

Turning Coconut Farmer to Entrepreneur

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1. Introduction

The Hon'ble Prime Minister of India has set the target to double farmers' income in the country by 2022. The most important approach to achieve this is product diversification of farm produce into high-value products with better price realization for farmers through competitive markets, value chains and improved linkage between field and fork. However, achieving the goal requires a clearly defined vision, a carefully crafted strategy, sufficient financial resources to support the efforts and above all a supportive government. Though coconut value addition is at its nascent stage in India, the recent innovations and the value chains developed in coconut can transform the farmers into entrepreneurs and can easily double their income. We have well established organizations for research (ICAR-Central Plantation Crops Research Institute), developmental agency (Coconut Development Board), financial sources (like central and state government schemes, NABARD) and to implement these value chains, Coconut Producer Companies are being established in each coconut producing states. Some of the value added products available in coconut which can be easily taken up as cottage or small scale industries are briefed below.

Coconut palm is widely acclaimed as Kalpavriksha or Tree of Heaven or Wonder tree where each and every part is useful. Based on the raw material used, the major products can be categorized as sap based, tender

nut water based, meat/ kernel based, husk based, shell based and leaf craft based. The process of sap, tender nut water and meat/ kernel based preparation of consumable products, their nutritive value and use which are now considered as prime products in the market are described here.

2. Product diversification and value addition

2.1. Coconut sap based products

2.1.1. Kalparasa (Neera): Coconut sap, usually called as neera (Kalparasa) is the phloem sap from the unopened coconut spadix. It is a very good health drink, rich in sugars, protein amino acids, minerals, antioxidants and vitamins. ICAR-CPCRI has developed 'Coco-sap chiller' to collect fresh, hygienic and unfermented sap.

Coco-sap chiller is a portable device characterized by a hollow PVC pipe of which one end is expanded into a box shape to house a sap collection container bound by ice cubes and the other end is wide enough to insert and remove a collection container of 2 to 3 litre capacity. Each of the side-wall of the pipe from outside is covered with an insulating jacket excluding the portion of spadix holder which retains the internal cool temperature for a longer period. This coco-sap chiller is



lighter in weight, water proof, easy to connect to the spadix, requires less ice and retains low temperature for longer period as compared to commercially available ice boxes.

Kalparasa collected by coco-sap chiller under low temperature can be sold as fresh juice under local market with adherence to quality standards prescribed by ICAR-CPCRI. The pH of the fresh sap is between 7 to 7.5 and pH > 7.0 is ideal for promotion to health drink. Other quality parameters easily judged are brix (around 14); color (golden brown) and taste (sweet and delicious).

The collected sap can be stored for any length of time under subs zero temperature. Deep freezers are used for this purpose. The sap gets frozen and just before use, it is thawed to get the original liquid form. Dispensers are used to keep it cool in kiosks or neera hub for selling fresh sap.

The hygienic, zero alcoholic sap collected by ICAR-CPCRI method is easy to process in a natural way without the use of chemicals into various value added products which fetches premium price both in domestic and international markets. Very good quality coconut sugar, jaggery, nectar or syrup can be produced in double jacketed cookers with temperature regulation and stirring facility.

2.1.2. Coconut sugar: It is the best natural sweetener, has several health benefits and which has a high market potential. It contains all essential amino acids required for protein synthesis; contains considerable amount of minerals like calcium, magnesium, zinc, iron and copper; rich in electrolytes like sodium and potassium; abundant in dietary fibers which normalizes bowel movements and digestion and rich source of phenolics which are potent and important contributors in reducing oxidative stress due to their antioxidant activity. Moreover its glycemic index is low and is in the range of 35 to 54 GI. Eating a low glycemic index diet reduces the risk of chronic diseases such as Type 2 diabetes.

2.1.3. Kalpa bar: From the coconut sugar, product like 'Kalpa Bar' a coconut sugar based chocolate purely from plant based ingredients without milk is prepared. It is a joint venture between ICAR-CPCRI and CAMPCO (Central Arecanut and Cocoa Marketing and Processing Cooperative Ltd.).

It contains cocoa powder, coconut sugar, natural vanilla extract and GMO free sunflower lecithin. It has low glycemic index and does not contain any added artificial ingredients. It is delicious dark chocolate for a healthy life and can be stored under room temperature and does not melt.

2.1.4. Kalpa drinking chocolate: It is an instantised blend of low GI coconut sugar, crafted from fine cocoa powder formulated to produce the delicious drinking chocolate. The product is soluble instantly in hot or cold



milk releasing the chocolate aroma.

Fresh Kalparasa based milk sweets are prepared in West Bengal. The advantage is that it is another way of transporting neera to long distance in the form of sweets. These sweets impart the minerals, vitamins and valuable fiber which will not be available in the normal cane sugar based milk sweets and their glycemic index is low and hence good for healthy life.

At ICAR-CPCRI, Kasaragod we have developed complete package of technologies and machineries for the production to consumption value chain either for Kalparasa (neera) to be sold as health drink or to be processed into value added products viz. coconut sugar, jaggery, concentrate, syrup etc. We have also developed on campus training module for a minimum period of two to three days for those entrepreneurs who wish to collect Kalparasa and market it as juice or process into value added products. (Coco-sap chiller) The manufacture and supply of has been entrusted to one of ICAR-CPCRI notified entrepreneur who supplies these boxes to those who signs an MOU with ICAR-CPCRI for technology transfer.

2.2. Coconut water based products

2.2.1. Tender coconut water processing: The water of tender coconut, technically the liquid endosperm, is the most nutritious wholesome beverage and has medicinal values. It has a calorific value of 17.4 per 100 g of water. It contains water (95.4%), protein (0.1%), fat (<0.1%), mineral matter (0.4%), carbohydrates (4.0%), calcium (0.02%), phosphorous (<0.01%) and iron (0.5mg/100g). At present, only 15% of the total coconut production is used for tender nut water. The price of tender nut in the market is more than double than that of mature nut and according to a survey, the demand for tender nut is increasing at a very fast rate of 135%. Thus, the existence of greater market demand and the higher price for tender nut should enable coconut growers to earn a better livelihood when there is poor price for mature nuts. However, the bulky nature of tender coconut and



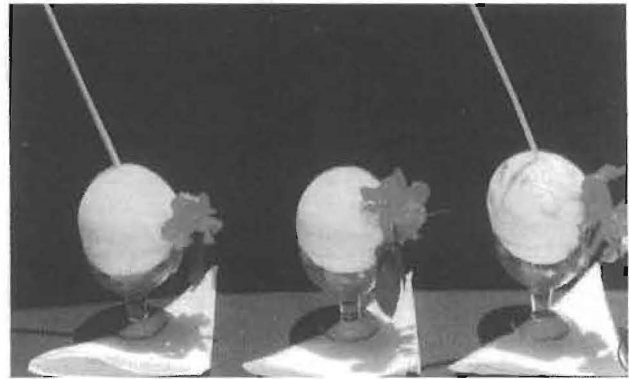
Packaged tender coconut water brands commercially available

its tendency to undergo biochemical change and spoilage within 2 to 3 days of its harvest are major constraints in marketing. Attempts are being made to minimally process tender nut for easy transport and extract the water and store it artificially with preservatives as described below.

2.2.1.1. Dressed tender nut/ minimally processed tender nuts: It is a partially dehusked cool tender coconut. Since husk constitutes major portion of the volume of tender coconut, partial portion of the husk is removed. The tender nuts are machine shaved to an attractive and uniform hexagonal shape, the smallest size possible that can retain the fluid safely inside. After removal of husk, tender coconut is dipped in anti browning agents (0.50% citric acid and 0.50% potassium metabisulphate), wrapped with food grade polyethylene for aesthetic and hygienic purpose. Product can be stored up to 24 days in refrigerated condition at 5-7 °C.

2.2.1.2. Preserved tender coconut water: The tender coconut water is highly susceptible to heating. Hence, it is subjected to mild heat, filter, sealed with or without carbonation and sodium citrate and citric acid is added. It is packed in flexible pouches and aluminium beverage containers. At a pH of 4.9-5.2 its acceptability is good. The product is found to be generally acceptable up to three months under ambient storage conditions.

2.2.1.3. Snow ball tender coconut: Snow ball tender coconut is the tender coconut without husk, shell and testa, which is white in color and in the shape of a ball. The ball contains tender coconut water, which can be consumed by just inserting a straw through the top white tender coconut kernel. Coconut of 8-month maturity is more suitable for making snow ball tender coconut. Since it is already devoid of husk and shell, there is no scope for littering of the premises. It is individually packaged and refrigerated to prolong the shelf life.



2.2.1.4. Tender coconut water jelly: Tender coconut water is a suitable option for the preparation of jelly as its delicate flavor can be well preserved in the form of jelly. The ingredients required are tender coconut water, sucrose and solidifying agent (china grass). The standardized quantity and concentration of tender coconut water is, sugar-250 g (20% of tender coconut water) and china grass- 20g (2% of tender coconut water).

2.2.1.5. Tender coconut water lemonade: Coconut water lemonade is a refreshing drink made of tender coconut water and lemon juice with addition of flavor ingredients. The formulation contains tender coconut water, tender coconut pieces, lemon juice, ginger juice, pepper powder and coconut sugar.

2.2.2. Products derived from matured coconut water

Matured coconut water is treated as a waste product of the coconut industries, as the sugar content goes up and rest of the nutrients are reduced. But various products can be derived from mature coconut water are as follows:

2.2.2.1) Nata-de-coco: Nata-de-coco is a very delicious dessert item served either mixed with other fruits or baked into a delicious cream pie or simply served with flavored syrup. It is a gelatinous dessert made from mature coconut water, sugar and bacterial culture (*Acetobacter xylinum*).

2.2.2.2. Coconut pulp ice cream: Tender coconut pulp also can be used in ice cream formulation to replace milk, fat, gums and emulsifier which are the common ingredients in this kind of food. The formulations included ingredients like coconut pulp, cocoa powder, sucrose, water, carrageenan gum, guar gum, hydrogenated vegetable fat etc.

2.3. Meat kernel based products

2.3.1. Fresh kernel based products

2.3.1.1. Desiccated coconut: Desiccated coconut is the white kernel of fresh mature coconuts, shredded and dried down to about 2.5% moisture content under strict hygienic conditions. It is rich in healthy medium

chain fatty acids with no cholesterol and an excellent source of dietary fibre. The main uses of desiccated coconut are for the confectionary industry, as a filling for chocolates and candies; the bakery industry for biscuits, cake and nut filling products; direct usage to decorate cakes, biscuits and ice cream and preparation of various snacks. India's export of desiccated coconut is only to the tune of less than one percent of the global demand. In comparison with the export figure of previous year, India achieved an increase to the tune of 60%, which indeed is a remarkable achievement. There exists an immense export potential the desiccated coconut across the world.

2.3.1.2. Coconut chips: Coconut chips is a ready-to-eat, snowy white crisp and healthy non fried snack food prepared from 8 to 9 month old fresh kernel through osmotic dehydration in a forced hot air electrical dryer at 70-80°C for 5-6 hours to less than 3% moisture content. Coconut kernels undergo paring, blanching, slicing and osmotic dehydration to prepare ready to eat chips. It contains 46% carbohydrate, 1.24% protein, 48% healthy fat, 6.13% fibre and 1.36% mineral content. Nutraceutical and medicated coconut chips can also be made by incorporating beet root, carrot, ginger and pepper.

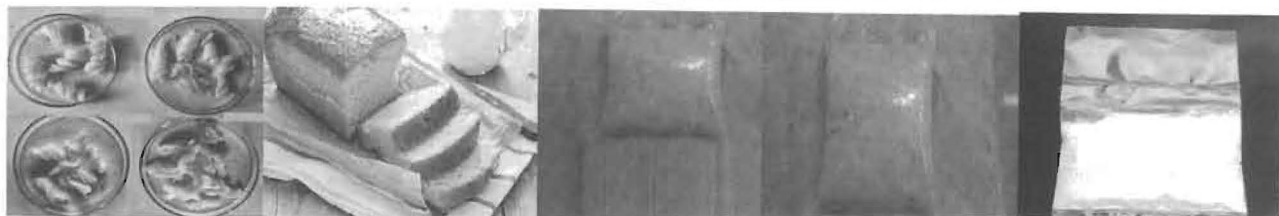
2.3.1.3. Coconut milk and milk products: Coconut milk is an emulsion of coconut oil in water into which some of the soluble components of the fresh kernel have already been passed. Apart from household culinary uses, coconut milk is utilized as 'a substitute for dairy milk as evaporated and sweet condensed milk and in the preparation of white soft cheese, yoghurt, ice cream and many other foodstuffs. Coconut milk processing involves extraction of milk from coconut, straining the milk in a cheese cloth into an aluminum kettle with 0.1 percent benzoic acid before placing the kettle in an autoclave at 117°C for three minutes with steam injection. The temperature of the milk in the pot is then brought down to 80-85°C, by running tap water. The milk is then homogenized for about five minutes and bottled at 70°C to 80°C. The final product is as good as cow's milk and is highly nutritious.

2.3.1.4. Coconut cream: Coconut cream is a white, smooth, liquid cream with excellent coconut flavour and

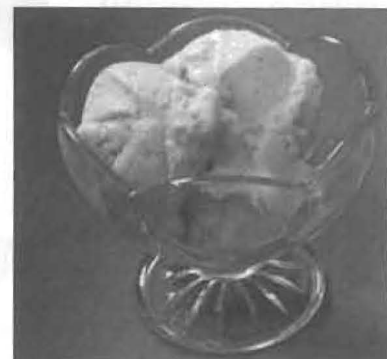
20-30% fat. The product is easily pourable and ready for direct serving or can be used in other food preparations. Coconut cream is essentially used as a fat source for the reconstitution of the skimmed dairy milk and as a component of infant milk powder.

2.3.1.5. Dehydrated coconut milk: This product is produced on a commercial scale in the Philippines, Malaysia and India. In this, fresh coconut milk is blended with small amounts of additives such as maltodextrin or casein and is spray dried. The final product is marketed in laminated foil bags. The powder is easily dissolved in water to form a milky white liquid with the flavor and texture of coconut milk.

2.3.1.6. Virgin coconut oil (VCO): It is the oil obtained from fresh, mature endosperm (kernel-meat) of coconut by mechanical or natural means, with or without use of heat and no chemical refining, bleaching or deodorizing. It is called "virgin" because the oil obtained is pure, raw and pristine. Compared to the conventional coconut oil, VCO, contains high tocopherol (Vitamin E), polyphenols and antioxidants. Its nutraceutical properties make it a best oil for both consumption and cosmetics. It has a fresh coconut aroma ranging from mild to intense depending on extraction process. It is extracted directly from fresh coconut meat or from coconut milk or from coconut milk residue. The different



CMR based pasta, CMR based bread, CMR based extrudates, CMR based pasta, Low fat desiccated coconut flour



VCO cake based ladoo, VCO cake based muffins, Pro- biotic product

methods involved are hot-processing method, natural fermentation method, centrifugation process and direct micro expelling method. The choice of technology to be adopted depends to a great extent on the scale of operation, the degree of mechanization, the amount of investment available and the market demand.

2.3.1.7. Edible coconut flour/ coconut milk residue flour: After, expelling the milk, the protein rich residue is dried and powdered to obtain a product called coconut flour. The flour so obtained typically contains 7-8 percent protein, 3-5 percent moisture and 17 percent oil. It can be used as an ingredient in weight control foods because of its high fibre content. A number of coconut flour based value added products have been standardized such as extrudates, pasta, sweets and ladoo, bread, porridge etc.

2.3.1.8. Virgin coconut oil cake: VCO cake obtained during the hot processing can be utilized for the preparation of cakes and ladoo.

2.3.1.9. Coconut delicacy: It is a non-dairy probiotic vegan product. Its ingredients are coconut milk/ cream, coconut sugar, tender coconut water, stabilizers with incorporation of air during freezing process.

2.3.2. Dried coconut products: Copra and the coconut oil as well as the cake derived from it are major source of foreign exchange for many coconut-growing countries in Asia, the Pacific and Africa.

The dried coconut endosperm is called copra. The copra and the oil it contains are the principal products of coconut palm. With oil content of 65-70 percent, copra is the richest source of fat. The essential requirement of copra drying is to bring down the moisture content of the wet fresh kernel from 45-55 percent to 5-6 percent. There are two types of copra: edible copra and milling copra. Edible copra is available in two forms: ball copra and cup copra. Copra (dried meat or kernel of coconut) may be made both in the forms of 'cups' or 'balls'. Copra in the form of balls is made from whole unsplit nuts. The process consists in storing coconuts with husk. Cup copra is made either by sun drying or kiln drying



to less than 6% moisture. Electrical, solar and electrical cum solar dryer technologies are optimized for effective drying.

3. Prospects of value addition in coconut

In the recent past, various value added products of coconut derived from sap, tender nut water and meat/ kernel have been developed and their adoption found to assure stable and lucrative income to the coconut farmer. For example, adoption of tapping for the collection of Kalparasa and its sale as fresh juice or production of value added products (e.g. coconut sugar) and sale has increased the revenue by at least 10 times than allowing it to produce nut. Similar kind of revenue advantages are seen in other enterprises like Virgin Coconut Oil, chips, desiccated coconut powder, coconut milk, tender coconut water etc. Thus, there is huge advantage for the farmer. These enterprises in addition to increasing the income also create lot of employment opportunities. Though the coconut value addition is at its nascent stage, the creation of Coconut Producer Companies, the financial support rendered by the government, the enhanced consumer preference towards coconut along with strong and supportive research back up is a right step in improving the economy of coconut sector. ■

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