



An Analysis of Tamil Nadu Income-Based Consumption Patterns and Consumer Behaviour for Jaggery and Khandsari Sugar: A Review

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Review Article

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ABSTRACT

Purpose and Objectives: Markets such as Coimbatore, Tiruppur and Erode district Cooperative Jaggery Marketing Federation (CTEDCJMF), Selur Farmers Sugarcane Products Market (Farmers jaggery market), Pilikalpalayam and Chitthode jaggery market exclusively for jaggery and khandsari sugar, coconut and palm sugar.

Methodology: Snowball sampling method was used for the data collection and also producers, visiting the market also enrolled in the study. Totally 30 producers of each sugar, 60 middlemen and 120 consumers who purchased sugar through the identified marketing channels were interviewed for the study. The data collected were analyzed to determine the cost and returns for

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three types of sugar. The price spread at various marketing levels, trader concentration ratios, and consumer buying behavior towards alternate forms of sugar were also examined. Principal component analysis was used to identify factors influencing consumer purchases of alternate forms of sugar.

Key Findings: The results of the sample respondents showed that sample respondents of jaggery and khandsari sugar producers, majority of the sample respondents were aged between 31-40 years (33.33%) followed by 26.67 percent in the category of 20-30 years, about 23.33 per cent of the sample respondents in the producer category were aged above 50 years, followed by 16.67 per cent aged between 41-50 years.

Implications: Hence, the demand for coconut sugar is very low, so promotional efforts should be made to popularize its health benefits among consumers. In the case of jaggery and khandsari sugar, product modification into cube form (similar to white sugar cubes) will increase market preference and acceptability.

Keywords: Jaggery; khandsari sugar; genetically modifies organisms.

1. INTRODUCTION

Today the World is conscious about sweeteners due to increasing threat of diabetes, obesity, hypertension and heart diseases and many other related concerns due to high consumption of sugar in food, beverage and confectionary products. Nowadays, many sugar free and synthetic sugar products are abundantly available in food markets. However, it may be unsafe and unhealthy, as there was a possibility to cause side effects [1-3]. In this case, natural sweeteners with low glycaemic index (GI) could be an alternate solution to the diabetes problem. With this background, the present study was proposed with the objective about the market demand for alternative forms of sugar such as Khandsari sugar, Palm sugar and Coconut sugar, as these were having low glycaemic index compared to white sugar. The traditional way of processing sugar is coming back in track. The white sugar industry in India is an organised sector, whereas the market for alternate sugar is an unorganised one. According to the *Indian mirror*, there were 453 sugar mills of which 252 were cooperative and the over 134 were private. Indian sugar industry is self-sufficient in its vigour needs and also makes surplus exportable power through cogeneration. But due to excess supply, nowadays cane mills were facing issues in terms of clearing debts to farmers and as well as the government. In this regard, alternative forms of sugar resolves this issue by providing better prices to farmers and also in sustaining the sugarcane production. "It also paves way for employment in securing rural livelihood. Further, the never ending demand of high quality, green & clean labelled, organic, nutritious food products amongst the diet conscious people had influenced food processing

sector to innovate and add value to the existing product line with a view to provide health and wellness to its consumers" [4]. Importance of sweeteners had long been recognized in Indian diets. In today's scenario, people are consuming their choice towards alternative forms sugar than white sugar due to various health issues.

"Indigenous science often called as folk knowledge, western science or traditional ecological knowledge" [5-8]. "Indigenous science was still in the form of concrete experience knowledge, while scientific knowledge was in the form of concept, principle, theory or reproducible laws (experimentally tested in laboratory) based on scientific work, have been asserted by scientific community, objective, universal, value-free process. The range of indigenous science knowledge includes chemistry, biology, physics, agriculture, ecology and medical" [9-12].

The most popular sweetener in the world, sugar, was invented in India. There was reference to sugarcane cultivation and preparation of sugar in an Indian religious text, the "Atharva Veda". The word sugar is a derivative of "Sakara", meaning gravel in Sanskrit. Sugar was introduced when the army of Alexander the Great came to India in 327 BC. Interestingly, they were surprised to see alternative to honey to sweeten food, and described it as a "reed that gives honey without bees". (National Federation of cooperative sugar fact). The agroindustry plays a crucial role in supporting the economy and generating employment [13]. One of the industries that thrive in rural areas was the palm sugar agroindustry, with material of liquid *Borassus flabellifer*. Agroindustry had an ability to absorb labour upto 68 per cent of total workforce available in rural areas [14-18].

“Plantation sector was one of the agricultural sectors that were traditionally able to generate foreign exchange for the country through export of agricultural products. Most of the plantations belong to smallholders, while the rest was large plantations that belong to government and private companies. To add value to the commodities, agroindustry should be established. Thus, an approach to the agribusiness of plantations had an important role to play. The system of plantation agribusiness consists of production subsystem, processing subsystem, marketing subsystem and supporting system or was a complex and dynamic system. Therefore, the development of plantation agribusiness ideally employs an agribusiness system, including the upstream and the downstream subsystems, in order to add value to the commodities, one of which was sugar palm trees” [19-23].

“The processing industry has a role in the economic growth of a region through meeting marketing needs both domestically and abroad” [24,25]. Traditionally, any occasion in India is celebrated with sweets. It is customary to 'sweeten the mouth' after every meal, joyous occasion, religious festival, and social gathering. Indian religious offerings mostly contain five amrits (elixirs) like milk, curd, ghee (clarified butter), honey and sugar; these indicated the importance of sugar not only as a food item but also as an essential, to Indian way of life. While sugar has of considerable cultural and hedonic relevance in India, nutritionally it provides only “empty” calories (1g of sugar gives 4 k cal). It lacks natural minerals which were present in beetroot or sugarcane.

“There was a strong relationship between calorie intake and obesity. In India, the prevalence of obesity was increasing at a rapid pace due to an increase in energy intake owing to increase in purchasing power and availability of high fat, energy-dense foods, along with reduction in the energy expenditure consequent to urbanisation and mechanisation” [26-28]. “Parallel to the rise in obesity, prevalence of metabolic syndrome and type 2 diabetes mellitus (T2DM) was increasing in India and has reached epidemic proportions. The estimates in 2019 showed that 77 million individuals had diabetes in India, which is expected to rise to over 134 million by 2045” [29].

2. SUGAR CONSUMPTION IN INDIA

“Data from India sugar trade industry (2013) revealed that India is the second largest

producer and largest consumer of sugar in the world” [30-32]. “Most of the khandsari sugar was consumed in rural areas for household consumption and feed use” [33]. According to the report, 6-8 MT utilised for jaggery and khandsari sugar to meet for domestic requirements of sweeteners. These sugars were decentralised sector, which provides employment to the rural population and also had great export potential. However, jaggery and khandsari sugar was prepared by local sweets manufacturers; mostly consumed in rural areas for household consumption and feed use.

Sugar-sweetened beverages (SSBs) include full spectrum of aerated drinks, fruit drinks, and energy and vitamins containing added sugars. Many of these beverages were sweetened with high fructose corn syrup (HFC's), most common added sweetener in processed foods and beverages, and some with sucrose or fruit juice concentrates.

“In Indian context, available databases do not define sugars clearly, however, from the data breakdown it appears that “sugar” means white sugar honey and was one of the household agro-industries that had been run for a long time by the rural peoples in some areas of Tamil Nadu. Sugar processing business was an effort to diversify sugar and increase of utilization of palm sap economically, and stimulate the participation of rural communities in increasing family income, even though processing was still using simple equipment's or done traditionally with limited human resources” [34]. Generally, these sugar processing business in western Tamil Nadu, are characterised by very simple technology and rely solely on family labour or even done by one or two people. Increase of traditional sugar has been seen in recent years. Regarding domestic demand, the biggest demand for granulated sugar comes from food and medicine industries across the country. The rise in demand for natural materials and innovative products were positively influenced this traditional sugar market. Global food industries were shifted to use natural or organic sweeteners. Therefore, Jaggery and Khandsari sugar, Palm sugar and Coconut sugar could be an alternative source of sugar for the consumers. However, consumers from Asia-Pacific regions, such as Indonesia, India and Philippines, preferred Palm sugar. People from India also preferred these alternate forms of sugar. People have begun to realize that these alternate forms of sugar benefits their health. Due to health reasons, manufacturers and

suppliers of food and beverages products were optimized the product offering in accordance with the consumer demand. Some manufacturers were successfully paved way to traditional sugar markets as they could obtain high profit margins. These factors were predicted to push growth of global market income for alternate forms of sugar. However, people were getting more conscious of health. As a result, organic and healthy foods were in greater demand. Sugar was not only of the world's key food commodities but also one whose appearance and sensation on the palate have long been subject to radical change. Sugar as we know was a relatively stable, storable and tradable commodity made from boiling down sweet juices of grass-originated canes.

3. COCONUT SUGAR AND PALM SUGAR

Coconut sugar produced from coconut sap - Neera sugar obtained from coconut neera, sweet sap of the palm, was fast becoming a popular drink on account of its highly nutritive value, delicious taste and agreeable flavour. Central government was trying to develop neera clusters under the Scheme of Fund for Regeneration of Traditional Industries (SFURTI). Gramodyog Sangh, which undertakes programmes to help those who tap the palm trees, has under its fold 50 co-operative societies or institutions. Khadi and Village Industries Commission (KVIC) implement the scheme. Apart from increasing availability of the drink, Neera cluster aimed at generating more employment for tappers.

Coconut sap could be a better potential source for the production of healthier sugar [32]. The income from palm sugar is 5-10 times higher than the income from copra products [35]. The main advantage of coconut sugar was that its glycaemic index value was relatively low at 35-42, and it was a safe sweetener for diabetes [36]. Coconut sugar also had sufficient nutrition compared to granulated sugar (cane sugar).

Coimbatore, Erode District Co-operative Jaggery Marketing Federation (CTEDCJMF), Kunnathur which was functioning exclusively for coconut sugar and palm sugar. There were 9 federations in Tamil Nadu all functioning under KVIC and 13 co-operative societies functioning under this federation. Auction for coconut sugar and palm sugar done in every monday in Kunnathur, tuesday in Siruvallur, friday in Pallagoundenpalayam and sunday in Perundurai. Producers market their produce in the auctioned price in market upto next auction day. Palm sugar production takes

place from January to July whereas coconut sugar takes place throughout the year. Palmyrah was one of the most valuable and important trees in India. It was not indigenous to this country but was extensively cultivated as it readily propagates itself in regions where it was abundant; it was also found growing wild. The use of various parts of the tree was innumerable. Palm Products Industry was also one of the major cottage industries under the Village Industries Sector in the State. Tamil Nadu is a pioneer in development of Palm Products Industry in India and was declared as the "State Tree" of Tamil Nadu. The State earns foreign exchange by exporting palm products and could last more than 100 years. Palm trees easily germinate and grow, both in domestic and wild environment. Tamil Nadu Palm Products Development Board was functioning since 1995 and engaged in the introduction of modern concepts to promote research for the development of palm products industry and for better utilization of palm products with social objective of uplifting economic condition of rural palm gur artisans.

Palm sugars had been used as a traditional for thousands of years in Asia. It is now gaining popularity globally because of its natural source, minimal processing and healthiness. One of the major health claims is its glycaemic index (GI). Palm sugars were normally marketed as low GI foods, though only a few published papers were evidence [37]. Palm sugars were minimally processed unrefined and contain natural sugars. They could present nutritionally significant quantities of minerals and vitamins, including antioxidant properties [38].

Palm jaggery was highly priced due to its medicinal properties and there was need of developing standard process as well as mechanisation for the same. There was a need to improve low cost palmyrah climbing device through greater mechanisation, system of tapping, improved efficiency in the collection process, reduced chances of contamination and improve shelf life without sacrificing the exotic flavour that makes sap a favourite of so many. Further, the product needs improved market promotion and marketing [39]. The global market of palm sugar consists of local and the regional market players 70 per cent to 75 per cent local players were estimated to dominate the market. Benefit externality in Palm sugar industry was that Palm trees producing sap to make palm sugar have ecological values.

4. JAGGERY AND KHANDSARI SUGAR

Gur had been manufactured in India from time immemorial. Till the advent of the modern sugar industry, the cane crop was marketed primarily in the form of gur. However, with increasing specialisation of economic functions farmer find self-processing of his produce quite irk-some. Organised gur manufacturers had come into being to buy his cane. In a way, it was a good development for it releases a good deal of labour and bullock resources for other agricultural operations at a time when the farmer was hard-pressed for these inputs. But the growth of these gur manufacturers has created problem in a way that they now divert substantial quantities of cane away from the sugar industry.

Khandsari sugar production rested with only unorganized sectors and mainly these were represented under cottage industries. Alternate forms of sugar were the major agro processing industries found in rural sectors of our country. Khandsari sugar was also termed as Cottage sugar which was obtained in unrefined crystalline form from small scale industries. In Tamil Nadu major production of Khandsari sugar areas were Erode, Namakkal, Salem and Dindigul districts. Piliikalpalayam of Namakkal district, farmers were jointly organised a licensed market for jaggery and khandsari sugar marketing to sell their produce and to get better price for them. Here all producers were sugarcane farmers and very few were only processors. In Erode district, khandsari sugar market was located at Kavindapadi and Chitthode and both farmers and processors got better price. Neera sugar was produced by Farmer Producer Companies (FPC). Major production was done in Coimbatore and Erode districts. Palm sugar was obtained from tree Palmyrah where production was mainly in southern Tamil Nadu. Keeping this in view, this study explored the market demand for alternate forms of sugar in the study area.

5. PROCESSING OF JAGGERY AND KHANDSARI SUGAR

Fig. 1 revealed about the jaggery and khandsari sugar processing where harvested raw sugarcane was purchased from the farmers and within two days of time it would be crushed to extract juices. However, before going for boiling the juice will be clarified i.e removing of impurities present in juice, as the harvested sugarcane would be processed directly from field

without doing any activities. The juice was boiled in open furnace for three hours until it reached the brix value. After reaching the brix value, blowing process cools down the sugar. Finally based on demand, the processed liquid form would be moulded into a wooden box to get desired shape whereas for khandsari sugar after it reached a brix value, they would again be transferred into a open wooden box and starts to break clods by traditional method or machine. Here, process for jaggery and khandsari sugar varies at the last stages.

6. PROCESSING OF PALM SUGAR

Fig. 2 depicts about the processing of Palm sugar. Palm sap would be collected from the tree which would be tapped. Then the collected sap would be filtered and boiled. These kinds of sugar are processed at a low scale but had a greater economic value. The boiling process takes place for about two to three based on boiling capacity until reaches a brix value of about 118 to 120 per cent. Then the sugar rob (which was partially liquid and solid in consistency) was poured into a wooden box and kept for about two hours. Then palm jaggery obtained was stored. Here, the producers produce sugar for about a period of six months (January to June) and from 18 litres of palm sap about 1.75 kg of sugar was obtained. Collected sap would be processed within two hours of time. Hence, the producers tap the sap from tree in the early morning and start to process once collected.

7. PROCESSING OF COCONUT SUGAR

Fig. 3 depicted various processing stages of coconut sugar which acts as home industry in many rural areas. The process was similar as in palm sugar processing. Here, tapping would be done in inflorescence of the tree as in palm tree. Producers will tap sap from the tree and start to produce within two hours. The problem that they faced was maintaining temperature to increase shelf life for two more days. They boil the liquid sap in an open pan and once the consistency was reached, sugar rob would be poured into wooden box to get the shape. After two hours, preferred size was obtained and taken for storage and then sold to market or other purposes based on their convenience. About 250 litres of sap would yield 40 kilograms of sugar.

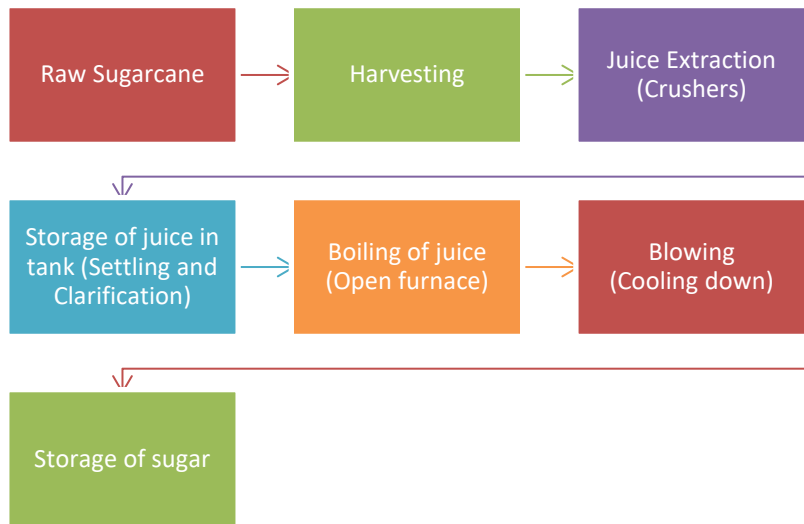


Fig. 1. Processing of Jaggery and Khandsari sugar

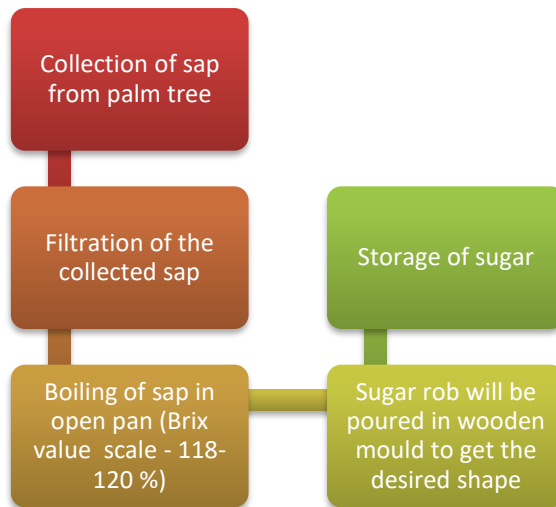


Fig. 2. Processing of palm sugar

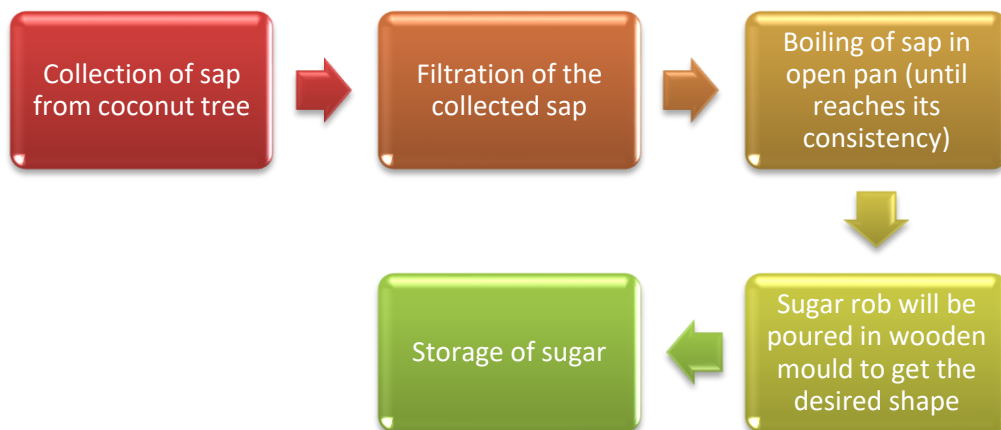


Fig. 3. Processing of coconut sugar

8. CONCLUSION

Through technical research, the current investigation aimed to paint a picture of jiggery production in which the producer receives a fair price for their output to cover all costs spent along the process. A lot of producers find it difficult to incorporate new technologies into their operations. These industries' development will make issues like unemployment and low educational attainment easier to handle. Increased productivity and longer product shelf life are two benefits that manufacturers receive from additional research and development in these areas. These kinds of studies will have a bright future because automation does not exist. This will facilitate the recruitment of young entrepreneurs by offering a range of subsidies. By offering a range of subsidies, it will readily inspire and draw in young entrepreneurs to start these kind of business

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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