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CDB Institute of Technology

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CIT to shape the future of coconut sector in India

This issue of Indian Coconut Journal is focusing on CDB Institute of Technology (CIT). The Technology Development Centre (TDC) which was functioning since 2003 has been redesignated as CIT in 2012 - 13. CIT needs to be transformed to an epicenter for development of technology, demonstration and transfer of technologies to entrepreneurs and FPOs. The Institute need to undertake research and establish pilot plants using the results of the research and to extend necessary training to farmers and entrepreneurs. India is the global leader in coconut production and productivity, we lag far behind many other countries in processing and value addition of coconut. Many reasons can be attributed for this lower level of achievement in processing and value addition. One of the major reasons could be the slow pace in development of technologies and its commercial utilization. Until recently we were treating coconut palm merely as a “copra tree and coconut oil tree”. We started venturing into product diversification and value addition in coconut sector, very recently.

Initially TDC was aimed at development of technologies for various coconut based products and for undertaking quality testing of the already developed products. However, CIT has now geared up for venturing into more advanced stages of research and development. They are now attempting to develop many innovative coconut based products which are new to our country and positioning these products at a premier position in the health, nutrition and wellness sector. CIT is having to its credit a fully equipped lab with NABL accreditation. The lab is equipped with most modern facilities for the chemical and micro biological testing for coconut based products and other food products. It can conduct quality testing for contaminants, impurities and adulteration in various coconut products. The process of development of value addition is relatively at a low level in India compared to many other coconut producing countries, which are much below India in production and productivity. The professional team heading CIT has to develop capacity to provide guidance and necessary support to prospective entrepreneurs and also to encourage and handhold FPOs in coconut sector to venture into value addition. We have been trying to develop necessary infrastructure facilities and human resources at CIT. What we require further is a strong vision and commitment to accelerate the pace of

activities to move ahead with specific and measurable objectives.

The team CIT needs to cultivate an entrepreneur friendly pro active attitude. Not a single product remains in its initial stage of development for longer period. Continuous research, development and refinement is the need of the hour. We have the example of the initial stage of many of the equipments and machineries. Take the case of mobile phones. When it was initially introduced, it looked similar to a wireless handset with a big antenna weighing around a kilogram. Due to lack of mobile towers, the connectivity was meager in many parts of the country. Incoming calls were charged @ Rs.24 per minute and the outgoing calls @ Rs.36 per minute. Competitive research and commercial development made revolutionary improvements in mobile technology and it keeps on improving regularly with reduction in size, increase in speed and network with seamless connectivity. Similar developments are happening in almost all sectors. Coconut sector cannot lag behind and needs further continuous improvement in the already developed products. The team CIT should be the driving force and fuel required for such changes.

Once we develop a novel product, we need to test it for commercial production and based on customer feedback take up further research for improving its quality, appearance and packaging. The team CIT needs to work collectively with the farmers through FPOs and other stake holders for the further development of the Institute and coconut sector. CIT can work in association with the Farmer Producer Organizations (FPO) in coconut sector by addressing their requirements for technical supports and issues in production and processing through continuous research. Once a new product is developed, further fine tuning is required to make the product more stable and sustainable. Along with Coconut Producer Companies (CPC), private entrepreneurs may also have such requirements in technology and testing. Technology and the TMOc divisions at Coconut Development Board and the CIT need to work collectively for addressing such issues. Continuous interaction between CIT, entrepreneurs and technology division need to be strengthened. Board used to extend financial support for developing new products through various Central Research Institutes, Universities and colleges. While continuing to support them, we

need to move ahead with development of own facilities for new product development. Experience shows that single project based assistance to other research intuitions are often lying idle after the completion of the project and report is submitted. Continuous interest in further research and development is hindered by change in the research team or change in priority and focus of the institution. Hence there is a strong need for developing own capabilities and competencies for optimal utilization of resources as well as for continuous improvement. In the long run CIT should become self sustainable in resource mobilization.

Apart from installing most modern machineries and employing qualified professionals, we need to have clear and specific objectives, clear priorities and focus on them with a team spirit. Sustained efforts are required for acquiring further advanced knowledge and for working in collaboration with other scientific and research institutes. Many teachers and scientists are working in Universities and colleges who are undertaking research studies. CIT should inform, inspire and motivate them to turn their attention to coconut sector by pointing out the benefits of coconut in human health, nutrition and wellness. Very often these researchers are contributing a great extent in the developmental activities of various other sectors. How can we attract them to coconut sector? How to retain their sustained interest in coconut sector?

CIT need to take up new research on the health, nutritional and wellness aspects of coconut based food products. A list of the technologies developed and the researches undertaken by CIT is included in this issue. The Coconut Producer Federations, Coconut Producer Companies and entrepreneurs are requested to take stock of the same and to persuade CIT to undertake research and develop technologies on need basis.

With our past experience, it is clearly emerging that only FPOs can ensure a fair, reasonable and steady price to coconut. Keeping this in view, the FPOs in coconut sector need to accelerate their activities and make use of the available technological achievements in value addition. CIT should aim to support those FPOs who exhibit their interest in pursuing such initiatives for value addition. They should act as a conduit between research and development and FPOs. I request the Coconut Producer Companies, Federations and Societies to come forward with their needs in processing technology to CIT. The basic responsibility of CIT is to provide the best available services to the coconut farmers and stake holders. The small and marginal coconut farmers need to be ensured a fair, reasonable and steady price for coconut by making use of the technologies developed by CIT. Compared to other research Institutions, CIT

should emerge as a farmer friendly and entrepreneur friendly development institute.

Another role to be taken up by CIT is quality training to be imparted to technical staff in processing units. CIT is already giving training to entrepreneurs in various aspects of value addition in coconut. Training of Master Neera Technicians is another role taken up by CIT during last year. Master Neera Technicians were trained from the states of Kerala, Tamil Nadu, Karnataka and Andhra Pradesh. These Master Neera Technicians in turn are expected to train thousands of Neera Technicians in their states.

A downward trend is observed in the price of copra and coconut oil in the recent months. Government of India has already declared the Minimum Support Price (MSP) for copra for 2016 season. The MSP for Milling Copra has been increased by Rs.400 per quintal to Rs.5,950 from Rs.5,550 and that of ball copra is increased to Rs.6,240 from Rs.5,830. NAFED has requested the state governments to commence procurement of copra under PSS scheme. Now the responsibility to help the farmers lies with the state governments. Coconut Development Board has requested state governments of Kerala and Tamilnadu, the states which are mostly affected by price fall to designate selected Coconut Producer Companies also as state level procurement agencies. I request all the Farmer Producer Organizations in coconut sector to avail the benefits of the new MSP. Along with accelerating the copra procurement, FPOs need to produce good quality pure coconut oil in more quantities and market the same under their own brand to consumers without intermediaries. Let this phase of price fall be taken as a good opportunity to strengthen the FPOs to develop coconut oil and other products in their own brand. CIT can extend the necessary technical knowhow for this. The long term vision of CIT should be to become the single 'hub of value addition in coconut' in the country.

I wish all the CPCs to take the opportunities thrown open by CIT to tide over the difficult phase of price fall and come out victorious. CIT will always be with you to support in your ventures.

Best wishes to all CPCs and member farmers.

With regards



T K Jose
Chairman



The CDB Institute of Technology

● Annie Eapen, Chemist, CIT.

India is endowed with excellent resources for promoting coconut based industries especially in farm level processing. The potential in this sector has not been tapped to the fullest extent. Post harvest losses due to quality deterioration in storage, poor handling techniques and inefficient processing, lack of attention to quality and hygiene and poor packaging techniques are some of the factors hindering the development of coconut based industries.

India is the global leader in coconut production and productivity. Unlike many other crops which are having specific harvesting seasons, coconut is available throughout the year. Hence value addition and preservation of coconut based products were not seriously thought of. But now we have to think of it very seriously in order to ensure the availability of coconut products in all parts of the country or in other countries where the crop is not grown. In order to address these issues, Coconut Development Board has established its Technology Development Centre (TDC) now renewed as Institute of Technology (CIT) at Vazhakulam, Kerala.

The objectives

CDB Institute of Technology is providing the following various services to Coconut Producers Societies, Coconut Producers Federations, Coconut Producers Companies, cooperative/government institutions and private entrepreneurs.

- Development and technology transfer of value added coconut products.
- Technical training in coconut based product processing
- Quality testing of coconut products
- Orientation on coconut product processing, quality testing and control measurers
- Equipping the entrepreneurs to initiate processing and marketing



- Technical services for establishing coconut processing units
- Practical sessions on coconut food products
- Providing infrastructure and technical guidance to science and food technology students to undertake project work as part of their curriculum
- Training for conducting analysis and setting up food testing laboratories in coconut processing units

The infrastructure

The institute is situated in one acre land at south Vazhakulam, Alwaye, Kochi. The lab of the institute has received the recognition of National Accreditation Board for Testing and Calibration Laboratories. The lab with its high end machineries are equipped to undertake chemical and biological testing of food products and can perform the quality testing of coconut based food products and other food products. The quality testing and nutrient analysis of coconut oil, vegetable oil, desiccated coconut, copra, vinegar, coconut value added products, neera and neera based products, tender coconut water etc. is done as per the standard procedure of BIS, AOAL, AOLS etc. Biological testing is conducted as per the standard procedure of USFDA, BAM, BIS etc.

Product development for value addition in coconut

CIT is performing various tasks like development of coconut based products, shelf life studies various packaging technologies and also analysis of the products. A highly professional team consisting of chemists, microbiologist, food technologist and food processing engineers with the required infrastructure facilities is performing these tasks at the CIT.

CIT has developed various coconut kernel based products like sweet/spicy chips, sweet chunks, pickle, chocolate, cookies, laddoo and burfi, coconut water based products like vinegar, lemonade and coconut milk based products like flavoured coconut juice, ice cream, and coconut milk spread.

CIT has also developed the technology for processing and packing of neera and various neera based products. Jaggery, honey and neera sugar are developed as primary by products from neera. Many value added products

are developed by CIT using these by products. These products are developed by the research wing of CIT. The institute is in the process of developing novel coconut based products like, coconut milk curd, lassi, coconut milk coffee whitener, instant coffee mix with neera sugar, coconut kernel, milk and coconut water based confectionaries and other products.



Technology Trainings

CDB Institute of Technology is conducting various training programmes. One day and 4-5 day training on coconut based convenience foods, training for producing vinegar, nata de coco, minimally processing of tender coconut, certificate course in coconut processing and Neera Master technician training programme are few of the training programmes conducted by CIT. During 2015-16, around 350 persons have undergone various training programmes at CIT.

The Future

CIT is planning to introduce more novel value added products from coconut and also wishes to equip the upcoming entrepreneurs to introduce and market novel value added products from coconut. Those who wish to produce new products on trial basis can avail the facilities of the pilot plant of CIT. CIT is planning to conduct orientation classes and hands on training for creating awareness among entrepreneurs, farmers and students on coconut processing technologies and to give opportunities to students for internship at CIT Lab. It is also envisaged to upgrade the CIT lab as a BIS referral lab. ■

For further information, contact :
Technology Development Centre,
Quality Testing Laboratory and CIT,
Coconut Development Board,
Keenpuram, South Vazhakkulam,
Aluva, Ernakulam District. Pin - 683 105. Kerala
Ph: (0484) 2679680 Email: citaluva@gmail.com



CIT catering to the research need of the sector

Coconut Development Board which was established during the 6th Five Year Plan period had also started developing various technologies for coconut based products. Initially these technologies were developed in association with Central Food Technological Research Institute and Defense Food Research Laboratory. Technology for production and preservation of packed tender coconut water, production of coconut vinegar, technology for coconut milk and coconut milk powder were some of the technologies developed during those period. Later on for undertaking further research and for developing newer technologies, Board established its own Technology Development Centre during the 9th Five Year Plan period. Initially the lab was undertaking quality testing of various products. A model plant for activated carbon and a packing unit was also set up. The Technology Development Centre was later changed to CDB Institute of Technology(CIT) and the Institute started extending training in coconut products and presently is imparting training in production, processing and packing of neera and its value added products.

Presently the CIT is led by a women team. Smt. Annie Eapen, Chemist and her team members are all ladies. The team has successfully developed various technologies from neera processing to neera chocolates. This women team proves through their team work, friendly atmosphere and mutual cooperation that nothing is impossible. Processed and packed neera and various coconut based value added products are the laudable results of this dedicated team work.

All the seven members of the CIT women team are concentrating on various segments like development of processing technologies for various coconut based products, quality testing and the conduct of training programmes. The team also

create and experiment with various novel coconut based recipes.

Smt. Annie Eapen, Chemist of CIT is extending the necessary guidelines and directions to his lady colleagues. Smt. Aneeta Joy, the Food Technologist of CIT is working here since the last seven years. She is in charge of the training extended by CIT in production of coconut food products, neera and its value added products etc. Training is given to farmers and small scale entrepreneurs. She also acts as the key resource person of the training programmes.

Smt. Praseetha K.C before joining as Chemist in CDB was working with a reputed cake manufacturer. She is doing the chemical analysis of the products before sending it to the market. Kum. Jagadeesh Priya and Kum. A S Geethu the Food Processing Engineers who are in charge of the neera pilot plant of CIT. Kum Jamuna John is the project manager of CIT who coordinates in Neera Master Technician training programme, functioning of neera processing plant and in the financial management of the Institute. Smt. Sumi S Nair is the Micro biologist of CIT who is taking





Annie Eapen
Chemist (In charge CIT)



Aneeta Joy
Food Technologist



Geethu A.S
Food Processing Engineer



Jamuna John
Project Manager



Praseetha K.C
Chemist



Jagadheesh Priya
Food Processing Engineer



Sumi S Nair
Microbiologist

care of the bacterial and fungal infection of the products and also on the shelf life of the products. Eventhough each of them differs in their area of work, the spirit of team work binds them together to achieve greater objectives.

The team acknowledges the support and cooperation extended by Coconut Development Board in all their endeavours. All the team members are having the experience of working with outside agencies and unanimously opines that the CIT offers them the freedom to work and also better opportunities. Their job at CIT is their means of living through which the team provides the means of living to many others especially ladies. Through the production and marketing of novel coconut products, the team is helping the coconut farmers and

small scale entrepreneurs to be self sufficient. They also extend the guidance to individuals or their groups to choose new means of living.

According to the team, there are many opportunities for ladies in coconut sector like production of neera cookies, biscuits and many other novel coconut products. CIT provides the necessary direction and training to the entrepreneurs who are ready to take up such ventures. CDB institute of Technology has developed an array of coconut products which includes chips, chocolate, squash, pickle, ice cream, chutney powder, tender coconut jam, flavoured coconut milk, flavoured coconut juice, laddu, burfi, diabetic friendly cookies, neera honey, jaggery, sugar, spicy jaggery, vinegar, cookies, cake, halwa etc. ■

Products developed by Technology Development Center (TDC) - [2003-2011]

● Nata de coco, ● Sweet Coconut chips, ● Coconut sweet cookies, ● Coconut Ginger cookies, ● Coconut choco cookies, ● Coconut chocolate, ● Coconut Burfi, ● Coconut Icecream, ● Coconut pickle, ● Coconut Instant Theeyal Mix, ● Coconut chutney powder, ● Coconut candy, ● Tender coconut Jam, ● Coconut Ladoo, ● Coconut milk spread, ● Coconut Tutti fruity, ● Coconut milk toffee



Products developed by CDB Institute of Technology (CIT)- [2012 onwards]

● Processed plain Neera ● Processed flavoured Neera ● Packed plain Neera and flavoured Neera, ● Primary products of Neera, ● Neera Jaggery, ● Neera sugar, ● Neera Honey, ● Value Added products of Neera like ● Neera spicy Jaggery, ● Neera Halwa, ● Neera squash, ● Neera Fruit spread, ● Neera coconut chocolate, ● Neera cookies, ● Neera cake, Neera peanut laddo, ● Neera Jamun, ● Neera pudding, ● Neera shake, ● Neera Icecream, ● Neera tart ● Traditional kerala sweets and snacks with Neera sugar etc, ● Fibre rich Healthy cookies with Neera sugar, ● Flavoured coconut milk, ● Sweet Coconut chunks, ● Sweet N' Spicy coconut chips, ● Instant Spicy Coffee mix with Neera sugar, ● Coconut Macroons



Research undertaken by CIT

● Neera harvesting and processing ● Neera Sugar
● Flavoured coconut juice ● Sweet coconut chunks



Processing technology for coconut Neera & Neera products at CIT

● **Aneeta Joy** Food Technologist, **Praseetha K.C** Chemist, CIT.

The vascular sap collected from unopened inflorescence of coconut in the fresh form is called Neera. Neera is a delicious health drink and a rich source of sugar, amino acids and vitamins. Coconut sap or Neera is obtained by tapping or cutting the spathe, enclosing the young flower bunches of coconut. The main constituent of the coconut sap juice is sugar (14-18 per cent).

Coconut nectar is widely consumed in countries such as India, Sri Lanka, Africa, Malaysia, Indonesia, Thailand and Myanmar. This sweet sap from Coconut tree is fast becoming a popular drink on account of its high nutritional value, delicious taste and flavour. Neera can be utilized for the production of a range of value added products like sap drink, Sugar, Jaggery, Syrup, Honey etc.

CDB Institute of Technology has developed for the processing technology for neera extraction and processing includes the production and processing of Neera. Technology for packed Neera includes three phases i.e harvesting, processing and packing

Technology

Tapping and harvesting of Neera

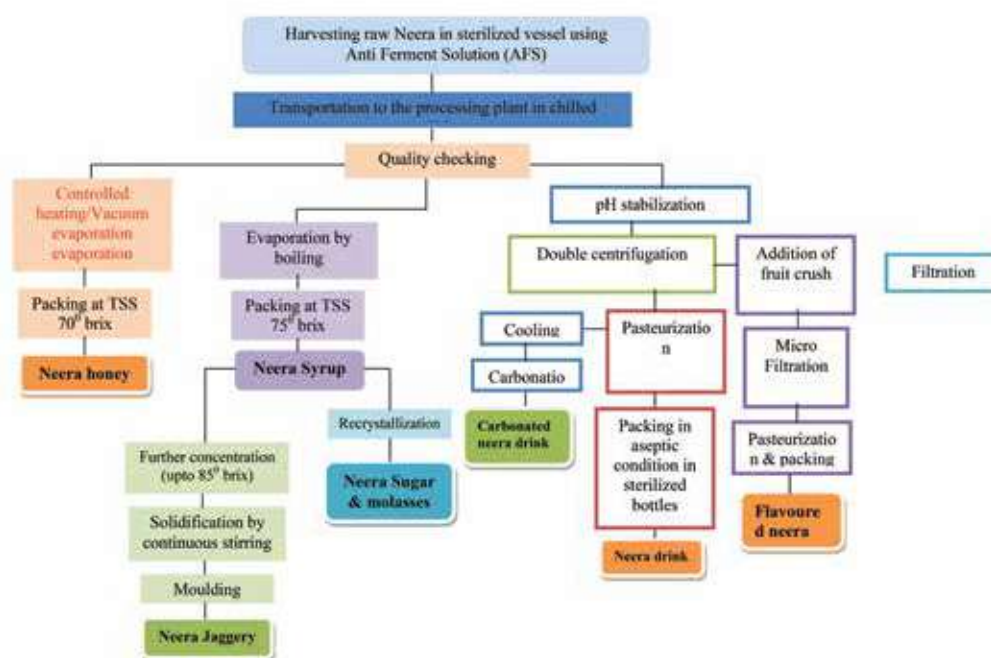
Neera tapping requires adherence to strict procedures right from the collection of the first drop. This is because the sap on extruding comes into contact with air and the process of fermentation is initiated.

Neera tapping is done thrice a day and the sap is collected twice daily using anti-ferment solution (AFS). Chilled condition is required for the storage of Neera. So, Neera is transported to the processing sites in chillers/iceboxes. On an average a palm yields about 1.5 - 2 litres of neera. To produce good quality Neera, it is necessary that all containers and vessels used should be clean at all times.

Processing

As neera is highly perishable due to natural microflora, it should be processed immediately after harvesting. Consumption of raw neera without processing may cause various food borne illnesses. Raw Neera collected using anti ferment solution (AFS) can be processed in different ways based on the quality of Neera. Apart from pH and brix, organoleptic properties also determine the quality of raw Neera.

Processing technology of Neera Products



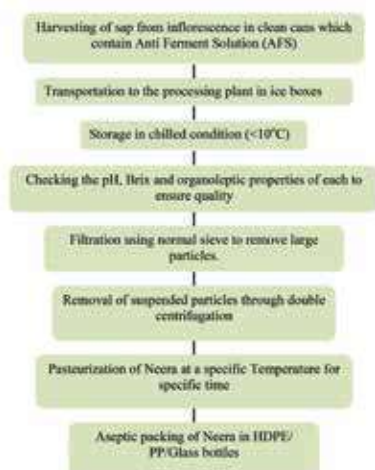
Neera Nutritious Health drink

Neera can be hygienically processed to a natural health drink. Quality of raw neera determines the quality of the processed drink. Raw neera of pH above 5 is always preferred for neera drink. Raw Neera is centrifuged, pasteurized and packed in aseptic conditions to produce Neera drink. Neera drink can also be produced in different flavours (Green apple, litchi, green coconut, lemon etc) for consumer acceptance. Neera is a nutritious drink and is a healthy alternative to aerated beverages and soft drinks available in the market.

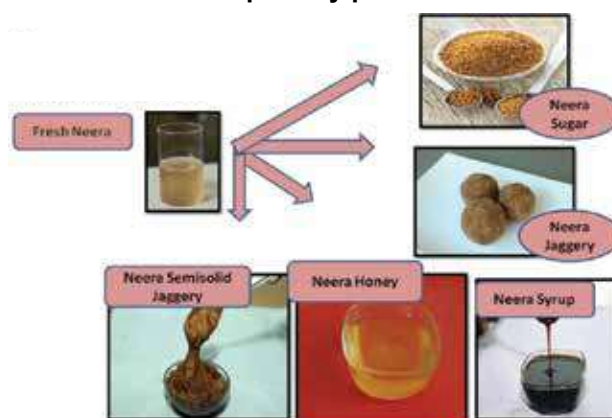
Physicochemical characteristics of Neera

Sl.No	Parameters	Raw Neera	Packed Neera	Flavoured Neera
1	pH	5.8	5.3	4.3
2	Brix/TSS	15.13%	15.37%	23.1%
3	Total sugar	15.00 %	15.00 %	18.5%
4	Total mineral matter	0.27 %	0.26 %	0.42%
5	Protein	0.106 %	0.106 %	0.24%
6	Fat	traces	nil	0.03%

The processing of Neera drink



Neera primary products



Neera Primary products

Diversified products could be produced from coconut neera by adopting simple technologies which does not require much capital investment. It is possible to promote on-farm utilization of selected products, the processing of which does not require the application of complex technologies. At house hold levels, it could provide employment opportunities to a sizeable population. When the production is organized in a cooperative sector like Farmer Producer Organizations (FPOs), adequate quality control is necessary for the production of good quality products. A high level of hygiene and professional management is necessary to meet the food standards of the confectionery and bakery industry

Primary products of Neera are products which can be prepared directly from Neera by evaporating and concentrating Neera of different pH to different brix levels. Primary products developed by CDB Institute of Technology include Neera sugar, Neera Jaggery, Neera syrup, Neera honey, and Neera semi solid jaggery.

Neera sugar

Neera sugar is the crystallised form of sugar prepared from Neera concentrate. It is prepared by heating and concentrating neera to a syrup consistency and crystallizing it with the help of crystallizing agent. Coconut sap sugar is very delicious, has more nutrients



and does not spike blood sugar like other types of sweeteners. Other sugars such as refined white sugar, muscovado sugar, and molasses have a range of GI from 65 to 100 per serving. GI of other natural sweeteners is as follows:

- Date sugar - 100 GI per serving,
- Maple Syrup - 69+ GI per serving
- Honey - 70+ GI per serving.

Coconut sugar has a low glycemic index (GI – 35) and a low glycemic load (GL – 1). This makes coconut sugar a healthy option for all people but it is particularly beneficial for diabetic patients. Yield of the product is 8-10%.

Neera Jaggery

Neera jaggery is produced by boiling (temperature- 103°C -105°C) and concentrating Neera (pH>7) upto a brix level of 85° and then solidifying it by continuous stirring and after judgement of end point, moulding it into desirable size and shape. Yield of the product is 12-15%.

Neera semisolid jaggery

Neera jaggery in its semi solid form is Neera semi solid jaggery. It is prepared by concentrating the sap and removing from fire before reaching the strike temperature for jaggery. It is very fine with loose bonding. Yield of the product is 12-15%.

Neera Jaggery syrup

Neera Jaggery Syrup is produced when fresh neera (pH ≥ 6) is heated under moderate temperature (103°C -105°C) and concentrated to syrup consistency (75 - 80° brix). Yield of the product is 18-20%. In many countries, Neera, syrup is used as a health and wellness drink and is prevalently used in Ayurveda and other systems of medicine.

Neera Honey

Neera honey is produced by concentrating neera (pH≤5.5) upto 70° brix level. It is thick liquid syrup like honey. It is used as table syrup as a sweetener in confectionary items like ice creams. Yield of the product is 20-22%. Coconut sap sugar is the crystallized form of sugar prepared from Neera



Nutritional Analysis of Neera Primary Products

Parameter (%)	Sugar	Jaggery	Semi Soild Jaggery	Syrup	Honey
Moisture	1.12	9.10	15.00	-	-
Carbohydrate	95.58	87.54	80.03	65.43	61.50
Protein	0.63	0.72	0.71	0.39	0.12
Total Minerals	2.66	1.97	1.95	2.00	1.75
Crude Fibre	-	0.46	0.43	-	-
Total Soluble Solids	-	-	-	81.44	74.26
Total Fat	Traces	Nil	Nil	Nil	Nil

Physicochemical characteristics of Neera

Sl. No.	Product Name	Carbohydrates (%)	Protein (%)	Fat (%)	Minerals (%)	Fibre (%)
1	Neera Cookies	38.85	6.86	40.90	0.28	2.51
2	Neera Cake	48.00	4.38	15.33	2.11	0.20
3	Neera Spicy Jaggery	85.93	0.79	1.00	3.17	0.61
4	Tutti Fruity in Neera Syrup	67.77	1.76	0.93	4.67	1.54
5	Neera Gulab Jamun	62.26	2.50	1.42	1.44	0.14
6	Neera Coconut balls	29.28	5.20	42.57	2.20	4.46
7	Neera Burfi	52.13	5.51	18.50	1.82	3.24
8	Neera Peanut Ladoo	67.15	10.23	15.33	2.84	0.04
9	Neera Chocolate balls	78.50	3.50	3.92	5.26	0.14
10	Neera Coconut Chocolate	56.14	4.25	34.89	1.34	0.46
11	Neera Fruit Spread	68.10	0.80	0.07	1.48	0.85
12	Neera Lemon Squash	66.10	0.51	0.01	2.07	-
13	Neera Pineapple Squash	63.20	2.03	0.01	1.05	-

concentrate. Coconut sap sugar is very delicious, has more nutrients and does not spike the blood sugar like other types of sweeteners so it is particularly beneficial for diabetic patients. Neera Jaggery is a rich source of minerals like iron and calcium and has medicinal properties. Neera syrup is prevalently used in Ayurveda and other systems of medicine. Neera honey is used as table syrup as a sweetener in confectionary items like ice creams and is also a rich source of iron.

Value addition

Neera has a high potential for value addition due to



its health benefits. Sweets and confectionaries prepared from normal sugar and jaggery can be prepared by substituting with neera sugar/jaggery/syrup/honey.

Low GI foods find applications in the proper control of Diabetes Mellitus and Cholesterol levels. The GI of coconut palm sugar is 35 while that of cane sugar is 70. Value addition of neera primary products can yield a variety of products in the category of snacks, sweets, Chocolates, candies, confectionaries, jam, squash, desserts & frozen delights.

Some of the products which can be produced from neera include neera spicy jaggery, neera cookies, neera chocolate, neera cake, neera peanut laddoo, Neera shake, neera pudding, neera fruit spread, neera squash, neera icecream, neera chunks, neera instant black coffee mix, etc.

Role of CIT

CIT has developed the technology for preservation and processing of Neera and standardized various value added products from Neera. CIT offers various services to the Farmer Producer Organizations (FPOs) viz. technology for preservation and packing of Neera, fourteen days training programme for traditional toddy tappers to equip them as Neera master technicians, six days training on Production of Value added products from Neera, consultancy services for setting up of Neera plant and quality testing services for Neera and Neera products. ■



● **Praseetha K.C.** Chemist , **Sumi S Nair.** Microbiologist, CIT.

Coconut Inflorescence Sap (Neera) is a natural and non alcoholic delicious health drink, high in nutritional value. Coconut Inflorescence sap is highly susceptible to contamination and deterioration by microorganisms whenever it is exposed to air and external environment. Proper handling, temperature management and sanitation management throughout the post harvest and processing chain is required to retain its inherent qualities.

Pre harvest factors such as contamination by insects and pests, contamination by microorganisms through collection vessels, water, manual handling, unhygienic practices etc. affects the quality of Neera. Contamination by microorganisms as a result of improper post harvest handling and processing techniques also results in poor quality of Neera. Improper packing and storage of bottled Neera may cause deterioration of the product.

Collection and Harvesting

Harvesting: High yielding, properly maintained and irrigated, disease free palms should be selected for tapping Neera. For collection of Neera, it is necessary to ensure the hygiene of the crown. Clear the crown of the palm and nearby areas of the selected inflorescence. The inflorescence should be made hygienic by treatment with disinfectant (Sodium Hypochlorite) and it should be covered with net for preventing the entry of insects and pests. Distilled water should be used for cleaning of inflorescence.

The tools and vessels used for harvesting Neera should be clean. Two collection jars are required for each

inflorescence. Both the collection and transportation containers should be washed with mild (colourless & odourless) soap solution and brush, then wash using water and rinsed by hot water, finally rinse by 0.05% Potassium meta bisulphite solution and dry in sunlight.

Preparation of Anti-Fermentation Solution: Anti Ferment Solution should be prepared in a hygienic environment. Personals involved in the preparation of AFS should wear hygienic aids. Work bench should be wiped using Isopropyl alcohol prior to the preparation. Glasswares used for the preparation should be washed and dried properly. Centrifuge tubes should be washed in mild hot water and should be dried properly before filling. Sterilized water should be used for the preparation of AFS. After preparation, AFS should be transferred immediately to the centrifuge tubes and capped properly to avoid air contact. Prepared AFS should be handled properly and should be stored in dry and hygienic environment.

Sterilization of clay: Clay should be sterilized to avoid contamination and to ensure hygienic collection of Neera. Clay is made in a paste form with adequate water, 2 -3 gm of which is wrapped using aluminum foil. Sterilize the clay using autoclave at 121°C and 15 lbs pressure for 15 minutes or in a pressure cooker. Pack the clays in plastic bags and use this within 2 days. Sterilized clay should be applied on the inflorescence using gloves.

Post harvest handling: Harvested Neera must be in contact with clean surfaces all time. Immediately after

harvesting, it should be stored in chilled condition. It is transported to the processing site either in mobile chillers or ice boxes. Dry, clean and well ventilated place should be selected for storage of Neera. Avoid contact with sunlight.

Personal hygiene: All employees involved in Neera processing must wash hands with soap and warm water before work, after using restrooms, upon returning to their work station from a break for lunch. All employees should wear, clean, good fitting uniform and hair restraints (hair nets, caps, scarves). No workers shall wear jewellery including: watches/bracelets/wrist bands, ring etc. Food, candy, chewing gum, or other comestibles should not be allowed in the plant and control bad habits. Employee infected with or showing symptoms of any infectious or communicable disease or that demonstrate open sores, boils, infected should leave from work place. Gloves should be cleaned and/or sanitized at the beginning of work. Personnel working in the low risk areas of the plant should not enter other high risk areas as this movement could possibly contaminate equipment and product with extraneous matter or pathogens. Visitors and Management should follow the same rules as employee.

Plant Environment: Maintain clean plant environment so as to reduce the potential for contamination. Plant surroundings must be free of trash and debris. It must have adequate drainage/disposal facility to avoid stagnation of water. Waste disposal facilities must be well maintained and designed to prevent contamination of product.

Process area and Storage: Ensure that all glass lights in processing and warehouse areas are shielded or otherwise protected against Neera contamination in case of glass breakage. Provide adequate lighting in all Neera processing and support areas, including hand-washing areas and all areas where Neera is examined, processed or stored. Provide adequate space and layout to facilitate production and prevent accidental contamination of Neera. Ensure that floors, walls, and ceilings are constructed of appropriate materials. Provide adequate ventilation or control equipment to minimize odors and vapors of steam in areas where they may contaminate Neera. Monthly fumigation and environmental monitoring shall be followed for maintaining hygienic environment.

Equipment: Specific attention shall be given to equipments and utensils used in the processing of Neera to ensure that the design is easy for cleaning and sanitation. Equipment must be made of non-toxic materials, appropriate to their use, and resistant to deterioration by cleaning and sanitizing agents. Design the equipment to minimize exposed screws, bolts, bearings, etc. that could potentially contaminate Neera. Equipment must be well

maintained, with no rust, excess lubrication, flaking paint, etc. Plastic (such as baskets, conveyors) should be well maintained without chips, cracks or breaks in the material.

All cold storage facilities in the plant must be equipped with a temperature measuring or recording device that can be accurately read to confirm temperature.

Before processing, the entire plant, machineries and utensils should be cleaned thoroughly using mild antibacterial agent Potassium metabisulphite (0.05%) and rinsing with hot water or steam. After Processing, clean the plant and machineries using water and mild (colorless, odorless) soap solution. Rinse the utensils and machineries using antibacterial agent Per Acetic acid (0.05%) and hot water. Effectiveness of cleaning should be verified by visual inspection or swab test.

Water: Water used for Neera contact surfaces or used in the facility for employee services must be potable and meet state and federal regulations for drinking water. There must be no cross-connections between potable and non-potable water supplies. Water shall be tested at yearly intervals.

Packaging control measures: Packing materials that are not being used immediately shall be stored safely to protect from contamination. All bottles and caps must be sanitized in portable water. It shall be dried in hot air oven at 40°C. Bottles should be kept in drain racks inside the oven. During bottling and capping, all chances of human and environmental contamination should be avoided. Immediately after processing, Neera must be bottled and aseptically sealed. Packing materials shall provide adequate protection for products to minimize contamination and prevent damage. Packaging materials shall be nontoxic /food grade and not pose a threat to safety and suitability of food under specified conditions, storage and use.

Pest Control: At the entrance of processing hall and storage areas, pest-capture lights or other facilities shall be installed. Service of licensed pest control agencies can be utilized on contract.

Storage & Transportation: Neera must be stored under conditions that protect against contamination and minimize deterioration. Storage facility used for finished products shall be maintained in a condition that protects products against biological, chemical and physical contaminants. Raw Neera and finished product



Quality requirements of packed Neera	
Parameter	Value
pH	5 – 5.5
Brix	14 - 17
Appearance	Clear and transparent
Taste	Characteristic sweet taste
Odour	Devoid of any off odour
Total plate count	<50 CFU/ml
Yeast and mold	<100 CFU/ml
Total coliforms	<3 MPN/ml
E.coli	Absent/ml
Staphylococcus aureus	Absent/ml
Salmonella	Absent/25ml

should be stored in different places in order to avoid cross contamination. Ensure that vehicles used to transport Neera to the facility are not used to convey any other items such as chemicals, waste products or other potential contaminants.

Product hold: A product hold and release program shall be established to ensure that no product is released until all the necessary chemical, physical and microbiological analysis have been completed and customer specifications have been met.

Major sensory parameters which determine the quality of Neera are colour, taste, odour and clarity. Chemical parameters such as pH & Brix / Total soluble solids need to be checked for assuring quality of Raw Neera after collection. pH of Neera immediately after collection in hygienic environment is 6.5 to 7.5 & Brix is 140 to 170.

Chemical analysis of Neera can be done in a laboratory for analyzing the nutritional parameters like carbohydrates, fat, protein, minerals etc. Microbiological analysis can be carried out to determine the number and type of microorganism present in a sample of the product. Since Neera is rich in nutrients, it is highly susceptible to contamination by microbes. Six parameters like Total Plate Count, Yeast and mould, Total Coliforms, E.coli and Staphylococcus aureus are commonly analyzed. ■

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Training for skill development at CIT

● **Jamuna John.** Project Manager, **Aneeta Joy.** Food Technologist, CIT.

Training is a process by which someone is taught the skills that are needed for an art, profession, or job. One needs to have technical knowledge for a particular job if they want to move up. So training aims at imparting information for accomplishing a particular task. Our government is also giving prior importance to skill development. It has a separate ministry

namely “The Ministry of Skill Development And Entrepreneurship” which is responsible for co-ordination of all skill development efforts across the country. CDB Institute of Technology (CIT) is the research wing of Coconut Development Board. It supervises the planning, co-ordination and conduction of training programmes, R&D programs and quality testing. The role of training is to raise the productivity of workers and enterprises by effective classes based on different subjects and it will contribute to boost their future innovation and development.

Training as part of transfer of technologies

CDB Institute of Technology is conducting institutional training programmes on various aspects of processing and packaging of coconut and coconut inflorescence sap which is beneficial for varied group of people including students, entrepreneurs, professionals, women etc. Training programmes mainly focus on providing a basic knowledge for the participants about coconut processing and to equip them as potential entrepreneurs/ professionals who are capable for handling coconut based enterprise. Coconut Food products’ training mainly aims at imparting skill on the preparation of coconut based food products and overall quality management.

Front line demonstration programmes on Post Harvest Technologies in coconut is mainly covered in the one day and four days’ package. The sessions cover each and every aspects for starting an enterprise including product identification, product preparation and packaging, quality control and quality assurance, good manufacturing practices to be adopted in a food



processing sector, licencing etc. Individuals/Self Help Groups/Students/Farmer groups/Women groups like Kudumbashree/FPOs are the targeted groups.

Six days’ package covers the processing technologies for Neera based value added products. This package is meant for Farmer Producer Organisations (FPOs) which are registered with CDB. They are provided with basic knowledge on the processing technology of Neera based products like Neera sugar, Neera syrup, Neera Jaggery, Neera honey and bakery and confectionary products from Neera. They are also provided with an exposure to pilot Neera processing plant which is functioning at CIT.

How to apply

Applicants have to register prior to the training date. Convenient dates will be intimated to the applicants over phone/ mail. Fees shall be charged for each programme based on the nature and duration of training.

Future & Scope of Neera Master Technicians Training Programme

Neera Master Technician Training Programme is one of the major programmes conducted in CIT and is exclusively for traditional tappers with a minimum of five years tapping experience. Trainees are selected through Coconut Producer’s Companies and Federations. Persons with reading, writing and listening ability and those who are physically able to climb coconut trees for tapping neera through proper procedure in the age group of 20 to 55 are preferred for the training.

The duration of Neera Master Technician Training Programme is 14 days and CIT is providing accommodation, food and a total stipend of Rs.2800/- to each participant. The training is chartered for consecutive

Training conducted at CIT					
Sl. No	Name of the Training Programme	Duration	Fees	Topics/Products Covered	Targeted Participants
1	Coconut Vinegar from coconut water by slow process/Nata de coco	1 Day	Rs.1500/-per 2 persons from a single firm	Coconut Vinegar	(Basic Science Knowledge) Kudumbasree Units, Individuals, other Groups, F-PO's (CPS, CPF, CPC)
2	Training Programme on Minimal Process of Tender Coconut	1 Day	Rs.250/- per person	Processed Tender Coconut	Kudumbasree Units, Individuals, other Groups, F-PO's (CPS, CPF, CPC)
3	Training Programme on Coconut Food Products	1 day	Rs.250/- per person	Coconut Chips, Chocolates, Cookies, Lemonade (Squash) – 5 Products, Theory sessions on Packaging & Hygiene	Kudumbasree Units, Individuals, other Groups, F-PO's (CPS, CPF, CPC)
4	Training Programme on Coconut Food Products	4 Days	Rs.1000/- per person	Coconut Chips, Chocolates, Cookies, Lemonade (Squash) ,Pickle, Chutney Powder, Burfi, Coconut Balls	Kudumbasree Units, Individuals, other Groups, F-PO's (CPS, CPF, CPC)
5	Training Programme on Neera Value Added Products	6 Days	Rs.5000/-per person with Accommodation Rs.2500/- per person without accommodation	Neera Drink, Jaggery, Honey, Spicy Theory sessions on Packaging & Hygiene. Jaggery, Sugar, Halwa, Cake, Chocolate, Cookies, Coconut Balls, Neera Peanut Balls, Spread, Lemon Squash Theory sessions on Packaging & Hygiene.	For Coconut Producer Federations (CPF's) having Neera License.
6	Neera Master Technician Training Programme	14 Days	No Fees	Theory and Practical classes for Tapping Neera From Coconut Trees	Traditional Tappers having minimum 5 years of experience in Tapping.
7	Coconut Processing Certificate Course	1 Month	Rs.12000/- per person (without accommodation) D/c-20% (Rs.9600/- for persons recommended by FPOs)	Practical – CCF, Neera Value Added Products, Chemical & Microbiological analysis. Theory – Other Coconut Products (VCO, DC, Coconut Oil, Coconut Milk Powder etc), Food Safety and Hygiene. Industrial Visit	(Basic Science Knowledge) Preferably +2 science

14 days consisting of theory, practical and other sessions for the improvement of their job life, mental health and social relations. Varieties of classes are included for the motivation and skill development of the participants. At the end of the training programme theory and practical tests are conducted and Neera Master Technician certificate is provided to the participants who clear the tests.

Neera Master Technician is different from Neera Technician and they have lots of opportunities in Neera and in coconut sector. Only those who get master technician certificate from Coconut Development Board are eligible to work as master technician in the 45 days neera technician training programme conducted by Coconut Producer's Companies or Federations. These trainees can also work as Neera Technician and produce Neera for Coconut Producer Companies.

CDB Institute of Technology (CIT, Aluva) assures

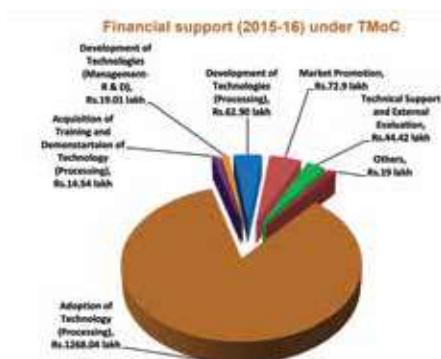


a bright prospect for the neera master technicians and neera technicians who are working in various neera companies. They are satisfied in their job and is earning a good monthly income from this green collar profession. ■

Technology Mission on Coconut records the highest ever achievement

● **Sasikumar C**, Technical Officer, CDB.

Coconut Development Board has been implementing the Technology Mission on Coconut (TMoC) programme since 2001. During the fiscal year 2015-16 the programme has recorded an all time high achievement of Rs. 15 crores by providing subsidy to various coconut processing and product development projects which is 10.33 % higher than that of the previous year. Many innovative new generation coconut products were



introduced during this year which has received good response from the general public. Flavoured coconut juice is the star product which was introduced during the year. Other novel products which have formed part of the coconut product basket are neera and neera products, virgin coconut oil, desiccated coconut powder, tender coconut water, coconut chunks, diabetic friendly neera cookies and major by products like activated carbon, coconut shell powder and coconut shell charcoal.

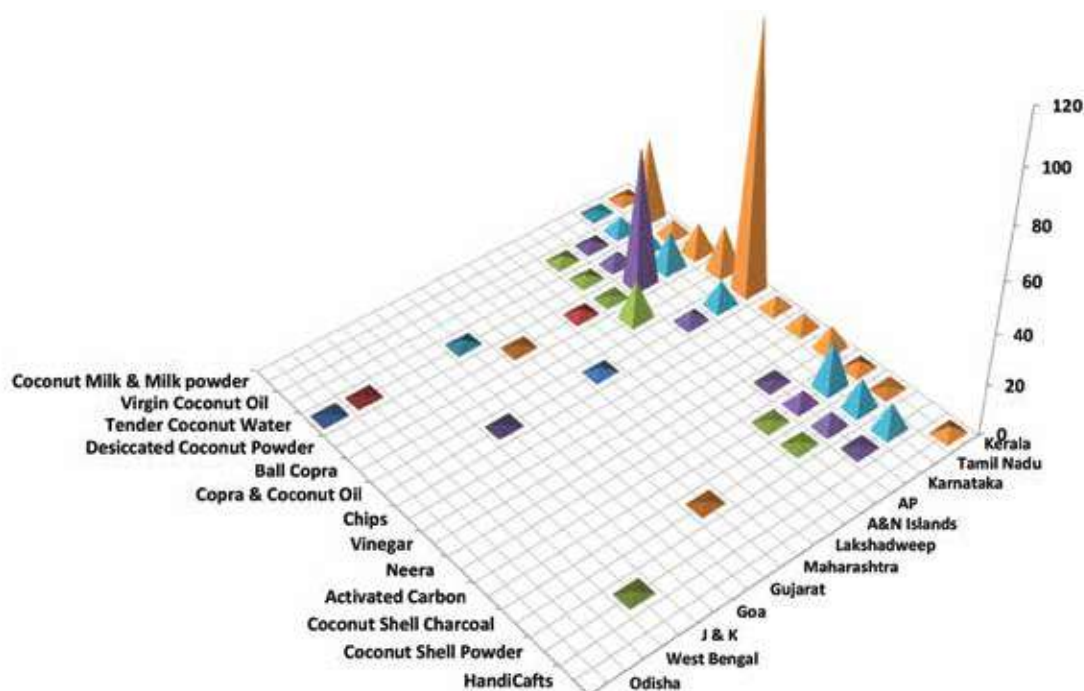
During the year, three meetings of the Project

Approval Committee of TMoC were held which had cleared the assistance for 92 projects with an outlay of Rs.138.77 crores and a subsidy of Rs.21.86 crores. Pollachi Coconut Producer Company Ltd. in Tamil Nadu has availed the assistance for setting up India's first flavoured coconut juice unit with an installed per day capacity of 5000 nuts. Four Coconut Producer Companies from Kerala have availed the assistance for setting up neera processing units. These units together are having the per day capacity to process 0.27 lakh litre neera. 10 Virgin Coconut Oil units with per day capacity of 3.74 lakh nut, 21 Desiccated Coconut Powder units of 6.30 lakh nut per day capacity and four Tender Coconut water units with capacity to process 38000 nuts per day were also approved during the year. Under by product utilization Board has funded three Coconut Shell Charcoal with 36 MT per day capacity, five Activated Carbon units with 26 MT per day capacity and one Coconut Shell Powder unit with installed capacity of 20 MT.

The novel trend being observed during the last two years is the presence of Farmer Producer Organizations entering into the processing sector. Four Coconut Producer Companies from Kerala have got their projects approved by the Board for setting up Neera Units. Two integrated coconut processing units are established by the Coconut Producer Companies in Andhra Pradesh and Kerala. Pollachi CPC has set up flavoured coconut milk unit by availing financial assistance under the TMoC programme. Perambra CPC has set up a VCO unit and a coconut water processing unit and four coconut oil units are set up by various CPCs. 25 CPFs across Kerala have also set up copra making units with the financial assistance of TMoC.

Technology Mission on Coconut is being implemented by the Board since 2001-02 as a part of the ongoing programmes for integrated development of coconut industry in India and to address various problems faced by the coconut industry in a strategic manner. The main objective of the programme is to improve the productivity of coconut through management of pests and diseases and also to promote processing, product diversification and marketing of coconut so as to ensure a fair, reasonable and steady price for coconut. However due to the price fall in





the recent past, the Board is concentrating more on promoting value addition and product diversification. Since the formation of the Farmer Producer Organization in coconut sector, TMOc is giving thrust for the growth of the FPOs extending them financial assistance for setting up coconut processing units, coconut points etc.

Presently coconut is enjoying a premier position in the health and wellness sector and more people are preferring to include coconut products in their daily diet. More coconut based industries need to come up in the country in order to meet the demand supply gap. Board conducted entrepreneurs meet in the traditional coconut growing states of the country to create awareness on the health, nutritional and wellness benefits of coconut

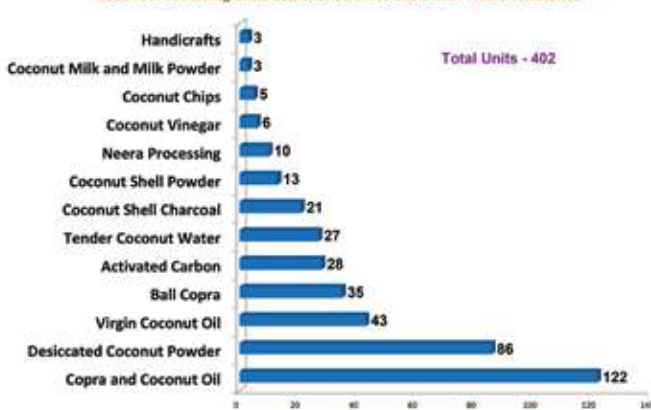
products and also to inform, inspire and motivate them of the umpteen entrepreneurial opportunities the sector possesses. All the meets had overwhelming response and Board is receiving many enquiries on processing and product development.

Board is focusing on product development with the help of national level institutions like CFTRI, DFRL, CPCRI, IISc, NIANP, CIFT etc and state Agricultural Universities such as TNAU, KAU, UAS, ANGRAU etc and also premier private institution such as PSG group of Institution, Coimbatore, SCMS Institutions, Amrita Vishwa Vidyapeetham University, SRM, Chennai etc.. Apart from this Board's CDB Institute of Technology is also a major contributor for bringing out various value added coconut based products since the past one decade.

Since its inception in 2001 TMOc has been instrumental in establishing 402 processing units which produces an array of value added coconut products. These units have the capacity to process 2420 million nuts per year which accounts for 12 % of the total production of the country.

Though India is the global leader in coconut production and productivity, the country lags far behind Srilanka, Indonesia, Thailand etc. in value addition. Board through its TMOc is making incessant efforts to motivate the farmers and young entrepreneurs to venture into value addition of coconut. Board is hopeful that this would position the coconut products of India in the Make in India programme of the country. ■

Coconut Processing units established since 2002 with TMOc assistance



Awaiting neera in Karnataka, Tamilnadu and Andhra Pradesh

● **D.S. Resmi** , Assistant Director, CDB.

Neera, the most “Natural Nutritious Health Drink” has become a reality in Kerala after surpassing all the legal hurdles and practical difficulties. The Coconut Producer Companies in Kerala are actively engaged in neera processing, branding and marketing. Different varieties of neera, neera based value added products such as neera honey, sugar, neera based cookies, neera chocolates, neera jaggery, spicy jaggery etc. have turned out to be popular and is found to have a growing demand in the market now.

Apart from Kerala, other major coconut producing South Indian states Karnataka, Tamilnadu and Andhra Pradesh are still pursuing for permission to extract neera through Farmer Producer Organizations affiliated with CDB. CDB had been continuously recommending State Governments to take a favourable policy decisions in neera production in respective states. However conducive policies are yet to be announced in these states for enabling neera extraction through the CPFs. A brief review of activities taken up for enabling neera policy in Karnataka, Tamilnadu and Andhra Pradesh is furnished below

Karnataka

The proposal for extraction of neera in Karnataka was mooted even from 2012. Amendments need to be made in existing Karnataka Excise Act wherein Neera is classified as a ‘Fermented Juice’ drawn from an excise tree. Neera which does not contain alcohol is included as Toddy. CDB has recommended amending the existing Act to remove the anomalies.

Government of Karnataka has conducted a series of meetings with officials of State Government, Excise Department, Horticulture Department and CDB to discuss the modalities in implementing neera extraction and processing through FPOs. In the meeting held on 9.1.2015 at Bangalore, Chairman CDB presented the economics of neera production and benefits to coconut farmers, neera technicians and State Government. As per the decision taken in this meeting, a team of Excise and Horticulture Department officials from Karnataka visited Kerala and Tamilnadu during 19th -20th May, 2015. Shri Rajeev Chawla IAS, Principal Secretary (Horticulture), Shri. S. Meena IAS, Excise Commissioner, Government of Karnataka and other senior officers from concerned departments attended the meeting. The team had made on site visit to neera processing plant of Thirukochi Coconut Producer Company at Kalamassery. They also had field visits to Pollachi and Palakkad to understand the neera extraction process.

CDB had ensured that if Karnataka Government goes



ahead with bringing amendments to Excise Act paving way for neera production in the state, all necessary support shall be given. In continuation of the first meeting, another team of Principal Secretary (Finance) and Excise Commissioner Karnataka made a two day study visit to Kerala during 22-23rd September, 2015. The team visited the neera plants of Thirukochi CPC at Kalamassery and Karappuram CPC at Kanjikuzhy and had interactions with CPC office bearers, excise officials and beneficiary member farmers. The field visit gave the study team a real visual experience of neera extraction from farmers field up to processing plant where the neera is processed and packed in sealed bottles.

Based on all these discussions and study visits, the Karnataka Excise officials has given a positive nod for amending the existing Karnataka Excise Act, 1965. The Karnataka Excise (Neera) Rules, 2015 was drafted by the excise department, Karnataka and same was vetted by CDB in November, 2015. Guidelines have been provided by CDB that neera extraction shall be through CPFs registered with CDB and neera processing and marketing shall be through CPCs registered under Companies Act, 2013. CDB is expecting Karnataka State Government to take appropriate policy decisions in this regard at the earliest, so that coconut farmers in the state can also reap a better price from their coconut palms through neera production.

Tamil Nadu

From 2012 onwards, CDB is requesting Government of Tamil Nadu to promote the new initiatives in coconut sector such as the production of neera, neera sugar, honey, syrup etc. and to grant license to well organized and federated Coconut Producers Societies for extracting neera. As per the request of Chairman, CDB a workshop on Neera was organised under the Chairmanship of Vice Chairman, State Planning Board on 29.10.2015 at State Planning Commission, Chennai wherein, Chairman, CDB made a presentation on Neera and convinced the policy

makers present over there viz. Vice Chairman, Tamil Nadu State Planning Commission, Secretary (Planning), APC cum Agri Secretary, Secretary (Handlooms & Textiles), Director of Agriculture, Director (Agri Marketing & Agri Business), Prohibition & Excise Commissioner and CEO, TN Khadhi & Village industries on the possible prospects of coconut farmers through the extraction of neera.

The major hurdle in the production of Neera and other value added products in Tamil Nadu is that even though Neera contains zero alcohol, it comes under the provision of “Prohibition and Excise 1939(Tamil Nadu Neera and Palm Sap Rules).As per the Prohibition and Excise 1939,(Tamil Nadu Neera and Palm Sap Rules), “drawing of Neera or Palm Sap in pots or other receptacles freshly coated internally with lime for the manufacture of Jaggery from such toddy or for the sale or use of such toddy as a beverage without fermentation” is allowed.

If the above order is modified as “drawing of Neera or Palm Sap in pots or other receptacles freshly coated internally with lime or by other modern technologies for the manufacture of Jaggery from such neera or for the sale or use of such neera as a beverage without fermentation” better quality neera and neera products can be manufactured in Tamil nadu in a big way.

At present, Neera license in Tamil Nadu is issued to the tappers who are the members of the Societies under the Palmgur Federations in the State. License is issued for traditional and old methods of Neera extraction by use of lime, as per the existing rules. As modern technologies of neera extraction and processing are available now, it is high time that suitable modifications are made in the Act.

A meeting was held by Prohibition Commissioner for Neera on 08.01.16 regarding the amendments to be made in the Prohibition and Excise Act, 1939. It was decided that the following amendment may be made in the Prohibition and Excise 1939, Tamil Nadu Neera and Padani Rules: a) Unfermented juice of coconut inflorescence needs to be deleted from the definition of toddy and Neera to be defined as “Nutritious Natural health drink”. b) A separate definition for Neera value added products may also be included as follows: “Value added products from Neera include packed Neera, fresh Neera dispensed through a cold chain, Neera syrup, Neera honey, Neera jaggery, Neera cookies and Neera sugar or any other products in which neera or neera concentrate or neera sugar is an ingredient. License for extraction of Neera from coconut using the modern technologies and processing, to be issued by the Prohibition and Excise Department, Tamil Nadu in each district.d)Extraction of Neera to be permitted at CPF level. Processing, marketing including exports to be done at CPC level. Sales of Neera as a nutritious natural health drink – a branded product which is packed and sealed in appropriate containers as per FSSAI license, by the CPCs. Further processing of Neera into value added food products with proper package

and sealed as per FSSAI license and marketed including exports also to be allowed e) Only the CPFs recommended by CDB be given license for neera extraction f) Only 5000 palms in a CPF need to be given Neera license to have proper balance between coconut production and neera production g)To impose heavy penalty for misuse of the license if any – like cancellation of license, monetary fine or a combination of both.

The neera policy also has been drafted by CDB, and forwarded to Prohibition & Excise Commissioner, Govt. of Tamil Nadu. CDB, Chairman met the Chief Secretary, TN and Advisor to CM on 09.02.16 and discussed the prospects of neera in Tamilnadu. A Tamil magazine– Thozhil Ulagam has published a detailed interview with Chairman, CDB in the November issue of the Magazine wherein benefits of neera production is highlighted. The revised neera rule for Tamil Nadu is also finalized by Chairman, CDB which was sent to the Commissioner of Prohibition and Excise through DD, Regional Office, Chennai.

Deputy Director, Chennai had met the APC; Finance Secretary (Expenditure); Director of Agriculture; MD, TN Khadi & Village Industries; Prohibition Commissioner as well as the Joint Commissioner(Prohibition) and briefed them on the goodness of neera. As per the decision of the second Joint meeting on Neera held by Prohibition Commissioner for Neera on 22.2.16 DD, RO, Chennai drafted the New Neera rule, which was vetted by Chairman, CDB and sent to the Commissioner of Prohibition and Excise, Govt. of Tamil Nadu for necessary amendments in the existing rule. Continous follow up is being done and positive policy decisions are awaited from Tamilnadu.

Andhra Pradesh

The Government of Andhra Pradesh has also shown positive interest in neera production and a team of officers from Prohibition and Excise Department, Dr YSR Horticulture University, AP visited Kerala from 7.12.2015 to 11.12.2015 to study and understand the neera production in Kerala. The team visited the Neera processing plants of Thirukochi CPC, Palakkad CPC and Karappuram CPC. Detailed discussions were held regarding the prospects of neera production in AP. It was suggested that amendments in the existing AP Excise Rules (Regulation of Drawal and Sales of Neera) 1969 can facilitate neera extraction by Farmer Producer Organizations affiliated to CDB. The proposed amendments by the AP State Government was forwarded to CDB on 4.3.2016 and suggestions of CDB in the amendments were forwarded to Commissioner of Horticulture and Sericulture, Government of Andhra Pradesh on 17.3.2016. It is anticipated that AP Government shall also take policy decisions favouring the neera production through FPOs as envisaged by CDB. ■

Coconut kiosks kick starts in Metro cities

● **Dr.G.R.Singh**, Director and **Arun Paul**, Technical Officer, CDB, MDIC, New Delhi.

During the hot summer evenings, after the busy office hours, people are really in need of a healthy drink or snack. Very often we see people nibbling unhealthy junk food items and sipping carbonated drinks. The non availability of refreshing as well as healthy item force people to depend on these insalubrious eateries. It is in this context that coconut products' kiosk assumes great significance. Manufacturers of healthy and delicious coconut based products like tender coconut water, Neera, tender coconut chips, coconut candies, coconut chunks, neera cakes, neera ice creams etc. can utilize this opportunity by installing small selling outlets/kiosks in metro stations, railway stations, bus terminals, airports etc.

Two decades before, only few consumers were visiting specialty retail kiosks and these kiosks were just starting to make their entry into shopping centers. Now a days it's almost impossible to walk through a mall without crossing a kiosk selling cell phone cases, sunglasses, ice creams, beverages and many other things.

Located in common areas of large malls and centers, carts and kiosks offer local entrepreneurs and national retailers an opportunity to showcase and sell their products in prime, high-traffic locations at a fraction of cost of an inline store.

Kiosks are incubators for small businesses with minimum basic infrastructure like a reasonably strong frame work/ standees, table, wending machine, freezer / cooling facility. There is no need to invest in seating space. It has relatively lower operational cost with limited staff. Consumption of fuel, water and electricity are also lesser than for other formats.

Realizing the scope of coconut kiosks and the demand for coconut products, Nitin Goyal, a Delhi based young coconut dealer is setting up coconut kiosk and standees in the heart of New Delhi. He is marketing many coconut products under the brand name Rabiah. He is planning to set around hundred portable sales outlets (coconut canopies) in Delhi. According to him these coconut canopies are suitable for metro cities like



Shri. T K Jose, IAS, Chairman, CDB and Dr. Shakeel P Ahamed, IAS, JS (MIDH) at the coconut canopy at Central Secratariat Metro Station In Delhi.



Delhi as the investment is comparatively less compared to the traditional retailing shops. At present he is selling packaged tender coconut water, virgin coconut oil, premium coconut oil, coconut chips, coconut sugar, hand made coconut soap, coconut based cosmetics etc.

Nitin is planning to set up tender coconut vending machines in Delhi along with these canopies. Apart from these canopies he is also planning to take the shops near to sports complexes on lease to sell tender coconut water, Neera etc. Nitin is engaging youngsters who are interested in business and having an enthusiasm to become entrepreneur. For selling his products these youngsters are not just salaried sales boys, but are getting 10 per cent of their sales as commission. On an average, these youngsters are earning Rs.15,000 to 30,000 per month. They are not only just selling the products, but also creating awareness among the people about the health benefits of coconut products.

The success story of Cane-o-la, a Bangalore based company, is worth mentioning in this regard. It transformed the consumption pattern of sugarcane juice in just a few months after its launch. The unhygienic conditions in which the sugarcane drink was being dished out kept away consumers. On seeing the potential for the indigenous version of an instant energy drink, the promoters of Cane-o-la launched it after a long-term of R&D. They created a high-quality ambience, offered takeaways and various flavours and have outlets at

corporate campuses of Infosys, Wipro, Toyota Kirloskar Motors etc. They also have kiosks in retail chains such as Big Bazaar and Spencer's. In addition, the company has tieup with the State Government to set up kiosks at public places such as bus terminals (www.Cane-o-la.com).

Variety is also something kiosk owners can experiment with and the feedback is almost instantaneous for instance the success story of , the 'Petawrap' kiosks, which are shaped like auto rickshaws which sells wraps in dizzy combinations. The menu can be localized to the extent of catering to a specific locality/area within a city. For instance, a kiosk at an office complex and one near a college campus can have different offerings on the basis of customer preferences and what sells most. If you think this concept works well only with the youth, think again, says Nithin, as he is getting good response from aged people who are concerned about their health and are aware about

the goodness of coconut products.

Challenges

While these kiosks offer several advantages, there are certain challenges too. The major challenge is in getting the right supply chain and delivery mechanism. Stock-outs and spoilage due to improper storage are likely as there is not much scope for back-up storage in the kiosks. If this critical piece is taken care of, a business can break through even in just six months and get a return-on-investment in 12 months. Although the kiosks are made from good-quality material, one cannot avoid the effect of the rains and winds. Also, footfalls depend on the location. So, one must take advantage of high-traffic locations such as outside a petrol bunk, inside a mall, IT parks, office campuses, colleges, training academies etc. Competition from local vendors is high especially as the latter is normally out of tax reach and enjoy the cost benefit, which ends in more competitive offerings. Cross-product competition is also building up as the consumers today have various on-the-go foods to choose from – ice-creams to salads, soups, rolls, wraps, candies and even sugarcane juice.

However Nithin is going ahead with his plan to install more kiosks and going to popularize coconut products in New Delhi. Apart from Delhi, he is expanding his sphere of activity in other northern cities like, Jaipur, Agra, Chandigarh, Amritsar, Haridwar, Manali, Mussorie etc. ■

Coconut Food Products

● **Aneeta Joy**, Food Technologist, **R Jagadheesh Priya**, Food Processing Engineer, CIT.

Coconut tree is acclaimed as the tree of life because of its range of environmentally sustainable uses. It is widely used for household as well as industrial purposes. As each and every part of the tree is useful, the potential of this tree cannot be neglected. It can be considered as a consistent food supplier. It has become an unavoidable item in the dining table of an ordinary Indian.

Being a wholesome and nutritious food item, coconut has attracted the diet of many people worldwide. There is a broad spectrum of different food items that can be prepared from coconut. These varieties of Coconut food products offer a vast scope of further development, value addition and commercialization.

Even though various technologies are being developed, there is a need for commercialization of these products in order to provide an additional source of income and to improve the economic status of farmers and the country.

Varied food items can be prepared from coconut. Kernel, water and the inflorescence makes the major source of food items from coconut.



Coconut Kernel - a consistent food source

Coconut kernel is the most important food source from coconut palm. It is rich in energy, vitamins, protein, minerals and fibre. Fibre rich coconut kernel is good for the health of digestive system and easy bowel movements. Some of the products which can be prepared from coconut kernel includes:

Coconut oil

Coconut oil is extracted from the kernel of matured coconuts harvested from the coconut palm. It is generally

obtained by mechanical extraction methods. It has been found that certain fatty acids like lauric acid and their derivatives of coconut oil can have detrimental effects on inactivating various microorganisms such as bacteria, yeast, fungi and enveloped viruses and thereby found to be good for immune system.

Desiccated coconut

Desiccated coconut is obtained by drying of shredded, ground coconut after separating from the brown testa. The fresh matured coconuts are de-husked and de-shelled. The de-shelling is done by a sharp knife to get the kernel, and the kernel is disintegrated into smaller size using hammer mill or pin mill. The coconut flakes are steam blanched for about 20 minutes to reduce the microbial count. The disintegrated kernel is dried in the hot air dryer / vibratory conveyor belt s to reduce the moisture content up to 3%.

The desiccated coconut has more shelf life and easy to transport. It is widely used in confectioneries, baking, puddings and ice creams. Desiccated coconut can be added to foods for its texture, added coconut flavor, garnish for savory foods, as a dusting for the outer layer and as a substitute to raw grated coconut.

Coconut milk

Coconut milk is a natural and very versatile ingredient broadly used in Asian and Indian cuisine. It is an oil-water emulsion obtained from the aqueous extract of coconut meat. The coconut kernel is disintegrated using rotary wedge cutter, then it is pressed and squeezed with hot water to extract the milk from the kernel. After extraction milk is filtered to remove the solids then it is pasteurized to eliminate the micro organism. Coconut milk is considered as a substitute for cow milk and can be used by lactose intolerant people. The fresh coconut milk serves as a valuable food for children suffering from nutritional deficiency. It has more vitamin A content than coconut itself and has adequate minerals.

Coconut cream

Coconut cream is mainly used as a source of fat, is similar to coconut milk but has a thicker and paste like consistency than coconut milk. Addition of food additives like emulsifiers and stabilizers to coconut milk are involved during the production of cream. This mixture is mixed well to get the desired consistency and it is moved to the plate heat exchangers for pasteurization (80°C) and hot filled into the container. It has a shelf life of nearly 6 month once opened. It can be used directly or diluted with water to make various preparations such as

fish and meat dishes, curries, sweets, deserts, puddings, cakes, cookies, jam, ice creams etc.

Spray Dried Coconut Milk powder

Coconut milk powder is the dehydrated form of coconut milk. This product has a good keeping quality and retains the natural flavor, texture and taste of coconut milk. CDB in collaboration with the CFTRI has developed technology for spray drying of coconut milk, which is the most potential method for preservation of flavour and texture of coconut milk with good keeping quality.

Flavoured coconut Juice

A technology for processing flavoured coconut juice has been developed by CDB Institute of Technology. Fresh green nuts of 9-10 months maturity are more suitable for processing of flavoured milk. The milk extracted from young fresh nut is thick and less in fat content. The fresh nut water is also mixed with the extracted juice so as to enrich the nutrient contents. Consistency is made in such a way to get an acceptance as a ready to drink beverage. On an average, 800 – 1000 ml flavoured coconut juice is obtained from one nut.



Coconut Flour

Coconut flour refers to the screened food-grade product obtained after drying, expelling and/or extracting most of the oil or coconut meat. The granulation is dependent upon the degree of grinding and meshing to which the raw material has been subjected and varies from 30-250 mesh. Coconut flour is proven to be a rich source of dietary fibre.

Coconut chips

Coconut chip is a ready to eat snack prepared from 9-10 months old coconuts. It can be prepared by dehydrating the intermediate moisture coconut kernel. Intermediate moisture coconut kernel is the mature coconut kernel after removing the moisture content of the kernel partially by osmotic dehydration by using osmotic mediums like sugar syrup. Coconut chip is crispy and can be packaged and marketed in laminated aluminium pouches, which will have a shelf life of six months. Since it is in ready-to-eat form, it could be used as snacks at any time. Coconut chips with different flavours can be prepared by adding the required flavour essence in the osmotic medium.

Coconut chunks

Coconut chunk is a delicious snack prepared from

fresh coconut kernel by means of osmotic dehydration. Sweet coconut chunk is in the ready to eat form. It is chewy and candy like and is similar to the traditional Indian sweet Agra petha prepared from cucumber.

Virgin coconut oil (VCO)

Virgin coconut oil is the purest form of coconut oil, water white in color which has not undergone oxidation. It is the oil obtained from the fresh and mature kernel of coconut by mechanical or natural means, with or without the use of heat, without undergoing chemical refining, bleaching or deodorizing, and which does not lead to the alteration of the nature of the oil. Fatty acid composition of VCO is predominantly Lauric (48%). Monolaurin, derived from the Lauric Acid is having antimicrobial, antiviral and antifungal effects in the body.

Apart from this, there are many other edible products which can be prepared from coconut kernel like coconut yogurt, coconut cheese, margarine, mayonnaise, icecream, pinacolada, coconut syrup, coconut jam, coconut noodles etc.

The healthy drink- Matured Coconut Water

Matured coconut water is a source of various food items. It contain 4-6% sugar. Products like vinegar, squash etc could be prepared from matured coconut water.

Bottled Coconut Water

Matured coconut water can be used as a ready to drink beverage if properly preserved and packed. It can be carbonated and used as a soft drink.

Coconut water concentrate

Coconut water can be concentrated by using spray evaporation technique. The products has a shelf life of 6 to 24 months depending upon the degree of concentration. The concentrate could be used to prepare aerated & bottled Ready To Drink beverages.

Coconut Vinegar

Coconut water can be converted into vinegar by using vinegar generators. The process involves fortification of coconut water with sugar, fermentation by inoculation of yeast and then mother vinegar, oxidation and acidification. Vinegar has extensive use as a preservative in the pickle industry and flavouring agent in food processing sector. Natural vinegar enjoys export market in place of synthetic vinegar prepared from commercial acetic acid.



Nata-de-coco

Nata de -coco is a gelatinous product prepared from mature



coconut water by the action of cellulose forming bacteria namely *Acetobacter aceti* subspecies *xylinium*. The culture solution is prepared by mixing coconut water with sugar and acetic acid at a stipulated proportion, which is inoculated with *Acetobacter xylinium* through a culture liquid. It is filled in glass jars covered with thin cloth and kept for 2-3 weeks without any disturbance. During this period a white colored jelly like substance forms and floats on the top of the culture medium. It is harvested, cut into pieces and washed in pure water to remove all acids, immersed in flavoured sugar syrup for 12 hours and packed in glass bottles. It is an excellent ingredient for sweet fruit salads, pickles, fruit cocktails, drinks, ice cream, sherbets and other recipes.

CDB has developed a technology under laboratory conditions for the production of nata-de-coco from matured coconut water. Various other products like coconut water based beverages, coconut treacle, coconut lemonade etc could be prepared by value addition of matured coconut water.

Tender Coconut – The natural delicacy

Tender coconut is the gift of nature. It is the liquid endosperm obtained from young coconut (6 - 8 months) which makes pure, nutritious and wholesome natural beverage. The sterile water, which is approximately 200 – 750 ml, is enclosed in a hard shell and a well- lined layer (8 – 10 mm) of coconut meat. It can be processed to yield a natural nutritious drink and can be blended with fruit juices to yield nutritious beverages.

Packaged Tender Coconut Water

Coconut Development Board (CDB) in collaboration with the Defence Food Research Laboratory (DFRL), Mysore has developed a technology for preservation and packing of tender coconut water in pouches and aluminum cans. The DFRL, Mysore has succeeded in retention of its flavour when packed in pouches/aluminum cans for a period of three months under ambient conditions and six months under refrigerated conditions. The product has acclaimed consumer acceptance throughout the country.

Minimal Processing of Tender coconut

Perishability of tender coconut is relatively high and once the tender coconuts are detached from the bunches its natural freshness will get lost within 24 to 36 hours even under refrigerated conditions unless treated scientifically. The bulkiness of tender coconut is due to



the husk which accounts for two-third of the volume of tender nut. Handling of tender coconuts will be easy if a major part of the husk is removed. But, when partial removal of husk is done the colour of the nut will be changed to brown thereby reducing the attractiveness of the nut.

Technologies for minimal processing of tender coconut have been developed for retaining the flavour and to prevent discolouration. The process involves dipping (partially) dehusked tender coconut in an anti browning solution for five minutes. The product can be stored up to 24 days in refrigerated condition at 10-12°C. By using this process, tender - coconut can be transported to distant places and served chilled like any other soft drink. Optimized uniform size facilitates using of plastic crates and insulated chill boxes for transporting and storage.

Snow Ball Tender Nut

Snow ball tender nut is tender coconut without husk, shell and testa which is ball shaped and white in colour. Coconuts of eight months age is more suitable for making snow ball tender nut in which there is no decrease in quantity of tender nut water and the kernel is sufficiently soft

Fruit juice blended tender coconut water

Process for preparation of fruit juice blended tender coconut water beverage using pomegranate, blue grapes, pineapple, mango and lemon juice have been standardized by Central Food Technological Research Institute (CFTRI) under sponsored project of CDB. Storage studies of these products at room temperature revealed that the beverages were safe for consumption for a period of six months.

Neera Coconut Inflorescence Sap, the hidden miracle

Coconut inflorescence when tapped yields a vascular sap called neera which is rich in sugar, amino acids and vitamins. This sap can be processed to yield a nutritious health drink. Various value added products can also be prepared from coconut sap namely coconut sugar, coconut jaggery, coconut honey, syrup and various other value added products.

Other than the products mentioned above, coconut can be utilized for the preparation of various bakery and confectionary items like chocolate, cookies, cake, bread, jam squash, candy, pudding, ice cream, pickle, burfi, laddoo etc. the possibilities of which can be utilized by self help groups/individuals for starting a micro enterprise.

Demonstration of Technologies under CDB

Technical knowhow of the coconut food products is available with Coconut Development Board. CDB Institute of Technology is conducting hands on training programmes which cover most of the economically viable products. ■

Flavored Coconut Milk - the processing Technology

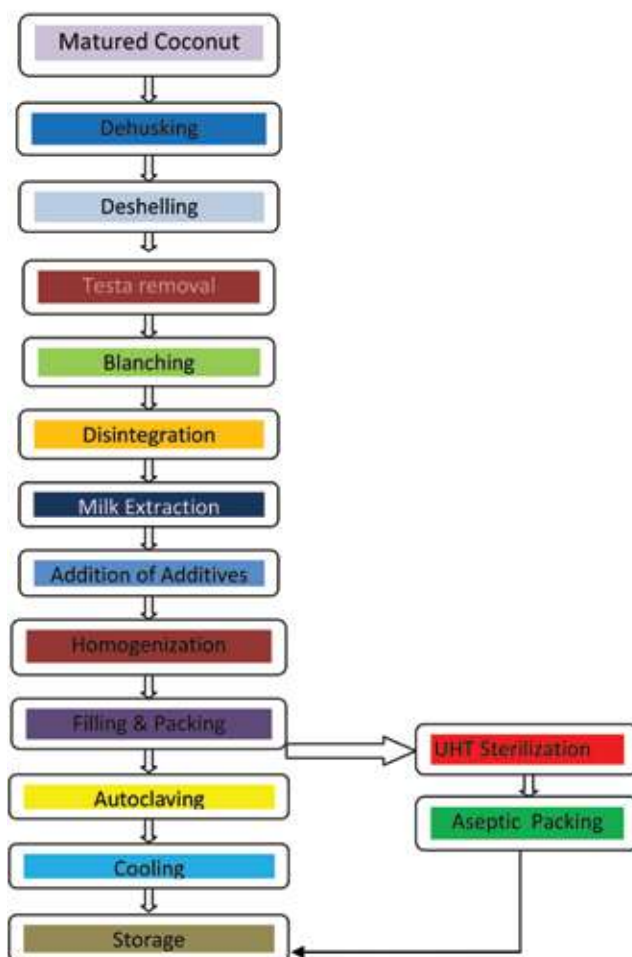
● **Sumi S Nair**, Microbiologist, **Geethu A S**, Food Processing Engineer, **R Jagadheesh Priya**, Food Processing Engineer, CIT.

Coconut milk is immensely rich in vitamins and minerals. Coconut milk can be processed as a nutritional health beverage with varying flavours according to consumer acceptability. Unlike cow's milk, coconut milk is lactose free and can be used as a milk substitute for those who are lactose intolerance. Coconut milk is derived from the flesh of coconut and requires processing. Since coconut juice is higher in natural oils, there are chances for early spoilage. Proper hygienic monitoring is required during each stage of processing.

Coconut juice is obtained by manual or mechanical extraction of comminuted coconut meat, with water. Coconut juice is rich in moisture, neutral in pH and rich in nutrients, and is an excellent medium for many kinds of microorganisms'. Coconut juice may possibly support the growth of *Bacillus* spp, *Pseudomonas fluorescens*, *E. coli*, *Streptococcus faecalis*, *Saccharomyces cerevisiae*, *Clostridium* spp, *Lactobacillus* spp and *Salmonella typhimurium*. Special precautions are necessary to ensure that contamination does not occur.

Fresh matured coconuts are dehusked and deshelled manually using hand tools. The deshelled coconut kernels in the form of round balls are pared using scrapers to remove the testa. The pared kernel balls are then cut open to drain off the water and then washed thoroughly in fresh water. The white coconut meat is blanched in hot water/live steam. The blanched white coconut meat is then ground into a fine mass using disintegrator and milk is extracted using a milk extractor. Some portion of the fat is removed from the milk so as to minimize the fat content in the final product. Extracted coconut milk is added with purified drinking water, sugar and permitted food additives. The solution is diluted in such a way to make it a ready to drink beverage. Careful cleaning procedures are adopted to eliminate most of the microorganisms. Strict hygienic practices are followed for scrapping, squeezing, filtering and homogenization so as to minimize the bacterial load in the juice. Equipments and utility items should be strictly bacterial free and the pasteurized coconut juice has to be packed in sterile bottles only. Hygienic handling and aseptic packing prevent microbial contamination.

Various time temperature combinations are adopted to find out the stability of product in ambient condition.



Trials are being conducted for shelf life studies of flavored coconut milk. Autoclaved samples are being packed in glass bottles at different temperatures and different time duration. Autoclaved samples are cooled immediately to prevent the growth of thermophilic bacteria surviving heat treatment. Sterilized coconut milk at 120°C for 30 min (Autoclave) is found microbiologically safe. Sterilization at 120°C for 30 min is sufficient to destroy the most heat resistant spore forming pathogenic organisms without affecting the physical and organoleptic characters of flavored coconut milk.



Flavoured Coconut Milk

Nutritional values of Flavoured Coconut Juice^r

Parameters	Flavored coconut milk
Energy Value (per 100 ml)	75 Kcal
Total fat Cholesterol	1- 3% Nil
Total Carbohydrates)	15-16%
Total minerals	0.39-0.42%
Protein	1-1.2%
Total Solids	21-22%
^r (Data generated at CDB lab)	

Project cost

The costing for setting up UHT plant for flavored coconut milk with a capacity of 4000 liter/shift is given below. The project cost involves the combination of land and building, plant and machinery, pre-operative expenses and working capital. The estimated project cost for the plant is calculated to be Rs.176 lakhs. The detailed broad item-wise breakup of project cost is given below.

S.No	Particulars	Amount (Rupees in Lakhs)
1	Land (50 cents)	-----
2	Building 4000 sq.ft	40.00 (@ Rs.1000/- per sq.ft)
3	Plant & Machinery	111.00
4	Preoperative Expenses	5.00
5	Working capital(margin)	20.00
Total		176.00

Land and Building

S.No	Particulars	Amount (Rs. in Lakhs.)
1	Processing area	12.00
2	Raw Material store	5.00
3	Finished goods store	6.00
4	Office room	6.00
5	Lab	5.00
6	Workers room	4.00
7	Reception	2.00
	Total	40.00

Sl. No.	Item	Qty	Unit	Unit Cost (Rs. In lakhs)	Amount (Rs. in Lakhs)
1	Desheller	3	no.s	1.5	4.50
2	Pairing unit	3	no.s	1.75	5.25
3	Washing	1	no.s	3	3.00
4	Precutter	1	no.s	2	2.00
5	Disintegrator	1	no.s	3	3.00
6	Screw press	1	no.s	3	3.00
7	Aquatic tank	1	no.s	1.5	1.50
8	Filter	1	no.s	3	3.00
9	Homogenizer	1	no.s	5	5.00
10	UHT	1	no.s	30	50.00
11	Packaging unit	1	no.s	8	8.00
12	Pipelines	1	lot	2	2.00
13	Diesel generator	1	no.s	5	5.00
14	CIP Unit	1	no.s	5	5.00
15	Laboratory equip- ments	1	lot	2	1.00
16	Plant IT system & networking	1	lot	3	3.00
17	Installation Charges & Labour	1	lot	5	5.00
18	Miscellaneous	1	lot		1.75
	Total		111.00		

Flavored coconut milk contains essential nutrients, which are having several health benefits and is considered a healthy drink. Coconut milk is an economically feasible and commercially viable product which offers a promising future for coconut sector and coconut farmers.

Coconut Points for better market and better income

● **Deepthi Vijayan** , Technical Assistant (Foreign Trade), CDB.

Coconut, one of the most promising agricultural crops, is providing a wide range of beneficiary means for progress to the agriculture sector of the country. There are several Farmer Producer Organizations (FPOs), functioning in India. FPOs are the collectivization of producers, especially small and marginal farmers, which forms producer organizations, the legal entity that manufacture and market coconut value added products. Once the FPOs start the production of value added products, the next step is to focus on the means to increase and improvise the reach of their products. How to effectively market the products among the customers was the first and foremost dilemma experienced by most of the newly formed FPOs. Coconut Points were the novel concept mooted by Coconut Development Board which is widely accepted by the FPOs

Coconut point is an outlet or kiosk of Coconut Producer Companies (CPCs) or Coconut Producer

Federations (CPFs) where they can sell all the coconut based value added products manufactured by the respective CPC or CPF under a single roof. It is more like a retail outlet like supermarkets where all products are made available, all under a roof. But in coconut points, only coconut and its value added products are available.

Coconut Points clearly help both buyer and seller. Customer will get all the products at one place and seller can find a safe market for his products. Coconut points provide the customer with the entire gamut of coconut value added products including neera, coconut oil, coconut neera jaggery, virgin coconut oil, coconut biscuits, neera honey, coconut chips, coconut milk powder, coconut vinegar, desiccated coconut powder, coconut chutney powder, coconut pickle, coconut chocolate, coconut halwa etc.

In business terms, it can be taken of as vertical forward integration which means integrating the business to the next higher level of activity. That means a manufacturer decides to perform distribution and /or retail functions within the distribution channel. This is commonly referred to as eliminating the middle man, as manufacturers may avoid the wholesaler to sell directly to retailers or the retailer to sell directly to customers. Many successful companies like Amul have taken the path of forward integration as a part of their business strategy to take advantage of marketing of the products by themselves.

Forward integration benefits

Forward integration by means of coconut points will be beneficial for FPOs. A common benefit of forward integration is that manufacturers can reduce steps in the distribution process and sell higher up in the distribution process. This can benefit both the manufacturing firm and the retailer or customer it sells to because one step--and one mark-up--has been passed over.

One of the main advantages sought by companies that get into vertical integration is more control over the value chain. When retailers decide to acquire or develop a manufacturing business, they get more control



over the production part of the distribution process. Similarly, when a manufacturer performs distribution or retailing activities, it has more control over the way the product is presented and at what prices it is sold in the market.

Forward vertical integration also offers significant ability to control costs throughout the distribution process. In the traditional distribution process, every step in product movement involves mark-ups so the reseller can earn profit. By selling directly to the end buyers, manufacturers can remove one or more steps of mark-ups along the way. A single entity managing the distribution process also has more ability to optimize the resource utilization and avoid wasted costs.

In the highly competitive market, a manufacturing company entering distribution or retailing field can gain direct access to the customer. It will be easier for a retailer to quickly adapt to changing customer needs if it owns the manufacturing or production firm that makes its products. Most importantly, the implementation of marketing strategy should be closely monitored and customer feedback should be collected on new products and existing products. Companies should always ensure that sufficient products are made available at the store. The feedback from customers collected should be informed or passed on to the processors for modification of processing and packing.

CDB's support for establishing Coconut Points

For setting up coconut points, CDB provide financial support to the FPOs in the form of subsidies. The Board will provide reimbursement of 50% of the cost incurred on infrastructure, purchase of furniture, cupboards, racks, signage, refrigerator, electrical installation etc limited to a maximum of Rs 1.5 lakhs. For availing this subsidy the CPFs /CPCs have to submit a detailed project report that explains in detail about the location of the kiosk, the space and structure of the outlet, the source of coconut products, the mode of operating and monitoring the outlet, the expected daily sales and the economic viability of project.

Way forward

During the initial phase, CDB is planning to establish 1000 coconut points in Kerala and expand the process by establishing coconut points in other states in India as well. CDBs objective is to establish a retail network for coconut and coconut value added products across all the states, so as to make the products available throughout the country. A direct forward linkage of the units producing the products with the retail end will ensure



a shorter supply chain thereby the producer earning a greater share of consumer price.

In the second phase, CDB also plans to establish tie ups with marketing or sales institutional retailing networks like Marketing Federations, Consumer Federations etc to expand the marketability of the products. The added advantage of such a network is that the market development is less difficult since it can be initiated by catering to the stabilized consumer base the retail chain can offer.

The benefits of coconut points are self explanatory on how it is a better strategy for the FPOs. Currently, in India, 117 coconut points are already established with CDBs assistance and the number is likely to exceed by the end of 2016. This is solely because of the fact that coconut points provide a means to FPOs to market their products better and earn more and more income out of it. Evidently, it helps the income to reach the hands of farmers directly. Coconut point provides a wider opportunity for farmers and enables the companies to be mutually benefitted. As the companies can collect and sell the products in other coconut points or outlets of other FPOs on demand basis, the companies can get benefitted by each other.

Analysts say that having its own retail outlets can enhance a company's customer relationship and the value of the company is thereby raised. If extended as retail network, the mutual benefits it brings in are way beyond the expectations. Thus coconut points are the best available and best possible option till date for the overall well being of FPOs. The success story of Amul, which at present is having nearly 10000 retail outlets is also truly inspiring the success journey of coconut points. ■

Export of Indian Coconut products increased by 8 percent

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

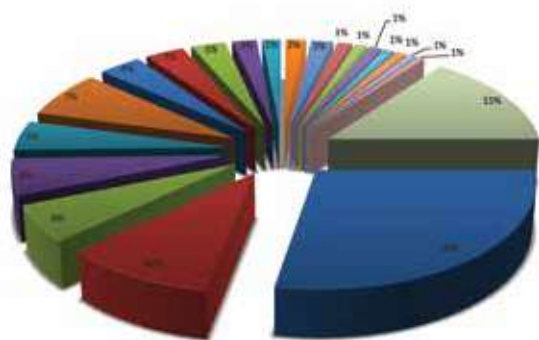
Table 1

Export of coconut products during the first eleven months of the financial year 2015-16 touched Rs. 1298.54 crores. Compared to the export during the corresponding period of 2014-15, an increase of 8% was recorded in coconut product exports. Significant increase was recorded in the export of virgin coconut oil, activated carbon, dry coconut and coconut oil. Export of coconut products from India during April 2015 to February 2016 is given in table 1.

Export of coconut products from April 2015 to February 2016				
Items	February 2016		April 2015 to February 2016	
	Cum. Qty (in MT)	Cum. Value (Rs. In lakhs)	Cum. Qty (in MT)	Cum. Value (Rs. In lakhs)
Activated Carbon	3769.16	4002.50	55413.77	57180.17
Coconut Fatty Soap		460.90		2974.17
Hair Cream		94.49		981.03
Coconut Oil	953.32	1765.67	7529.31	15904.28
Coconut Water		92.61		692.75
Copra	492.38	365.24	4073.95	3408.91
Desiccated Coconut	979.38	1045.46	3155.34	4117.61
Dry coconut	1132.04	953.04	16631.19	16519.95
Fresh coconut	4579.68	1570.90	35771.41	13751.81
Grated/sliced coconut	145.08	314.55	1924.19	3521.80
Oval coconut shell	133.99	93.27	1480.83	816.51
Shell charcoal	22.79	7.39	7406.30	2449.32
VCO	3.18	17.50	771.12	2483.40
Misc coconut products		243.83		5052.81
Total		11027.35		129854.52

Activated Carbon

The export of activated carbon from India during the period April 2015 to February 2016 was 55,414 metric tonnes. United States was the major importer of Indian activated carbon, followed by United Kingdom. Details of export of Activated Carbon from India is given in table 2



Country wise export of Activated Carbon during April 2015 to February 2016

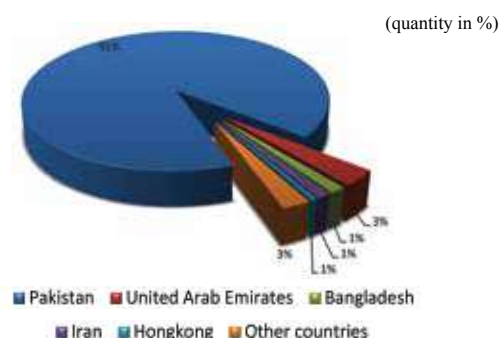
Country	Qty(in MT)	Value(Rs in lakhs)
United States	15502.56	16115.59
United Kingdom	5557.58	5979.48
Germany	3227.90	3535.61
Netherlands	3174.00	3248.19
South Korea	2595.05	3098.36
Sri Lanka	4063.42	3092.52
Russia	2018.80	2164.36
Belgium	1837.40	1830.17
Italy	1631.20	1414.78
Estonia	1158.00	1188.91
France	874.20	1152.81
South Africa	959.90	1115.46
Japan	1046.81	1053.98
China	681.02	884.79
Tanzania	575.92	650.18
Canada	569.05	602.87
Philippines	511.79	600.98
Taiwan	497.18	586.46
Finland	389.55	369.11
Turkey	344.30	317.58
Other Countries	8198.15	8177.96
Total	55413.77	57180.17

Dry Coconut

During the first eleven months of the financial year 2015-16, 16,631 metric tonnes of dry coconuts were exported from India. Out of this 15,162 MT was to Pakistan. Country wise export of dry coconut from India is given in table 3.

Export of dry coconut during April 2015 to February 2016		
Country	Qty (in MT)	Value (Rs in lakhs)
Pakistan	15161.90	14886.44
United Arab Emirates	560.29	605.11
Bangladesh	225.00	188.98
Iran	200.00	218.69
Hongkong	75.04	155.63
Other countries	408.96	465.10
Total	16631.19	16519.95

Table 3

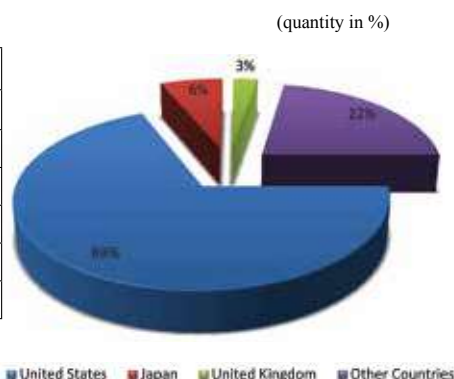


Virgin Coconut Oil

Export of virgin coconut oil from India during the first eleven months of the financial year 2015-16 was to the tune of 771 metric tonnes. United States alone imported 530 metric tonnes of VCO from India. During the corresponding period last year, the export was only 629 metric tonnes. Country wise details of export of virgin coconut oil from India is given in table 4.

Export of VCO from India during April 2015 to February 2016		
Country	Qty (in MT)	Value (Rs. In lakhs)
United States	530.04	1606.22
Japan	49.87	117.73
United Kingdom	19.11	59.32
Other Countries	172.09	700.13
Total	771.12	2483.40

Table 4

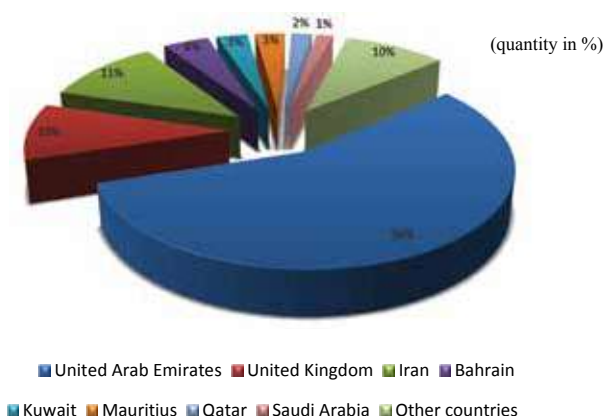


Fresh Coconut

Export of husked coconut from India during the first eleven months of 2015-16 was 35,771 metric tonnes. Major portion of export was to UAE. Export of fresh coconut from India is given in table 5.

Export of fresh coconut during April 2015 to February 2016		
Country	Qty(in MT)	Value (Rs in lakhs)
United Arab Emirates	20106.32	8176.18
United Kingdom	3430.03	1499.74
Iran	3942.69	1398.54
Bahrain	1534.15	505.14
Kuwait	1047.68	482.46
Mauritius	999.82	339.95
Qatar	702.92	347.38
Saudi Arabia	552.05	205.38
Other countries	3455.74	797.03
Total	35771.41	13751.81

Table 5



Coconut Oil

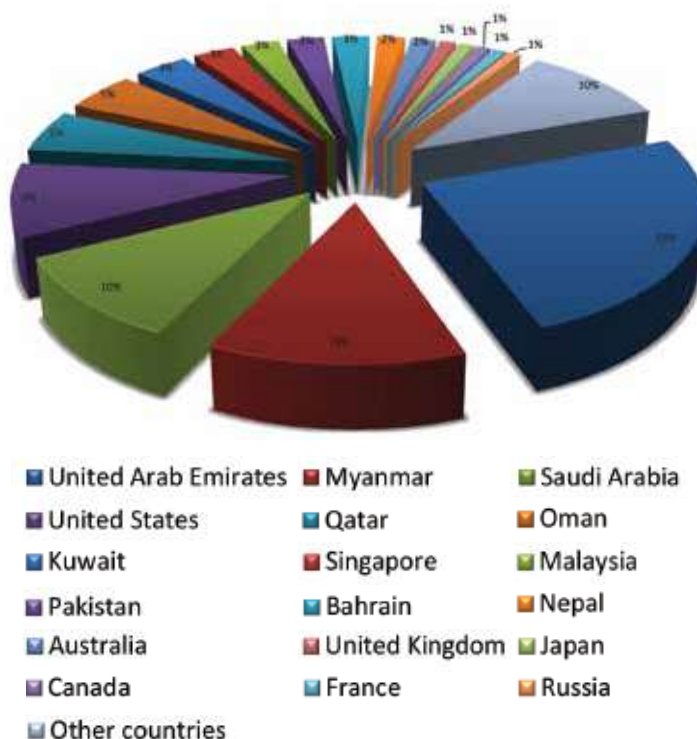
Export of coconut oil from India during the first eleven months of the financial year 2015-16 was 7529 metric tonnes, which is 21% higher compared to 6215.48 metric tonnes recorded during the corresponding period of 2014-15. UAE alone imported 1893 metric tonnes of coconut oil.

Coconut oil is also exported for edible purpose to United Arab Emirates, Myanmar, Saudi Arabia, United States, Qatar, Oman, Kuwait, Singapore, Malaysia, Pakistan, Bahrain, Nepal etc. Export of coconut oil from India is given in table 6.

Country	Qty (in MT)	Value (Rs in lakhs)
United Arab Emirates	1893.05	3758.36
Myanmar	947.81	2088.57
Saudi Arabia	777.68	1518.05
United States	677.26	1627.57
Qatar	394.23	816.68
Oman	369.51	760.38
Kuwait	278.75	558.36
Singapore	212.52	529.73
Malaysia	194.79	464.33
Pakistan	190.25	340.70
Bahrain	190.23	372.47
Nepal	144.37	253.14
Australia	126.42	314.71
United Kingdom	82.30	199.18
Japan	79.83	168.12
Canada	70.07	126.53
France	68.48	153.43
Russia	62.34	111.34
Other countries	769.42	1742.61
Total	7529.31	15904.28

Table 6

(quantity in %)



Import

During the first eleven months of the financial year 2015-16, India imported Rs 300 crores worth coconut products. Copra expeller cake, coconut fatty acid, coconut oil and coconut shell charcoal are the major items of import. Details of import of coconut products into India during the first nine months of 2015-16 is given in table 7.

Item	February 2016		April 2015 to February 2016	
	Qty (in MT)	Value (Rs. in lakh)	Cumulative Qty (in MT)	Cumulative Value (Rs. in lakhs)
Coconut fatty acid	644.66	463.88	6821.93	5264.51
coconut oil	0.00	0.00	4689.12	3840.16
Copra oil cake	6475.32	970.47	94135.99	14568.96
Coconut shell charcoal	0.00	0.00	11605.59	3679.51
Cream-milk-powder		219.09		1382.47
Copra	0.00	0.00	291.25	208.45
Misc coconut products		86.87		1058.49
Total		1740.31		30002.56

Table 7

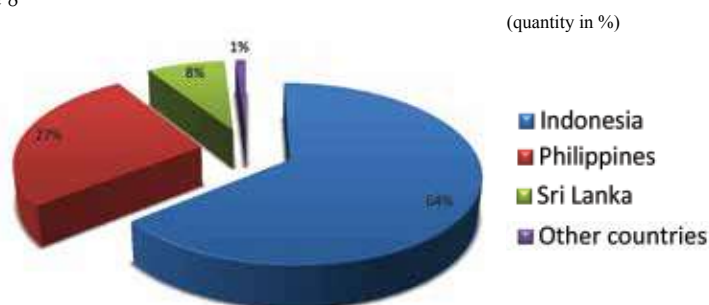


Copra expeller cake

One major item of import among coconut products is copra expeller cake. During the period from April 2015 to February 2016, the quantity of import of this product was 1,12,386 metric tonnes. Details of import of this product is given in table 8.

Import of coconutoil cake to india during April 2015 to February 2016		
Country	Qty (in MT)	Value (Rs. In lakhs)
Indonesia	72165.89	11243.02
Philippines	30072.81	4459.47
Sri Lanka	8982.75	1422.31
Other countries	1164.64	164.43
Total	112386.08	17289.22

Table 8



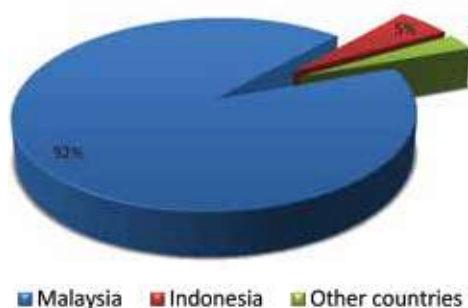
Coconut Fatty Acid

Import of coconut fatty acid into India during the first eleven months of the financial year 2015-16 was 7463 metric tonnes, out of which 6865 metric tonnes was from Malaysia. Details of import of coconut fatty acid to india is given in table 9.

Import of coconut fatty acid to India during April 2015 to February 2016		
Country	Qty (in MT)	Value (Rs.in lakhs)
Malaysia	6864.92	5269.62
Indonesia	382.81	326.42
Other countries	215.28	162.62
Total	7463.01	5758.66

Table 9

(quantity in %)



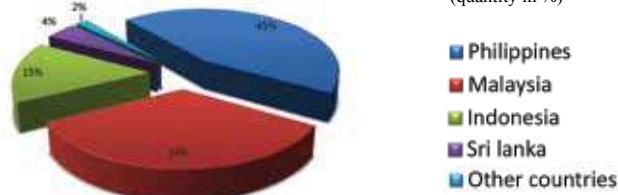
Coconut Shell Charcoal

Import of coconut shell charcoal into India during the first eleven months of the financial year 2015-16 stood at 11,606 metric tonnes. The highest import was recorded from Philippines. Details of import of coconut shell charcoal to India is given in Table 10.

Import of coconut shell charcoal to india during April 2015 to February 2016		
Country	Qty (in MT)	Value (Rs. In lakhs)
Philippines	5152.53	1606.82
Malaysia	3978.79	1250.70
Indonesia	1785.21	612.95
Sri lanka	503.36	157.27
Other countries	185.70	51.76
Total	11605.59	3679.51

Table 10

(quantity in %)



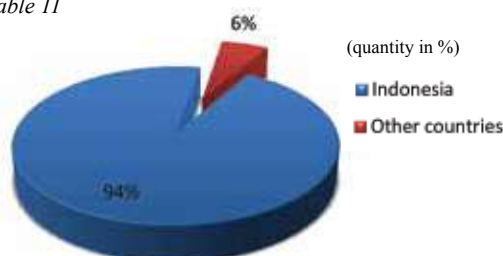
Coconut Oil

Import of coconut oil into India during the first eleven months of the financial year was 5109 metric tonnes. Highest import recorded was from Indonesia, which was 4816 metric tonnes. Import of coconut oil to India is given in Table 11.

Import of coconut oil to india during April 2015 to February 2016		
Country	Qty (in MT)	Value (Rs. In lakhs)
Indonesia	4815.85	3894.29
Other countries	293.27	280.02
Total	5109.12	4174.30

Table 11

(quantity in %)



Delhiites becoming great fans of coconut products - Krishi Unnathi Mela



Theme pavilion of CDB in Krishi Unnathi Mela

Shri Narendra Modi, Hon'ble Prime Minister, inaugurated the three-day National Agriculture Fair-Krishi Unnathi Mela at IARI, New Delhi on 19th March 2016. The mela was held from 19-21 March, 2016 at IARI campus, PUSA. The Hon'ble Prime Minister, in his inaugural address, emphasized the important role of rural economy in enhancing and pushing up the national economy which largely depends on agricultural growth. The Government is striving for and has taken necessary steps for doubling the income of farmers by 2022. Shri Radha Mohan Singh, Union Agriculture and Farmers' Welfare Minister highlighted the major features of the National Agriculture Fair. Dr. Sanjeev Kumar Balyan and Shri Mohanbhai Kalyanjibhai Kundariya, Ministers of State for Agriculture were

also present during the occasion.

The mega event was organized by Ministry of Agriculture and Farmers' Welfare, Government of India. Institutes of ICAR across the country along with various government departments, NGOs, private sector and other stakeholders participated in the National



Shri Mohanbhai Kalyanjibhai Kundariya, Minister of State for Agriculture in CDB stall.

Agricultural Fair and exhibited farmer friendly technologies, innovations and products. More than 50,000 farmers from across the country visited the mela and benefited from the Fair.

CDB participated in the mela with the theme “Coconut for Health, Nutrition and Wellness”. The presentation and exhibits were showcased in such a way that the essence of the theme is conveyed to the public. The platform of Krishi Unnathi Mela was fully utilized for projecting coconut as a crop for food and nutritional security.

A separate section of 11 stalls was set up for coconut products’ manufacturers and entrepreneurs for display and sale. Around 25 Coconut Producer Companies and prospective coconut based entrepreneurs actively participated and strengthened their business. Ministry of



Secretary (Agri) Shri. S.K. Patnaik IAS and Joint Secretary (MIDH), Shri. Shakil Ahamed IAS in the CDB stall.

Kerala, Palakkad Coconut Producer Company, Kerala, Kalpatharu Coconut Producer Company, Karnataka, Agricoles Natural Food, Palakkad, Kumar Enterprises, Valsad, Gujarat, Vama oil Pvt Ltd, Phalada Agro Research Foundations Pvt Ltd., Surya Sobha, Yogic

food Pvt Ltd, Rabiya Coconut Products etc. participated in the mela along with CDB. The manufactures of coconut products who displayed their products in the stalls received positive reviews and the products brought for selling in the sales outlet were exhausted on the second day itself. The demand for the coconut products once again proved that there is tremendous scope for coconut value added products across the country.



Agriculture and Farmers Welfare arranged the pavilion on the theme Make in India. Coconut and coconut products were the focused items in the theme pavilion among other agricultural and horticultural crops.

Krishi unnathi mela gave an opportunity to the Delhiites to taste novel and innovative coconut products. Flavoured Coconut juice, Neera cookies and Neera were the stars of the show. Many youngsters from various parts of the country expressed interest to enter into coconut business. Enquires received on coconut juice, neera and packed tender coconut water were properly responded. Another product that attracted the crowd was neera cookies. Once the cookies were tasted by the visitors, the feedback was overwhelming. They started asking about the sales outlet and availability of Neera cookies.

Thejaswini Coconut Producer Company, Kannur, Pollachi Coconut Producer Company, Tamil Nadu, Kozhikode Coconut Producer Company,

The marketing strategy of coconut product manufacturers, entrepreneurs and FPOs should be dovetailed in such a way that the coconut products are available across the country. There are niche markets for coconut products in urban and rural areas which should be tapped. The visitors thronged to CDB stall was a testimony of the Pan India demand for coconut products as a source of health, nutrition and wellness. Mr. TK Jose IAS Chairman, CDB received VIPs who visited the CDB stall.

Hon. Prime Minister visited the pavilions and appreciated the organizers for the successful conduct of the programme. CDB stall was visited by Hon. Union Agriculture Minister, Shri. Radha Mohan Singh, Ministers of State for Agriculture Dr. Sanjeev Kumar Balyan and Shri Mohanbhai Kalyanjibhai Kundariya,. Secretary (Agri) Shri. S.K. Patnaik IAS, Joint Secretary (MIDH), Shri. Shakil Ahamed IAS and many senior officials of various departments.

Aahar- 2016

Coconut Development Board participated in the 31st edition of Aahar-the International Food & Hospitality Fair held from 15-19 March 2016 at Pragathi Maidan New Delhi. The event was hosted by ITPO in collaboration with the Ministry of Food Processing Industries, Government of India with the active support of the various apex trade bodies. Union Minister of Food Processing Industries, Smt. Harsimrat Kaur Badal inaugurated the show on 15th March, 2016 at Pragati Maidan, New Delhi.

CDB participated in the show with various food, beverage and health products made from coconut. The visitors were briefed about the nutritional value and health benefits of coconut products like tender coconut water, virgin coconut oil, desiccated coconut powder, coconut chips, flavoured coconut juice, neera and neera honey. M/s Yogic Foods, M/s Pure Tropic, M/s Keratech, M/s Thirukochi CPC and M/s NGO products had their display cum sales counters in Board's stall. Reliable enquires were received for various coconut products. The international demand and export prospects of these products were appraised to the business visitors.

The general public and traders were amused to know about the varied uses of different products of



A view of CDB stall in Aahar 2016

coconut. Many people were aware of the packed tender coconut water available in Delhi retail markets and were eager to know the availability of coconut chips, virgin coconut oil and other value added coconut products. The recipes of various dishes and sweets using desiccated coconut, vinegar, milk & milk powder, etc. were also distributed to the visitors along with Board's publications.

CDB conducts training in management for CPC office bearers

CDB conducted training programme for Board of Directors of CPCs of Andhra Pradesh on issues in management of CPCs during 16th to 19th March 2016 in two batches at National Institute of Agricultural Extension Management (MANAGE), Rajendranagar, Hyderabad. 50 persons including Chairmen and Board of Directors from all six CPCs and Board Officials attended the programme. Smt. V. Usha Rani, IAS, Director General, MANAGE inaugurated the training programme on the 14th March 2016. In her inaugural address, she appreciated Board in conducting training programmes on Management to the office bearers of Farmer Producer Companies (FPOs). She emphasised the need for more professionalism, credibility and transparency in the day to day functions of the CPCs. The collective activity in the three tier system of FPOs is highly essential at the time of implementing various projects especially Neera. These FPOs will ultimately help the farmers of Andhra Pradesh in realising better returns from coconut farming. She offered the co-operation of MANAGE in handholding the FPOs in coconut sector.

The inaugural session was followed by a technical



Smt. V. Usha Rani, IAS delivering the inaugural address

session wherein Shri. S. P. Pavan Kumar, CEO, Legalin Aid, Chennai made a presentation on Incorporation of Producer Company- various steps involved, Legal provisions governing the Producer companies in the Companies Act and Finance, Account & Audit of Producer Companies. Shri. A. Gopala Krishna, Cactus consulting, Secunderabad, Shri. Koteswara Rao, Consultant, NIRD, Dr. Surendra Sood & experts from MANAGE spoke on various aspects to be followed while managing a Farmer Producer Company.



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% chlorpyrifos 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% dichlorvos 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% chlorpyrifos 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 $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$ 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% chlorpyrifos 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 2016

Highlights

- The prices of milling copra and coconut oil expressed an erratic trend in major markets in the country during February, 2016.
- The international price of coconut oil & copra expressed an upward trend during the month of February 2016 compared to previous month.

The month of February 2016 witnessed an erratic trend in prices of coconut, copra and coconut oil at all important markets in the country.

Coconut Oil

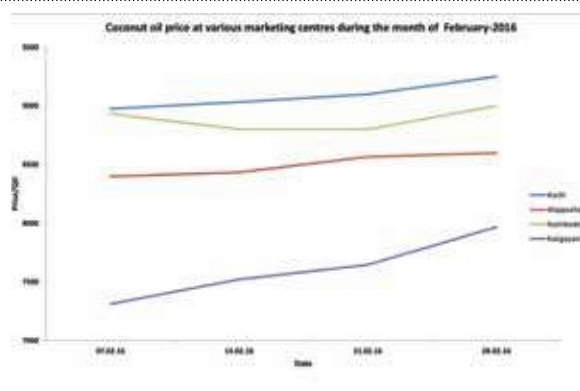
The price of coconut oil which opened at Rs.9,000/- per quintal at Kochi market, declined to Rs. 8950/- on 4th. The price which improved to Rs.9,100/- on 11th, ruled steady at the same price till 22nd and thereafter expressed an upward trend and closed at Rs.9,200/- per quintal with a net gain of Rs.200 per quintal. The price of coconut oil at Alappuzha market which opened at Rs.8,400 per quintal improved to Rs.8,600/- on 15th and thereafter expressed mixed trend and closed at Rs.8,700/- per quintal with a net gain of Rs.300/- per quintal. The price of coconut oil at Kozhikode market which opened at Rs.9,000/- per quintal, declined to Rs. 8,900/- on 3rd and further to Rs.8,800/- on 8th and ruled steady till 20th. The price which improved to Rs. 8900/- on 23rd, expressed an increasing trend and closed at Rs.9,100/- with a net gain of Rs.100/- per quintal. The monthly average price of Rs.9,093/-per quintal at Kochi market, Rs.8,500/-per quintal at Alappuzha market and Rs.8,896/- per quintal at Kozhikode market were marginally lower than that of previous month and about 36 to 40 percent less than that of corresponding month last year. The monthly average price of Rs.7,607/-per quintal at Kangayam market in Tamil Nadu was marginally lower than that of the previous month and about 42 percent lower than that of the corresponding month last year.

Milling Copra

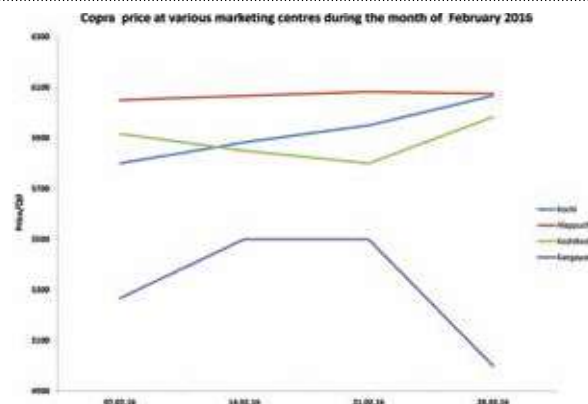
The price of FAQ copra which opened at Rs.5800/- per quintal at Kochi Market, increased to Rs.5,850/- on 10th January and further to Rs.5,950/- on 11th and thereafter ruled steady at the same price till 21st. The price which increased to Rs.6,000/- on 21st, expressed an upward trend and closed at Rs.6,000/- per quintal with a net gain of Rs. 200/- per quintal. The price of Rasi copra at Alappuzha market which opened at Rs.6,050/-per quintal increased to Rs.6,100/- on 12th and thereafter expressed a mixed trend and closed at Rs.6,150/- with a net gain of Rs.100/- per quintal. The price of milling copra at Kozhikode market which opened at Rs.5950/- per quintal expressed declining trend and attained Rs.5800/-on 15th and thereafter expressed a mixed trend and closed at Rs.5,950/-. The monthly average price of Rs.5926/- per quintal at Kochi market, Rs.6069/- per quintal at Alappuzha market and Rs.5894/- per quintal at Kozhikode market were marginally lower than that of the previous month and about 37 to 40 percent lower than that of the corresponding month last year. The monthly average price of milling copra at Kangayam market in Tamil Nadu was Rs.5,304/- per quintal, which was 8 percent lower than that of the previous month and about 43 percent lower than that of the corresponding month last year.

Edible Copra

The monthly average price of Rajapur copra at Kozhikode market was Rs.10,394/- per quintal, which was marginally lower than that of the previous month



Price behaviour of coconut oil during February 2016



Price behaviour of copra during February 2016

and about 32 percent lower than that of corresponding month last year.

Ball Copra

The monthly average price of ball copra at Kozhikode market was Rs.9,296/- per quintal, which was marginally lower than that of the previous month and about 32 percent lower than that of corresponding month last year.

The monthly average price of ball copra at Tiptur APMC market in Karnataka was Rs.9,707/- per quintal. Which was marginally lower than that of the previous month and about 28 percent lower than that of the corresponding month last year. The monthly average price of ball copra at Arsikere APMC market in Karnataka was Rs.9,767/- per quintal, which was marginally lower than that of previous month and about 21 percent lower than that of corresponding month last year.

Dry Coconut

The monthly average price of Rs.8,200/- per thousand nuts at Kozhikode market was 5 percent lower than that of the previous month and about 29 percent lower than that of corresponding month last year.

Coconut

The monthly average price of partially dehusked coconut at Nedumangad market was Rs.10,000/-per thousand nuts, which was 6 percent lower than that of the previous month and about 37 percent lower than that of the corresponding month last year.

The monthly average price of partially dehusked coconut at Arisekere APMC market in Karnataka was Rs.9,426/- per thousand nuts, which was marginally lower than that of the previous month and about 31 percent lower than that of the corresponding month last year.

The monthly average price of partially dehusked coconut at Bangalore APMC market in Karnataka was Rs.12,700/- per thousand nuts, which was 5 percent lower than that of the previous month and about 20 percent lower than that of the corresponding month last year. The monthly average price of Grade-1 quality partially dehusked coconut at Mangalore APMC market was Rs.14,720/- per thousand nuts, which was 16 percent lower than that of the previous month and about 18 percent lower than that of the corresponding month last year.

Tender coconut

The monthly average price of Tender coconut at Maddur APMC market in Karnataka was Rs.10,520/- per thousand nuts, which was marginally higher than that of the previous month and 8 percent lower than that of the corresponding month last year.

International

The International monthly average price of coconut oil at Philippines (C.I.F. Rotterdam) market was US\$ 1208 per MT. This was about 5 percent higher than that of previous month and about 10 percent higher than that of corresponding month last year. The monthly average price of US\$ 795 per MT of copra was 4 percent higher than that of the previous month and was marginally lower than that of the corresponding month last year.

The domestic price of coconut oil during the month of February 2016 in Philippines was US\$ 1158 per MT and in Indonesia the price was US\$ 1178 per MT. The international price of Palm oil was US\$ 569 per MT, Palm kernel oil (RBD) US\$ 863 MT and Soybean oil US\$ 756 per MT during the month of February 2016.

Prices of coconut oil , copra and coconut at various marketing centres during February 2016

Date	Coconut Oil (₹/Qtl)				Milling Copra (₹/Qtl)				Edible Copra (₹/Qtl)	Ball Copra (₹/Qtl)				Dry Coconut	Coconut	Partially dehusked Coconut		
	Kochi	Alappu- zha	Kozhi- kode	Kan- gayam	"Kochi (FAQ)"	Alappu- zha (Rasi Copra)	Kozhi- kode	Kan- gayam	Kozhi- kode	Kozhi- kode	Tiptur	Ban- glore	Arsikere	(₹/1000 nuts)				
														Kozhi- kode	Nedu- mangad	Arsikere	Banglore	Mangalore (Grade-1)
07.02.16	8975	8400	8933	7311	5800	6050	5917	5267	10483	9308	9735	11000	9967	8333	10000	9375	13000	15000
14.02.16	9033	8433	8800	7522	5883	6067	5850	5500	10733	9633	9658	11000	9800	8450	10000	9667	13000	14000
21.02.16	9100	8567	8800	7645	5950	6083	5800	5500	10330	9290	9650	12333	9600	8300	10000	9317	13000	14833
28.02.16	9250	8600	9000	7967	6067	6075	5983	5000	10083	9033	9817	13000	9713	7800	10000	9750	12000	15000
Average	9093	8500	8896	7607	5926	6069	5894	5304	10394	9296	9707	11880	9767	8200	10000	9426	12700	14720

Source: Kochi: Cochin Oil Merchants Association and Chamber of Commerce, Kochi - 2, Kozhikode: The Mathrubhumi daily
Alappuzha: The Malayala Manorama daily, Arsikere : APMC, Arsikere
Price quoted for office pass copra at Kozhikode and Rasi copra at Alappuzha markets.