EMERGING TRENDS IN THE PRODUCTION OF COCONUT WATER BEVERAGES IN INDIA

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Abstract

Coconut occupies an incredible place of significance in the Indian Economy due to its dual nature of utility. As a horticultural crop, it provides food and livelihood security to millions of people in the country besides being served as an inevitable item in the socio-religious rituals. It is the unique beverage crop that provides refreshing drinks filled with vitamins and minerals of natural origin. The ripe kernel which is rich in lauric acid and dietary fiber is an important ingredient in the culinary preparations of many households in India and hence become a daily dietary item in the food basket of every Indian. As a cash crop it is cultivated mainly for the production of copra and further extraction of coconut oil, which is also distinguished by multifarious applications besides being served as a dietary fat. Thus coconut and coconut products play a vital role in uplifting the nutritional status along with health protection of the people in India. It also plays an important role in supplying the minimum per capita daily requirement of optimum calories of the low-income group of people particularly those who are staying along the coastal India. The water of tender coconut, the liquid endosperm, is the most nutritious wholesome natural beverages. Unlike soft drinks, which are characterized by having higher sugar content, higher acidity and more additives such as preservatives and colorings and is devoid of any nutritional value, tender coconut water is an emerging health drink having inherent qualities embedded with the wellness of organic vitamins and minerals appropriate to all ages. Minerals are essential to the functioning of the organ systems and our entire body. A number of diseases are caused by the deficiencies of essential minerals in the human body. Similarly the rich source of potassium and the optimum level of sodium in TCW help to regulate water and alkaline balance and help treat blood pressure. The Calcium presence in this beverage helps to keep bones and teeth strong and helps muscles to contract and heart to beat. It is the purest drink in the world trapped in natural bottle. A connoisseur of soft drink, now gage at TCW, takes months to make and bottle. It has the taste of pristine honey and bottled at source by the tree of heaven " Kalpavriksha". It has calorific value of 17.4 per 100 ml with normal pH varies between 4.9 and 5. The chemical composition of tender coconut water varies depending on the variety, maturity of the nuts, soil conditions and the topographical variations. The major constituents of TCW are sugars and minerals. TCW contains organic compounds possessing growth-promoting properties and its consumption keeps the body cool. It is an isotonic

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beverage and functional food recommended as sport drinks, geriatric and pediatric drinks. Tender coconut is traded in almost all the cities across the country in its natural forms. The increasing demand for Tender Coconut Water among the health conscious people in the country and the propaganda on the adverse impact on the consumption of soft drinks which do not have any nutritional value in terms of vitamins and minerals but have higher sugar content, higher acidity, and more additives such as preservatives and colourings, necessitated the development of viable technologies for preservation and packing of tender coconut water in convenient containers for enhancing the shelf life without loosing its inherent qualities and taste as well as for easy transportation to non-producing consuming centers. The timely interventions of Coconut Development Board, has made possible, the development of different technologies for preservations, packaging of coconut water and milk based beverages, its commercial exploitation and marketing and market expansions both domestic and international markets. As a result many processing units have been set up in various states with Boards financial assistance. The Coconut Development Board's efforts to put the coconut sector onto the path of sustainable growth and vibrant development have been making tangible results in improving the competitiveness of the Indian Coconut Industry and the economic well being of the small and marginal farmers who are the backbone of Indian Coconut Economy.

1. Introduction

Coconut occupies an incredible place of significance in the Indian Economy due to its dual nature of utility. As a horticultural crop, it provides food and livelihood security to millions of people in the country besides being served as an inevitable item in the socio-religious rituals. It is the unique beverage crop that provides refreshing drinks filled with vitamins and minerals of natural origin. The ripe kernel which is rich in lauric acid and dietary fiber is an important ingredient in the culinary preparations of many households in India and hence become daily dietary item in the food basket. As a cash crop, it is cultivated mainly for the production of copra and further extraction of coconut oil, which is also distinguished by multifarious applications. Coconut oil is one of the important cooking oils in the country and hence fulfills about 6 per cent of the total oil pool of the country. Coconut oil is also used in the non-edible sector mainly for the manufacture of superior quality soaps, shampoo and other nutreceutical products. Thus coconut is considered as the gateway and lifeline of Indian populace.

Even though coconut and coconut products are found extensive uses and have consistent demand throughout the country, its substantial production is confined to four southern states of India, viz. Kerala, Tamil Nadu, Karnataka and Andhra Pradesh accounting for more than 90% of the coconut production. It is estimated that out of the total production of 14,800 million nuts about 2220 million nuts are utilized in the country for tender coconut water. The consumption of tender coconut water is gaining momentum and is expected to increase to the tune of 4500 million nuts by 2010. This paper examines the current status of the crop as consumer goods, particularly as food

and beverage commodity of millions of people across the country and then further explains how the Indian tender coconut water industry is slowly making its mark internationally as a favourite destination. The paper is classified in to five parts. Part-I is introduction followed by Economic importance of the crop in the country and an over view of domestic coconut industry in Part-II. The Part III explain the health benefit aspects of coconut followed by the main theme of the presentation, "Tender Coconut Water: an emerging beverage and a lifesaving tonic" in Part-IV with a concluding session in Part-V.

2. Economic Importance

Coconut palm is considered as the benevolent and benign tree, which provides food, drinks and shelter to mankind. Coconut kernel forms an important ingredient in the diet of many people in India. Coconut milk, extracted from the grated wet kernel, is an indelible additive in culinary preparations to make the food nutritious and tastier. Copra, the dried kernel, is one of the richest sources of vegetable oils. As edible oil its consumption is mostly confined to the state of Kerala and the boarder districts of Tamil Nadu and Karnataka. Coconut oil is an important raw material for many industrial products; such as toilet soaps, liquid soaps, shaving cream and natural shampoos. Similarly coconut oil finds extensive use in the food industry due to its characteristics such as easy melting behavious, resistance to oxidative rancidity, pleasing flavour and good digestibility besides using directly as hair oil and body oil. Coconut oil derivatives are used in most of the cosmetic products. The coconut oil cake, the byproduct of oil industry is in great demand and is a major ingredient in the manufacturing of cattle feed.

The inflorescence sap, traditionally called "neera", is produced from the unopened spathe/ inflorescence of selected healthy palms, through a process known as tapping by skilled climbers. It has varied commercial application. Neera, without fermentation is an ideal isotonic drink composed for vitamins, minerals and free nuclei. It is used for production of palm sugar, jaggery, vinegar, wine and arrack in many countries. Besides, the inflorescence is used to make ayurvedic medicines. Another important product that has got consumer demand, throughout the country, is tender coconut. It is a nutritious health drink which is diuretic and re-hydrating fluid. The tender coconut water is a base for many ayurvedic preparations. Of late tender coconut is also used for the manufacturing of wine. The water of mature nut yields various products such as vinegar, nata-de-coccoa, edible jelly 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 known as cabbage or coconut "heart" is edible and nutritious. The matured coconut timber is a strong building material apart from making furniture, wall panels, showpieces and floor tiles. The plaited leaf of the palm is used for thatching, fencing, shading, etc. Dried leaves and other palm parts are used as fuel. The spindle leaf is used for decoration and costuming in folk dances. The midribs of leaves are used to make brooms, fish traps, and baskets and tongue cleaner. The husk yields fiber and pith. Coconut fiber is used for making an array of products ranging from coir mats to geo-textiles, which command consumer demand through out the world. The coir and coir products forms

an export commodity of the producing countries. Coconut pith, a by-product of coir industry is ideal organic manure on composting, soil conditioner and rooting medium besides having many other end uses. The spathe and stipules are used as fuel and also for making handicrafts and other attractive articles. Coconut is an eco-friendly plant which helps to conserve soil, provides aesthetic beauty to the nature, perennial and less exhaustive and ideal tree for bio-hedging on the coastal ecosystem. Coconut farming, trade and processing activities sustain the livelihood of millions of people across the globe. It provides livelihood securities to more than 10 million people in 18 states and 3 union territories of India. Coconut contributes more than US$ 2000 million to the country's GDP apart from an export earning of US$ 150 million.

3. Coconut for Food and Nutrient Security

Coconut and coconut products play a vital role in uplifting the nutritional status along with health protection of the population particularly in southern India where coconut is consumed in the form of an important ingredient in the daily diet. It also plays an important role in supplying the minimum per capita daily requirement of optimum calories of the low-income group of people in these states. In Kerala, at times of consistently in short supply of rice during the monsoon season, people have access to diverse non-cereal food sources, which form part of the daily diet contributing to a significant proportion of the calorie intake. The common non-cereal foods to which the people have ready access are coconut; tapioca, yam and other tubers; jack and banana including other plantains. The combined contribution of dietary energy from these sources is more than that derived from the domestic output of cereals. Hence the fruit of coconut is considered as the reservoir of food and nutrition. **Therefore** coconut is a veritable source of food and drink to millions of people across the country. Since coconut is composed of important nutrients in reasonable quantity, consumption of coconut either in fresh or any other form at least twice or thrice a week would go a long way in achieving the nutritional security as well. Thus growing two or three coconut in a home stead not only provide aesthetic environment to the dwellings but also ensure constant availability of a fairly balanced diet to the family members and thereby improve in nutrient intake status.

The mature coconut kernel is the rich source of protein, fat, carbohydrate and dietary fiber. Similarly the tender coconut water is the natural source of vitamins and minerals. The major constituents of ripe kernel and tender coconut water are given in the following table.

Table 1. Constituents of fully ripe kernel

Solano.	Items	Quantity in percentage
1	Moisture	35.40
2	Protein	5.50
3	Fat	44
4	Carbohydrates	0.60
5	Crude fiber	3.00
6	Ash	2.10

Table 2. Constituents of Tender Coconut Water

Sl.No.	Items	Quantity in Percentage
1	Total Solids	4.71
2	Reducing sugars	0.08
3	Sucrose	1.28
4	Total sugars	2.08
5	Ash	0.62
6	.Unidentified organic substances	2.01
7	Sodium	15 mg
8	Potassium	312 mg
9	Calcium	29 ,,
10	Magnesium	30 ,,
11	Iron	0.01 ,,
12	Copper	0.04 ,,
13	Phosphorous	37 ,,
14	Sulfur	24 ,,
15	Chloride	183 ,,

Table 3. Constituents of immature kernel

Sl.No.	Items	Quantity in percentage
1	Moisture	90.80
2	Protein	0.80
3	Fat	1.30
4	Carbohydrates	6.30
5	Ash	0.60

Coconut based food and beverages are highly nutritive and have medicinal properties. As seen from the above table, coconut kernel is rich in protein, carbohydrates, dietary fiber and different minerals and vitamins. Hence the continuous use of coconut gratings as a major ingredient in the food preparations ensures adequate supply of balanced diet. Similarly, coconut oil, a medium chain saturated fatty acid, rich in lauric acid, is ideal source of dietary fat. India annually produces about 4.5 lakhs MT of coconut oil and 1.7 lakh MT of edible copra. The coconut oil is positioned as one of the essential edible oils in the country. Coconut oil has many physical and chemical properties that give its edge over other vegetable oils and fats. It is a "functional food". "Functional foods" are those foods that provide a health benefit over and beyond the basic nutrients. The role of coconut in providing food security with links to poverty alleviation, policy planning, control of malnutrition, improving health for millions of people in the country is considered important. Its unique nature of giving fruits continuously at fixed intervals offer opportunities for easy access of the product for the daily needs of the mass and is an instrument in overcoming issue of malnutrition in the developing countries.

4. Tender Coconut Water: An emerging beverage and a lifesaving tonic

The coconut is both a food and beverage crop. As a beverage crop it is unique as it is the nectar provided by mother earth. The water of tender coconut, the liquid endosperm, is the most nutritious wholesome beverages which is 100 per cent natural, untouched and unprocessed. Unlike soft drinks, which are characterized by having higher sugar content, higher acidity and more additives such as preservatives and colorings and is devoid of any nutritional value, tender coconut water is an emerging health drink having inherent qualities embedded with the wellness of organic vitamins and minerals appropriate to all ages. Minerals are essential to the functioning of the organ systems and our entire body. A number of diseases are caused by the deficiencies of essential minerals in the human body. Similarly the rich source of potassium and the optimum level of sodium in TCW help to regulate water and alkaline balance and help treat blood pressure. The Calcium presence in this beverage helps to keep bones and teeth strong and helps muscles to contract and heart to beat. It is the purest drink in the world trapped in natural bottle. A connoisseur of soft drink now gage at TCW that takes months to make and bottle. It has the taste of pristine honey and bottled at source by the tree of heaven " Kalpavriksha".

It is liked by all classes of people irrespective of caste, creed and gender. Of late the consumption of tender coconut is popular even in economically weaker people. A new demand sector of inelastic nature is emerging in the country for tender coconut trade. It has calorific value of 17.4 per 100 ml with normal pH varies between 4.9 and 5. The chemical composition of tender coconut water varies depending on the variety, maturity of the nuts, soil conditions and the topographical variations. The major constituents of TCW are sugars and minerals which are given in the table-2.

4.1. Chemical Constituents of Tender Coconut Water:

i) Sugars:

Sugars form major constituents of tender coconut water. The concentration of sugars in the nut water steadily increases from about 1.5 per cent to 5.5 per cent in the early months of development of the nuts. On maturity of the nuts the sugar content in the nut water falls gradually and at the age of 10-12 months it reaches to 2 per cent. In the early stages of maturity sugars in the nut water is in the form of glucose and fructose, the reducing sugars which form the major sugars in the nut water till the maturity of 8 months and subsequently non reducing sugars predominates. In mature coconut water about 50 per cent of the total sugar is sucrose.

ii) Minerals:

Tender coconut water is rich in potassium, sodium, calcium, phosphorous, iron, copper, sulfur and Magnesium. Due to its high content of potassium and magnesium, Tender coconut water is a prescribed as health drinks for heart patients. It is also an ideal drink for patients recovering from surgeries of various ailments.

iii) Proteins:

The tender coconut water contains fairly a good amount of proteins. The important amino acids present in the TCW are arginine, alanine, cystine and serine. The absence of complex protein made it fit for prescribing as life saving drinks to patients. The protein content in the tender coconut water is reported to be higher at 7^{th} month of development of the nuts and at this stage about 70 per cent of the free amino acids are Glutamine, Arginine, and Arpargine. Similarly the protein content in the unripe kernel reaches maximum of 8.3% at the 8^{th} month and there up on it decreases and reaches to 6.2 at maturity. The amino acids and the reducing sugars, minerals presents in the TCW and the unripe nuts are in the simplest form and absorb the body directly without routing through the digestive system and hence TCW and unripe kernel is a functional food.

iv) Vitamins:

The tender coconut water is the natural source of adequate quantity of Vitamin C & B group. The concentration of ascorbic acid ranges from 2.2 to 3.7 mg per ml of water, which gradually diminishes on maturity of nuts due to the development and hardening of kernel.

v) Fat:

The tender coconut water contains only negligible quantity of fat and hence termed as a beverage of no fat. The water of unripe nuts contains 0.12 per cent fat only and that of the unripe kernel is 1.4 per cent.

4.2. Medicinal Properties

In Ayurveda, Tender Coconut Water is advised for increasing semen, promoting digestion and clearing the urinary tract. It is also recommended for feeding infants suffering from intestinal disturbances, oral re-hydration medium for the patients suffering from cholera, gastro-intestinal disorders and similar ailments. TCW contains organic compounds possessing growth-promoting properties and its consumption keeps the body cool. It is an excellent drink for the children and old age people and hence termed as a pediatric and geriatric drinks. It is an isotonic beverage and hence is recommended as a sport drinks. It is diuretic and is used for the treatment of kidney and urethral stones. The Tender Coconut Water, in its sterile conditions, is used as blood plasma substitutes as it neither produces heat and nor destroys the red blood cells and is readily accepted by the body. Tender Coconut water is gentle on the system and hence preferred for infants and young as a daily dose of refreshing tonic. Similarly, taking a glass of tender coconut water daily by athletes and sports persons helps to rejuvenate the body instantaneously.

4.3. Kernel of Tender Coconut

The kernel of tender coconut or the solid endosperm is rich in carbohydrates and protein. It is sweet and soft and is taken along with the tender coconut. A tender coconut along with its kernel serves as a good diet, particularly on journey when hygiene foods are generally not accessible. In Kerala, in many households, tender coconut water and kernel is mixed together by grinding and served as a drink flavored with cardamom. It is also used for making puddings and many a times it is consumed as it is or mixed with sugarcane jaggery. Seven to eight months old nuts are ideal for utilizing the tender kernel.

4.4. Market for Tender Coconut

In India tender coconut is traded in almost all the cities in its natural forms. The traders are mostly street venders. India is the largest producer and the consumer of tender coconut water in the world. The major assembling markets for upcountry sales of tender coconuts are Maddur in Karnataka, College Street, Kolkatta in WestBengal, Junagat in Gujarat and Mumbai in Maharashtra. Tender coconut is widely marketed in the states of Tamil Nadu, Karnataka, Kerala, Andhara Pradesh and Goa. In Tamil Nadu more than one lakh tender coconut is being sold daily in the cities like Chennai and Madurai. Of late Tamil Nadu supply tender coconut to the neighbouring states like Kerala for their daily requirements. In Karnataka, the Agricultural Produce Marketing Co-operatives (APMCs) at Maddur, Mandya, Channarayapatana, Holenarshimapura, Hosdurga and Kadur are the major assembling markets for tender coconuts. India annually produces about 14,810 million nuts out of which about 2300 million nuts are utilized as tender coconut. About 15 per cent of the total production of coconut in the country is consumed in the form of tender coconut. More than 3 lakhs people are dependant on the trade of tender coconut. The consumption pattern of coconut in the country is given in the following table 4.

Table 4. Consumption Pattern of Coconut in India

	2005-2006*						
	Area		Production	Consumption pattern of coconut			
Sate/UT	('000 ha)	% Share	(Million Nuts)	Mature nuts for edible purpose	Nuts for copra(milling edible)	Nuts for tender coconut water	Nuts for other purposes
ANDHRA PRADESH	104	5	892	312	312	223	45
ASSAM	21.3	1	205	154	0	41	10
GOA	25.2	1	124	68	12	37	6
Gujarat	16.4	0.84	138	55	0	55	28
KARNATAKA	385.4	20	1210	363	423	363	60
KERALA	900	46	6326	2783	2910	316	316
MAHARASHTRA	18	0.92	273	109	27	109	27
Nagaland	0.9	0.05	1	0.96	0	0.12	0.12
ORISSA	50.8	3	275	220	0	55	0
TAMIL NADU	370	19	4867	973	2677	730	487
TRIPURA	3.3	.17	7	5	0	1	0.7
WEST BENGAL	24.3	1	324	0	0	292	32
A & N ISLANDS	25.6	1	87	35	26	17	9
LAKSHADWEEP	2.7	0.14	53	21.2	16	11	5
PONDICHERRY	2.2	0.11	30	15	9	6	0
ALL INDIA	1950.1	100	14811.9	5115 (34.53)	6413 (43)	2257 (15)	1027 (7)

***Source Directorate of Economics and Statistics, Ministry of Agriculture, GOI*

4.5. Coconut Development Board in Pursuit of Promoting TCW as Health drink

4.5.1. Technology Development for the Preservation and Packing of Tender Coconut Water

The increasing demand for Tender Coconut Water among the health conscious people in the country and the propaganda on the adverse impact on the consumption of s**oft drinks which do not have any nutritional value in terms of vitamins and minerals but have higher sugar content, higher acidity, and more additives such as preservatives and colourings, necessitated the development of viable technologies for preservation and packing of tender coconut water** in convenient containers for enhancing the shelf life without loosing its inherent qualities and taste as well as for easy transportation to non-producing consuming centers. The CDB in collaboration with the Defense Food Research Laboratory (DFLR), Mysore had developed a technology for preservation and packing of tender coconut water in pouches and aluminum cans without adding any synthetic preservatives. The shelf life of the product without losing its flavour and quality remains for a period of three months under ambient conditions and six months under refrigerated conditions.

The Coconut Development Board, Government of India, Kochi is responsible for the transfer of the technologies to entrepreneurs for setting up the units. The Board supports entrepreneurs to set up the units for production and marketing. The Board is succeeded in transferring the technology for setting up the industries in Karnatka, Tamil Nadu, Andhara Pradesh, Gujarat and West Bengal with varying capacities ranging from 5000 nuts to 25,000 nuts per day. Altogether thirteen entrepreneurs in the country spread over different States have procured the technology from the Board and established their units. The essential infrastructure, machineries and equipments required for setting up a unit with a processing capacity of 5000- 10,000 nuts are; (a) Built in-area of 3500 ft^2, (b) Boiler (NIBR) with 300-400 Kgs capacity per hour, (c) Steam Kettles with 1000 liter capacity (one) 500 lit capacity (two), (d) Impulse high frequency sealing machine (Double jar)-one, (e) Can sealing machine in case of packing in canes (one), (f) Plastic bottle sealing machine (one), (g) Coconut chopping and tcw extraction unit (one) (h) Filling machine (one) (i) SS Tables 6’ x 4’ (four) (j) SS Trolleys (4) (k) Sundries like knives, ss wire, waste baskets etc. , (l) Cold storages and Microbiology and Chemical lab.

4.5.2. Minimal Processing of Tender Coconut

The development of Technology for the preservation and packaging of tender coconut water was a breakthrough in Indian Coconut Industry. The marketing of tender coconut water *as natural drink for several occasions like; marriages, rituals, ceremonies, social gatherings, conferences, seminars, symposia, exhibitions, trade fairs etc.* in the cities of non producing states of Delhi, Chandighar, Indore, Mumbai etc. has become routine reality. However, its promotion in the traditional states particularly in hotels, hospitals and other service sectors like IT centers has become difficult on account of consumers choice for natural packing. Due to the bulkiness and the problems in the disposal of Tender coconut husks become major hurdles for its smooth marketing in these places. The Kerala Agricultural University, Trichur, developed a technology for the preservation of tender coconut in its natural packing

after partial removal of husk to reduce its volume and size for easy transporting and marketing in public places. *Minimal processed Tender coconuts are thus partially de-husked nut, since husk constitutes major portion of the volume of Tender coconut.* The tender coconut bunches after harvests are collected in a common place and simultaneously remove major portion of the husk manually or mechanically. The trimmed nuts are then immediately immersed in a mixture of solution containing citric acid and sodium metabisulfite at 2000 ppm for 5-10 minutes to prevent oxidation as well to avoid spoilage whiteness of the remaining husk. Such nuts are then taken out from the solution and immediately wrapped with food grade cling film for aesthetic and hygienic purpose. The product has shelf life of 4 to 5 days in room temperature and 20 to 30 days in controlled temperature of 10-12 ºC. The products can be marketed easily through Food Chain Market, through hotels and serve afresh to IT Campus etc. It can be transported bulk in plastic containers to retail outlets.

4.5.3. Snow ball Tender Coconut Water

The Central Plantation Crops' Research Institute(CPCRI), Kasaragodu, Kerala, India developed a Technology for the production of Snow Ball Tender Coconut Water packed in the unripe kernel for serving as a delicious food-cum-beverage, particularly in hotels during the Tourists season. The Technology is developed under the sponsored program of the CDB. The Board has already promoted many units in the state for the commercial manufacturing and sales of the snowball tender coconut water.

4.5.4. German Technology for Concentration of Tender Coconut Water

Packing of concentrated tender coconut water by using the Spray Evaporation Technique (SET), is the another method popularized in India to promote the consumption of tender coconut water in public functions, hotels, marriage ceremonies and railways. The Technology was developed and patented by Winter Umweettechnik, Germany and was first attempted in Indai by M/s Miracle Food Processors International Ltd, Perinthalmanna, Kerala in 1996.The concentrate tender coconut water has a shelf life varying from 6-24 months depending upon the level of concentration. Ten lit. of tender coconut water is required to make about 800g of concentrate. The chilled, aerated and bottled ready to drink tender coconut water beverage is also manufactured by the firm from the concentrate and marketed through out the country.

4.5.5. RRL Technology for Up Gradation and Preservation of Mature Coconut Water

The Regional Research Laboratory, Trivandrum, Kerala developed a technology for utilizing mature coconut water, otherwise wasted, as a beverage drink under a sponsored program of the CDB. The process involves the collection of mature coconut water mainly from the copra processing centers, up gradation to bring the product to the level of tender coconut water by supplementation with additives including sugar and preserving it by a judicious combination of heat pasteurization and permitted chemicals. The drink can be carbonated and marketed as a beverage.

4.5.6. Coconut Milk Beverages

The Coconut Development Board has sponsored a project for the development of coconut milk base beverages, to Nadukkara Agro Processing Company Ltd.(NAPCL) an ISO 9002/HACCP certified company involved in the production of concentrate of pineapple, mango etc.in aseptically packed Bag-in-drum, fruit candies from pineapple, papaya, ginger etc and Ready to Serve(RTS) juice/nectar (branded JIVE) based on pineapple and pineapple/mango tropical mix for retail in 250ml/200 ml Tetra Brick cartons promoted as natural juice/nectar. The NAPCL has since developed a health platform with a mixture of Pineapple juice with coconut milk at the ratio of 20:20 coconut milk with pineapple juice –pinacolada. The coconut is extracted from the grated kernel and contains 6 per cent fat. The drink is a rich source of bromoline enzyme which is responsible for the digestion of food. Similarly it contains carotinoid and other antioxidants. The shelf life of the product is six months. The important machineries for the processing of Pinacolada are; can reforming unit, seaming machines, double jacket kettles, exhausting box, retorts in addition to the aseptic packaging: tetrapak & compiblock machines - in tetrapak packets are formed out of laminate rolls by transverse & longitudinal sealing. Sterilization of packaging material taken place inside the machine. product filling is done in a sterile atmosphere.

4.5.7. Mobile Tender Coconut Water Dispenser

The CDB has been promoting the trade of tender coconut water in a hygienic manner and consumer friendly ambient more convenient to customers to have a drink on the go. The Board had sponsored a project to M/S **Coco fresco, Hyderabad,** a project for the development of a device for marketing ready to serve chilled tender coconut water aiming mainly for promoting the tender coconut water to International Airports and other important public places. The device is made up of fiberglass with a storing capacity up to 100 Tender Coconuts. The top portion of the cart has an insulated compartment, which acts as a cooling chamber from where the chilled water comes from an outlet attached to the cooling chamber. The cart comes with an umbrella and a cup dispenser as additional features. Coconut water is served in chilled condition in disposable cups. The “Mobile Tender Coconut Water Dispenser” with its aesthetic look attracts customers and hence enhances the sales considerably. The sales surroundings are free of wastage in the surroundings.

4.6. Quality Standards on the Production of Coconut Water Beverages in India

Even though sales of coconut water beverages has been practiced in India, it has not been brought under the purview of “Prevention of Adulteration Act” as the trade has been done under the unorganized sector by street venders in its natural form. However in recent years, the packed and preserved coconut water beverages in different forms are being sold in the consumer markets. The CDB is in the process of developing standards for these products and imposing the quality standards through Beurau of Indian Standard (BIS), an Agency under the Ministry of Food Processing, Government of India. The draft specifications for the Packed and Preserved Tender coconut and that of mature coconut water are as follows.

4.6.1. Quality Parameters for Coconut Water Beverages in India

Parameters	Tender Coconut Water (Wight in g per 100 ml)		Mature Coconut Water (weight in g per 100 ml)	
a) Chemical Total Solids	4.71		3.9-5.5	
Reducing sugar	0.08		0.23-1.3	
Sucrose	1.28			
Other Sugars (as invert sugar)			0.98-3.15	
Total Sugar	2.08		1.7-3.38	
Ash	0.62		0.5-0.84	
pH	4.5		5.2	
b) Pesticides Residue				
Organochlorine	0.01 ppm		0.01 ppm	
Organophosphate	0.01 ppm		0.01 ppm	
c) Microbiological	Units		Units	
Total Plate Count(TPC)	5000/gm max		5000/gm max	
Yeast & mould	50/gm max		50/gm max	
E.coli	10/gm		10/gm	
Coli forms	Nil		Nil	
Salmonella	Nil		Nil	
Staphylococci	10 per g		10 per g	

4.6.2. Food Additives

Food additive namely, Niacin is permitted within the restrictions and use prescribed under Part XIX of food additives in food products under the PFA Act 1955.

4.6.3. Imposing the Food Safety and Standards Act 2006

The Government of India and the concerned State Governments are the rule-making authorities under the Act and the Food Safety and Standard Authority of India is mandatory agency to make regulations. The Prevention of Food Adulteration Act, 1954, The Fruit Products Order, 1955, The Packaging (Regulation) Order, 1998, The Milk and Milk Products Order, 1992 and any other order issued under the Essential Commodities Act, 1955 are the legal tools for **Quality Standards on the Production of Coconut Water Beverages in India.**

4.6.4. National Centre for Quality Testing of Coconut Products

The Coconut Development Board has is in the process of setting up a full fledged NABL accredited Quality Testing Laboratory for coconut at Technology Development Centre attached to the Head Quators of the Board with the main objective of providing quality testing facilities for chemical and microbiological analysis in the coconut processing sector. The Board would be acting as a nodal agency for certification of quality of coconut products through a logo of CDB and it would also conduct training programmes on quality management systems like GMP, HACCP, Food Safety and Hygiene practices etc. for manufacturers venturing into coconut processing. The laboratory has already procured the latest analytical instruments and equipments for detection of adulterants, pesticide residue, afflatoxins, toxic metals etc. along with the basic facilities to carryout routine chemical and microbiological analysis for coconut food products. The lab will also work out to recommend quality standard and specifications for the new coconut products.

4.7. The CDB in hunt of Generic Promotion of Coconut Products for Creating New Markets

The unstable prices and other market slips in the coconut sector have been adversely affecting the growth of the coconut industry in the country due to the dependency on the copra and coconut oil price. The initiatives taken in recent years by the Board in the field of product diversifications and its market promotions have been resulted a dynamic push and cushioning effect to the trade. The commercial introduction of various new coconut products and by-products in the domestic markets and their aggressive market promotions induced a definite segment shift to consumers' product choices and purchasing behaviour. The Indian Coconut Market experienced a paradigm shift from coconut oil centered market to diversified products markets. Among the various steps taken by the Board, promotion of tender coconut as health drink has brought about tangible results on account of the health benefit. The availability of packed and preserved tender coconut water in the non producing consuming centers enhanced the fresh demand for tender coconut as a salubrious drink all over the country. The coconut and its products in the domestic market have established a strong link with the price- discovery. The commodity touches upon every common man's life. A demand sector with inelastic behaviour has been experiencing in the market. Thanks to the CDB's tireless efforts to place the coconut as a niche product in every Indians' food basket. The implementation of *Technology Mission on Coconut in the country has become an impetus in addressing various*

impediments, which stood against the sustainable growth of coconut cultivation and industry. The Technology Mission on Coconut Development is a multidisciplinary tool for effecting sustainability of the coconut sector. The accent of the Technology Mission is not only on improving production technologies but also for attaining a quantum leap in the areas of value addition, post-harvest processing and product diversification. The Mission also advocates introduction of agribusiness principles in the coconut sector, contract farming in coconut based farming systems etc. The Technology Mission on coconut development is having the potential for effecting structural changes in the coconut industry and for revolutionizing the programme of value addition and price discovery. The interventions by the Coconut Development Board to put the coconut sector onto the path of sustainable growth and vibrant development have been making tangible results in improving the competitiveness of the Indian Coconut Industry and the economic well being of the small and marginal farmers who are the backbone of Indian Coconut Economy.

5. Conclusion

Coconut occupies an incredible place of significance in the Indian Economy due to its dual nature of utility. The coconut and coconut products play an important role in uplifting the nutritional status along with health protection of the people in India. Regular consumption of coconut ensures the supply of minimum per capita daily requirement of optimum calories of the low-income group of people particularly those who are staying along the coastal India. The water of tender coconut, the liquid endosperm, is the most nutritious wholesome natural beverages. TCW contains organic compounds possessing growth-promoting properties and its consumption keeps the body cool. It is an isotonic beverage and functional food recommended as sport drinks, geriatric and pediatric drinks. It is a health platform which provides vitamins and minerals of natural origin that absorb the body easily and quickly. To promote the consumption of tender coconut and other coconut-based beverages the CDB has initiated various measures including development of technologies for preservations, packaging of coconut water and milk based beverages and its commercial exploitation. *The* interventions by the Coconut Development Board to put the coconut sector onto the path of sustainable growth and vibrant development have been making tangible results in improving the competitiveness of the Indian Coconut Industry and the economic well being of the small and marginal farmers who are the backbone of Indian Coconut Economy.