

# A Study on Operational Efficiency and Challenges in Technological Adoption in the Cashew Industry

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**Abstract**—The cashew industry plays an important role in employment generation, export earnings, and agro-based industrial development. The cashew industry has developed steadily because of favorable climatic conditions, labour availability, and growing demand for processed cashew products. The study aims to analyse the operational efficiency and challenges faced in technological adoption in the cashew industry. The study analyses various cashew processing stages such as raw cashew handling, roasting, cutting, hot chamber processing, machine peeling, sorting, grading, drying, nitrogen filling, and packaging. The study also discusses how modern technology improves productivity, reduces wastage, maintains quality standards, and increases operational efficiency. Further, the study identifies major challenges faced by the industry, such as a shortage of raw cashew nuts, dependence on imported raw materials, rising labour costs, increasing international competition, technological investment costs, and operational difficulties in adopting modern machinery. Both primary and secondary data were used in the study. Primary data was collected through observation and interaction with workers and management, while secondary data was collected from industry reports, journals, books, websites, and company records. The study concludes that modern technology and systematic operational practices improve productivity and quality standards, but continuous technological improvement, efficient management practices, and worker training are necessary to overcome operational challenges and achieve sustainable industrial growth.

**Index Terms**—Operational Efficiency, Cashew Processing, Technological Adoption, Processing Challenges

## I. INTRODUCTION

Manufacturing industries play an important role in economic development by converting raw materials into finished products. Agro-based industries contribute significantly to employment generation, exports, and rural industrial growth. Among these

industries, the cashew processing industry occupies an important position because of its contribution to food processing, exports, and regional economic development.

The cashew industry includes various processing activities such as roasting, shelling, peeling, grading, drying, sorting, and packaging. Cashew kernels are widely used in snacks, sweets, bakery products, chocolates, and processed foods due to their nutritional value and market demand. The industry is highly labor-intensive and provides employment opportunities, especially in rural and semi-urban regions.

Operational efficiency is essential in the cashew industry to maintain product quality, reduce wastage, improve productivity, and increase profitability. Modern technology, such as steam boilers, cutting machines, peeling machines, colour sorters, grading systems, moisture control equipment, and nitrogen-filled packaging units, helps industries improve operational performance and maintain export quality standards.

However, the industry also faces several challenges in adopting modern technology. Rising labour costs, shortage of raw cashew nuts, dependence on imported raw materials, increasing competition from international markets, and high investment costs for machinery create operational and financial difficulties for the industry.

This study focuses on operational efficiency and challenges faced in technological adoption in the cashew industry.

### A. Objectives of The Study

- To study the operational efficiency in the cashew industry.
- To identify challenges faced in technological adoption in the cashew industry.

## B. Need for The Study

The cashew industry plays an important role in employment generation, agro-based industrial growth, and export activities. Maintaining operational efficiency is important for improving productivity, reducing wastage, maintaining product quality, and increasing profitability.

This study helps in understanding the operational activities followed in the cashew industry and analyses the role of technology in improving production efficiency. The study also identifies challenges faced in technological adoption such as rising labour costs, competition, raw material shortages, and high investment costs. Understanding these challenges helps industries improve operational practices and achieve sustainable growth.

## II. REVIEW OF LITERATURE

Danso-Abbeam, G., Fosu, S., & Ogundeji, A. A. (2021) studied technical and resource-use efficiencies in cashew production and found that lack of modern technology and poor management practices reduce productivity and efficiency in the cashew sector.

Movidha, M., Thasnimol, F., Durga, A. R., Kuruvila, A., & Pratheesh, P. G. (2024) examined the challenges faced by the cashew processing industry and identified labour shortages, rising operational costs, and technological difficulties as major problems affecting the industry.

## III. RESEARCH METHODOLOGY

The study is descriptive in nature to understand operational efficiency and challenges in technological adoption in the cashew industry.

### a) Sources of Data

#### Primary Data

Primary data was collected through observation and interaction with workers and management in the cashew industry.

#### Secondary Data

Secondary data were collected from industry journals, books, websites, and previous studies related to the cashew industry.

### b) Research Method

The descriptive research method was used for the study.

## IV. OPERATIONAL PROCESS IN CASHEW INDUSTRY

The cashew processing industry follows a systematic operational process to maintain product quality, improve efficiency, and reduce wastage. Modern machinery and technological systems help improve productivity and maintain export standards.

### A. Raw Cashews

Raw cashew nuts are the primary raw material used in the cashew processing industry. The quality of raw cashews directly affects kernel yield, taste, and market value. Proper storage and handling are necessary to prevent spoilage and maintain product quality.

### B. Roasting

Roasting is an important stage where raw cashew nuts are heated using high-pressure steam. This process softens the hard outer shell and makes shell removal easier. Proper roasting improves shelling efficiency and reduces kernel breakage.

### C. Cutting

Cutting is carried out after roasting to remove the hard shell without damaging the kernel. Special cutting machines or manual cutters are used in this process. Proper cutting improves kernel recovery and reduces wastage.

### D. Hot Chamber

The hot chamber is used to heat cashew kernels under controlled temperature conditions. This process loosens the thin outer skin and makes peeling easier. Proper temperature control helps maintain kernel quality and improves operational efficiency.

### E. Machine Peeling

Machine peeling removes the thin outer skin from the kernels using specialised peeling machines. These machines improve production speed, reduce labour dependency, minimise kernel breakage, and increase productivity.

### F. Sorting

Sorting machines separate good-quality kernels from defective kernels. Advanced optical sorting machines help identify damaged, broken, or discoloured kernels. This improves product quality and export standards.

#### G. Grading

Cashew kernels are graded according to size, shape, and colour. Proper grading increases market value and ensures quality consistency. Modern grading machines improve accuracy and reduce manual errors.

#### H. Drying Process

Drying is important to remove excess moisture from the kernels. Proper drying improves peeling efficiency, prevents spoilage, and increases shelf life. Controlled drying systems help maintain product quality.

#### I. Nitrogen Filling and Packaging

Nitrogen-filled packaging helps maintain the freshness, taste, and shelf life of cashew kernels. Proper packaging protects the product from moisture, air, and contamination during storage and transportation. Hygienic and attractive packaging also improves customer satisfaction and market value.

### V. CHALLENGES FACED IN TECHNOLOGICAL ADOPTION

The cashew industry faces several challenges in adopting modern technology and maintaining operational efficiency.

#### A. Shortage of Raw Cashew Nuts

Limited availability of locally produced raw cashew nuts forces industries to depend on imported raw materials. This increases operational costs and affects production stability.

#### B. Rising Labor Costs

The cashew industry is labor-intensive and requires skilled workers for processing activities. Increasing labor wages raise production costs and reduce profitability.

#### C. Labor Shortage

Many industries face shortage of skilled labor due to migration and changing employment preferences. Labor shortage affects production efficiency and operational continuity.

#### D. High Investment Cost

Modern machinery and advanced processing systems require heavy investment. Small and medium industries often face financial difficulties in adopting new technology.

#### E. International Competition

Countries such as Vietnam use highly mechanised processing systems and lower-cost production methods. This creates strong competition in international markets.

#### F. Technological Maintenance Issues

Advanced machines require regular maintenance, skilled operators, and technical support. Lack of technical expertise can reduce operational efficiency.

#### G. Fluctuation in Market Prices

Frequent fluctuations in global cashew prices affect profitability and create financial uncertainty for processing industries.

### VI. FINDINGS OF THE STUDY

- Modern technology improves operational efficiency and production speed.
- Machine peeling and sorting systems reduce kernel wastage and labour dependency.
- Proper grading and packaging improve product quality and market value.
- Rising labour costs and raw material shortages increase operational difficulties.
- High investment costs create challenges in technological adoption.

### VII. SUGGESTIONS

- Increase adoption of advanced processing technology.
- Provide technical training programs for workers.
- Improve maintenance systems for machinery and equipment.
- Strengthen quality control and operational management practices.

### VIII. CONCLUSION

The cashew industry plays an important role in employment generation, industrial development, and export activities. Operational efficiency and technological adoption help improve productivity, maintain quality standards, and reduce wastage in processing activities.

The study identifies several challenges such as labour shortages, rising operational costs, shortage of raw

materials, and international competition. Although modern technology improves efficiency and product quality, industries require continuous technological improvement, worker training, and better operational practices to achieve sustainable growth and competitiveness in the cashew industry.

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