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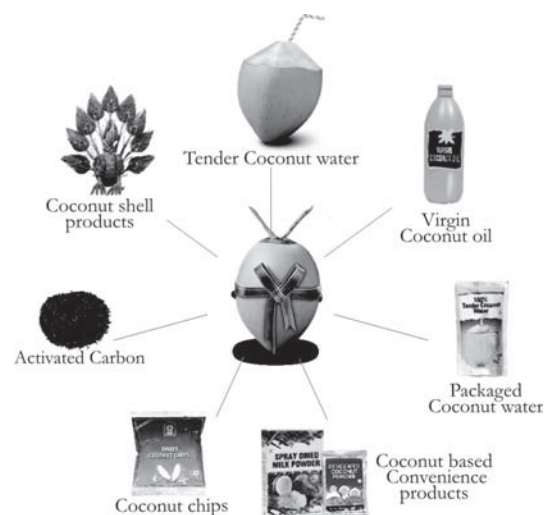
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## THEME Non Traditional Value Added Coconut Products

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## Value addition of coconut products for price stabilization and better income to farmers

*Dear coconut farmers,*

Sri Lanka is marching ahead of the state of Kerala in area under coconut, production and even in productivity. Srilanka's total production is far less than that of four districts of Kerala. But it is interesting to note that Sri Lanka's export earnings from coconut products are 3 times that of India. This is a model worthy to be studied and followed. The export earnings of Philippines is 14 times, while that of Indonesia is 9 times that of India. Malaysia, Vietnam and Thailand are too far ahead of India in this aspect. In none of these countries fall in price of coconut oil is affecting the price of coconut. Far beyond copra and coconut oil, various other value added coconut products are influencing the price of coconut and income of farmers in all these countries.

**India leads the Asian countries in productivity of coconut with 8303 nuts per hectare per annum while in production we are at the second position behind Indonesia. Our farmers are yet to have a say on the market price of coconut as lions' share of the product is going through the copra coconut oil route.**

Without value addition and by product utilization, farmers cannot get a fair and steady price for their products. The price of a product cannot be controlled, until and unless there is a procurement mechanism for surplus products, opportunities for value addition and export. Declaring of Minimum Support Price for copra and procurement of copra by NAFED alone cannot ensure stabilization of price of coconut. Various coconut products have good demand in international market and that is increasing too. Unlike other commercial

crops like rubber, coconut products cannot be made artificially. Synthetic products to replace tender coconut water, coconut milk, coconut milk powder or virgin coconut oil are not existing. Neither there is anything to replace coir, shell charcoal nor activated carbon.

In case of other seasonal food crops price fall can be arrested within one or two production seasons. But in a perennial crop like coconut which is having a long gestation period from planting to production, it is difficult to control the price cycles. In such cases shifting from one crop to another will take more time.

Which are the value added coconut products that can be made with moderate investment in India? First and foremost is packaged tender coconut water. At present there are only six such units in India. Can we try to enhance this to 100 in the next three years? Board is extending technology and 25% financial assistance for setting up coconut milk, coconut milk powder, desiccated coconut, virgin coconut oil, ball copra and shell charcoal units. Units producing value added products from coconut is given on page 10. Government of India has established Ministry of Food Processing Industries for the promotion of food processing industries in the country. APEDA is also looking after promotion and export of Indian agriculture products.

Small Farmers Agri Business Consortium (SFAC) is extending 10% venture capital funding for Farmer Producer Organizations (FPO). 25% capital subsidy is available from Coconut Development Board for producing various coconut products. NABARD is having various schemes for assisting Producer

Companies. In spite of such opportunities we do not have sufficient coconut processing units. The lack of entrepreneurial spirit could be a reason. In Tamilnadu entrepreneurs have started taking up coconut processing as a diversification from textile industry. For eg. 'Pure Tropic' is exporting tender coconut water packed in tetra pack to US under the brand name 'Tendo'. 'Vita Coco', a company processing and marketing tender coconut water is promoted by film actors and pop singers, Madonna and Rihanna. 'Zico' is another company owned by US Olympic medalists, producing and marketing energy drink out of pure tender coconut water. 'Coyo', an Australian company is using the slogan 'heaven in a mouthful' for their ice cream made out of coconut milk. There are more than 500 companies in Sri Lanka and 1000 in Philippines which are into processing, marketing and exporting tender coconut water and coconut products while in India there exists only a couple of such units.

Why don't we have Coconut Producer's Societies and Producer Companies (wherein only coconut farmers are stakeholders) for procuring and processing coconut instead of waiting for other businessmen and foreign companies? The Board has fixed the target of forming 1000 CPS this year, 2000 in 2012 and 2000 in 2013. If we can form 200-250 Federations and 20-25 Producer Companies, we need not wait for other entrepreneurs anymore. Each member of a CPS should take one coconut per tree in each harvest. Each CPS would have around 4000-5000 trees, and thus 40000 nuts can be collected from 8 harvests per year. So from 1000 CPS, four crore nuts can be collected as farmers' share. Thus taking the price of Rs 10 per nut, Rs. 40 crore can be mobilized as capital.

If 1000 CPS can form 4 Producer Companies, they can have the capital of Rs.10 crore each. How about government also taking equal share in these companies which are venturing to value addition? Let the district or

block panchayath also join in this venture by providing financial assistance for infrastructure development. Thus for setting up a 400 crore industry for value added coconut products, we need not wait for the domestic or foreign entrepreneurs anymore.

**I am hopeful that the sincere efforts of the farmers can make drastic changes in the agriculture sector of the country. Board is dedicating itself for identifying good market for coconut products.**

Board can extend support for exports to international market too since it is designated as 'Export Promotion Council' for coconut products (other than coir and coir products) by Government of India.

The domestic and NRI entrepreneurs, Co-operatives and Producer Companies undertaking coconut based projects are eligible for financial assistance under TMOC programme of Board. CPS can also come forward. Board is creating awareness on coconut and its various products across the country by participating in exhibitions and awareness programmes. Board is extending assistance to entrepreneurs for taking part in foreign food festivals.

If we can build up a novel entrepreneurial culture, India can excel in the world coconut market along with Sri Lanka and Philippines. The 12<sup>th</sup> Five Year Plan Period can be utilized for accelerating our activities for achieving this. If we utilize 25 % of our production for tender nut purposes and 40% for value addition other than copra and coconut oil we can ensure a steady and stable price for coconut products.

I solicit the keen attention and whole hearted co-operation of all coconut farmers for a bright future with financial security. Let us work together for achieving the same.

With best wishes,



T.K. Jose IAS  
Chairman



## Value addition, product diversification and by-product utilization in coconut

*K. Muralidharan\* and Jayashree. A\*\**

India is one of the largest producers of coconut in the world. Coconut in India is predominantly a small holders crop contributing to about Rs.83,000 million annually which is about 2% of the contribution of agriculture and allied sectors. More than 10 million farming families dependent on this crop for their livelihood.

Even though a major producer of coconut, India consumes more than 50% of its coconut production of 15.84 billion nuts per annum as raw nuts for culinary and religious purposes. 35% of the production is utilized for conversion to copra, 11% for tender nut, 2% for seed purposes and hardly 2% is utilized for value addition and industrial purposes. As such there is a need for the country to devote more intensive research and development and technology transfer on utilization and product diversification in both food and non food uses so that the practice of fixing the price of coconut based on the existing market price of coconut oil could be done away with.

Coconut has the advantage of having hundreds of uses which no other oil seed or horticultural crop can claim. Coconut products and by-products can be commercially utilized for multiple purposes. Coconut is a food as well as an oil seed crop. It is also a source of fibre, timber, and fuel. Coconut palm is also a

beverage crop in many states in the country. The kernel is an integral part of the diet of the people of the West Coast of India. Nutritious milk is obtained from the kernel, which yields oil on its boiling. Coconut milk is an essential ingredient in many culinary preparations.

The dried kernel or the copra is the richest source of cooking oil of Kerala. Coconut oil is also used as hair oil, body oil and industrial oil throughout the country. It is an illuminant and lubricant as well. Coconut oil is an ingredient in most of the premium cosmetic products.

Coconut oil yields many oleo chemicals which have wide applications in various sectors. It can also be converted into bio-diesel. The coconut oil cake, the residue obtained after the extraction of oil from copra is a good cattle feed. Coconut palm yields toddy from which jaggery, vinegar and arrack are manufactured. The timber of coconut is used in house construction and to make furniture, wall panels, show pieces and floor tiles. The inflorescence of coconut is used to make ayurvedic medicines. Tender coconut is used as a nutritious health and sports drink and is a base for many ayurvedic preparations. The water of mature nut yields products such as vinegar, jelly, nata de coco and wine. The shell is used as a fuel besides



manufacturing various commercial products like shell powder, shell charcoal, shell based activated carbon, ice cream cups, buttons of garments, utility articles and show pieces.

The soft bud of the palm is edible and nutritious. Spongy ball like haustorium developing inside the nut when stored over a period is a sweet delicacy which can be exploited as a commercial value added product. The leaf of the palm is used for thatching houses. Dried leaves are used as fuel besides serving as country torch in villages. The spindle leaf is used for decoration and costuming in folk dances. The midribs of leaves are used to make brooms, fish traps, baskets and tongue cleaners. The husk yields fibre and pith. The fibre is made into hundreds of products, which enjoy both domestic and export market. The pith is a soil conditioner and rooting medium besides having many other uses. The spathe and stipules are used as fuel and for manufacturing handicrafts. It is rightly said "The coconut palm is alone sufficient to build, rig and freight a ship with bread, wine, water, oil, vinegar, sugar and other commodities".

The various products of coconut other than copra and coconut oil offer a vast scope for further development, value addition and commercialization. A large number of products are developed from coconut. However due to paucity of space, this article covers only the major products developed from coconut water, coconut kernel and coconut shell.

## Food products from coconut water

### Tender Coconut Water

Tender coconut water serves as a mineral drink



with therapeutic properties that help in regaining the vitality of the human body. The characteristic flavor of tender coconut is contributed by delta lactones. Glucose and fructose form an important constituent of the tender nut water. Tender Coconut Water contains most of the minerals such as potassium, sodium, calcium, phosphorous, iron, copper, magnesium etc.

Tender Coconut Water has become popular as an emerging, natural and healthy product. Reports have indicated that coconut water has now become the fastest growing new beverage category in the US and is expected to be replicated in many other countries. Coconut water has recently caught on among athletes, health freaks and urbanites in many developed countries. Soft drink giants like Coca Cola and Pepsi have acquired top two brands, Zico and O.N.E. UK, Netherlands, Canada, Mexico, UAE, Japan, Korea and Australia are the major importers of tender coconut water.

### Packaged Tender Coconut Water

The Coconut Development Board 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 through out the country. At present six units have been set up in the states of Orissa, Andhra Pradesh and Karnataka for the commercial production of this product. Another unit using the tetra pack technology has also been established recently in Tamil Nadu. The products are available in both domestic and international markets. Major exporters of the product are Philippines, Indonesia, Malaysia and Thailand.



The Defence Food Research Laboratory, Mysore under sponsored project of the Board has also developed technologies for mechanical cleaning of

tender coconuts, mechanical chopping and collection of tender coconut water, additive treatment and mixing and filling of water into pouches/cans, modification of process (hot filling) for PET bottles, conveyor system to carry pouches/cans to continuous pasteurization system. The technology is being adopted by the existing units for quality upgradation. FAO has also patented a technology for bottling tender coconut water using micro filtration technology. Board has transferred the technology to 10 entrepreneurs and 6 processing units with a capacity to process 78000 nut per day are operational now.

### 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 by Kerala Agricultural University (KAU) for retaining the flavour and to prevent discolouration. The process involves dipping (partially) dehusked tender coconut in a solution of 0.50% citric acid and 0.50% potassium metabisulphate for three minutes. The product can be stored up to 24 days in refrigerated condition at 5-7 degree centigrade. By using this process, tender coconut can be transported to distant places and can be served chilled like any other soft drink. Optimized uniform size facilitates using of plastic crates and



insulated chill boxes for transporting and storage.

In Thailand young coconuts trimmed, treated and packaged with opener, straw and spoon are commercially produced and marketed (even exported) to countries like Australia, Europe, Japan, USA, Taiwan, Hong Kong etc. The shelf life of the processed young coconut is 45 days in 3-60 C or 3 weeks in 7 – 100 C.

### Major products from coconut kernel

#### Desiccated Coconut

Desiccated coconut is the white kernel of the coconut, disintegrated and desiccated to a moisture content of less than three percent. It is white in colour. It is a popular commercial product having demand all over the world in the confectionary and food industries, as one of the main subsidiary ingredients of fillings for chocolate, candies, etc. It is also used uncooked, as decoration for cakes, biscuits, ice cream and toasted short eats. Common grades of desiccated coconut like granulated and fancy cuts like flakes, treads etc. are popular. Granulated cuts include coarse medium fine and superfine grades.



The manufacturing process involves selection of matured, seasoned, ungerminated, undamaged, dehusked nuts, deshelling by a small hatchet chisel, paring of the testa using the paring knife, slicing the kernel and removal of water, washing, sterilizing (blanching) using hot water, disintegrating into granular pieces of 1-5 mm size, drying in batch type of semi automatic tray drivers or fluid bed dryers to bring down the moisture to 3%, cooling the product to room temperature, sieving, grading and packing in polyethylene lined craft paper.

Sri Lanka, Philippines, Indonesia and Malaysia are major producing countries. Other countries producing small quantities of desiccated coconut are India, Fiji, Tonga, Ivory Coast and Brazil. Among its major export markets are the USA, United Kingdom, France,

Netherlands, Italy, Eastern Europe, Australia, Japan, Taiwan and the Middle Eastern countries. 23 desiccated manufacturing units are established with the financial assistance from Board which could together having processing capacity of 6.60 lakh nuts per day.

### Coconut Chips

Coconut chips 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 Chips



is crispy and can be packaged and marketed in laminated aluminium pouches, which will have a shelf life of 6 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. Instead of sweet, salted coconut chips and medicated coconut chips can also be prepared by suitable change in the osmotic medium.

CPCRI, Kasaragod has developed a process for preservation and packing of coconut chips. CPCRI and CDB have already provided training to many women entrepreneurs and self help groups in coconut chips making. A few units have started commercial production. There is a insatiated demand for this product in the domestic market and elsewhere.

### Coconut milk

Coconut Milk refers to the oil-protein-water emulsions obtained by squeezing fresh grated coconut kernel. The undiluted and diluted are referred to as coconut milk and concentrated form as coconut cream.

Coconut milk is obtained by extraction of fresh coconut wet gratings with/without water. This is an instant product, which can either be used directly/



diluted with water to make various preparations such as fish & meat dishes, curries, sweets, deserts, puddings, cocktails, cakes, cookies, coconut jam, ice creams etc. It can also be used in the manufacture of

bakery products and for flavouring food stuffs. Preserved forms of coconut milk such as canned cream or milk and dehydrated whole milk are now available in many coconut growing countries. Commercial production of these products has been promoted in the Philippines, Thailand, Indonesia, Western Samoa, Sri Lanka and Malaysia and to some extent in India. Indonesia is the leading exporter followed by Sri Lanka, Thailand and Philippines.

CDB in collaboration with the Regional Research Laboratory, Trivandrum has developed technology for preservation and packing of coconut cream in tin containers with a shelf life of six months. The process involves dehusking of the fully mature nuts, breaking the nuts into halves, deshelling, washing and blanching of the kernel, grating, comminutions of the grated kernel to extract the milk, filtration through vibrating screens, additions of emulsifier and stabilizers, emulsifications, pasteurizations, hot filling in cans, can seaming and sterilization. 10,000 mature nuts could yield about 2500 kg of coconut cream and 500 kg of residual grating.

The technology has been transferred for commercialization and the product is available in the domestic markets at reasonable rates. Production of canned coconut milk is also commercialized in Thailand, Malaysia, Philippines, Indonesia and Sri Lanka.

### Coconut Skimmed Milk

Coconut fresh kernel is a rich source of plant protein and could well be an invaluable material for the preparation of milk substitutes. Coconut skim milk is a solution of the soluble components of coconut after the cream is separated in a cream separator. Skimmed milk is a good source of quality protein suitable for the





preparation of many useful food products or as supplemental protein source, especially in regions deficient in animal proteins. Freshly prepared coconut milk from pared kernel is filtered through a 120 mesh vibrating screen and the pH of the filtered milk is raised from 6.3 to 7.0 with the additions of sodium hydroxide. The milk is then pasteurised at about 60°C for one hour and subsequently centrifuged in a cream separator to yield the aqueous phase or the protein rich skim milk.

Skim milk can be concentrated to a protein rich non-fat solid-product for industrial use. Skim milk can be used for the production of a variety of products like spray dried powder, coconut honey, coconut jam and sweetened condensed milk. In addition, it can also be used as a substitute for the preparation of fermented beverage concentrate and also as a source of vegetable casein. The gastro-intestinal disturbances in infants can be treated by feeding coconut milk, which shows that coconut skim milk having the same protein level (1.6 percent) as mother's milk is well-utilized by infants.

### Spray Dried Coconut Milk powder

Coconut milk powder is the dehydrated form of the 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. The process involves deshelling, paring disintegration of the kernel, squeezing the comminuted kernel in a screw press, standardization of coconut milk with maltodextrin and sodium cassiate, pasteurization spray drying and packing in aluminum packets. The powder is easily dissolved in water to form a milky white liquid with the flavour and texture of coconut milk. To make coconut cream, it is suggested to mix or blend 100g powder with 120 ml water. The product contains 60.5 per cent fat, 27.29 per cent carbohydrates, 9.6 per cent protein, 1.75 per cent ash, 0.8 to 2.0 per cent moisture and 0.02 per cent crude fibre.

The product has consumer demand in both



domestic and international markets. Spray dried milk powder is produced on a commercial scale in the Philippines, Indonesia, Malaysia, Thailand and India.

The major markets for coconut milk and milk powder are European countries like UK, Netherlands, Germany, France, USA, Mexico, Canada, UAE, Australia, Japan, Korea, Malaysia, South Africa, Singapore etc.

### Virgin Coconut Oil

VCO can be produced from fresh comminuted coconut kernel or coconut milk. Different production processes are adopted depending upon the scale of operations, degree of mechanisms and investment available. VCO produced from each process exhibits different organoleptic characteristics of which brief description of the process are given below:



#### *Virgin Coconut Oil through Wet Processing of Coconut*

Wet processing of coconuts is a new process of oil extraction from fresh matured coconuts producing high value, high quality Virgin Coconut Oil (VCO) rich in vitamin E and possessing long shelf life period of one year. Apart from virgin coconut oil, a number of other value added coconut products like coconut milk, low fat coconut powder, skim milk and packed coconut water, could be developed from the process. A plant processing 1 lakh nuts per day can produce 7.5 tons of virgin coconut oil, 9 tons of medium fat DC, 11,500 liters of matured coconut water 16.5 tons of skim milk and 11.5 tons of coconut shell.

*Fresh dry process – Wet milling route –* Oil is extracted from partially dried coconut meat using special screw type press. This is applicable for small to medium scale plants. By product is food grade full protein medium fat coconut flakes and coconut flour.

*Fresh dry process – Desiccated coconut route –* This process involves extracting the oil from the desiccated coconut. This process can be applied for converting the desiccated coconut which does not pass the quality standards into high value VCO and coconut flour or aflatoxin free cattle feeds. This process is useful in medium scale plan operations and involve



high investment or mechanical equipments.

*Fresh dry process* – Grated coconut route – This process involves splitting the coconut, grating, blanching and drying of the meat and extracting oil using screw press. This is similar to DC route except that this requires fewer process steps and equipments and useful for small scale plant operations. The by products are flakes and coconut flour.

*Wet processing of coconut* – VCO through wet processing – Traditional wet processing – modified kitchens method. The process involves gradually heating the coconut milk mixture (first & second extract) until all the water is evaporated to produce VCO and proteinaceous residue. The milk is allowed to stand for three hours. Watery portion that settles at the bottom is removed and the remaining cream is gradually heated to produce the oil. This process produces the VCO with intense coconut aroma. If the oil is not heated in dryers it became rancid within five days. The proteinaceous residue has no commercial value but can be consumed by adding to rice cakes. Investment is low and useful for home scale operations.

*Virgin Coconut Oil through cold process of centrifugal separation* - The process involves a two staged centrifuging process wherein the skimmed milk (watery phase) is separated and the cream is subjected to vacuum evaporation and passed through the centrifuge again to obtain the VCO.

CDB has developed a technology through the CFTRI for production of virgin coconut oil by wet processing. Technology has been transferred to 9 entrepreneurs the product is marketed commercially under various brand names like Keravita, Indhulekha etc. 10 VCO units using wet processing method are assisted by Board under Technology Mission on Coconut. These units have the capacity to process 1 lakh nuts per day.

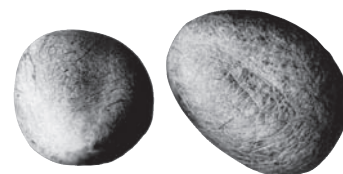
Philippines is the leading exporter of virgin coconut oil (VCO) in the world market. Thailand, Indonesia, India, Malaysia, Sri Lanka, Vietnam, Fiji, Western and Samoa also produce and export VCO. The major buyers are USA, Canada, Europe, Asia and Pacific, Middle East, Australia and South Africa.

VCO is used as food supplement, body oil, massage oil and in various personal care products. The increase in demand for VCO could be attributed to the re-

discovery of the health benefits of coconut oil as a medium-chain triglyceride (MCT). The major demand for VCO is as food supplement.

### Ball Copra

Ball copra is made by storing unhusked coconuts in a suitable



store, which is usually a two-storey brick and mortar building, the floor and the four sides of the upper storey being made of wooden bars spaced two to three inches apart. Fully ripe nuts of twelve to fourteen months are stored in the upper floor of the store. They are frequently stirred and smoked by a slow fire, set under the platform using coconut palm waste or cheap firewood. During the period of storage, the water inside the nuts gets dried up and the kernel gets detached from the shell. The entire process takes eight to twelve months. When quite dry, the nuts are husked, the shells are broken with a heavy iron knife and the copra balls removed. The copra is clean, white inside and sweet in taste and is therefore highly priced. A study conducted by the erstwhile Central Coconut Research Station, Kasargod (India) on the preparation of ball copra revealed that small sized nuts are best suited for making ball copra, as it takes less time for conversion into ball copra.

### Major products from coconut shell

Coconut shell powder, coconut shell charcoal and activated carbon are the three major products that can be made from coconut shell. Coconut shell powder finds extensive uses in plywood and laminated board industries, as a phenolic extruder and as a filler in synthetic resin glues, mosquito coils and agarbathy industries.

Coconut shell powder is manufactured from matured coconut shell by using pulverizes / ball mills. 12,000 shells would yield around one tonne shell powder. Coconut shell charcoal is manufactured by burning shells of fully matured nuts in limited supply of air sufficient only for carbonisation, but not for complete destruction. The output of charcoal in the traditional pit method is just below 30 per cent of the weight of the original shells. In India the average output in the traditional method has been found to be 35 kg of charcoal from 1000 whole shells or about 30,000 whole shells yield 1 tonne of charcoal. Shell is converted to shell charcoal by carbonization process

in mud pits, brick kilns and metallic kilns.

Activated Carbon is a non graphite form of carbon which could be produced from any carbonaceous material. Coconut shell based activated carbon is considered superior to those obtained from other sources due to its small macro pore structure which renders it more effective for the adsorption of gas/vapor and for the removal of color and odor of compounds. It is widely used in the refining and bleaching of vegetable oils and chemical solutions, water purification, recovery of solvents and other vapors, recovery of gold, and in gas masks for protection against toxic gases. On an average 3 tons of coconut shell charcoal would yield 1 ton of activated carbon.

Taking into account the versatility of coconut and as can be seen from the above there is immense scope for more processed foods to be manufactured with coconut as base. Cooperation between producing countries will be mutually beneficial in the area of



new product development, technology development and product diversification which will result in increased demand for coconut globally. Considering the dwindling market for traditional products like copra and coconut oil such efforts on manufacture of increased value added products will enhance the competitiveness of the coconut industry globally.

A brief on various other products from coconut will be continued. For full version of the article visit [www.coconutboard.gov.in](http://www.coconutboard.gov.in).

\* Director, \*\*Senior Technical Officer, CDB, Kochi-II

## Production and export of value added coconut products

Export share of major coconut producing countries (Metric ton)

Coconut Products	India	Indonesia	Malaysia	Philippines	Sri Lanka	Thailand
Coconut	30602	72818	4149	1638	59199	24210
Copra	29625	39517	2569	84	8592	339
Coconut Oil	5870	570311	128855	826237	1932	17886
Coconut Cake	214	209035	3011	399782	20007	1326
Desiccated Coconut	900	46699	9448	116421	38651	1181
Coconut Milk/ Milk Powder	-	23264	3641	3723	10089	-
Shell Charcoal	15523	199045	-	34747	3550	-
Activated Carbon	38712	22741	17730	20027	17635	7023

Major coconut products and number of producers in India	
Products	No. of producers
Copra	Above 10000
Coconut Oil	Above 2000
Desiccated Coconut	80
Coconut Milk Powder	2
Virgin Coconut Oil	15
Activated Carbon	16
Shell Charcoal	Above 1000
Shell Powder	Above 20

Major Importers of Copra (Metric Ton)	
Philippines	68764
Malaysia	29607
Bangladesh	19000
Pakistan	9944
Australia	9440
Other countries	1891
<b>Total</b>	<b>138646</b>

Major Importers of Desiccated Coconut (Metric Ton)	
U.S.A.	35886
Singapore	27109
Belgium	16372
Germany	15618
U. K.	13315
Netherland	10487
Turkey	10228
Other countries	233344
<b>Total</b>	<b>362359</b>

## Value added products from coconut

*K.S.M.S. Raghavarao\*, Navin K. Rastogi and A. Hrishikesh*

### Introduction

India is one of the third largest coconut growing nation in the world. In order to develop the products from coconut and to improve the economy of this sector, Coconut Development Board is extending financial assistance for research projects to Central Food Technological Research Institutes (CPCRI) for developing technologies. With the financial support of Coconut Development Board, CFTRI has developed the processes for production of coconut milk products, coconut dietary fiber and virgin coconut oil.

**There is an ever-increasing scope for producing diversified products from the by-products of coconut industry. Such products will ensure better prize for the farmer, better products to consumer and more effective cost of production to the industry**

Introduction and adoption of modern technologies in coconut processing sector to provide technical impetus for transformation of traditional coconut dependent rural economy into a vibrant commercially viable economy, development of technologies/process for consumer based products from by-products in coconut processing in order to increase the consumption of coconut and exploitation of by-products in coconut processing for production of value-added, shelf-stable, convenient products are the major objectives of the research and development works.

The R&D works done at CFTRI on various products like mature coconut-water concentrate (i.e. coconut honey), tender coconut beverage (i.e. coconut lassi), coconut whey protein from aqueous extract after the recovery of coconut milk, coconut spread based on mature coconut-water concentrate and dietary fiber, coconut soufflé and coconut chutney are initiated and presented in the following sections.

### Tender coconut beverage (Coconut lassi)

Coconut beverage is produced mixing the solid

white meat and liquid coconut water endosperm from tender coconut. The product is having refreshing and fresh taste of coconut, good shelf life, characteristic coconut flavour and natural electrolytes. There are numerous health benefits of tender coconut water as it is a natural source of minerals, vitamins, complex carbohydrates, amino acids and other nutrients. The natural carbohydrate content is 4-5%, which makes tender coconut water suitable for sports persons.



A homogenized mixture of liquid and solid endosperm of tender coconut forms a beverage. Once it is exposed to air, the mixture rapidly loses most of its organoleptic and nutritional characteristics, and begins to ferment. Since the pH of the mixture was less acidic, hence the product needs to be bottled and sterilized.

The tender coconut water and thin solid endosperm from the tender coconut are together homogenized and the mixture is formulated. The formulated beverage is filtered with cheesecloth, heated and filled in pre-sterilized glass bottles. The bottles are subjected to hot water to expel the air present in the headspace. Further, the bottles are sealed and autoclaved (Raghavendra et al., 2009). The product, with no preservative added during the process, was found to have characteristic taste and aroma of tender coconut. The novelty of the present invention lies in the way of selecting the processing steps, conditions/parameters and components to obtain a value added product, which is not hitherto available, without losing the characteristic flavour of tender coconut. The world market for sports beverages is about \$1,000 million.

Ratio of tender coconut endosperm to tender coconut water was maintained in order to get very highly acceptable product having characteristic

flavour of tender coconut. The time and temperature of processing was also found to have direct bearing on the quality of the product. The product was having nutritional qualities of both tender coconut water and the solid coconut endosperm as well as taste and aroma of tender coconut water and endosperm was rendered intact. The product was made without altering the pH and without the addition of chemical preservatives.

The product has shown a shelf-life of more than six months when packed in pre-sterilized glass bottles and kept at ambient storage conditions. The physico-chemical and microbial analysis of tender coconut beverage is shown in Table 1. Sensory quality studies of the product were conducted by using Quantitative Descriptive Analysis (QDA) where the attributes were quantified on 15 cm structured scale. The samples were evaluated against fresh sample by trained panel. The attributes considered were whiteness, consistency, coconut like, milky, coconut oil like, fermented, sweet and overall quality. The product prepared was well received by the panel with a high score of 12.1.

#### Mature coconut water concentrate (Coconut honey)

Mature coconut water is procured from desiccated coconut industry filtered and centrifuged to remove suspended solids and fats. Mature coconut water is passed through cationic, anionic and mixed bed resins to remove saltiness caused by the minerals in the final product. The mature coconut water is then subjected to thin film evaporator to achieve the desired concentration. Further sugar is added to increase the concentration level.

Membrane concentration of mature coconut water is also attempted using reverse osmosis using cellulose acetate membrane (membrane area 0.9 m<sup>2</sup>, pressure 20-40 bar). Further, concentration of coconut water is achieved by thin film evaporator. Since the salt concentration in the concentrate is high, it was not possible to consume mature coconut water concentrate as such and hence diversified products from this concentrate is made. Keeping this in view the mature coconut water

**Table 1: Physico-chemical and microbial analysis of tender coconut beverage**

Parameter	
Moisture, % by weight	82.9
Total ash, % by weight	0.52
Total soluble solids	13°Brix
pH	5.6
Titrateable acidity (g/100g)	0.50
Fat, % by weight	0.90
Protein, % by weight	0.50
Crude fiber, % by weight	Below detection limit of 0.2!
Carbohydrate (by difference), % by weight	13.74
Calorific value (kCal/100g)	65
Aerobic mesophilic spore formers	Absent
Aerobic thermophilic spore formers	Absent
Anaerobic mesophilic spore formers	Absent
Anaerobic thermophilic spore formers	Absent
Fermentation test	Negative

concentrate was mixed with various ratios of sugar concentrate and sensory tested for its acceptance.

Mature coconut water concentrate is formulated with sugar solution in increasing proportions, and referred as A, B, C, D and E, respectively. The samples are analyzed sensory using a panel consisting 10 members. The mean scores were plotted in the web plot against different attributes. The sample D and E containing higher proportion of sugar content attained the highest score for overall quality as compared to other samples.

#### Coconut spread from mature coconut water concentrate

Coconut spread is one of the several important aspects of value addition to the by-products (concentrate from mature coconut water and dietary fiber) generated in the coconut processing industries, besides solving an environmental problem vide the disposal of these by-products. This exotic spread can find extensive utilization in sandwiches, chapatti, dosa or similar breakfast foods to make them more appealing

and appetizing. Coconut spread is prepared by partial replacement of sugar with concentrate from mature coconut water along with addition of other ingredients





such as citric acid, pectin and benzoic acid followed by thermal treatment. Addition of coconut dietary fiber, which can be evenly suspended in the spread, provides a characteristic coconut flavor, texture and taste. The high osmotic pressure in the product creates unfavorable conditions for the growth and reproduction of most species of microorganisms like yeast, mold and bacteria responsible for spoilage of food.

The process involved filtration with the help of a muslin cloth of mature coconut water followed by concentration in thin film type of evaporator. The ingredients, sugar, water, pectin solution, xanthan solution, citric acid blended and the mixture is boiled till a moderately viscous and thick mass of desired concentration is achieved. At that time, the concentrated mature coconut water is added to the boiling mixture at the end of processing to the above mixture. Finally, dietary fiber obtained from coconut was added to the above mixture. The dietary fiber was obtained by dehydrating spent grating after extraction of coconut milk, solvent extraction of fat and finally ground to reduce particle size. The spread mixture is added with class II preservative, filled into pre-sterilized glass bottles, capped, cooled and stored at room temperature. The product is characteristic flavour of coconut and is having an expected shelf life of more than six months.

Microbiological analysis indicated the yeast and mould count is zero, whereas mesophilic aerobes count is less. Sensory studies are done with the help of Quantitative Descriptive Analysis (QDA) where the attributes were quantified on 15 cm structured scale. The samples are evaluated against fresh sample by trained panel. The product prepared is well received by the panel and scored high score of 12.0. Sensory studies indicated that the note of taste of coconut was very well noticeable in the product. Further, sensory acceptability of the product was quite high. Spreadability of the product was excellent that was supported by the back extrusion measurements.

**The level of replacement of mature coconut water concentrate with sugar was optimized to get very highly acceptable product having characteristic taste and flavor of coconut.**

Similarly, the addition of mature coconut water concentrate at an appropriate stage during processing allowing the mature coconut water concentrate to be

heated for minimal duration (2-3 minutes), so that the flavour components of mature coconut water remain intact in the final product.

The process provides the value-addition to the by-products, which are currently disposed to environment. In this process only a part of sugar was replaced with concentrated mature coconut water, which resulted in a product having characteristic flavour and taste of coconut. Process is easy to scale up. The product contains dietary fibre from coconut, which has added health benefits. Production of coconut spreads without any artificial flavouring agents has niche market to cater the consumers who prefer least chemical additives.

### Coconut soufflé

Coconut soufflé is a light fluffy baked dish. Coconut soufflé is made with butter, egg yolk and white mixed with corn flour, milk, sugar and coconut water. Coconut soufflé can be prepared by two methods such as baking or refrigeration. Production of baked soufflé involve cooking of ingredients like butter, corn flour and milk over hot water until the batter becomes thick and smooth and then stiffly beaten egg yolk is added along with sugar to the batter. The mixture was thoroughly mixed along with egg white and coconut milk and then it is baked. In another approach, coconut soufflé was prepared by mixing the ingredients (cream sugar, egg white and corn flour) with boiled milk and then cooked until the mixture became thick. Sodium alginate, coconut extract, tender coconut water and stiffly beaten egg white were added to this mixture and then it was poured in a mould and refrigerated. Further efforts are in progress to produce ready mix for coconut soufflé.

### Coconut chutney from spent coconut gratings

Coconut chutney is a culinary specialty and food adjunct /accompaniment, served along with south Indian dishes. It may be served either as thick coarse paste/slurry/dried. The spent coconut gratings after the extraction of coconut milk is used to make coconut chutney. The ingredients like Bengal gram, green chilly, coriander, ginger, pudina, tamarind, garlic, salt and water are made into paste and then mixed with coconut gratings in required proportions and then the chutney is seasoned and then packed. The dry coconut chutney powder is then sent for sensory and microbiological analysis. Sensory attributes like yellowish brown, fibrous, spicy, coconut like, fresh,

pungency and overall quality are measured in 15 cm web scale. The coconut chutney powder was well received by the panel and scored a high score of 10.0. The pH and moisture content of the ready chutney were 4.5 and 6.2%. The TBA value, which is an indicator of rancidity is found to be low (0.42 mal/kg). Attempts are under progress to produce dried coconut chutney powder with increased shelf life.

### Coconut whey proteins

Coconut whey protein is a byproduct of virgin coconut oil industry. The technology for virgin coconut oil was earlier developed at CFTRI. In order to provide value-addition to the protein obtained, the following approaches are adopted.

### Membrane processing of coconut whey proteins

Ultrafiltration in combination with spray drying was explored as a method for the production of coconut whey protein powder. The coconut whey was centrifuged to remove fat and then it was subjected to ultrafiltration using membranes of MWCO of 5, 10, 30 and 50 kDa. The retentate and permeate were collected. It was found that MWCO of 5 kDa gave maximum retention of proteins in the retentate (96%). The ultrafiltration was performed in the pressure range of 2 to 10 bar, the separation process occurring across a membrane, which discriminates solute molecules on the basis of their sizes. The retentate collected was then spray dried to get coconut protein powder.

### Differential partitioning studies of coconut whey proteins using aqueous two-phase extraction

In aqueous two-phase extraction (ATPE), the purification of most of the proteins is mainly due to the differential partitioning of the target protein to one phase and the contaminant proteins to the other phase. The phase system is dependent upon many factors such as type of aqueous two-phase system, phase forming salt, molecular weight of the phase forming polymer, pH of the system and phase volume ratio.

### Selection of type of aqueous two-phase system

In order to know the suitable type of phase (polymer-polymer or polymer-salt), both polymer-polymer and polymer-salt phase systems were prepared using coconut whey. The results indicated that the protein yield was higher in polymer-salt system as compared to that of polymer-polymer system. After selecting the type of phase system (polymer-salt), the next most important step was the selection of type of

phase forming salt.

### Selection of phase forming salt

In order to identify the suitable salt for the yield of coconut whey protein ATPE experiments were carried out by adding predetermined weighed quantity of different molecular weight PEG and different phase forming salts (ammonium sulphate, magnesium sulphate, sodium sulphate and potassium phosphate) to a given quantity of coconut whey making the total weight of the system 100% on w/w basis. Out of these salts potassium salt has resulted the maximum yield of protein in the bottom phase.

### Selection of polymer molecular weight

In order to identify the suitable molecular weight of phase forming polymer for the yield of coconut whey protein, ATPE experiments were carried out by adding predetermined weighed quantity of different molecular weight PEG. The PEG of MW 1000, 4000 and 6000 resulted in protein yield of 82, 92 and 98%, respectively. Hence PEG 6000 was found to be most suitable.

### Effect of different tie line length

The effect of tie line length (TLL) was studied on the partition of proteins in the PEG 6000/potassium phosphate phase system. Increase in the yield of protein was increased with an increase in %TLL; a maximum yield of 96% was obtained at a particular high value of TLL. Very high values of TLL resulted in decrease in the yield of proteins.

There are number of areas in coconut research which have not been explored in India. There is a need to further think about the development of diversified products from coconut such as diary whiteners, coconut paneer, nata-de-coco etc. Of course, the coconut research may take vibrant trend with the advent of latest technologies like membrane processing and other techniques. These things are only possible when regulatory and governing agencies come forward to sponsor further research projects in this potential field. It would be very encouraging if the private industries come closer to R&D institutions and work together for development of state of the art technologies and can finance part of the research.

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## Value Added Products from Coconut Timber

K.P.Jayabhanu\*

The increased demand for timber has caused indiscriminate felling of trees from the natural forests, seriously affecting the ecology as well as the living conditions on earth. Growing population and higher per capita consumption of timber products due to elevated living conditions have put tremendous pressure on the natural forest resources. Illegal felling has caused serious environment problems in many regions of the world, which are considered to be the green areas required for maintenance of the ecological balance. The development of plantations for lumber has been a parallel activity and the results in terms of yield from such plantations are not yet appreciable in comparison to the increased requirement of the timber. Many heavily wooded areas in the developing countries have become importers of timber to meet their requirements of wood and wood products. India with a very large requirement of timber and a highly depleted forest resource depends largely on imported timber to meet the various requirements of wood products. Since the effect of plantation timber is not appreciable yet, it is absolutely necessary to explore the possibility of processing plantation residue timber as well as monocots from plantation or fast growing species like Bamboo.

Coconut tree has been planted in many tropical regions and it is one of the oldest plantations in organized sector or informal sectors and thus the over matured coconut trees offer a good raw material base for production of lumber and products for various end-uses.

### Salient features of coconut wood processing

The proposal for production of value added products from coconut wood should seriously consider the structure and density variation of coconut wood

stem. The variation in density necessitates a programme to manufacture various end-use products based on this particular feature. The coconut trunk stem analysis is shown in Fig-1.

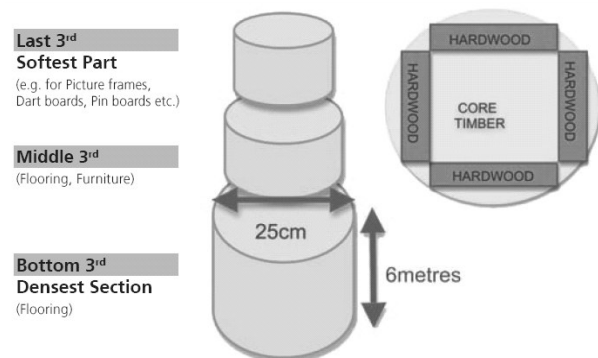


Figure 1

The durability of the hardwood segment is increased by coating the wood surface (at the bottom) with a suitable low toxicity chemical preservative. The coconut wood does not have any diametric growth, wood rays, branches or annual rings, and hence the swelling and shrinkage properties hardly differ in the tangential or radial direction. Compared to other species of corresponding densities the volume of shrinkages and expansion is negligible. The outer segment which is air-dried for normalization provides a stable parquet slat input.

The table-1 shows the density segment of a coconut stem recommended for different uses as coconut lumber product for building construction.

As a rule, it is suggested that coconut wood with density below 400 kg/m<sup>3</sup> should not be used as load bearing structural components but only in the internal parts of a building such as ceilings and wall linings in the form of boards and wall paneling.

The other end-use products from coconut wood could be listed as follows.

### Production of charcoal

Coconut wood is comparable to other woods as a fuel. Medium to good quality charcoal could be produced from coconut wood using any of the conventional methods of making charcoal.

The high density segments of the trunk yield higher charcoal recovery and better quality, compared to that from the low density segments. Experience has also shown that good quality charcoal can be obtained from logging and sawmilling residues like coconut trunk slabs and timber off-cuts and from the butt part of the trunk. The upper portion of the trunk, consisting of low density wood, gives charcoal of inferior quality.

### Torrifaction

Coconut wood chips could be utilized to generate high quality fuel by the process of torrifaction. The fuel produced by torrifaction burns with very less smoke and generates lesser ash. However, this process is still under trials and commercial exploitation has not started.

### Coconut Fiber-cement Board (CFB)

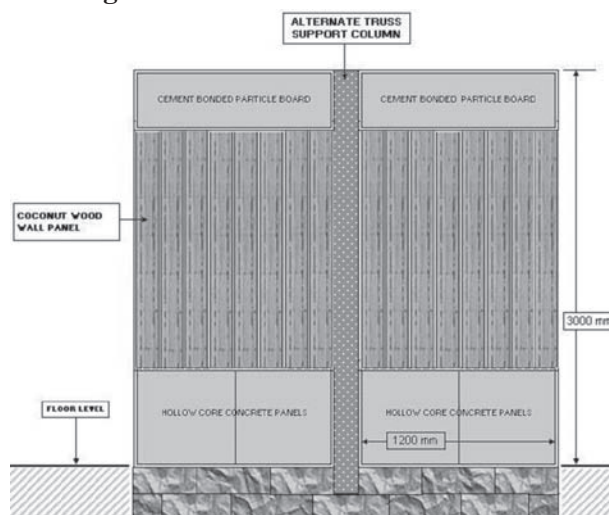
The coconut fiber-cement board (CFB) is a relatively new product that makes use of coconut

wastes and can be combined with coconut wood. It is manufactured from fibrous materials like coconut coir, fronds, mid-ribs, coconut top logs, or even shredded wood from small



diameter fast-growing trees growing along the borders of coconut plantations. Manufacturing CFBs can be a good investment segment in developing countries facing huge demand for housing. CFB is a good replacement for tiles, brick, plywood, asbestos and cement hollow blocks.

### Housing and shelters



Coconut lumber and CFB could be utilized for building residences and commercial blocks, utilizing a well engineered prefabricated housing technology. The coconut lumber houses are built in various parts of the world. Efforts are made in India also to establish alternate products for building houses and coconut wood and boards could be a reliable source.



The model houses built in Philippines indicate considerable scope for utilizing coconut lumber and coconut wood based panels.

### Wood Polymer Composite (WPC)

Efforts have been made to produce coconut fiber / chips and polymer composites for various end-uses.



The trials have been successful and WPC based on coconut fiber could be produced on a commercial basis. However, the cost of production seems to be high. Hence the production is commercially viable for few selected applications only.

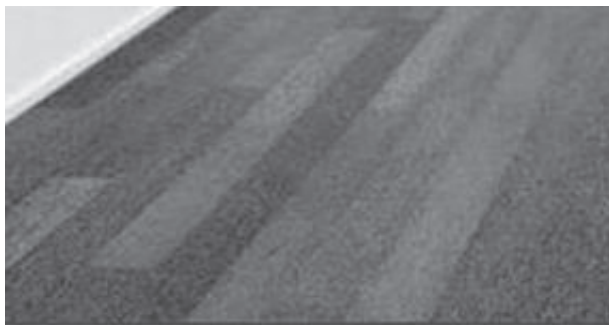
### **Commercially Viable Value Added Products From Coconut Wood**

#### **Investment opportunities**

Currently, in India, there is no organized investment programme in the sector of secondary processing of coconut wood. Some of the items which could be commercially manufactured with viable economics are listed below.

#### **Parquet Flooring**

The wooden parquet flooring market in India has registered very high growth rate in the last few years. The discerning customers prefer wooden flooring in selected areas in their residences or apartments. Recently wooden parquet flooring has made inroads to commercial buildings, office spaces, super markets and clinics also. The high price of timber and the resultant increase in the prices of wood parquet encouraged use of coconut wood parquet for various end-uses. The technological development improves the durability and wear and tear of the coconut wood parquet and renders it as a cost effective eco-friendly natural product.



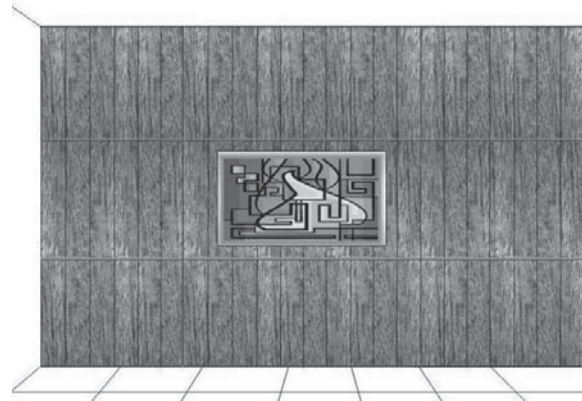
**PARQUET TONGUE & GROOVE JOINT DETAILS**

#### **Wall Paneling**

The demand for solid wood wall paneling for interiors in residences, commercial spaces and restaurants has been increasing at a rapid pace. The preference for eco-friendly natural product is strong and coconut wood wall paneling is one of the alternate sources, which is cost effective. An investment in coconut wood parquet flooring could produce wall paneling also.

#### **Door and Window Frames**

Matrix impregnated door and window frames from processed coconut wood could be a product which will meet the large demand for door and window frames in India. The recovery could be increased by



laminating smaller thickness scantlings. Such a product will be more stable and cost effective.

#### **Coconut Wood Veneers**

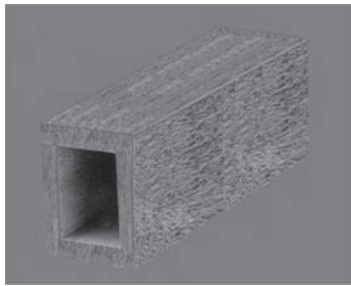
There is demand for coconut wood face veneer from certain panel manufacturing units in India and abroad. Slicing of coconut wood could cause problems of fiber separation. This problem will be acute during the veneer drying process. One solution is to upgrade the input coconut wood slab for slicing by impregnating a matrix which will provide lateral binding of fibers. Also the thickness of the veneer has to be designed to minimize such a problem. The timber slicing units in India could be interested in developing coconut wood face veneers also.

#### **Furniture and Components for Interiors**

Processed coconut wood offers a refreshing change in the segment of solid wood furniture. Considerable headway has taken place in developing coconut wood furniture for various applications and end-uses.

Pre-engineered and pre-finished components could be produced from coconut wood for application in interiors as well as exteriors. The range includes hollow beams, columns, pickets, poles, cabinets and other utility products.

Coconut wood hollow beams of different cross sections could be produced in lengths up to 4 Mtrs. The product may find application in interiors as well as exterior pergolas. The design and cross section of the product



The item could be mass produced as long hollow beams and the same could be cut to the required length for the production of various smaller components. The product may find application as an element in house construction also.



### Novelty and crafted Products

A well processed and upgraded coconut wood lumber could be utilized for production of various crafted items and utility products.

Handicrafts could be produced from coconut shell also. Such items which are combined with the craftsman skills could find export markets in Europe and other developed countries. Coconut wood provides a suitable input for development of skills and production.

### Conclusion

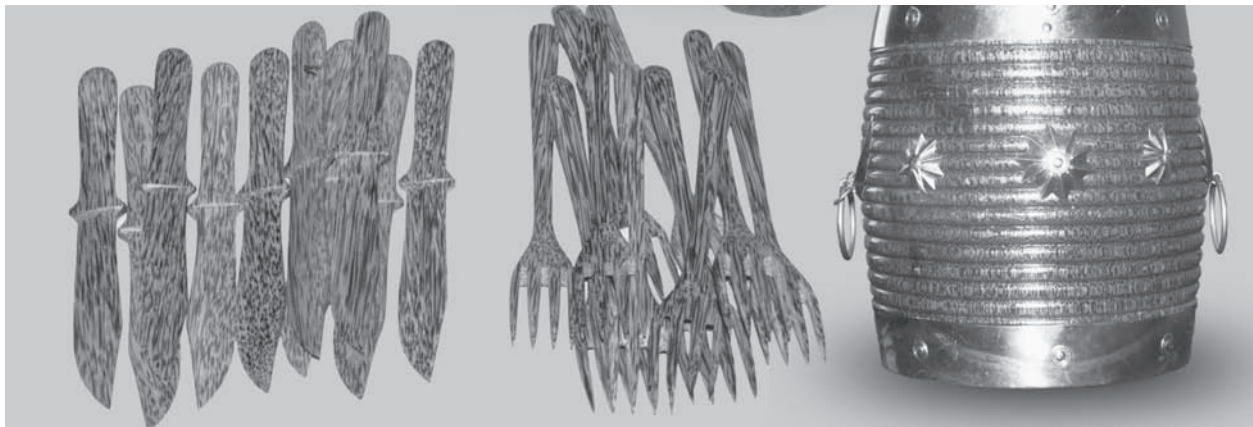
Large scale replantation of the senile coconut trees opens opportunity for investment in coconut wood lumber processing, secondary processing of lumber as well as power generation. A coordinated and a well planned effort will be of tremendous social benefits. The rejuvenation and replantation scheme initiated by Coconut Development Board will act as a prime mover for the development of primary and secondary processing of senile coconut palms, generating considerable economic benefits to the society.

could be varied according to the applications. This component could be employed as columns also. In combination with metal sections, the hollow beam could be used as a load bearing component.



The web of the beam could be engineered either as a finger jointed and laminated timber or solid planks with glued lap joints.

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## Processing of Coconut Chips

### The Kalpakam and Kerasree Success Stories

*K. Muralidharan, C. Thamban and M. M. Lajina\**

Coconut plays an important role in the livelihood security of millions of people in the southern states of India. However, this sector faces a number of structural problems mainly arising from the fluctuating price of coconut. The price of coconut at present solely depends on the price of coconut oil in the domestic market which in turn depends on the international prices of edible oils.

**Till recently making of copra was the only processing option at farm level which often failed to ensure reasonable economic returns to the farming community. However, novel products like coconut chips and available technologies for utilization of coconut water to make vinegar and squash extend the scope for community level processing of coconut and in the long run will help the coconut farming communities to realize better returns from coconut cultivation.**

For a successful agro processing enterprise both backward and forward linkages are to be established, which are often overlooked in many developmental programmes. Efforts were made to bridge this felt gap in the processing of coconut products under the National Agricultural Innovation Project (NAIP) on 'Value Chain in Coconut' being implemented by



CPCRI for the period 2009-2012. As part of the project women Self Help Groups (SHGs) were formed and the members were provided with technical support for the production of coconut chips. Comprehensive training programme covering various steps involved in preparation of coconut chips were imparted to the members of these groups at Agro Processing Laboratory, CPCRI, Kasaraogd. They were further empowered to make a range of coconut food products by providing training on production of coconut pickle, chutney powder, coconut water squash, vinegar etc. at Technology Development Centre of CDB. Apart from these training programmes, capacity development programmes for



*Women SHG unit engaged in the production of coconut chips*



the SHG members on themes like good processing practices, quality control, procurement of raw material, maintenance of machinery, marketing of value added products, maintenance of accounts and audit etc were also organized. The processing units were formally linked with coconut farmers for assuring procurement of nuts of appropriate maturity. The SHGs sold their products at the local markets by direct marketing and also through intermediaries. They also participated in many exhibitions conducted with the financial support from NAIP in various parts of the state.

The 'Kalpakam' Women SHG unit at Madikkai gramapanchayath and the 'Kerasree' unit at Bedadka gramapanchayath are the two SHGs engaged in the production and marketing of coconut product under NIAP in Kasaragod District. Both these groups are having eight women members each: and all from rural background. Till the formation of SHGs, these women were underemployed for most part of the year without any regular income and were in a state of marginalization in the development process. 'Kudumbasree Mission', the state sponsored poverty alleviation programme facilitated the formation of self help groups of women for taking up income generating activities with arrangements for microcredit facilities. The project sensitization activities brought these two SHGs as partners of the NAIP and helped them to establish coconut processing units in the year 2009. The 'Kalpakam' unit is located at Kalichampoti, PO Madikkai 671314 and the 'Kerasree' unit is located at Kanhirathinkal, PO Bedakam 671541. Smt. Sheena and Smt. Suja are currently the Presidents of these two SHGs and Smt. Sreeja B and Smt. Lakshmi K are the Secretaries in order.

At present around 100 numbers of coconuts are



*Kerasree in an exhibition*



*The coconut chips produced by the SHGs displayed in a departmental store under the brand name 'Magicco'*

being processed per day in each of these units. The coconut chips produced by them is currently marketed in Bangalore for which they signed an MoU with a private distributor. They produce on an average 7 kg of coconut chips from 60 nuts (as it is the capacity of the dryer installed in their unit). The cost of production of chips varies between Rs.160.00 to 185.00 per kg depending upon the procurement rate (Rs.14.00 to 18.00 per kg of coconut). They sell the product at Rs.200 per kg to the distributor. Besides, the members get regular employment and earn Rs.150/- per day as labour charges and also realize better margins from a portion of coconut chips and other value added products by means of direct marketing. Through the experience gained in managing various activities of production and marketing of coconut chips members of both women SHGs opines that they have gained more self confidence and also could develop leadership qualities.

**Recognition in the society, improvement in communication skills, knowledge in financial management, skill for negotiation and ability to actively participate in the development process in their localities are the benefits they could derive by involving in the management of the coconut based product diversification unit.**

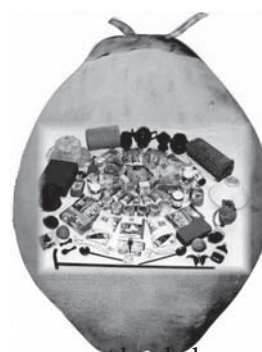
Above all, the economic empowerment is the most important benefit accrued, they opined. The success story of the two women SHGs from Kasaragod indicate the potential of coconut chips, a simple but wholesome coconut product, to provide income and employment opportunities in the rural economy of coconut grown areas of the country.

*\*Central Plantation Crops Research Institute, Kasaragod 671 124*



# Prospects for coconut value added products in the export markets in the post WTO regime

Anup Nair\*



World consumption of coconut increased from 42 million tonnes to 60 million tonnes (valued as USD 6 billion) during the past two decades. Domestic markets in producing countries themselves consume around 58% of all nuts each year with a value of USD 3.8 billion. Export markets are worth approximately USD 2.3 billion.

The world consumption of coconut is oil (55%), fresh (37%), desiccated (5%) and a small amount as value added products. In value terms, this translates to coconut oil USD 2.9 billion, fresh nuts USD 2.2 billion, desiccated coconut USD 0.3 billion, other kernel products USD 0.3 billion, husk products USD 0.3 billion and shell products USD 0.1 billion. For kernel products, 97% of all exports (in nut equivalent) were in the form of oil (82%), copra1 (4%) and desiccated coconut (11%).

While oil and desiccated coconut are the main products sold in volume terms, these are also low value commodity products. Hence, despite the size and wealth of the industry, most coconut growers are among the poorest in the society. Nevertheless, a number of value added products (such as packaged tender coconut water, coconut milk products, virgin coconut oil etc) available through integrated processing achieve significantly higher unit value per coconut for farmers. The market size and value share of such high value added products have been registering

exponential, consumer demand driven growth.

High value added industries, outside the commodity markets, will be the best place to withstand the harsh market conditions within the mainstream markets in the coming years – as their competitive advantage comes from the efficiency of utilisation of the entire nut for value added products and a diversity of end markets, as opposed to simple competition on the lowest price of a nut.

Despite being the third largest producer, India accounts for only 0.3% of world exports of coconuts and edible coconut products. Concerted efforts are being carried out by Coconut Development Board and Government of India to enhance exports of coconut and coconut products like coconuts (fresh, dry), coconut oil, desiccated coconut,

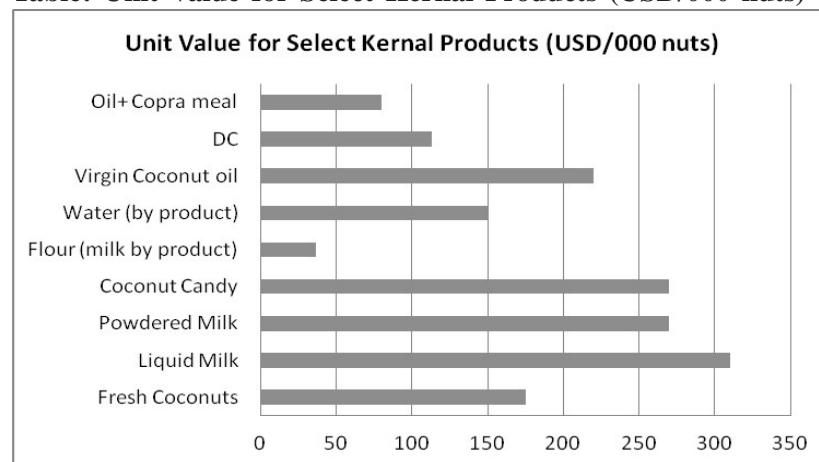
coconut hookah, coconut oil cake, coconut shell un-worked etc from India.

## Coconut Oil

Coconut oil has been losing market share to palm oil in recent years. However, the strong growth in global vegetable oil consumption has made it possible for coconut oil to still sustain positive growth, albeit at around 2.5% per year. Global CNO consumption increased from 2.8 million tonnes in 1990 to 3.5 million tonnes in 2006. This is primarily due to a 3.4% p.a. growth in the industrial use market. Growth in the food segment is nevertheless flat.

2.2 million tons of coconut oil is traded today, valued at roughly \$3 billion per annum. The Philippines account for roughly half of the total. EU is the biggest importer of CNO, accounting for 1 million tonnes in 2006 or about 46% of global imports. The top 12

**Table: Unit Value for Select Kernel Products (USD/000 nuts)**



importing countries account for 86% of total CNO imports. While consumption of coconut oil has decreased in Africa, America and Europe, it is growing fast in Russia, Vietnam, and China.

Annual production of coconut oil in India is around 4.9 lakh tonnes, and is mostly exported to the Gulf countries. Indian prospects can be greatly enhanced by focusing on Russia and China.

### **Copra**

Global copra production has grown slightly over the last fifteen years, and stood at 5.3 million tonnes in 2006. Total exported volume of copra too has been declining, down from 380,000 tonnes in 1996 to 128,000 tonnes in 2006.

The two broad varieties of copra produced in India are milling copra and edible copra. India produces about 6.5 lakh MT of milling copra and 2 lakh MT of ball copra. India exported 23,000 tonnes of copra in 2009, mainly to Bangladesh and Nepal.

### **Virgin Coconut Oil**

The demand for Virgin coconut oil is presently experiencing high market driven growth. There is an increasing consumer demand for VCO globally (especially in US and EU) largely due to its therapeutic qualities, and for use as cooking oil, skin and massage oil, cosmetic products, functional foods etc. Philippines is the producer of VCO, largely for domestic consumption. Other producers include

### **Tender Coconut Water**

Since 2008-09, packaged tender coconut water has made a remarkable breakthrough in the world market as one of the most popular natural alternative to

traditional energy drinks. Consequently the global trade in tender coconut water has soared to Rs. 2250 crores. International demand for coconut water is expected to continue to rise as more and more people are becoming health-conscious.

Countries such as Philippines and Malaysia have been able to garner the lion's share of growth in export volumes in this segment. The volume of coconut water exports from Philippines in the first semester of 2011 alone was 7.5 million litres, a four-fold jump over 2010.

This exponential growth of export market for coconut water offers tremendous potential for Indian farmers. Currently India is a minor player in this market and exports small quantities to Asian countries. With an aim of boosting exports of packaged tender coconut water, the Union Commerce Ministry has recently provided two percent incentive to the product.

### **Desiccated coconut**

The demand for desiccated Coconut (DC) has been growing steadily in international markets, driven largely by growth in bakery and confectionary industry which consumes 60-80% of global DC production. Desiccated coconut is often used as a substitute to grated coconut in food preparations such as curries, cakes, sweets and chutneys.

### **Coconut Milk Products**

Milk products include a similar range of products to conventional dairy milk, such as low and full fat milk, cream, milk or cream powder, ice cream and more. Coconut milk is a high value use of coconut, generating over USD 300 per 1000 nut equivalent. Coconut milk is one of the largest volume high value

product, with an estimated annual market volume of 150,000 - 250,000 MT. Philippines, Malaysia, Indonesia, Sri Lanka and Samoa are the major exporters.

### **Activated Carbon**

Shell based activated carbon is extensively used in the process of refining and bleaching of vegetable oils and chemical solutions, water purification, recovery of solvents, and recovery of gold. It is used in gas masks and a wide range of filters for war gases and nuclear fall outs. There are around 18 medium sized companies in India involved in manufacturing activated carbon. The total production of activated carbon in India is around 45000 MT / annum. The present export is directed at USA, UK, Germany, Japan, France.

### **Prospects for India**

Indian coconut products are rated as premium quality products in the world. Coconut oil has a huge potential in Gulf, Europe, and America, due to presence of large ethnic Indian population. Activated carbon has been increasing its share in the bio-energy segment and the demand from USA, UK, Germany, France, and Japan has been increasing. Processed and packaged tender coconut water has an increasing demand in Gulf countries and UK. China is also a growing market for coconut and its various products. Russia is emerging as one of the major buyers of coconut oil and virgin coconut oil. Germany is an emerging market particularly for desiccated coconut powder, and coconut milk powder. Handicrafts, ice cream cups and spoons made from coconut shell are increasingly being exported to European countries and hold good potential.

*Secretary, LEDS, Edappally, Kochi*



## Relevance of Quality Standards in Global Marketing of Coconut Products

*Sreekumar Poduval\**

Quality standards are of great importance in facilitating both national and international trade. Quality standards simplify industrial transactions and improve international trade relations, which in turn creates a proper environment for trade, thus promoting industrial development.

One of the objective of standardization is to facilitate the movement of materials and products through all stages of production in any industrial activity starting from the raw material to the finished products; then to the dealer and finally to the retailers and consumers. Standards make it possible to carry on trade in an economic and efficient manner for they make possible quantitative measurement, physical and chemical analysis and manufacture of products of constant and uniform quality.

The establishment of standards is a long and tedious process. It involves proposing, devising, discussing, adopting, announcing and revising, in consultation with the trade organizations, processors, government regulatory agencies and consumer groups. The government authorities should carefully weigh the need for and the effect of the particular proposed standards or regulations. Question should be asked whether it promotes improved safety of food, whether it enhances availability of food products and whether it is feasible in terms of both industrial production and enforcement. The answers to the questions may vary from country to country due to differences in agricultural, industrial, marketing, economic or regulatory potentials and resources. In general all countries have the main objective to safeguard the well being of their people with effective food and health laws and regulations. Most countries have a Food Administrative Authority, which is widely recognized for its responsibilities and authority in establishing and enforcing standards of identity for food products.

### Issues and problems in coconut products quality

Traditional coconut products such as copra, coconut oil and desiccated coconut rely heavily on international markets for their trade. Similarly new value added coconut products like canned, frozen and spray-dried coconut milk, coconut juice etc are also dependent on foreign market. Quality control problems including the aflatoxin levels in copra and copra meal and the presence of microorganisms in other coconut products resulted in numerous complaints from buyers. Some of the major quality control issues in coconut products are follows.

#### Aflatoxin in Copra

The aflatoxin problem is one of the serious threats to the coconut industry. Poor quality copra resulting from inadequate drying, improper handling and faulty storage usually favors the growth of aflatoxin by fungi. Based on the characteristics of coconut meat and review of different types of drying methods, the international recommended procedures for producing good quality copra would be as follows:

- (1) The nuts for copra making should be mature. (11-12 month old)
- (2) Drying should be started within 4 hrs from splitting to avoid start of microbial action.
- (3) To avoid case hardening, the temperature of drying should not exceed 60° C during the first 10 hrs and should be about 55° C during the next 14 hrs.
- (4) Copra should be stored with 6% moisture level in well-ventilated areas to prevent mould growth and reduce storage losses.

#### Microbial contamination of coconut milk products

Coconut milk is an excellent medium for many kinds of microorganisms being rich in moisture, neutral in pH and rich in nutrients. On the other hand, canning

of coconut milk results in coagulation of certain constituents. Due to these technical constraints, coconut milk is favored to be preserved by freezing which requires strict sanitation practices for the safety of the product.

### **Microbial contamination of Desiccated coconut and other Coconut Convenience foods**

In the manufacture of desiccated coconut and other coconut convenience foods, the plant workers must receive extensive training in quality control aspects at every stage of processing in order to control microbial contamination. The packaged DC should be stored in well ventilated warehouses and not shipped until microbiological tests are negative for salmonella. In spite of all these provisions, exported DC is sometimes found to be rancid, discolored and clumped due to lapses in handling, processing and distribution of the product. It is therefore important to observe strict quality control in the raw materials, equipment and storage of finished product in order to produce high quality and safe product. The soapy flavor sometimes found in DC is an important defect and this causes concern among buyers. It is attributable to enzymatic hydrolysis of coconut oil, which results in the release of free fatty acids principally lauric acid which is the source of the soapy flavour. The enzymes responsible for this undesirable reaction are derived from microorganism present in the DC. The soapy flavour is readily apparent at a free fatty acid level of around 0.25 %. The occurrence of this problem in the desiccated coconut can be minimized by ensuring that only good coconuts are preserved and (b) efficient blanching of the kernel to reduce any microbial contamination. Bad odour and a "greasy feel" to the desiccated coconut are usually attributable to insufficient care being observed during transit and storage of desiccated coconut bags. In most of the developing countries, there is a lack of adequate awareness on standards in ensuring good quality and safety. The enforcement agencies are deficient and lack adequate physical and human resources in ensuring the prescribed standards.

### **Quality Improvement through Food Safety Management System (ISO 22000)**

The extent of food safety problem in India due to microbial contamination, natural toxicants and plethora of adulterants is compounded by the widespread

consumption of unsafe street foods, especially in urban areas, unhygienic environment in public catering places, and sometimes improper handling in the household. There have been reports of food contamination from industrial pollutants, non-judicious use of agro-chemicals, mainly pesticides, and use of non-permitted food colors.

The problems of food safety in coconut processing industries in India are enormous. The problems posed during transport of raw material, handling, processing, packaging, and waste disposal are considerable. There have been considerable efforts in improving food safety/quality scenario in the country by many Governmental Agencies. These include grading, certification and inspection measures such as those under AGMARK, BIS, FPO, MMPO, EIC, as well as the developmental activities of agencies like APEDA, MPEDA, Ministry of Food Processing Industries and Commodity Boards. While each one of these operates under its own legislative provisions with a clear objective, they do have a positive impact on food safety and quality, which could be further enhanced through better coordination within an integrated system. Export Inspection Council have already moved from inspection mode to quality assurance including HACCP through out the food chain coupled with appropriate monitoring. There has been a sea change in consumer awareness about food safety and consumer protection issues. Consumers seek competent and reliable source of information about their concerns in this area. They want protection measures to be scientifically based and determined in consultation with all the stakeholders. Consumer organizations give a high priority to systemic change in governmental approach through the establishment of a professionally competent and autonomous food control agency. They demand transparency and accountability in the food control system.

At present there are a number of laws, control orders, legislative and administrative directives at the central and state level, which relate to food safety. It is recognized by all the stakeholders that the current status of food control system is far from satisfactory and it has not succeeded in achieving the objectives set for it. BIS has recently launched Food Safety Management Systems (FSMS) Certification IS/ISO 22000:2005 scheme which envisages grant of FSMS Certification licence to organizations according to IS/



ISO 22000.

Food Safety is related to the presence of food borne hazards in food at the point of consumption. Food reaches to consumers via supply chains that may link many different types of organizations. One weak link can result in unsafe food that is dangerous to health. As food safety hazards can occur in the food chain at any stage, adequate control throughout the supply chain is essential. Therefore food safety is a joint responsibility of all organizations with in the food chain including, producers, manufactures, transport and storage operators, sub contractors, retail and food service outlets and service providers.



#### Highlights of IS/ISO 22000:2005

- Integrates the principles of Hazards Analysis and Critical Control Point (HACCP) system developed by Codex Alimentarius Commission. It combines the HACCP plan with prerequisite programme (PRPs) and operational PRPs.
- Requires that all Hazards that may be reasonably expected to occur in the food chain are identified, assessed and controlled.
- Can be applied independent of other management system standards or can be integrated with existing other management systems.
- Allows even small, tiny scale organizations to implement as externally developed combination of control measures.
- Intended for organizations seeking more focussed, coherent and integrated food safety management systems.
- Emphasis on prevention of food safety hazards of all types.
- Ensures compliance with legislative and regulatory requirements.
- Provides for management of potential emergency situations and accidents that can impact food safety.

#### Key elements to ensure food safety

The key elements of FSMS for managing and

reducing the risk to health resulting from operations across the food chain to final consumption are:

Interactive Communication, System Management, Prerequisite Programmes and HACCP Principles.

#### Benefits to Customers

Increased international acceptance of food products, reduces risk of product/service liability claims, satisfies customer contractual requirements, ensures safety of food products, greater health protection, demonstrates conformance to international standards and applicable regulatory requirements, helps to meet applicable food safety related statutory and regulatory requirements and ensures to compete effectively in national and international markets

*Comparison of existing quality standards of Indian coconut products with available international standards*

Presently only a few coconut products like copra, coconut oil, desiccated coconut and coconut vinegar are covered under the BIS Agmark and FPO standards. In the present scenario there are a series of value added coconut products launched in the Indian market. The products are virgin coconut oil, packed tender coconut water, coconut milk, coconut milk powder, frozen coconut gratings and other coconut convenience foods. A comparison of the available standards of coconut oil and desiccated coconut in India with the International standards is presented in table 1 and 2.

At present there is a wide variation in the quality parameters for copra, coconut oil, desiccated coconut, virgin coconut oil and other coconut products. In India, presently standards have been developed for only a few coconut products like copra, coconut oil, oil cake, desiccated coconut vinegar by BIS/Agmark/PFA. At the international level, Codex standards have been formulated only for Virgin coconut oil, DC and aqueous coconut products-coconut milk and coconut cream. APCC needs to initiate action in evolving appropriate standards for all the coconut based products which should more or less be in harmony with the prevailing national standards available in coconut producing countries.

The following suggestions could boost the trade of coconut products so as to meet the standards of

the importing countries.

1. Generating significant number of well trained scientists with sufficient knowledge in various aspects of food technology, food nutrition, food safety, laws and standards.
2. Co ordination of agencies involved in food quality, quantity and safety to avoid duplication of functions, thus increasing effectiveness.
3. Establishment of standards that should be precisely standardized carefully by those persons involved in the design, manufacture, distribution and use of the product.
4. Information campaign should be carried out so that the concerned agencies could be informed of the standards and they should be willing to enforce the same.
5. Institutions and laboratories, which are engaged in programmes to ensure food safety, should be adequately equipped to carry out necessary analytical techniques using the most modern up-to-date procedures, conforming to the highest international standards.

**Table -1 - Quality Standards for Desiccated Coconut**

Parameters	BIS	Agmark	Thai Industrial Standards	Sri lankan Standards	Codex Standards
Fat	65% min	68% max-Grade 1 64% max- Grade 11 60% max-Grade 111	60% min	65% min	55% min
Moisture	2.5% max	0.25 max	0.20 max	3.0% max	3.0% max
Ash	2.0% max	2.0% max	-	-	2.5% max
Acid insoluble ash	0.1% max	0.1% max	-	-	-
Free fatty acid (as lauric acid)	0.2 max %	0.25% max	0.3 % max	-	0.3% max
Particle size	1.4-1.0 mm-Grade 1		2.0-2.35 mm-Coarse		0.85 mm-Extra fine
	1.7-1.4 mm -Grade 11	--	1.4-2.0 mm -Medium	-	1.4 mm-Fine
	> 1.7 mm- Grade 111		< 1.0 mm- Fine		2.8 mm Medium

6. Intensive programmes of Health/Nutrition education through schools, primary health centers and media should be undertaken in order to promote hygienic habits with regard to preparation, handling, preservation and storage of foods in households to ensure food safety at the home level.
7. Food safety and nutrition should be an integral part of the national policy on food and nutrition security and continue to receive high visibility and high priority.

**Table -1**

**Quality Standards for Coconut Oil**

Parameters	BIS	Agmark	Thai Industrial Standards	Sri Lankan Standards Institute
Acid value	0.25 max	0.5 max	0.6 max	0.4 max
Moisture & Volatile matter	0.1 max	0.25 max	0.20 max	0.40 max
Refractive Index	1.448-1.449	1.4481-1.4491	1.448-1.449	1.448-1.449
Iodine value	7.5-10	7.5-10	7-11	7.5-11
Saponification number	250 min	250 min	248-264	255 min
Unsaponifiable matter	0.5% max	0.5% max	0.5% max	-
Insoluble impurities	--	--	0.05 %	-
Sp Gravity	0.915-0.920	0.915-0.920	0.915-0.927	0.92
Polenske Value	13.0 min	13.0 min	--	-
Peroxide value	--	--	3.0 milli equiv. oxygen/kg	-
Lead	5 mg/kg	-	1.5 mg/kg	-
Arsenic	0.5 mg/kg	-	0.1 mg/kg	-
Cadmium	1.0 mg/kg	-	-	-
Mercury	0.25 mg/kg	-	-	-

8. Launching of a Food Quality Literacy Movement to cover primary producers, secondary food processors, middlemen, traders and consumers.

For this purpose, appropriate networking and alliances among stakeholders and educational institutions should be promoted.

9. Primary responsibility for ensuring food safety lies with the industry. They need to upgrade their quality control systems, apply HACCP and educate consumers. Unsafe products must be withdrawn from the market and the consumer compensated monetarily either on voluntary basis or through legal action.

\* Junior Processing Engineer, CDB, Kochi-11

# Opportunities for availing assistance for coconut processing units under TMOC

Jayashree. A\*

## Introduction

Post harvest processing and value addition of coconut for effective utilization of harvested produce has become a major thrust of the coconut growing countries. Fluctuation in price of the product is mainly due to the dependency on coconut oil. Opportunities in coconut industry can be realised by focusing attention on the non-traditional products from coconut. Research undertaken and recent technological developments brought out viable technologies in the processing sector and thereby preference for processed and convenience oriented products opened the global market for value added coconut products. Priority has to be given for integrated processing for full utilization of coconut along with all other by products like husk, shell, leaf, midrib, timber etc. which will increase the overall income from coconut by farm level processing.

Under Technology Mission on Coconut (TMOC), Coconut Development Board is providing assistance for setting up of coconut based industry other than husk. The programme is being implemented by the Board since 2001-02 as a part of the ongoing programmes for integrated development of coconut industry in India to address serious problems faced by the coconut industry in a strategic manner. The implementation of Technology Mission on Coconut programme by the Coconut Development Board has helped to solve production constraints to a great extent besides developing many technologies for product diversifications and by-product utilization and their commercial adoption. Technology for the products viz virgin coconut oil and dietary fibre, packing of tender coconut water, spray dried milk powder, vinegar and other convenience foods is available with the Board on payment of technology transfer fee.

## Eligibility for availing assistance

Back-ended credit capital subsidy is provided to projects under TMOC, which are found to be technically and financially viable limited to 25% of the project cost but not exceeding Rs.50 lakhs for infrastructure development, establishment or modernization and up gradation of coconut based

processing units under the scheme. Registered societies, NGO's, entrepreneurs, individuals and any other institutions having capacity to adopt technology are eligible for this assistance. All the proven technologies in processing and product diversification are included as components under this. A detailed project report along with application and all the relevant documents has to be submitted for availing the financial assistance from the Board under the scheme. The promoter can avail subsidy from the concerned State Government agencies also but the total subsidy availed should be below 50% of the project cost altogether.

The scheme under the components Adoption of Technologies cover setting up/expansion/modernization of coconut processing units, adopting technologies for value addition and shelf life enhancement for coconut products viz. preserved and packed tender coconut water, virgin coconut oil, spray dried milk powder, desiccated coconut as well as shell powder, charcoal and activated carbon. Refinement of traditional processing methods including quality certification, micro-filtering and branding could be considered as value addition in the case of coconut oil and virgin coconut oil and considered for assistance under the scheme. In general only those works, which were undertaken, and machinery/equipments purchased after the date of submission of project to the Board shall be considered for financial assistance. All machinery/equipments procured for the project should preferably satisfy ISI standards. However, in case of fabricated machinery the materials used for such fabrication shall be of ISI specification/standard. Applications submitted to Board one year after commencement of commercial production will not be considered for financial assistance under the scheme.

## Procedure for availing assistance

The promoter has to avail at least 40% of the project cost as term loan from a bank or financial institutions of his choice. The cost of land development, construction of building, electrification, machinery, its installation, know-how fee, etc. shall be considered normally for arriving at eligible subsidy.

However civil works like guest house, staff quarters, canteen etc. shall be excluded while computing the eligible subsidy. The cost of building shall be restricted to the minimum requirement of the processing unit proposed to be established as per the ceilings worked out for each product by the Board which normally is restricted to 40% of the total project cost. Eligible plant and machinery will not include office equipments, computers, air conditioners etc. The items, contingent expenditure, cost of vehicles, working capital margin etc. shall not be considered for working out eligible subsidy.

The promoter shall display a permanent board in the premises of the unit stating that the project was established with the financial assistance from the Coconut Development Board under the scheme Technology Mission on Coconut. All the beneficiaries of the scheme should submit annual statement of accounts to the Board on a regular basis duly certified by a Chartered Accountant.

The unit shall not be entitled to any subsidy in case the project is abandoned midway or the term loan availed from the bank is closed within 3 years of availing the same. In such cases, the subsidy available in the subsidy reserve fund shall be returned to the Board by the bank/financial institution fully or as directed by the Board. All the projects having a capital investment of 100 lakhs and above shall engage qualified technical experts to ensure professional/management and technical supervision of the units. In case any foreign technology is acquired and adopted in the project, Indian Embassy/Consulate of that particular country shall vouch such acquisition/transfer of technology.

The small units should obtain AGMRK/ BIS standards for their products and bigger units should have GMP and HACCP/ ISO certification. The products should be tested periodically at Board's Quality Control Lab at Vazhakulam, Aluva, Kerala.

#### **Terms and conditions for release of subsidy**

Subsidy under the scheme shall be sanctioned by Project Approval Committee (PAC) which shall be released by way of cheque/DD favouring the subsidy reserve fund of the of the promoter with their bank/ financial institution.

Release of first installment of subsidy shall be subjected to the fulfillment of the conditions in the tripartite MOU executed between the Board, financial institution and the promoter. The release shall be time specific and in accordance with the successful

completion of different stages of approved project, limited to 50% of the eligible subsidy or first year requirement of the project, whichever is less. Fifty percent of the loan should be availed by the promoter before granting the first installment.

Upon completion of the project, the financial institution concerned shall inform Board that the project has been completed as per the guidelines of Board. A joint inspection of the unit by Bank and CDB shall be undertaken in the presence of the promoter. For release of second installment the promoter has to avail full loan sanctioned by the bank. The promoter shall submit an asset accrued statement as per the MoU duly certified by the Bank/ CA along with list of machineries and cost and building completion report by the engineer for availing second installment of subsidy.

Final payment of subsidy shall be released to the financial institution concerned on receipt of a satisfactory completion report and on stabilizing the production as per the MoU. Month wise production details for three months have to be submitted by the promoter before availing the final installment of subsidy.

The subsidy released by the Board shall be kept in Subsidy Reserve Fund account with the bank from which term loan has been availed by the unit and shall be in the joint name of the Unit and Coconut Development Board, Kochi. The bank shall ensure the repayment of the loan strictly in accordance with the mutually agreed loan repayment schedule. Even if the entire loan is repaid prematurely, bank should retain the lien on the assets offered by the promoter as security for a period of not less than 5 years from the date from which loan is availed. Before adjusting the subsidy to the loan account of the promoter from the subsidy reserve fund, the bank should seek the permission of the Coconut Development Board. Production status has to be furnished by the promoter periodically and also the annual audited statement to the Board.

The processing units on reaching commercial production can also avail market promotional assistance from Board for brand promotion, participation in fairs/ exhibitions, advertisement through electronic and print media etc. The maximum eligibility for such assistance would be Rs. 10 lakhs on reimbursement basis. For detailed information visit: [www.coconutboard.gov.in](http://www.coconutboard.gov.in).

*\*Senior Technical Officer, CDB, Kochi-11*



# Technology Mission on Coconut

Technology Mission on Coconut aims to establish a convergence and synergy among ongoing programmes of Coconut Development Board to bring about vertical and horizontal integration to ensure adequate, appropriate, timely and concurrent attention to all the links in production, processing, product diversification and marketing an dissemination of technologies in the consumption chain for the upliftment of stakeholders on coconut. Four components under TMOC are:

## I. Management of Insect Pests and Disease affected gardens

**Development of technologies:** ♦ 100% of the cost of project limited to Rs. 50.00 lakhs for ICAR(CPCRI)/ State Agricultural Universities/State Deptt. of Horticulture/ Agriculture/and cooperative sector. ♦ 50 % of the cost of project limited to Rs.25 lakhs for NGO's and other organisations

**Demonstration of technologies:** ♦ 100% of the cost limited to Rs.25 lakh projects to ICAR (CPCRI)/ State Agricultural Universities/State Dept. of Horticulture/ Agriculture/other related public sector units/Registered cooperative societies. ♦ 50% of the cost for individuals / group of farmers/NGO's, private companies limited to Rs.10 lakh.

**Adoption of technologies:** ♦ 25% of the cost of technology adoption. ♦ 25% of the cost in case of group of farmers/ NGO's/other organizations.

## II. Processing and product diversification

**Development of technologies:** ♦ 100% of the project cost limited to Rs.75 lakhs for all the Govt. institutions and cooperative societies. ♦ 50% of the project cost limited to Rs.35 lakhs for NGO's, Individual entrepreneurs and other research organizations

**Adoption of technologies:** Financial Assistance @ 25% of the project cost limited to a maximum of Rs. 50 lakhs is extended as credit linked back ended subsidy for setting up of coconut processing units for production of value added coconut products. Modernization and expansion of existing processing units will also be eligible for assistance. The detailed project for seeking assistance for setting up coconut processing unit should be submitted through the Financial Institution, willing to

sanction a minimum of 40% of the project cost as term loan for Private entrepreneurs and 25% term loan for Co-operative societies. Packed tender nut water, coconut water based vinegar, desiccated coconut powder, defatted coconut powder, coconut cream, coconut milk powder, packed and branded coconut oil with agmark standards, virgin coconut oil (VCO), coconut chips, coconut jaggery, snow ball tender coconut, shell powder, shell charcoal, activated carbon, shell/wood based handicrafts, coconut wood processing units, copra dryer, integrated processing units and such other new and innovative coconut based products, which are backed by commercially viable technologies will be considered for granting financial assistance.

## III. Market research and promotion

**Market research :** 100% of the cost limited to Rs.25.00 lakhs for Govt. agencies and cooperative societies ♦50% of the cost limited to Rs.12.50 lakhs for Individuals, NGO's and other organizations. **Market Promotion:** 100% of the cost limited to Rs.25 lakhs for Govt. agencies and cooperative societies ♦ 50% of the cost limited to Rs.10 lakhs for NGO's and private institutes. Financial assistance is provided to manufacturers for market promotion of coconut products through brand publicity through electronic media including website, print media, parlours, kiosks, warehouse, undertaking activities like buyer-seller meet, exchange of delegations, participation of exhibitions/fairs/melas, printing of leaflets, pamphlets, brochures, posters, display of coconut products at Air Ports/ Railway Stations and erection of hoardings etc. on the basis of approved proposals. The financial assistance is 50% of the project cost limited to Rs.10 lakhs for individual and Rs.25 lakhs to co-operative organizations on reimbursement basis.

## IV. Technical support, external evaluation and emergent requirements

Technical support for scrutinizing the project proposals, hiring experts from various fields as per the requirements, concurrent external evaluation and mid term corrections wherever necessary are being carried out by engaging experts/committees under this component programme. Besides, those colleges having Botany, Zoology, Bio Chemistry and Bio Technology depts can also apply for taking up the research projects of CDB.

For more details contact:

### COCONUT DEVELOPMENT BOARD

(Ministry of Agriculture, Government of India), Kera Bhavan, SRVHS Road, Kochi – 682 011, India  
Email: cdbkochi@gmail.com, Web:www.coconutboard.nic.in, Tel: Office:0484 - 2376265, 2377266, 2377267

## Project Profiles

### TENDER COCONUT WATER

#### 1. Process

Coconut Water of 6-7 month stage is first extracted from the nut using a vacuum suction device. It is then filtered through pressure filters and then mixed with the desired proportion of additives plus sugar and concentrated to the appropriate level. The water is then packed in pouches/cans and retorted in an autoclave, after which it is cooled in a stream of cold water.

#### 2. Product specification

Total solids%	-	6.5
Reducing sugars %	-	4.4
Minerals %	-	0.6
Protein %	-	0.01
Fat %	-	0.01
Acidity mg %	-	120.0
Ph	-	4.5
Potassium mg%	-	290
Sodium mg%	-	42
Calcium mg%	-	44
Magnesium mg %	-	10
Phosphorous mg%	-	9.2
Iron $\mu$ g%	-	106
Copper $\mu$ g%	-	26

#### 3. Project cost (10000 nuts per day)

• Land	-	60 cents
• Building-3000 sq ft	-	Rs.20 lakhs
• Plant & machinery	-	Rs.40 lakhs
• Electrification works	-	Rs.10 lakhs
• Preliminary & pre-operative expenses	-	Rs. 05 lakhs
• Working capital (Margin money)	-	Rs.15 lakhs

#### 4. Machinery

- Feed Conveyors for washed nuts
- Automatic boring and sucking system
- TCW collection tank
- TCW filtering unit
- Treatment Chamber
- Double Head Filling Machine
- Pouch Sealing Machine
- Can Seaming Machine
- Conveyor for filled pouches/cans
- Steam boiler
- Pasteurizer
- Thermal validation system
- UV Chamber
- Air Compressor
- Packaging machine for pouches

#### 5. Product yield

10000 coconuts would yield about 2000 litres of tender coconut water

#### 6. Internal Rate of Return - 20-22 %

#### 7. Source of Machinery

1. United Engineering Eastern Corporation, 517 Ansal Tower, 38 Nehru Place, New Delhi, Ph : 011 26429822
2. Ace pack Mac ines, 23, VN Industrial Estate, Avinashi Road, Coimbatore – 641004
3. Eeshwari Fabs, Santhepet, Tiptur-572201, Karnataka, Mob-9343210041

### COCONUT CREAM

#### 1. Process

The first step is breaking the dehusked nuts into halves. The split nuts are deshelled to separate the kernel. These two operations usually are done manually. Kernel is washed and then blanched by immersing in hot water at 80°C for 10 minutes. The next step is comminution of kernel into small gratings using a hammer mill. The gratings are subjected to pressing using continuous screw press to extract the milk. The coconut milk thus obtained is filtered by passing through a vibrating screen. Food additives like emulsifiers and stabilizers,

are to be added to the milk to obtain a stable consistency and texture. For this purpose, permitted emulsifiers and stabilizers are mixed with hot water separately and mixed thoroughly. This is added to the coconut milk and then subjected to emulsification using a mechanical impeller emulsifier. The emulsified milk assumes a creamy consistency. The coconut cream is then pasteurized at 95°C for 10 minutes in a plate heat exchanger. The pasteurized coconut cream is hot filled in cans using a mechanical volumetric filling machine followed by steam exhausting. The cans are seamed using an automatic can seamer. The seamed cans are sterilized in a rotary retort at 15 psi for 20 minutes. The cans are then cooled in running water. The residue obtained after the extraction of milk is dried in a hot air dryer to 3 per cent moisture level. The residue forms a base for making coconut burfi, coconut cookies, curry and chutney powder. Other by-products like coconut water and coconut shell could be processed into value added products. Vinegar and Nata-de-coco can be manufactured from coconut water. Shell charcoal and shell powder can be manufactured from coconut shells. The utilization of byproducts would improve the economic feasibility of the process.

## 2. Product specification

Appearance- White smooth creamy consistency

Flavour - Coconut	Sugars - 5%
Fat - 23%	others - 1%
Protein - 4%	Water - 67%

## 3. Project cost (10000 nuts per day)

Land	- 1 acre (cost variable)
• Building	- 4000 sq ft Rs.30 lakhs
• Plant & machinery	- Rs. 60 lakhs
• Preliminary and pre-operative expenses	- Rs. 05 lakhs
• Electrification	- Rs.15 lakhs
• Margin money for working capital	- Rs. 15 lakhs

## 4. Machinery

• Hammer mill	• Vibrating sieving machine
• Elevator	• Coconut residue mixer
• Screw press	• Additive mixing tank
• Coconut milk storage tanks	• Emulsifier

• Homogenizer	• Horizontal rotary retort
• Pasteurizer	• Hot air drier
• Volumetric filling machine	• Agrowaste vertical boiler
• Exhaust box	• Sterilization tank
• Can seaming machine	• Coconut residue storage bins.

## 5. Yield of products/by-products

- Raw material: 10,000 ripe green coconuts
- Coconut cream (main product) - 2,500 kg
- Coconut cream residue - 500 kg

## 6. Internal Rate of Return - 20-22 %

## 7. Source of Machinery

1. Mosons Engineering  
Dharmadam Tellichery  
Kannur, Kerala, Mob- 9388636181
2. Eeshwari Fabs  
Santhepet, Tiptur-572201  
Karnataka, Mob-9343210041
3. H & G Technomark  
Cherukunnam, Asamannoor PO  
Perumbavoor 683549, Ernakulam, Kerala

## SPRAY DRIED COCONUT MILK POWDER

### 1. Process

Coconut Milk Powder is whole coconut milk that has undergone five major processing steps: extraction of the coconut meat to get the milk, formulation, pasteurization, homogenization and spray drying. White coconut meat after removal of shell and paring is passed through a rotary wedge cutter; the grated coconut meat is pressed in a screw press to extract the coconut milk. The coconut milk is formulated by addition of 8-10 % maltodextrin as carrier. This formulated coconut milk is then pasteurised, homogenised and spray dried.

**2. Product specification***Chemical*

Moisture	- 2.5% max
Oil Content	- 65%
Free Fatty Acid (as oleic)	- 0.15% max
Free Oil	- 3% max

*Microbiological*

Standard Plate Count	- 5,000 col/g maximum
Mold Count	- 100 col/g maximum
Yeast Count	- 100 col/g maximum
Total Coliform Count	- 10 col/g maximum
Salmonella	- 10 col/g maximum
E.Coli	- 10 col/g maximum

**3. Project cost (20000 nuts per day)**

- Land - 1 acre
- Building-8000 sq ft - Rs. 60 lakhs
- Plant & machinery - Rs.175 lakhs
- Electrification - Rs. 30 lakhs
- Preliminary & pre-operative expenses - Rs. 25 lakhs
- Working capital (M money) Rs.40 lakhs

**4. Machinery**

- Hammer mill
- Elevator
- Screw press
- Coconut milk storage tanks
- Vibrating sieving machine
- Coconut residue mixer
- Additive mixing tank
- Emulsifier

- Homogenizer
- Pasteurizer
- Volumetric filling machine
- Exhaust box
- Can seaming machine
- Horizontal rotary retort
- Spray drier
- Agro waste vertical boiler
- Sterilization tank
- Coconut residue storage bins

**5. Product Yield**

20000 coconuts would yield about 1000 kgs of coconut milk powder

**6. Internal Rate of Return - 22-24 %****7. Source of Machinery**

1. United Engineering Eastern Corporation  
517 Ansal Tower, 38 Nehru Place  
New Delhi, Ph : 011 26429822
2. Kilburn Engineering Ltd  
6, MIDC Industrial Area, Saravali,  
Kalyan Bhiwandi Road, Thane 421 311  
Maharashtra, India  
Tel. : 02522 241800, Fax. : 02522 280346
3. Filtron Engineers Limited  
"Filtron House" 124/3 Vitthalwadi Road,  
Pune 411-030 (MH) INDIA.  
Tel : +91-20-4338643/44/45, Fax : 020-4337913
4. GEM Group of Companies  
10/C Middleton Row, 3rd Floor  
Kolkata - 700 071, Ph : 033-22177328

**DESICCATED COCONUT\*****1. Process**

The 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 to remove the invert sugars from the inner surface of the kernel. The kernel is then ground into a fine mass using hammer or pin mills. The ground mass is blanched with live steam for about 20 minutes to bring down the microbiological counts. The blanched mass is then dried in hot air drier at a temperature of 80-90°C for about 10 hours so as to bring down the moisture content to below 3 per cent. The hot air drier is provided with a drying chamber consisting of a series of trays, which hold the feed. Hot air is blown into this chamber from an external source through blowers. The dried mass is tested for moisture, free fatty acid and microbiological counts. The product is packed in polythene pouches. \*The cash estimates and returns are variable.

**2. Product specification (IS: 966-1975)**

- Moisture, per cent by mass - Max. 3.0
- Fat, per cent by mass - Min. 65.0
- Fat acidity, as lauric acid - Max. 0.3

**3. Project cost (OneTon/Day capacity)**

- Land (cost variable) - 50 cents
- Building 2000 sq. ft. - Rs.15 lakhs
- Plant & Machinery - Rs. 20 lakhs



- Preliminary and pre-operative expenses - Rs.5.00 lakh
- Electrification - Rs. 5.00 lakhs
- Working capital (M Money) - Rs.10.00 lakhs

#### 4. Machinery

- Washing tank with spray arrangement
- Hot dip blancher tank
- Disintegrator provided with screens and aluminum trays
- Hot air tray drier with blower
- Sieving machine
- Storage bins
- Heat sealing machine

#### 5. Product Yield

- Raw material 10,000 coconuts
- Desiccated coconut 1 tone

#### 6. Internal Rate of Return - 18-20 %

#### 7. Source of Machinery

(1) Gardeners Corporation, 6 Doctors Lane, Near Gole Market, Post Box 299, New Delhi - 110 001. (2) Vivega Engineers, 143-C, Nava India Road, Coimbatore - 641 007. (3) Padmanabh Corporation, No.69, Lake view Road, Kamakoti Lane, West Mambalam, Madras - 600 033. (4) Premier Engg. Products, 3rd floor, C.R.C. Building, M.G. Road, Cochin - 682 011. (Dryer) (5) Heat Flow Engineers, Plot 305, Netaji Nagar, Perungudi, Madras - 600 096. (Dryer) (6) Bedi & Bedi Pvt. Ltd., 11/13, 1st Main Road, Jawaharlal Extension, Bombay-560 046. (Dryer) (7) Kilburn Engineering Ltd., Subhash Nagar, Bandra, Bombay - 400 078 (Dryer) (8) Package India, W-115A, 111 Avenue, Anna Nagar, Madras - 600 040. (Packaging machine)

### VIRGIN COCONUT OIL

#### 1. Process

Coconuts are deshelled followed by paring. Pared coconuts are disintegrated by passing through a hammer mill/disintegrator where shredded coconut gratings are forced out. The disintegrated coconut gratings are pressed in a screw/hydraulic press to extract fresh coconut milk. The coconut milk is filtered and passed through a high speed centrifuge wherein the coconut oil gets separated from the coconut milk. The coconut oil is then packed in consumer packs in an automatic packing machine.

#### 2. Product specification

Free fatty acids	0.5 max
Moisture & Volatile matter	0.25 max
Refractive Index	1.4481-1.4491
Iodine value	4-11
Saponification number	250-260
Unsaponifiable matter	0.2-1.5% max
Sp Gravity	0.908-0.921
Polenske Value	13.0 min
C 6:0-0.4-0.6 %, C 8:0-4.6-10 %, C 10:0-5.5-8.0 %, C 12:0- 45.1-50.3 %, C 14:0-16.8-21.0 %, C 16:0-7.5-10.2 %, C 18:0- 2.0-4.0 %, C 18:1-5.0-10.0 %, C 18:2- 1.0-2.5 %, C 18:3- 0-0.2 %	

#### 3. Project cost (OneTon/Day capacity)

- Land - 40 cents
- Building 3000 sq ft - Rs. 20 lakhs
- Plant & machinery - Rs. 35 lakhs
- Electrification works - Rs. 10 lakhs
- Preliminary & pre - operative expenses - Rs. 05 lakhs
- Working capital (Margin money) - Rs.10 lakhs

#### 4. Machinery

• Hammer Mill/Disintegrator • Blanching Tank • Screw conveyor • Screw Press • Vibratory Screen • Collection Tank - Milk • Milk feed Tank • Tubular Centrifuge • Oil Collection Tank • Hot Air Dryer for Partially defatted coconut powder/granules • Packing machine with Compressor & Packing line • Pumps and Accessories • Piping & accessories

#### 5. Product Yield

- 10000 coconuts would yield about 600 Kg of virgin coconut oil

#### 6. Internal Rate of Return - 18-20 %

#### 7. Source of Machinery

1. Mosons Engineering, Dharmadam Tellichery, Kannur Kerala Mob- 9388636181, 2.Eeshwari Fabs,Santheper, Tiptur-572201, Karnataka Mob-9343210041, 3.H & G Technomark, Cherukunnam, Asamannoor PO,Perumbavoor 683549, Ernakulam, Kerala

## Drink tender coconut water easily

Sona John\*

The tender coconut water, the wholesome natural beverage is mostly sold on the road sides and there is no means to sell the same inside the offices and buildings as the process of cutting the tender coconut is a tedious, hazardous and risky job and it needs special skill. Tender Coconut water is an unadulterated, natural, medicinal, drink for all peoples.

Shri. Subramani Pandiaraj, a mechanical engineer and an M Tech holder in design was once admitted in a nature cure home where he was given tender coconut water as a basic drink. The idea of designing an easy means for punching and splitting tender coconut was in his mind since then. He was having to his credit more than 20 years of experience in product design. He thought it was worthwhile to do some innovative products which will be useful to the society.

It was at this juncture that he was also asked by Shri. Prabhakar of BG Farms, Anamalai, Pollachi to redesign the technology he was already having to pierce tender coconut.

**Even when we know that tender coconut has all the natural health benefits, we go in for soft drinks to quench our thirst as tender coconuts are not easily available. For 100 soft drink outlets there are only 3 to 4 tender coconut outlets. Shri. Pandiaraj feels that this is because of the non availability of experienced persons to cut open the tender coconut.**

splitting, coconut splitting and dehusking.

The punch cum splitter developed by Shri. Pandiaraj is a simple device that is easy to operate and do not require any special skills.

He is hopeful that with this device, it is definitely possible to increase the retailing outlets, thereby increasing the availability of tender coconuts and increasing the consumption and the market of tender coconut. This device can be easily used at shops, canteen, theatres, colleges, industries, bus stands, hospitals, railway stations, airport, park, exhibitions, marriage functions, etc.



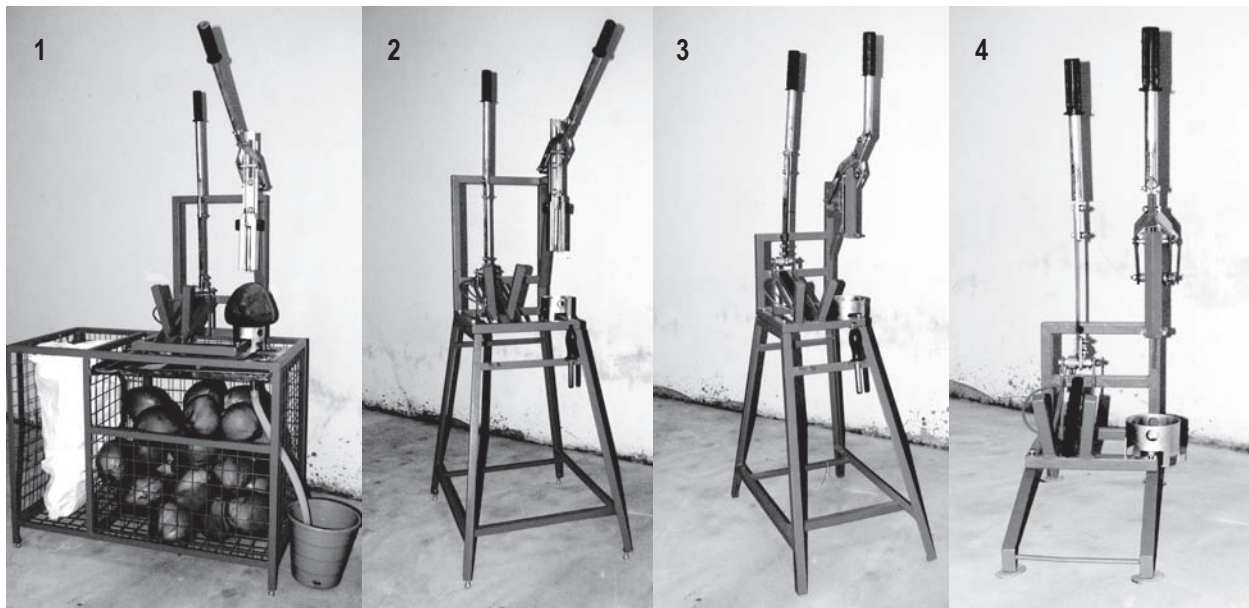
*Operating the punch cum splitter*

Based on their inputs he designed the Punch Cum Splitter and the same was launched in Agri Intex 2010 in CODISIA, Coimbatore.

Since its introduction, Shri. Pandiaraj has made many alterations in the product based on its field input and failures. Once the product was accepted, requests came for a low cost product, which triggered the development of Handy Punch Cum Splitter. The Economy Punch Cum Splitter is the economy version of Punch Cum Splitter and the Table Top Punch Cum Splitter is the economy version of Handy Punch Cum Splitter. Based on the market inputs, he is in the process of developing machines for dry coconut

Shri. Pandiaraj has also designed a tender coconut opener which can easily make a hole on tender coconut, to consume its water. This is a very simple and handy device that we can use even at home.

The punch cum splitter has a container at the base which has two compartments, one to store tender coconuts and the other with bag holding hooks for storing consumed tender coconuts. On the top of the container the punching and splitting mechanism is placed. The piercing tube is moved up and down using a manually operated lever. The punching mechanism has a locking device to hold the tender coconut when pulling the piercing tube from the tender



1. Punch cum splitter, 2. Economy punch cum splitter, 3. Handy punch cum splitter, 4. Table top punch cum splitter

coconut. The locking device has one fixed base and two sliding parts. After piercing the tender coconut, till the inner slider touches the top of the outer slider, the outer slider will lock the tender coconut and after that it will be lifted along with the inner slider. Depending upon the size of the tender coconut, the outer slider will be locked to the near by square teeth in the fixed base. A ring is provided at the base to the center of the punching pipe. Tubular adjuster is provided inside the ring to accommodate the various sizes of tender coconut.

The splitting is done using a stainless steel blade fitted with extended lever. The base of the splitting blade is placed at certain angle to transfer the cutting load to the center of the frame. A stopper is provided perpendicular to the base frame to place the tender coconut in a balanced position. One tray is provided at bottom of the top unit to collect the water spilling out of the tender coconut.

The tender coconut opener is another tool designed to make a hole on top of the tender coconuts to drink the water. It is made from a 19mm OD 0.6 mm stainless steel tube which was moulded with an ergonomically designed plastic handle.

The end of the stainless steel is having a cutting profile like a reversed saw tooth with sharp cutting edge along the periphery. In clockwise rotation, it will have smooth

cutting edge which will cut the soft tender coconut fibers and not pull the fibers. In anticlockwise rotation, it will cut the hard shell like a sharp saw tooth.

The tender coconut opener is having a plastic moulded stem in the middle of the tube for pushing out the material inside the tube, after opening the tender coconut.

In the top end of the stem it has snap fit such that it will lock to safeguard the sharp cutting edge during accidental falling and avoid contact to the fingers when not in use.

Shri. Pandiaraj has designed and developed full cycle projects in Sweeper, Scrubber Drier, Vacuum Cleaner, High Pressure jet Cleaner, Vegetable Cutting equipment and Tender Coconut machines. He also has at his credit one US Patent in Vacuum Cleaner design (D528, 256). He has applied for two Indian patents for Tender Coconut machines He has also designed and developed various re-engineering and reverse Engineering products



Shri. Pandiaraj (right) with the punch cum splitter; Shri. D.P. Prabhakar of DG Farm is also seen

For more details contact: Subramani Pandiaraj, 6/4, Abirami Nagar, Bharathiyar Road, Ganapathy, Coimbatore - 641006, Phone: +91 422 2531054, +91 9894949506, E-mail: apexdesigncenter@gmail.com. Distributor Kerala: V.P. David, Phone: 9946748333.

CDB, Kochi -11



## Farm Journalists' Meet held

Coconut Development Board organised a farm Journalist Meet at the Head Office of the Board on 16<sup>th</sup> November 2011. Senior officials of the Board have had interaction with representatives of various of print and audio visual media. Shri. T K Jose IAS, Chairman of the Board made a presentation of the various programmes of the Board. Under the Replanting and Rejuvenation programme, Board has spent Rs. 40 crores for cutting and removal of 6.60 lakh old, senile and disease advanced palms. He further spoke on accelerating the export of coconut products from the country and also on formulating Coconut Producer's Societies.

Dr. Mohan Kumar, Director of the Bio technology department of the School of Communication and Management Studies who took part in the workshop spoke on the project of developing low fat



*A view of the Farm Journalist's Meet*

cream from coconut. The cream is developed from tender coconut at its eighth month stage, when the proportion of the fat in coconut is low. When the mature coconut has as much as 44 per cent of fat, it is just 4 per cent at eight months. This cream which can be consumed even by diabetic patients can be used for making various food products like ice cream. In

his concluding remarks Shri. T. K. Jose IAS informed that Board will undertake farmer friendly projects and will also encourage those who are coming forward with novel coconut products and projects. Dr. K Muralidharan, Director, Dr. T I Mathewkutty, Dr. Remyan Gopalakrishnan and Shri. Rajeev P George Deputy Directors of the Board spoke on the occasion.

## Chandigarh Fair 2011

Coconut Development Board participated in Chandigarh Fair 2011 from 20<sup>th</sup> to 24<sup>th</sup> October 2011 at Parade ground, Chandigarh. The exhibition was organized by Confederation of Indian Industry Northern Region, with the support of Government of Punjab and Haryana. Shri Shivraj V.Patil, Governor of Punjab inaugurated the exhibition. A number of centre/state departments and NGOs participated in the exhibition. Shri Shivraj V.Patil also visited the Board's stall.



*Shri Shivraj V.Patil, Governor of Punjab in the Board's stall*

## Board observed Vigilance Awareness Week

Coconut Development Board observed Vigilance Awareness Week 2011 from 31<sup>st</sup> October to 5<sup>th</sup> November 2011. Central Vigilance Commission has desired that the focus of observing vigilance awareness period this year

Chairman, Coconut Development Board read out the oath to the employees of the Board on 31<sup>st</sup> October 2011. The valedictory session was held on 4<sup>th</sup> November 2011. . Shri. T K Jose IAS in his presidential address called upon

transaction. Shri. Manoj Chandran I T S, Chief Vigilance Officer, Cochin Port Trust was the chief guest of the function. He spoke on the need for being transparent and vigilant in official procedures. Dr. K Muralidharan, Director, CDB



*Shri. Manoj Chandran ITS delivering the address. Shri. T K Jose IAS and Dr. K Muralidharan are seen.*

is participative vigilance through active involvement of all stake holders as the fight against corruption cannot be won in isolation. Shri. T K Jose IAS,

the employees that effective utilization of money, natural resources and time will pave the way for good governance. He emphasized the need for quality

delivered the welcome address and Dr. Remany Gopalakrishnan, Deputy Director, CDB proposed a vote of thanks.

### Global Agri Connect- 2011

Coconut Development Board participated in Global Agri Connect- 2011 from 14<sup>th</sup> to 16<sup>th</sup> October 2011 at IARI Campus, Pusa, New Delhi. Shri Harish Rawat, Union Minister of State for Agriculture inaugurated the exhibition. Agriculture Industries including central/state departments and NGOs from various sectors like agriculture, horticulture, food, and cottage industries participated in the exhibition. The exhibition and farmers fair was organized by National Skills Foundation of India. Shri Harish Rawat visited the Board's stall. Board displayed various value added coconut products and handicrafts.

### National Convention and Seminar held

A national convention and seminar organised by the All India Coconut growers' federation was held at Andhra Bhavan, New Delhi on 29<sup>th</sup> and 30<sup>th</sup> August 2011. Shri. Harsha Kumar, Member of Parliament (LS) inaugurated the convention. Shri Kiran Kumar Reddy, Chief Minister, Andhra Pradesh and Prof. KV Thomas, Union Minister of Consumer Affairs, Food and Public distribution spoke on the occasion. Dr. Ravi Prakash, Deputy Director,

CDB MDIC, New Delhi made a presentation on Good Agricultural Practices in coconut garden, product diversification and marketing of coconut products during the seminar. M/s. Subhiksha Coconut Producer Society, Kerala had its sales cum display counter in the exhibition held as part of the convention. A variety of coconut products were available for sale which attracted farmers from different parts of the country. Board displayed various value added coconut products.

## Ente Thengu - Elocution competition held

P Nithin Raj of Durga Higher Secondary School, Kanjagad, Syril S Prasad of St. Thomas English Medium High School, Pandalam and J Mahalakshmi of Vimalahridaya Higher Secondary School, Kollam won the first place in the state level elocution competition conducted by the Mathrubhumi Vidya in association with Coconut Development Board. The competition conducted for Upper Primary, High School and Higher Secondary schools could create awareness among children on coconut farming as well as the goodness of coconut. The young generation stressed the importance of agriculture in the present era and expressed their concern on the present environmental problems.



Winners of the elocution competitions with Shri. M.P. Gopinath and Shri. S. Krishnankutty, Deputy Editors, Mathrubhumi, Dr. Remany Gopalakrishnan, Deputy Director, CDB, Shri. M. Thomas Mathew, CCDO, CDB and Shri. S. Unnikrishnan, DFO, Ernakulam

Around 3000 students from across the state took part in the competition. Shri. M Thomas Mathew, Chief Coconut Development Officer, Coconut Development Board was the chief guest of the valedictory function held at Kochi on 3<sup>rd</sup> November

2011. He distributed prizes to the state level winners. Dr. Remany Gopalakrishnan, Deputy Director, CDB and Shri. S Unnikrishnan, DFO, Ernakulam offered felicitation. Shri. S Krishnankutty, Deputy Editor, Mathrubhumi presided over.

## Management Academic Institutions coming forward for mentoring CPS

Coconut Development Board is making tie up with academic institutions for the research and development of good quality hybrid

and opportunities of the first 100 Coconut Producers' Societies in Ernakulam district. Rajagiri will be assisting in vision building, business



A view of the meeting of CDB with Rajagiri College of Management and Applied Sciences

seedlings, pest and disease control, value addition, mechanization and extension activities. Rajagiri College of Management and Applied Sciences, Kochi is associating with Board for creating leadership, communication

plan and in project assistance. It is expected that the association with management institutes will equip the farmers for making coconut farming profitable by availing the assistance extended by various agencies like CDB and

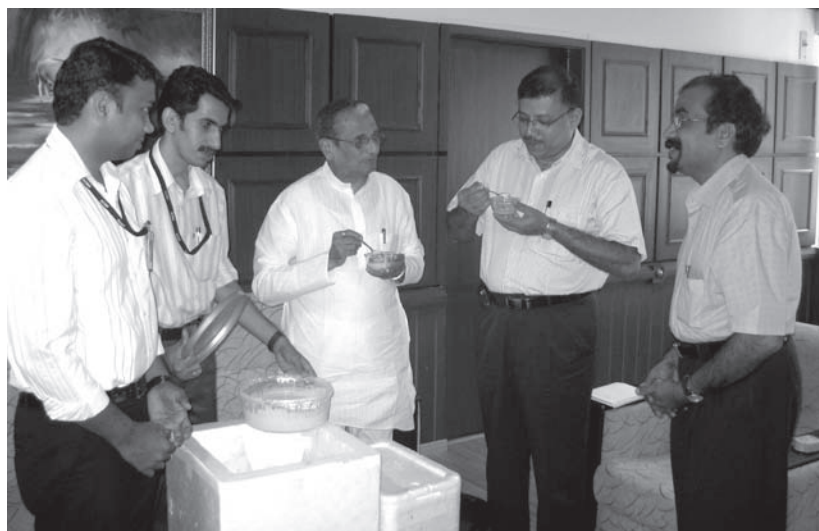
SFAC. A meeting of senior officials of the Board and the School of Management Studies was held at Kochi on 18<sup>th</sup> November 2011. Shri. T K Jose IAS, Chairman, Coconut Development Board made a presentation on the opportunities for tie up with the institute in selected areas with particular focus on mentoring CPS and Producer Companies.

Coconut Development Board is interested in associating with other management institutes across the state for mentoring CPSs. Interested institutes may contact; Dr. K Muralidharan, Director, CDB (9496119103) or K S Sebastian, Assistant Marketing Officer, CDB (9446211460).



## Low fat coconut cream developed for the first time in India

Biotechnology Department of the School of Communication and Management Studies, has for the first time in India developed low fat cream from coconut. A team headed by Dr. Pramod, Director, SCMS and Dr. Mohan Kumar, Director, Department of Bio Technology, SCMS held discussion with CDB officials on the proposed project 'Low fat nutritionally rich delicious fresh tender coconut cream'. Samples of two types of ice creams made out of coconut cream was presented before the officials of the Board and media in the Farm Journalists workshop held at Kera Bhavan on 16<sup>th</sup> November 2011. The cream is developed from tender coconut at its eighth month stage, when the proportion of the fat in the kernel



*Shri. Vasantha Vishnu Limaye, Board Member and Shri. T.K. Jose IAS tasting the coconut cream. Dr. Mohan Kumar is also seen*

is low. When the mature coconut has as much as 44 per cent of fat, it is just 4 per cent at eight months. The fat level of this cream is lower than cow milk. The product will

take two more years for it to be used for commercial production on a large scale and for export.

## Parliamentary Committee reviewed the progress of official language implementation of CDB

The 2<sup>nd</sup> sub-committee of Parliament on Official Language reviewed the progress of the official language implementation of the Board on 29<sup>th</sup> October 2011 at Kochi. Dr. Prasanna Kumar Patasani, M.P.(Lok Sabha) was the convener of the sub committee and Sh.Kishanbhai V.Patel, M.P.(Lok Sabha) Shri.Y.P.Trivedi, M.P.(Lok Sabha) were members. Dr. L.R.Yadav, Officiating Secretary, Dr. S.P.Shukla, Under Secretary, Shri.Sanjeev Chopra, Joint Secretary(NHM), Ministry of Agriculture and Shri. Mohan Singh, Joint Director(OL), Ministry of

Agriculture also took part in the meeting. The Board was represented by Shri.T.K.Jose IAS, Chairman, Shri.M.Thomas Mathew, CCDO, Dr. A.K. Nandi, Secretary, and Dr. V.K. Kanakalatha, Hindi Officer. Shri.T.K.Jose IAS made a presentation on the activities and achievements of the Board in Official Language implementation. A display of Hindi publications and awards obtained by the Board for the effective implementation of official language was made on the venue of the meeting.

## OBITUARY



P.M. Muhammedkutty (59) employee of Coconut Development Board expired on 30<sup>th</sup> October 2011. He joined the service of the Board on 1<sup>st</sup> April 1982. A condolence meeting was held at Kera Bhavan on 31<sup>st</sup> October 2011 to mourn the sudden demise of P.M. Muhammedkutty.

## Monthly operations in coconut gardens

December

**Andaman & Nicobar Islands:** Pile up soil into mounds in sandy and loamy soils. Hoe or plough in other types of soils.

**Andhra Pradesh:** Spray young seedlings affected with black-headed caterpillar (*Opisina arenosella*) with 0.05 per cent malathion or phosalone or 0.02 percent dichlorvos on the lower side of the leaves. Release stage specific parasites like Bethyloid, (*Goniozus nephantidis*) for 3rd larval stage and Chalcidid (*Brachymeria nosatoi*) for early pupal stage. Larval parasitoid Braconid (*Bracon hebetor*) an pupal parasitoid Ichneumonid (*Xanthopimpla punctata*) can also be used as promising parasitoids. In multistage 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. Treat red palm weevil affected palms by injecting 0.1 per cent dichlorvos or one per cent carbaryl. Depending on the intensity of pest infestation about 1-1.5 litres of insecticide suspension may be required for one palm. In the case of crown damage, the damaged tissues have to be removed and the insecticide suspension may be poured in. When pest entry is through the trunk all the holes on the stem may be plugged with cement or plaster of paris to avoid further damage of the tree from the pest attack. Harvest cowpea, raised as an inter

crop in coconut garden. Plough the land and leave it fallow.

**Assam:** Irrigate the garden. Collect seednuts from selected mother palms and store them in shade in a cool, dry place. If rat damage is noticed organize a planned group action in the whole locality covering the residential houses and surrounding crop field including coconut and other horticultural gardens. Use poison baits, traps, etc. against rats. Fixing rat cones made of tin sheets on the trunk at a height of 2m above the ground will prevent the entry of rats on the palm. Clean the crowns of the palms periodically.

**Bihar / Madhya Pradesh/ Chhattisgarh:** Start irrigation depending upon the need. Keep the newly planted pits and basins of the palms weed free and remove the soil from collar region of the seedling. Protect young palms from winter scorching by providing suitable shade. Raise winter vegetable suited to the locality. Apply blitox @ 5g/ litre or dithane M-45 @ 2g/litre at the crown and bunches alternatively to avoid secondary infections due to cold injury and continue upto February. Check the palms for termite attack. Drench the soil with 0.05 percent chlorpyrifos twice at 20 to 25 days interval. The affected trunk may be swabbed with the above chemical. Do not cut the green leaves and other living plant parts.

**Karnataka:** Irrigate young seedlings. Keep the nursery free of weeds and continue discarding of poor seedlings. If the attack of the mite is noticed, spray neem oil - garlic - soap emulsion 2 percent (20 ml neem oil + 20 gm garlic emulsion + 5 gm soap in 1 litre water) or azadiractin 1 per cent @ 4ml per litre or root feed azadiractin 5 per cent @ 7.5 ml with equal quantity of water. Collection of seednut from selected mother palm may be continued.

**Kerala/Lakshadweep:** Mother palms may be selected during the month for the collection of seednuts. Level down the mounds piled up earlier in the coconut garden. If the garden soil is sandy, add clay and if it is clayey add sand around the palms to improve the soil structure. Clear the irrigation channels. Clean the crowns of the palms periodically. Shade the newly planted and young seedlings. Apply sevidol 8G (25g) + fine sand (200 g) per palm in the topmost 2-3 leaf axils against rhinoceros beetle and red palm weevil. Apply one-fourth of the recommended dose of fertilisers in the irrigated gardens. If mite infestation is noticed clean the crowns of the palms and spray neem oil - garlic - soap emulsion 2 percent (20 ml neem oil + 20 gm garlic emulsion + 5 gm soap in 1 litre water) or azadiractin @ 4ml per litre or root feed @ 7.5 ml with equal quantity of water.

**Maharashtra/Goa/Gujarat:** Plant yams as intercrop in the pits

of 75 cm diameter and 15 cm depth spaced 100 cm apart. Before planting, fill the pits with farm waste and burn them. Level down the mounds piled up earlier in the garden.

**Orissa:** Seasonal intercrops may be sown. Irrigate coconut and the intercrops. Incorporate green manure. Coconut basins may be mulched with coir pith/ husk etc.

Plant protection chemicals may be applied according to the pest/disease. If the attack of eriophyid mite is noticed root feed azadirachtin 5 per cent @7.5 ml with equal quantity of water. Clean

the crown. Continue other maintenance operations to the intercrops as well as coconut.

**Tamil Nadu/Puducherry:** Treat all manure pits with carbaryl 50wp @ 0.01 per cent to destroy the grubs of rhinoceros beetle. Start irrigating the young seedlings. Keep the nursery free of weeds and continue discarding poor seedlings. Select mother palms for seednut collection. In areas where mite infestation is noticed, spray neem oil - garlic – soap emulsion 2 percent (20 ml neem oil + 20 gm garlic emulsion + 5 gm soap in 1 litre water) or azadiractin 1 per cent @ 4ml per litre especially on

the perianth region of buttons and affected nuts or root feed azadiractin 5 per cent @ 7.5 ml with equal quantity of water.

**Tripura:** Irrigate the palms. Mother palms may be selected during the month for collection of seednuts for next year. Partial shade should be provided in south-west direction to the newly planted seedlings to prevent scorching.

**West Bengal:** Start harvesting of nuts. Treat the manure pit. Keep the nursery free from weeds. Continue discarding of poor seedlings. Irrigate the nursery once in a week.

## Major Coconut Producing Countries of APCC

### MALAYSIA

#### A. GENERAL INFORMATION

1. Capital	: Kuala Lumpur
2. Total Area (Sq. Km)	: 329,961
3. Population (Million)	: 27.73
4. Gross Domestic Product (Rp Billion)	: 504,408
5. Currency Unit	: Ringgit Malaysia (RM)
6. Exchange rate to US\$ (Average)	: Rp. 3.33

#### B. COCONUT INDUSTRY

1. Area Under Coconut (Million Ha)	: 0.115
2. Total Coconut Production	
2.1. - In Million Nuts Equivalent	: 390
2.2. - In Copra Equivalent (Million MT)	: 0.078
3. Estimated Domestic Consumption	
3.1 -In Million Nuts Equivalent	: 418
3.2. -In Copra Equivalent (Million MT)	: 0.096
4. Export Volume (MT)	
4.1 -Fresh Coconuts (in '000 Nuts)	: 23,559
4.2. Copra	: 1,503
4.3. Coconut Oil	: 297,007
4.4. Copra Meal	: 3,960
4.5 Desiccated Coconut	: 6,601
4.6 Coconut Milk Powder	: 5,006
4.7 -Activated Carbon	: 15,076
4.8 -Fibre & Fibre Products	: 1,738
5. Total Coconut Export Value (Million RM)	: 700
5. Total Export Value (Million RM)	: 663,494
6. Percentage Contribution to National Export Earnings (%)	: 0.11

The Asian and Pacific Coconut Community (APCC) is an intergovernmental organization organized in 1969 under the aegis of the United Nations of the Economic and Social Commission for Asia and the Pacific (UN-ESCAP). The APCC has 17 coconut producing member countries accounting for over 90% of world coconut production and exports of coconut products.

The APCC member countries include: Federated States of Micronesia, Fiji, India, Indonesia, Jamaica, Kiribati, Malaysia, Marshall Islands, Papua New Guinea, Philippines, Samoa, Solomon Islands, Sri Lanka, Thailand, Tonga, Vanuatu, and Vietnam. Jamaica is an associate member of the APCC. An introduction on Malaysia is given in this issue.





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## Market Review October 2011

### Highlights

- ◆ The price of milling copra, ball copra and coconut oil expressed a downward trend at all the major markets during the month under report.
- ◆ The international price of coconut oil expressed a downward trend during the month under report. The domestic price of coconut oil at Kochi market was about 39 percent higher than that of the international price.

### COCONUT OIL

The price of coconut oil quoted at all the major marketing centres in the country expressed a downward trend during the month under review. The weekly average prices at Kochi market varied between Rs.7650 and Rs.8450 per quintal. The monthly average price of Rs.8031 per quintal was about 9 percent lower than the price in September 2011 and was higher by about 16 percent when compared with the price in October 2010.

The price of coconut oil at Alappuzha market also moved in tune with the price behavior at Kochi market. The weekly average prices ranged from Rs.7700 to Rs.8400 per quintal.

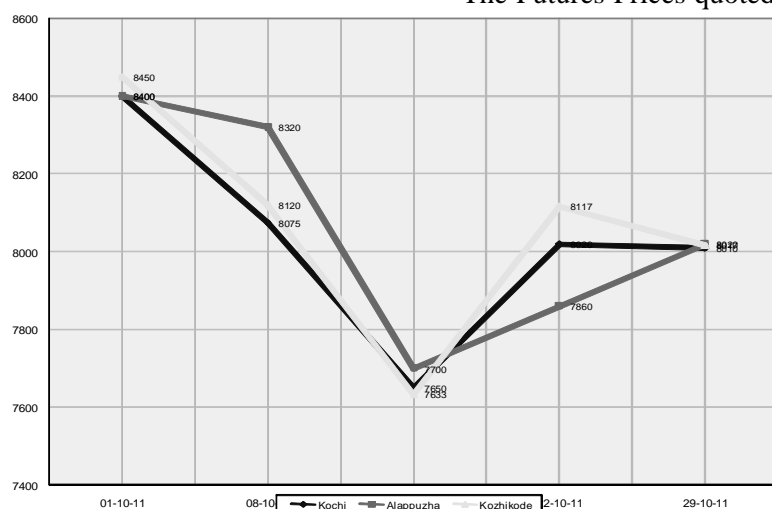
The weekly average prices of coconut oil at Kozhikode market, varied between Rs.7633 and

Rs.8450 per quintal. The monthly average price of Rs.8067 per quintal was about 11 percent lower than the price in September 2011 and about 13 percent higher than that of the corresponding month last year.

It is reported that the North Eastern monsoon along the coconut growing regions of Tamil Nadu may hamper the harvest operations.

The monthly average price of coconut oil at Kochi market projected by the First Commodities Exchange of India Ltd. for the month of October 2011, during July'11, August 2011 and September 2011 were Rs.8721, Rs.9154 and Rs.8684 respectively, while the average spot price ruled at Kochi was Rs.8031 per quintal.

The Futures Prices quoted for



Price behaviour of coconut oil during October 2011

November, December and January during October by the First Commodities Exchange of India were at Rs.8065, Rs.8073 and 8077 respectively.

### MILLING COPRA

The weekly average prices of FAQ copra at Kochi market ranged from Rs.5167 to Rs.5650 per quintal. The monthly average price of Rs.5423 per quintal was about 7 percent lower than that of the previous month and about 12 percent higher than that of the corresponding month last year. The weekly average prices of Rasi copra at Alappuzha market varied between Rs.5108 and Rs.5700 per quintal. The monthly average price of Rs.5285 for Office Pass copra at Kozhikode market was lower by about 9 percent when compared with the price in September 2011 and higher by about 11 percent when compared with the price in October 2010.

The weekly average prices of milling copra at Ambajipeta market in Andhra Pradesh ranged from Rs.4600 to Rs.5300 per quintal.

### EDIBLE COPRA

The weekly average prices of Rajapur copra at Kozhikode market varied between Rs.8100 and Rs.8317 per quintal. The monthly average price of Rs.8186 per quintal was marginally higher than that of the previous month and about 51 percent higher than that of the corresponding month last year.

The weekly average prices of ball copra at Kozhikode market varied between Rs.7300 and Rs.7450 per quintal. The weekly prices of ball copra at APMC market Tiptur, in Karnataka varied between 6526 and 6697 per quintal. The monthly average price of Rs.6736 per quintal in September 2011 slid to Rs.6638 in October 2011.

The weekly average prices of ball copra at Bangalore market ranged from Rs.6700 to Rs.6800 per quintal. The weekly average price of Ball copra at Arsikere APMC market varied between Rs.6500 and 6600 per quintal.

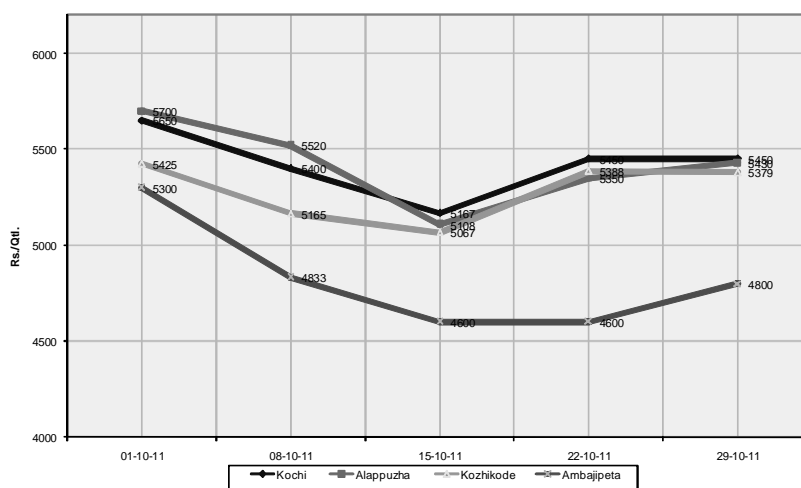
### DRY COCONUT

The monthly average price of Rs.7365 per thousand nuts for dry coconut at Kozhikode market was about 9 percent lower than that of the previous month and about 90 percent higher than that of the corresponding month last year.

### COCONUT

The monthly average price of Rs.7000 per thousand nuts for dehusked coconut at Nedumangad market was about 22 percent lower than that of the previous month and about 26 percent higher than that of the corresponding month last year.

The monthly average price of partially dehusked coconut at Arsikere APMC market in October 2011 declined to Rs.6600. The weekly average prices of partially dehusked coconut at Bangalore APMC market ranged from Rs.6000 to Rs.6700 per thousand nuts. The monthly average price of partially dehusked coconut Grade-1 quality at Mangalore APMC market in October 2011



Price behaviour of milling copra - October 2011

declined to Rs.9827.

### TENDER COCONUT

The weekly average prices of tender coconut at Kochi market ranged from Rs.18 to Rs.20 per nut.

### INTERNATIONAL PRICE

The monthly average price of US \$1165 per MT for coconut oil in Europe (C.I.F. Rotterdam) for the month of October 2011 was lower by about 12 percent when compared with the price of the previous month and lower by about 18 percent compared to that of the corresponding month last year. The monthly average price of US\$ 773 per MT for copra was about 13 percent lower than that of the

previous month and about 18 percent lower than that of the corresponding month last year. The domestic price of US\$1625 for coconut oil at Kochi market was about 39 percent higher than that of the international price.

The domestic price of coconut oil during the month of October, in Philippines was US\$1105 per MT and in Indonesia; the price was US\$925 per MT. The international price of Palm oil, Palm kernel oil and Soybean oil were US\$1000, US\$1150 and US\$1235 per MT respectively, while the price of coconut oil in international market was US\$1165 per MT and the domestic price in India was US\$1625 per MT.

### Market Price

Date	Coconut Oil			Milling Copra				Edible Copra	Ball Copra					Dry coconut	Coconut	Partially dehusked coconut		
	Rs./Qtl.																	
	Kochi	Alappuzha	Kozhikode	Kochi (FAQ)	Alappuzha (Rasi Copra)	Kozhikode	Karkala	Kozhikode	Kozhikode	Tiptur	Bangalore	Arsikere	Kozhikode	Nedumangad	Arsikere	Bangalore	Mangalore (Grade-1)	
01-10-11	8400	8400	8450	5650	5700	5425	5300	8100	7300	6686	6700	6600	7600	7000	8000	6000	10000	
08-10-11	8075	8320	8120	5400	5520	5165	4833	8140	7340	6697	6700	6608	7600	7000	6000	6333	10000	
15-10-11	7650	7700	7633	5167	5108	5067	4600	8317	7450	6713	6800	6650	7475	7000	5917	6500	9617	
22-10-11	8020	7860	8117	5450	5350	5388	4600	8192	7400	6568	6800	6554	7017	7000	6667	6667	9650	
29-10-11	8010	8020	8017	5450	5430	5379	4800	8183	7383	6526	6800	6500	7133	7000	6417	6700	9867	
Average	8031	8060	8067	5423	5422	5285	4827	8186	7375	6638	6760	6583	7365	7000	6600	6440	9827	

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. NT : No transaction

Prepared by P.O. Baby, CDB, Kochi-11