and around 25 million more employed in various coconut based enterprises.

A production downturn was noticed in 2016 resulting from the prolonged El Nino induced dry spell in key production areas but coconut production is expected to recover in 2017 to 3.379 million MT. The estimated productivity in 2017 is around 0.948 tons per hectare.

The Philippine Coconut Authority (PCA)

PCA is the agency of the Philippine Government under the Office of the President responsible for developing the coconut and other palm oil industry to its full potential in line with the new vision of a united, globally competitive and efficient industry. It is the sole government agency that is tasked to develop the industry to its full potential in line with the new vision of a united, globally competitive and efficient coconut industry. The mandate of PCA concentrates on the promotion of rapid integrated development and growth of the coconut sector to ensure that coconut farmers become direct participants in and beneficiaries

of development and growth. The vision of PCA gives thrust on food security, improved income and enhanced participation by all stakeholders. The main programs include Production Services (which include projects on coconut planting and replanting, coconut rehabilitation and maintenance of seed farms, institutional development, and farm diversification), Market Development Services (which revolve around activities to promote the coconut industry), Research and Development (which includes projects on varietal improvement, crop protection and product development) and Regulatory Services (which include the implementation of the coconut cutting act, the registration of key products and stakeholders, and upholding quality standards).

Projects for Poverty Reduction and Empowerment of the Poor and Vulnerable

The Kaanib Enterprise Development Project (KEDP) promotes institutionalization of coconut-based enterprise through an integrated resource service convergence approach to increase farm productivity and income of the small coconut farming communities. It promotes establishment of coco-based enterprises which may be coconut farmer's organization (CFO's) or cooperative and establishing start-ups or expanding mature community-based enterprise engaged in coconut processing, inter cropping and livestock raising. The major components of KEDP are Coconut Intercropping Project (CIP) and Community/Household level coconut processing (CHLP) to foster the entrepreneurial skills of the community or household members for coconut processing.

Projects for Rapid, Inclusive and Sustainable Economic Growth

The projects under this key area include the Coconut Fertilisation Proect (CFP) and the Kaanib Coco Agro-Industrial Hub (KCAHP) in the hub and spoke model. The Central Business Unit (CBU) that will act as primary or secondary processor of coconut products into value added products, integrator, consolidator, market, as well as source of technology and information; and the "spokes" which shall form the base for entrepreneurial business operations of the CBU. Initially, they shall act as primary processor of coconut products or medium-large scale supplier of raw materials.

Market Development Services- Investment and Trade Promotion

This involves the participation in trade fairs/ exhibition and conduct of missions, market match, industry dialogues to promote coconut products, both in local and foreign markets.

Research and Development

The Research and Development Branch (RDB) is the agricultural research and development arm of the Philippine Coconut Authority that manages the research and development functions of the Authority with the institutionalized support of the three major strategic research centers located in Albay, Davao and Zamboanga. It is involved on the enhancement of the major concerns of the industry such as: food security, environmental protection, sustainable agriculture and environmental management of natural resources, income enhancement and profitability of farmers; global competitiveness through world class R&D products and technologies; and stable production and supply. The seven disciplines include Varietal Improvement; Crop Agronomy, Nutrition and Farming Systems; Biotechnology; Food Product Development (FPD); Non Food product Development (NFPD); Integrated Crop Protection and laboratory and Technical Services.

Integrity of the Environment and Climate Change Mitigation and Adaptation

The projects under this key area include Accelerated Coconut Planting and Replanting (with the components Participatory Coconut Planting Project, Coconut Seedlings Dispersal Project and Indigenous Peoples Outreach Program), Maintenance of Coconut seed Farm/Seed garden and the Small holder Oil palm Development.

Regulatory Services

It is the policy of the State to provide for the regulation of the cutting of coconut trees as well as to promote the growth of the industry by embarking on a sustainable and efficient replanting program, quality standard for high-value coconut products and by-products for export and referential and the registration of coconut products/by products traders/dealers and manufacturers

Yolanda Rehabilitation and Recovery Program

As an immediate response to the Yolanda crisis, Philippine Coconut Authority implemented the project in the provinces affected by Typhoon Yolanda in Region 6 (Western Visayas), Region 7 (Central Visayas) and Region 8 (Eastern Visayas) to recover the coconut farmer's livelihoods back fast. The components included coconut planting/replanting, coconut intercropping, Coconut fertilization, Debris management and Integrated Rhino-beetle control.

Integrated Pest Management

It is the concern of Philippine Coconut Authority to control or at least contain damage to coconut brought about by insects pests in different regions of the country. As part of the treatment protocol against Coconut Scale Insects and other pests and diseases, activities like trunk injection, leaf pruning and massive production of biocontrol agents are being undertaken. Biocontrol laboratories are established to increase the production of both predators and parasitoids required to control and prevent CSI.

Processing of Coconut and its value added products :

Philippines processing industry in coconut has been a strong sector since the colonial periods and has been growing sustainably since then. Philippines produce the maximum number of products from coconut. There are around 3216 registered traders and manufacturers of coconut products in the country. Coconut oil continues to be the most traded commodity.

A good portion of coconut production is converted into copra for coconut oil milling, around 70-80%. The coconut oil produced is shipped in bulk for export whereof the traditional markets of US and Europe jointly corner at least 80%. The by-product copra meal is mainly exported to South Korea, Vietnam, China, India, Japan etc. In the local market, coconut oil is utilized for the most part as edible oil for cooking/frying; as raw material for margarine, shortening, and specialty fats; as milk fat replacement for fortified skim milk; as spray oils for biscuits and crackers, among others. For non-edible oil application, it is used mainly as raw material for oleochemicals, laundry/toilet soap, and biodiesel production.

If not processed into copra, the coconut is raw material in the manufacture of desiccated coconut, virgin coconut oil, coconut milk, coconut cream, all of which also are largely exported. These raise the value of fresh mature coconut. As new products spin off, more value added ensue. Other new products have been introduced into the export market with great success. From other parts of the coconut, activated carbon adds value to charcoal derived from coconut shell; coir nets, mats, mattress, brush, peats, and pet accessories drive the value of coconut husk upward. The coconut water which used to be a waste product that is costly to dispose of due to environment concerns presently has value of its own, boosting income from fresh nuts.

As leading agriculture export earner, coconut turns in USD1.694 billion annually (2011-2015 average). Coconut oil remains the primary foreign exchange contributor with annual turnover of USD1.086 billion representing two-thirds of total export income. The new wave of coconut products and by-products which we call non-traditional exports has seen increasing contribution to total coconut revenue.

Export Scenario of coconut products

Philippines is the leading exporter of coconut products across the globe. This is primarily due to large exports from Philippines and also high amount of domestic consumption of coconut in the leading coconut producing countries of India and Indonesia. The Netherlands is a re-exporter of coconut oil for the most of Europe. Coconut and its value added products constitute the top agricultural export product in the Philippines and the export values were at USD

FOB 2.12 billion and USD FOB 1.27 billion in 2014 and 2015 respectively. As a consequence of El Nino, exports in 2016 dropped by about 13.5% from the earlier year. Forecast however, indicate that exports will recover by at least 7%. Coconut oil exports have actually increased over 70% year on year in the first five months of the 2017. The major export commodities include: fresh coconut, copra, coconut oil, desiccated coconut, coconut milk/cream, virgin coconut oil, oleo chemicals, nata de coco, coconut water, coconut sugar, coconut flour, charcoal, activated carbon, coir fibre and copra meal. Increased demand of coconut coir, peat and activated carbon are anticipated.

Export is undertaken mainly to Europe, USA, Asian countries and Australia. Notwithstanding the impact of El Niño, revenue from exports was higher for 2016 and is expected to improve further in 2017 driven by higher volumes and prices. Moreover, local consumption of coconut products rose by 3.7% from the prior year. Favorable forecast for sustained growth in domestic demand is also seen in 2017.

The Philippines has long graduated from copra as major export item with the advent of coconut oil milling units in the country producing crude coconut oil. The major players earlier were multinational companies and some local millers. This has expanded the country's export mix with the addition of coconut oil and copra meal in the export items. Later, two new coconut oil types were introduced, the cochin oil (semi-refined or refined, bleached oil) and RBD oil (fully refined or refined, bleached and deodorized oil), raising the bar from basic material copra.

RBD oil is the vegetable oil used locally as cooking oil. Apart from the households and institutional users like hotels, restaurants, and fast food chains which use edible coconut oil mainly for cooking and frying, other major consumers of coconut edible oil utilize it as material for other food products like margarine, shortening, and other vegetable fats products, milk fat substitutes, biscuits, oleo fats for the production of various specialty oil products and tailor-made oils for special clients.

Further, higher value products from coconut oil were developed and marketed like oleochemicals such as coconut methyl ester, coco fatty acid, and coco fatty alcohol. The oleochemicals moved another step forward with the introduction of alkanolamide. Later the biodiesel sector was added which provides the biodiesel for blending with fossil diesel, as mandated, for use in the transport sector. Glycerin is by-product of oleochemical production as copra meal is to coconut oil.

On the other hand, desiccated coconut has been a mainstay export item for decades with the likes of Franklin Baker Co. of the Philippines, Peter Paul Philippine Company, Red V Coconut Products as pioneers. Practically all of Philippines' desiccated coconut production from its 13 desiccated coconut plants is exported. Merely less than 3% is retained for domestic consumption mainly by institutional users like hotels, restaurants, pastries and bakery industries.

After desiccated coconut came other food products like coconut milk, coconut cream, creamed coconut, nata de coco which are derived from fresh mature coconut. Except for nata de coco, these products are largely produced by desiccated coconut manufacturers. The process for making desiccated coconut provides some flexibility for the manufacturers to allow room for making these food products. Moreover, the newest addition to the coconut exportables like virgin coconut oil, coconut flour and coconut water are produced in bulk by desiccators. Coconut sugar, meanwhile, remains a small scale operation like nata de coco. The Philippine export mix comprises of about 40 major products. ■

(To be continued in April 2018 issue.)

Retired

Shri. Babu N Sreenilayam retired from the service of Coconut Development Board on 29th February 2018. He joined the Board in October 1987.

IIT Roorkee undertakes study for easy identification of spoiled coconut

A study to develop a low cost and easy to use sensor for detecting spoiled coconut at pre – processing stage is undertaken conducted by IIT, Roorke with the financial assistance of CDB.

Coconut is one of the most important palm crops of India accounting for 31% of total global production of coconut. Coconut water has tremendous health-protective properties. During the production of value added products from coconut, mostly the water gets contaminated at pre-processing stage due to mixing of spoiled coconut water. As a result a huge amount of coconut water is wasted without any value addition. Presently no technology is available for the detection of spoiled coconuts at pre-processing stage to avoid mixing of spoiled coconut water with good water. Now IIT, Roorkee has approached the Board with a project to identify spoiled coconut at pre-processing stage using a hybrid sensor technology. Initially, changes in the permittivity of healthy and spoiled coconut will be tested in terms of changes in the output frequency of radio-frequency (RF)-signal and then specific volatile metabolites present in the spoiled coconut will be detected using a suitable semiconductor metal oxide transducer. There is a major gap in current research for an accurate, automatic, cost effective, and durable spoiled coconut detection aid.

The objective of the study is to develop a low cost and easy to use sensor so that spoiled coconuts at pre – processing stage can be identified. Metabolite profiling of healthy and spoiled coconut at various stages will be made to detect specific volatile metabolites associated with spoiling stage.

At various stages of study, coconut cultivars at various developmental stages will be selected for the study. Three groups of coconut will be selected for sample preparations viz. healthy coconut at various stages of development, naturally infected coconut and artificially infected coconut.

Volatile metabolites will be analyzed directly using head –space GC-MS. For enhanced analysis of targeted group of volatiles, suitable chemical traps, sorbents and solid phase micro extraction (SPME) based analysis will be adapted. Unknown metabolites are also subjected to LC-MS/MS analyses for knowing molecular mass.

Spoiling associated metabolites that serve potential biomarkers for sensing using e-nose will be established. As part of the study differentially accumulating volatile metabolites will be identified from infected coconut. Multivariate statistical analyses and a database of metabolite profiles will be established by IIT Roorkee as part of study. Volatile metabolites that are unique to spoiling stage will be targeted as biomarker for e-nose development

The project is expected to provide information on spoiled coconut-associated metabolites as biomarkers that can represent early degradation stages in coconut. Such metabolic profile would help to delineate the biochemical pathways and molecular networks that are responsible for differential accumulation of volatile metabolites in spoiled coconut as well as the nutritional status of healthy coconut. IIT is using an array of novel metal oxide semiconductors as sensing material (antenna) to catch specific volatile metabolite emitted by spoiled coconut. The final outcome would be a sensitive low cost, non-invasive wireless sensor prototype capable of detecting spoiled coconut. This conceptual advancement can also be applicable to other agricultural crops towards pest and pathogen management. In addition, the study would provide an opportunity to explore the science behind the novel electronic circuits for development of electronic e-nose sensor.

Dr. Debabrata Sircar, Assistant Professor, Department of Biotechnology, IIT Roorkee, Roorkee is the Principal Investigator of the project.

During the half yearly review of the project, Dr. Sircar informed that his team is working on three models for identification of spoiled coconut. First, the mobile based app that can be used by the common man. Secondly, for the detection of spoiled coconut from heap of coconut and finally a conveyor based model for the use of industry. ■

Workshop on scientific coconut cultivation and value addition

Coconut Development Board, Regional office Guwahati conducted a district level workshop on scientific on coconut cultivation and value addition on 8th March 2018 at Dhemaji district, Assam in association with Jonai Block CPS. Mr. Krishna Kanta Mili, President of Jonai CPS welcomed the gathering. Shri Nisarg Hivare, IAS, SDO, Jonai was the chief guest and Shri Jiten Padi, SDAO (Agri) was present on the occasion. (Around130 farmers attended the programme.)

Shri Lunghar Obed, Director, CDB, Regional Office, Guwahati delivered the keynote address. He briefed on the coconut scenario in Assam and value addition of coconut.

Shri Nisarg Hivare, IAS, SDO, Jonai appreciated Coconut Development Board for organising the district level workshop on coconut in Dhemaji district. He spoke on the importance of coconut. He encouraged the farmers to attend various training programmes being organised by CDB.

Shri Jiten Padi, SDAO (Agri), Jonai called upon the farmers to take up scientific plantation of coconut. He briefly described about scientific plantation of

coconut in Assam. Shri Ravindra Kumar, Technical Officer, CDB, Guwahati spoke on coconut cultivation technologies, disease and pest management of coconut, etc.

Shri Kamal Baishya, DEO, CDB, R.O, Guwahati spoke on CDB schemes, training programmes, CPS formation etc and also detailed on CDB schemes being implemented through CPSs in Assam. The programme was ended with vote of thanks proposed by Shri Narayan Pao, Secretary, Jonai CPS.

Krushi Odisha-2018

The Department of Agriculture and Farmers Empowerment, Govt of Odisha, in association with Confederation of Indian Industries (CII) conducted a State level exhibition, Krushi Odisha 2018 from 6th to 9th March at Baramunda, Bhubaneswar. Honourable Chief Minister of Odisha, Shri.Naveen Patnaik was the Chief Guest of the inaugural function.

Coconut Development Board, State Centre, Odisha participated in the four days programme and in the exhibition. Coconut varieties and value added products of coconut were displayed for the benefit of the farmers. Board displayed various value added products like virgin coconut oil, VCO capsule, desiccated coconut, coconut milk, coconut jam, squash, coconut oil, coconut milk powder, handicrafts items, coconut palm climbing machine, coconut seedlings of different varieties, mature nuts of different varieties etc. CDB activities were briefed to the visitors. Dr.R.K.Pal, Deputy Director, CDB & Smt. Neethu Thomas, Technical Officer, CDB cleared the queries raised by the farmers on schemes of CDB, cultivation of coconut, Farmers Producer Organizations in coconut sector, Training Programmes, availability of palm climbing machine and coconut seedlings, value addition in coconut etc. More than 15,000 farmers visited CDB stall. During the Farmer-Scientist interactive session Dr.R.K.Pal, Deputy Director, CDB spoke on marketing and value addition in coconut. Shri.Pradeep Maharathy, Honourable Minister of Panchayati Raj & DW, Agriculture and Farmers Empowerment, F&ARD was the chief guest of the valedictory function.

105th Indian Science Congress

Coconut Development Board, Regional Office, Guwahati participated in the Pride of India Expo organized by 105th Indian Science Congress held from 16th to 20th March 2018 at Manipur University, Imphal, Manipur. More than 1000 people visited the CDB stall during the exhibition. Coconut products, handicrafts and posters were displayed in the CDB stall. Brochures on CDB schemes, neera and coconut products were distributed among the visitors. Shri Lunghar Obed, Director, CDB explained about CDB schemes and on coconut food products to the visitors.

India raises import duty on palm oil

With an objective to safeguard the interests of the domestic edible oil crushing industry and oilseed farmers in India, the Ministry of Finance, Government of India increased the import duty on refined and crude palm oil to the highest levels in the last decade.

Vide Notification No.29/2018-Customs dated 1st March 2018, India raised import tax on crude palm oil to 44 percent from 30 percent and lifted the tax on refined palm oil to 54 percent from 40 percent.

Awareness Programme on Coconut

Coconut Development Board, State Centre, Port Blair organized a Block level farmer's awareness programme on coconut on 23th March, 2018 at Beodnabad village, Andaman & Nicobar Islands. Smti. V. Shanthi, Pradhan, Gram Panchayat, Beodnabad inaugurated the programme. Shri. S. Pradeep, Panchayat Secretary as well as one of the progressive farmers from Beodnabad village. Shri. Avinash Norman, Technical Officer, CDB, State Centre, Port Blair and farmers from different areas of South Andaman were present during the occasion.

Shri. Avinash Norman delivered the introductory remraks. Shri. V. Shanti, Pradhan, in his inaugural address appreciated CDB for conducting such programmes for the benefit of farmers. He called upon the farmers to extend cultivation of coconut on larger areas by availing the benefits of the various progarmmes implemented by the Board from time to time.

In the technical session which followed, Shri. Avinash Norman spoke on CDB schemes, Neera tapping and value addition of neera. He briefed the farmers on coconut cultivation, nursery techniques, mother palm selection and other management practices.

An interaction session was also held as a part of the programme wherein farmers clarified their doubts on cultivation coconut.

Tender coconut and chocolate duet

INGREDIENTS

- Gelatin 20gm
- Milk 400 ml
- Sugar 120gm
- Dark chocolate - 100gm
- Tender coconut pulp-100gm

METHOD

- Soak gelatin in 50 ml water
- Boil milk with sugar and then add gelatin
- Keep the mixture for 30 mints in room temperature.

Then separate it into two parts

- Add chocolate to one part of the mixture
- Keep the other part in chiller
- Mix half of gelatin milk mix with tender coconut
- Pour the mixture with chocolate on top and chill again for one hour. Garnish with grated chocolate and serve chilled.

Monthly operations in coconut gardens-April

Andaman & Nicobar Islands:

Fill the previously prepared pits half with a mixture of wood ash, sand and surface soil. Plant the seedlings in a small hole dug in the centre of the half filled pit. Provide bunds around the pits to prevent the entry of rain water. Clean the crowns of all the bearing palms and fill 2-3 upper most leaf axils with sand and naphthalene balls (2-3 nos) to prevent the attack of rhinoceros beetles.

Andhra Pradesh: Prepare nursery beds. If there is termite problem in the area, raise the nursery in sandy soil or apply thick layers of river sand on the beds or drench the nursery beds with 0.05% chlorpyriphos twice at 20 to 25 days interval. Sow seed nuts in the beds. Plant one-year-old seedlings in the main field. If coconut husk is available bury it in trenches taken 3m away from the trunk between rows of palms or in circular trenches, taken around the palm at a distance of 2m. The husk is to be placed in layers with concave surface facing upwards and buried. The husk helps in the retention of moisture and supplies nutrients especially potash. The beneficial effect of husk burial will last for 5 to 7 years. Apply the first dose of fertilizers in the basins, i.e. 400 g urea, 700 g single Superphosphate (SSP) and 750g muriate of potash (MOP) per adult palm. Apply green leaf manure @ two headloads per palm, cover it with soil and irrigate the basins. If cattle manure is available, apply 25 kg along with the above manures. Apply ¼ cartload of tank silt depending on its availability. If the attack of black-headed caterpillar is noticed, cut down and burn the severely affected lower leaves to arrest the spread of the pest. Spray the affected palms with 0.02% dichlorovos or 0.05% malathion. Liberate stage specific parasites on older palms according to stage of the pest. In a multi-stage condition of the pest, combined release of all the parasitoids is required. When an initial insecticide treatment is given the parasitoids may be released only after three weeks of spraying. If the attack of mite is noticed, spray neem oil formulation containing 0.004% azadirachtin (neemazal T/S 1% @ 4 ml/ litre of water). The spray droplets are to be directed towards the second to fifth immature bunches.

Assam: Continue transplanting of seedlings in the main field. Regularly drain out accumulated rainwater from the pits of newly transplanted seedlings. Clean the crowns of the palms and tie or prop up bunches to prevent buckling. Take preventive measures against diseases. If termite attack is noticed, adopt soil drenching of the nursery beds and basins of newly transplanted seedlings with 0.05% chlorpyriphos twice at 20 to 25 days interval. Against leaf rot disease, pour contaf 5EC @ 2ml/300 ml of water or mancozeb 3g in 300 ml water per palm around the base of the spindle leaf after cutting and removing the rotten portion.

Bihar / Madhya Pradesh / Chhattisgarh: Increase the frequency of irrigation. Start transplanting of seedlings in the main field by taking pits of 1.2m x 1.2m x 1.2m size in laterite soils and 1m x 1m x 1m size in sandy loam soils. Search for the incidence of termite attack/fungal diseases and adopt recommended control measures.

Karnataka: Sow the seed nuts before the onset of monsoon and irrigate them if necessary. Irrigate the seedlings if dry spell prevails. Clean the irrigation channels and repair the bunds. Continue irrigation, if the monsoon has not set in. Fresh planting may be done in previously prepared pits after filling up half of the pit with wood ash, cattle manure and surface soil. Apply the first dose of fertilizers, organic manure (FYM) @ 50 kg and neem cake @ 5 kg per palm. Give a prophylactic spray with 1% bordeaux mixture or any other copper fungicide against fungal diseases. If the attack of mite is noticed, spray neem oil formulation containing 0.004% azadirachtin (neemazal T/S 1% @ 4 ml/ litre of water). The spray droplets are to be directed towards the second to fifth month old bunches.

Kerala / Lakshadweep: Take basins around the palms at 2m radius and sow green manure crop in the basins if it has not been sown in the main field. Husk burial can be done to conserve the soil moisture. Application of sufficient quantities of organic manures and balanced dose of inorganic fertilizers in the basins is recommended to improve nutrient status of

the soil to nourish the palms. Apply organic manure (FYM) @ 50 kg and neem cake @ 5 kg per palm per year. Search for leaf eating caterpillars and destroy them by cutting down and burning the severely infested lower leaves. Spray the affected palms with 0.02% dichlorovos or 0.05% malathion. Liberate stage specific parasites on older palms according to the stage of the pest. In a multi-stage condition of the pest, combined release of all the parasitoids is required. When an initial insecticide treatment is given the parasitoids may be released only after three weeks of spraying. Search for rhinoceros beetle and red palm weevil affected palms. The black rhinoceros beetle should be hooked out and destroyed. Inject the red palm weevil attacked palms with 1% carbaryl using a funnel. Search for bud rot infection. If infection is found, cut and remove the rotten tissues and treat with bordeaux paste and spray the neighbouring palms with 1% bordeaux mixture as a prophylactic measure. If the attack of mite is noticed, spray neem oil formulation containing 0.004% azadirachtin (neemazal T/S 1% @ 4 ml/ litre of water). The spray droplets are to be directed towards the second to fifth month bunches.

Maharashtra / Goa / Gujarat: Plough the land once or twice and remove the grasses. Sow green manure crops such as sunnhemp, dhaincha, sesbania or kolinji @ 28 to 34 kg per hectare. Apply fertilizers if not given earlier.

Orissa: Start planting seedlings in the main field by taking pits of 1.2m x 1.2m x 1.2m size in laterite soils and 1m x 1m x 1m size in sandy loam soils. Dig the basins around the palms. Apply green leaf manure and cattle manure at the beginning of the southwest monsoon. First apply the green leaves and then cattle manure and cover them with soil. Apply the first dose of fertilizers @ 250g urea,500 g single superphosphate (SSP) and 500 g muriate of potash (MOP) per adult palm. For younger palms apply ¼, ½ and ¾ of the above dose of fertilizers to the one-year, two year and three-year old palms, respectively.

Tamil Nadu / Puducherry: Start sowing of seed nuts in the nursery.Continue irrigation in the garden. Apply 80 litres of water/day/palm in drip-irrigated gardens or apply 500 litres of water/palm through basin irrigation once in 6 days in the western region and once in 5 days in eastern region. Start sowing of green manure crops like sunnhemp and dhaincha in the basins of palms. Search for the black-headed caterpillars. If infestation is noticed, cut down and burn the severely infested lower leaves and spray the affected palms with 0.02% dichlorovos or 0.05% malathion. After 3 weeks of spraying, release larval or pupal parasites according to the stage of black-headed caterpillar. If grey leaf blight is observed spray palms with copper oxychloride @ 0.3% or carbendazim 0.1% or root feed with 2 g carbendazim in 100 ml water. Ensure 45 days interval between root feeding and next harvest of nuts.

Tripura: Prepare nursery beds for sowing of seednuts. In areas of poor drainage make raised seedbeds. The seedbeds are to be treated with 0.05% chlorpyriphos twice at 20 to 25 days interval to protect the nuts from the attack of termite. Remove the weeds from the garden and improve the drainage facilities. Transplanting of new seedlings should be taken up during this month. Spray 1% bordeaux mixture if bud rot is prevalent in the area. To protect the palms from rhinoceros beetle and red palm weevil fill the top 3-4 leaf axils of the palm with a mixture of 25g sevidol (8G) with 250g fine sand.

West Bengal: Sow seednuts before the onset of monsoon and irrigate them if necessary. Dig out pits for new planting if it is not yet done. Prepare bunds and clean the irrigation channels. Continue irrigation if the monsoon has not set in. Apply the first dose of fertilizers if not done. Give palms a prophylactic spray with 1% bordeaux mixture to prevent bud rot and other fungal diseases (Dissolve 10 g of copper sulphate in 500 ml water and 10 g quick lime in another 500 ml water, each in separate nonmetallic pots. Pour the copper sulphate solution into the lime solution to get one litre Bordeaux mixture of 1% concentration. Check the acidity by dipping a knife or blade in the solution; if rusting on knife/blade is seen add some more lime solution.

Market review – February 2018

Domestic price

Coconut Oil

During February 2018 the price of coconut oil opened at Rs.19800 per quintal at Kochi and Alappuzha markets and Rs.22000 per quintal at Kozhikode market. The price movement in all three markets in Kerala expressed an overall downward trend during the month.

The price of coconut oil closed at Rs.19600 per quintal at Kochi market and Rs.19700 per quintal at Alappuzha market and Rs.21000 per quintal at Kozhikode market with a net loss of Rs.200 at Kochi market, Rs.100 at Alappuzha market and Rs.1000 per quintal at Kozhikode market.

The price of coconut oil at Kangayam market in Tamilnadu, which opened at Rs.18333 per quintal, expressed a mixed trend and closed at Rs.18000 per quintal with a net loss of Rs.333 per quintal.

Table1: Weekly price of coconut oil at major markets Rs/Quintal)

	Kochi	Alappuzha	Kozhikode	Kangayam
01.02.2018	19800	19800	22000	18333
04.02.2018	19800	19800	22000	18200
11.02.2018	19800	19800	22000	18333
18.02.2018	19800	19800	21800	18333
25.02.2018	19700	19700	21500	18333
28.02.2018	19600	19700	21000	18000

Milling copra

During the month, the price of milling copra opened at Rs.13700 per quintal at Kochi, Rs.13050 per quintal at Alappuzha and Rs.14400 per quintal at Kozhikode market. The price movement in all three markets in Kerala expressed an overall downward trend during the month.

The prices closed at Rs.13000 at Kochi and Alappuzha market and Rs.13200 at Kozhikode markets with a net loss of Rs.700 per quintal at Kochi, Rs. 50 per quintal at Alappuzha market and Rs.1200 per quintal at Kozhikode market.

At Kangayam market in Tamilnadu, the prices opened at Rs. 12900 per quintal and closed at Rs.12500 per quintal with a net loss of Rs.400 per quintal.

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

	Kochi	Alappuzha (Rasi Copra)	Kozhikode	Kan-gayam
01.02.2018	13700	13050	14400	12900
04.02.2018	13700	13050	14400	12900
11.02.2018	13700	13200	14200	12900
18.02.2018	13700	13200	14100	13000
25.02.2018	13500	13100	13800	12700
28.02.2018	13000	13000	13200	12500

Edible copra

The price of Rajapur copra at Kozhikode market which opened at Rs.14400 per quintal expressed a mixed trend during the month and closed at Rs.14000 per quintal with a net loss of Rs.400 per quintal.

Table3 :Weekly price of edible copra at Kozhikode market (Rs/Quintal)	
01.02.2018	14400
04.02.2018	14800
11.02.2018	14500
18.02.2018	14900
25.02.2018	14600
28.02.2018	14000

Ball copra

The price of ball copra at Tiptur market which opened at Rs.13200 per quintal expressed a mixed trend during the month and closed at Rs.12750 per quintal with a loss of Rs.450 per quintal.

Table 4 : Weekly price of Ball copra at major markets in Karnataka (Rs/Quintal)	
	Tiptur
01.02.2018	13200
04.02.2018	13100
11.02.2018	13200
18.02.2018	12900
25.02.2018	12900
28.02.2018	12750

Dry coconut

At Kozhikode market, the price of dry coconut opened at Rs.9650 per quintal. The price expressed an downward trend and closed at Rs.9550 with a net loss of Rs.100 per quintal.

Table5 : Weekly price of Dry Coconut at Kozhikode market (Rs/1000 coconuts)	
01.02.2018	9650
04.02.2018	9650
11.02.2018	9650
18.02.2018	9650
25.02.2018	9550
28.02.2018	9550

Coconut

At Nedumangad market the price of partially dehusked coconut opened at Rs. 20400 and closed at Rs. 22200 with a gain of Rs.1800 per thousand nuts. At Pollachi market in Tamil Nadu, the price of coconut opened at Rs. 19000 and closed at Rs.18000 per thousand nuts with a net loss of Rs.1000 per thousand nuts. At Bangalore APMC, the price of partially dehusked coconut opened at Rs. 20000 and closed at Rs. 25000 with a gain of Rs.5000 per thousand nuts during the month. At Mangalore APMC market the price of partially dehusked coconut of grade-I quality ruled at Rs.25000 per thousand nuts.

Table 6: Weekly price of coconut at major markets (Rs /1000 coconuts)				
	Neduman-gad	Pollachi	Banglore	Mangalore (Grade-1)
01.02.2018	20400	19000	20000	25000
04.02.2018	20400	19000	20000	25000
11.02.2018	20400	19000	20000	25000
18.02.2018	22200	19000	20500	25000
25.02.2018	22200	19000	25000	25000
28.02.2018	22200	18000	25000	25000

Tender coconut

The price of tender coconut at Maddur APMC market in Karnataka opened at Rs.10000 per thousand nuts and remained at the same level throughout the month.

Table7 : Weekly price of tender coconut at Maddur market (Rs/1000 coconuts)	
01.02.2018	10000
04.02.2018	10000
11.02.2018	10000
18.02.2018	10000
25.02.2018	10000
28.02.2018	10000

International price

Coconut oil

The international and domestic price of coconut oil in Philippines, Indonesia and India expressed a downward trend during the month. The price of coconut oil quoted at different international/ domestic markets is given below.

Table 8: Weekly price of coconut oil in major coconut oil producing countries				
	International Price(US$/MT)	Domestic Price(US$/MT)		
	Philippines/ Indonesia (CIF Europe)	Philippines	Indonesia	India*
03.02.2018	1300	1268	1270	3190
10.02.2018	1257	1240	1270	3190
17.02.2018	1255	1200	1210	3157
24.02.2018	1255	1190	1190	3122
				* Kerala Market

Coconut

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

Table 11: Weekly price of dehusked coconut with water				
Date	Domestic Price (US$/MT)			
	Philippines	Indonesia	Srilanka	India*
03.02.2018	189	200	446	668
10.02.2018	186	200	443	675
17.02.2018	186	185	448	668
24.02.2018	186	182	448	660
				*Pollachi market

Copra

The domestic price of copra at Philippines, Indonesia, Srilanka and India expressed an overall downward trend during the month. The price of copra quoted at different domestic markets is given below.

Table 9: Weekly price of copra in major copra producing countries				
	Domestic Price(US$/MT)			
	Philippines	Indonesia	Srilanka	India*
03.02.2018	788	672	1556	2128
10.02.2018	741	651	1561	2128
17.02.2018	719	644	1535	2113
24.02.2018	716	639	1531	2070
				* Kochi Market