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THE STUDY OF THE CASHEW INDUSTRY IN INDIA

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ABSTRACT

Cashew is a cash crop and a highly valued nut in the global market. It is commonly referred to as the "poor man's crop and wealthy man's diet." Cashew agriculture covers the largest area in India. In terms of productivity, processing, and quality, however, this is not the case. In actuality, the Indian cashew business offers a lot of untapped potential for supporting cashew farmers' livelihoods, creating a lot of jobs, and increasing returns through worldwide commerce. The current study suggests that significant modifications to the existing system are required in order to significantly increase the growth of the Indian cashew industry.

Keywords: Indian Cashew Industry, Global Trade. Cash Crop, The Global Market.

I. INTRODUCTION

Cashew and Human Health:

The cashew is a popular tropical cash crop native to Brazil's east coast. It was brought to India by Portuguese explorers five centuries ago. Cashews are high in protein (21.2%), carbs (22%), fat (47%), and minerals (Calcium, Phosphorus, and Iron), and give 575 kcal of energy per 100 g. Cashews are utilised as a delicacy in confectioneries, breakfast cereals, health meals, baked goods, and as chocolate additives. Cashew, in addition to being an edible nut, is also recognised to have medicinal value, with the ability to treat a variety of conditions such as scurvy, anaemia, cough, urinary problems, liver diseases, and diabetes. Because of its high amount of unsaturated fatty acids, it plays an important function in the treatment of cardiovascular illnesses and obesity. Nervous weakness, overall melancholy, and loss of appetite are among the medical uses.

II. METHODOLOGY

India and the World Cashew Market:

Along with Vietnam, Nigeria, and the Ivory Coast, India is a major cashew nut grower. Seventy per cent of the world's cashews are produced in these four countries. The crop covers 4.71 million hectares worldwide, producing 2.75 million tonnes per year. In 2010, India produced 0.61 million tonnes of in-shell nuts from 0.92 million hectares of land (NHB, 2010). This equates to 17.10 per cent of worldwide cashew production from 19.6 per cent of the global cashew planting area (FAOSTAT, 2010). Maharashtra (32.3%), Andhra Pradesh (16.15%), Orissa (13.7%), Kerala (10.76%), and Tamil Nadu (9.8%) are the states that contribute the most within the country, showing that the peninsular area is where the crop is growing the fastest (Personal communication, 2010). India is the world's largest importer, especially of goods from Africa.

Indian Cashew Industry:

India was the first country to enter the cashew trade on a worldwide scale. In 3650 cashew processing mills across the country, the country processed about 1.14 million tonnes of cashew. From 170 in 1959 to over 3500 in 2008, the number of cashew processing mills has increased dramatically. Around 0.5 million individuals are employed in the business, with nearly all of them being women. The organised sector accounts for 46% of cashew processing, while the unorganised sector accounts for 54%. The annual demand for cashew processing in India is 1.5 million tonnes, with only half of it being met by current production. India buys raw in-shell cashews from Congo, Tanzania, Indonesia, and Thailand to meet expanding demand. Processed nuts are exported from India to the United States, the United Kingdom, Japan, the Netherlands, Australia, Canada, and Germany (Directorate-General of Commercial Intelligence and Statistics, 2011). The value of cashew is global, and Table 1 summarises the numerous uses of cashew products and by-products.

III. MODELING AND ANALYSIS

Commercial Cashew processing:

Cashew processing is a set of unit activities required to make the edible nut available. Variances in processing methodology amongst manufacturers are attributable to differences in cashew, equipment availability, human resource availability, and fuel source. The majority of cashew processing operations in India are located in rural

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areas. Unit processes like roasting, shell liquid extraction, and shelling were mechanised around 1960. The majority of other processing stages, on the other hand, are still as time-consuming as manual operations. The following section outlines the most often used cashew processing unit procedures. Figure 1 depicts the unit processes involved in commercial cashew nut processing.

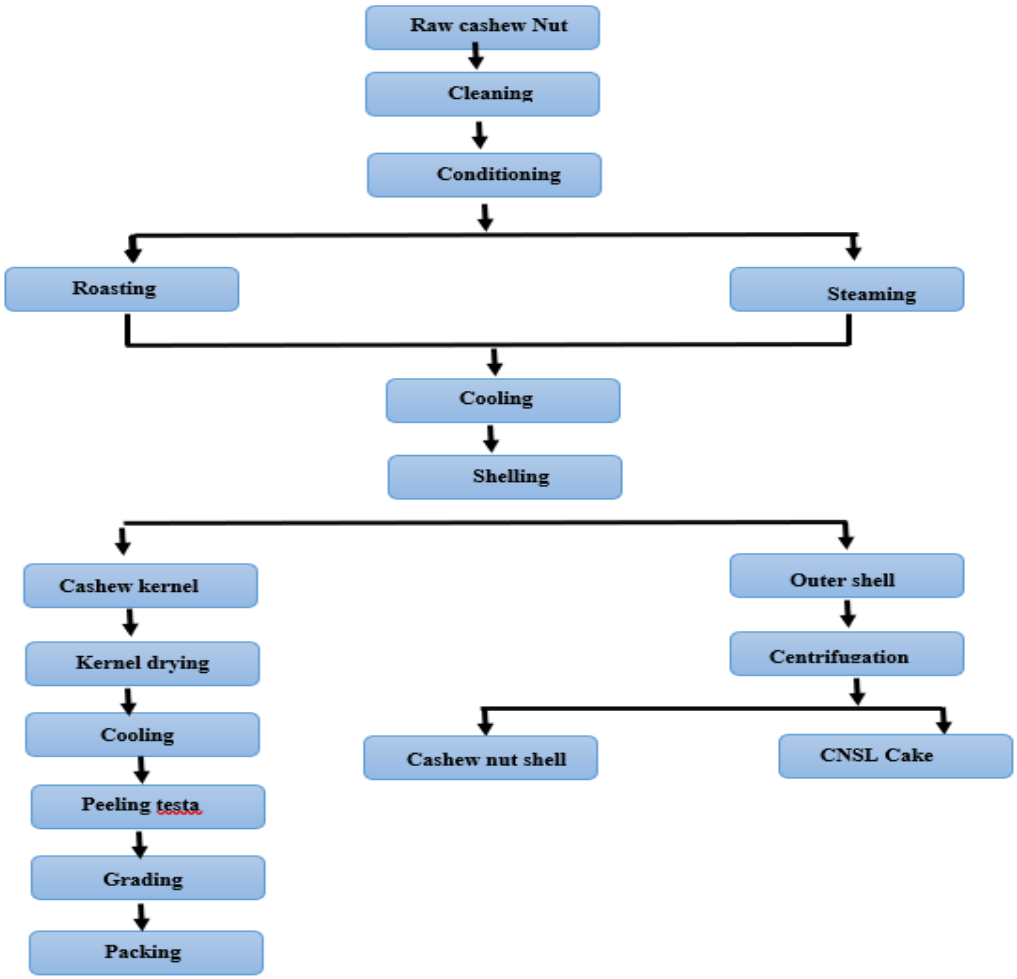

Fig 1: Unit operations involved in cashew nut processing

Before any further processing, cleaning is frequently done manually to remove unwanted extraneous elements such as stones, sand, twigs, and leaves. Soaking nuts in water before roasting helps to prevent them from burning. This conditioning procedure (soaking, draining, and drying) is repeated until the moisture content reaches around 9% w.b. Roasting nuts causes the shell to become brittle, allowing the kernel to separate from the shell. At the same time, the nut exudes a dark brown liquid called Cashew Nut Shell Liquid (CNSL). The open pan method, drum roasting method, and oil bath method are the most frequent roasting methods. While direct heat transfer is used in both open pan and drum roasting, the latter method uses non-edible oils as a heat transfer medium. The texture, colour, flavour, and overall appearance of cashew kernels are all affected by roasting. As a result, selecting the proper roasting procedure is an important factor in determining the quality of the final product. The shelling of the roasted outer cover is the next stage. This can be done manually (nuts are placed on a level surface and individually cracked with a wooden mallet) or mechanically (a knife is used to open the shell mechanically). The majority of Indian units have a 50-56 percent outturn off. Minimal broken and splits are produced by an efficient unit. However, the majority of units produce fewer than 70% intact kernels. The next step is to separate cashew kernels from broken shell pieces and unshelled kernels. This can be done manually (by hand-picking) or mechanically (by using a machine) (using a blower). The testa adhering to the surface of the shelled kernels would be present. To make the testa brittle, the kernels go through several rounds of drying and cooling. Most traditional drying techniques, such as hot air and kiln dryers, lose a significant amount of energy. The moisture content of the kernel is reported to decrease from 7% to 3% w.b.

during this stage. The testa is next peeled either manually (by rubbing the kernels and then finishing with a knife) or mechanically (by air-blasting the kernels and then passing them through a succession of rubber rollers). The testa, on the other hand, is known to be a major source of polyphenols and catechins. These figures are said to be higher than those found in tea and chocolate.

The anti-oxidant activity of an ethanolic extract of testa was shown to be substantial. The testa's nutraceutical value has been overlooked. To sort the kernels into wholes, brokens, and splits, a sorting procedure is necessary. Finally, cashew kernels are assessed according to size, colour, and other criteria.

For grading cashews in India, the Cashew Export and Promotion Council (CEPC) criteria are commonly used. According to ISO criteria, international market values are mostly based on kernel size and the proportion of cracked kernels. Market prices for whole kernels are higher. Broken, on the other hand, have higher nutritional content and are frequently employed in nut butter and other product compositions. Finally, the kernels are packed, preferably under vacuum, with inflexible polymers or metal packs. This is to reduce the impacts of deteriorative oxidative processes, which can lead to the formation of rancid off-flavour chemicals and, as a result, a decrease in market value.

IV. RESULTS AND DISCUSSION

Problems in Cashew Processing in India: The processing of cashew nuts necessitates a large amount of labour and fuel. Despite the development of numerous technologies, the majority of small and medium processing units still use traditional processing methods. This could be due to issues with technology transfers, a lack of capital investment, a lack of resources, or simply indifference. Concerns have also been raised about the need to meet the safety and health standards of cashew workers. The parts that follow describe the issues that the Indian cashew processing sector is dealing with.

1. Supply-Demand Imbalances

Despite being the world's largest producer of raw cashew nuts, India continues to import various forms of the commodity from the Middle East to meet rising demand. The global processed cashew markets are dominated by India (58 percent), Vietnam (25 percent), and Brazil (15 percent). When a raw cashew nut is treated to separate the kernel, the market value increases tenfold, as shown in Table 1.

Table 1: Cashew nut, products and by-products

Component	Percent weight (a)	Value (Rs.) (b)	Usage
Raw cashew nut (c)	15%	75	Requires further processing
Cashew kernel	3.75%	750	60 % used as an ingredient with in the snack food industry and 40 % in the confectioneries.
CNSL	3.60%	66	Component in drugs, paper ink, textiles, cosmetics and paints manufacturing; also in the treatment of certain dermatological disorders
Outer shell	7.5%	-	Fuel; Directly burnt as a biomass or is used as feedstock for gasification or is converted into briquettes
Testa/ peel	0.15%	-	Natural antioxidant, useful resource in leather manufacturing industry
Cashew apple	75-85%	20	Medicinal: treatment of scurvy, diarrhoea, pharyngitis and chronic dysentery. Food: jam, syrup, chutney, beverage and juice

(A) assigning a weight of 100 to the sum of weights of freshly harvested raw cashew nut and fruit.
(b) corresponds to the per kg market value of the particular component in its freshly obtained form.
(c) comprises of cashew kernel, outer shell and test variety.

In addition, as compared to raw cashew nut, a processed product like spiced cashew would bring around Rs. 1300 per kg, showing a 17 to 18 percent increase in value. Table 1 shows that the processing by product CNSL has a wide range of industrial applications in addition to the edible portion obtained. In India, nut butter manufacture is a relatively easy but underutilised technique.

2. Energy losses:

The majority of cashew processing plants continue to use non-standardized unit operations, which waste a lot of fuel and energy. Raw cashew nuts are steamed or roasted, and cashew kernels are mechanically dried. To crack the shell and extract the testa, these high-temperature treatments are required. In such operations, temperatures ranging from 75 to 200 oC are typically used (Trox et al., 2010). Water molecules penetrate the shell structure during steaming, causing cell matrix components to relax. As a result, pressure, temperature, and exposure duration are crucial process parameters. Cutting and shelling activities consume a significant amount of energy. The kidney-shaped kernel, the existence of a robust outer shell, the reactive CNSL, and the brittleness of the kernel all contribute to this (Jain and Kumar, 1997, as quoted by Ogunsina and Bamgboye, 2013). There is potential for a 30–48 percent reduction in overall energy consumption (Mohod et al., 2010a). Mohod et al. (2010a) also suggested that renewable energy sources such as solar energy and biomass gasification might be used in this industry. The use of contemporary equipment necessitates a significant financial expenditure. This is due to the usage of inefficient, traditional equipment. In most situations, the fuel utilised in roasting is high–moisture agricultural bio-mass. This may entail the direct combustion of cashew nut shells in a furnace or in semi–open pits, and is characterised by low fuel calorific value and subsequent thermal energy losses.

3. Inferior Product Quality

Many small-scale cashew processing operations have dismal and unsanitary working conditions, resulting in lower cashew nut quality and significant levels of contamination. For example, the soiling procedure used in most rural units before to shelling (Fig 2) to remove oil adhered to the surface is recognised to be a significant source of direct contamination of the edible product.

Fig 2: Soiling the outer shell for surface oil removal

Heat-sensitive bioactive chemicals in the kernel may be harmed by the high temperatures needed to release the outer shell. Furthermore, storing high moisture cashew kernels in unfavourable settings could lead to aflatoxin contamination, a growing food safety concern. The "Flores" hand-cracking method developed in Indonesia allows cashew nut kernels to be extracted from the shell using a manual cracking apparatus and is one of the newest treatments that could be used in India. The test of cashews generated after 3 hours of mild temperature drying at around 45oC was unharmed, with minimal emergence of CNSL, which could come into touch with the kernel and reduce its value. In comparison to open pan roasting and oil-bath roasting, the approach showed low levels of reduction of bio-active chemicals in the cashew kernel and is considered to be a better shelling process (Trox et al., 2010). Furthermore, there is a scarcity of information in India about cashew kernel grading norms. This is a significant issue since inadequately roasted kernels with a reduced size and shape sell for less on the international market. Another concern is the possibility of mould infection in inadequately roasted kernels. The Indian grading criteria for cashew kernels are shown in Figure 3.

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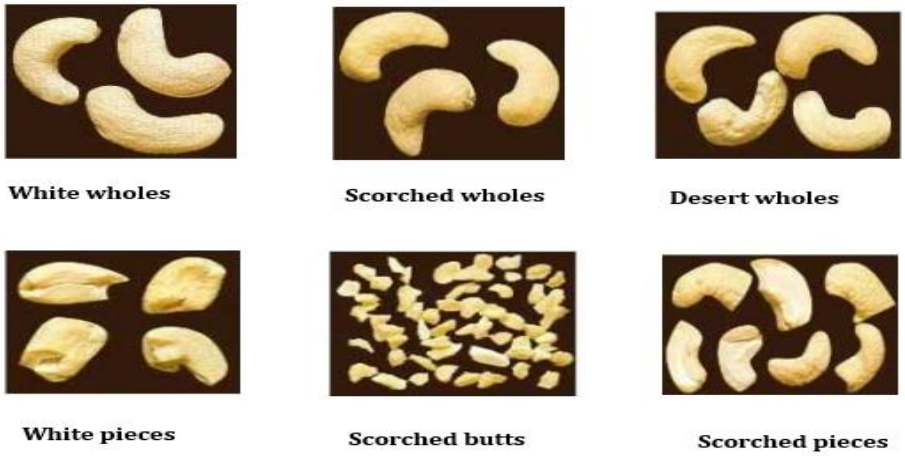

Fig 3: Commercial cashew grades in the Indian cashew industry (Source: Adapted from the Cashew export promotion council of India)

4. Health and Safety Issues:

Workers in most cashew processing plants suffer from a variety of health issues. Shelling is thought to be the most dangerous part of the process. Workers squat in rows on smoky, unsanitary floors filled with charred nutshells and dust (Fig 4).

Fig 4: Woman working in the shelling section

Female employees are frequently used for this reason. Over 82 percent of the units in India are manual-processing units, compared to 40 percent in Vietnam and 25 percent in Brazil. CNSL seeps out as the shells are broken. This corrosive oil can irritate the fingertips severely and result in skin burns. To avoid this, workers scatter ash over skin regions and add a coating of oil (usually coconut oil) (Fig 5).

Fig 5: Ash used to avoid skin burns

Only a few facilities supply workers with hand gloves. There have also been cases where sharp broken bits have struck a worker's eye during shelling, causing permanent eyesight impairment. Almost 90% of workers are exposed to health risks while working in such environments. Other medical difficulties mentioned by those

workers included allergic contact dermatitis, respiratory ailments, cancer, reproductive abnormalities, lower back pain, stiff neck, pain in the heels, eye muscle strain, finger pain, numbness, and even bleeding from fingernails. Even after 25 years since the publication of the above-mentioned work, the situation remains unchanged. According to medical results, prolonged squatting causes degenerative tissue changes and musculoskeletal system functioning abnormalities. In addition to muscular soreness and cramps, women workers in the peeling and grading area face comparable problems. Asthma and other respiratory problems are common as a result of their working circumstances.

5. Environmental Issues:

Many Indian state governments have banned cashew nut drum roasting due to its contribution to air pollution. Its cost-effectiveness comes at the cost of negative environmental consequences. Steam cooking is an environmentally friendly option. According to a study, using steam cooking and a hand-cum-pedal driven sheller together is more cost-effective than using alternative processing methods. However, most units do not use this strategy. Also polluting the atmosphere is the thick acrid fume produced during the roasting process. When it comes to environmental protection, cashew processing plants must closely conform to environmental protection criteria that have been authorised by the Central Pollution Control Board's Peer and Core Committee.

V. CONCLUSION

As the demand for cashew nuts develops, so does the area under cashew plantations. However, this pattern is limited. Currently, research and development efforts are focused on improving cashew productivity and quality by implementing appropriate agricultural methods and producing high yielding cultivars, insect-resistant crops, and other technologies. India imports various types of cashews to help close the supply-demand mismatch. In the cashew processing sector, India must take the required steps to boost productivity, farming techniques, and food safety requirements. In the cashew processing industry, there is limited data on the processing efficiency of different unit operations using manual and mechanical techniques.

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