



Supply chain management in the jaggery industry: A study of production, processing, and marketing

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DOI: <https://doi.org/10.66856/ijcmr.2026.12.3.12224>

Abstract

The jaggery industry is one of the oldest agro-processing industries in India and plays a significant role in rural employment, income generation, and agricultural development. India accounts for more than 70 percent of global jaggery production, and a substantial share of sugarcane output is utilized for jaggery manufacturing. Efficient supply chain management is essential for ensuring smooth movement of raw materials, processing, storage, transportation, and marketing of jaggery products. The present study examines the supply chain structure of the jaggery industry with special emphasis on production, processing, and marketing activities. The study is based on secondary data collected from government reports, research articles, industry publications, and academic literature. The findings reveal that the jaggery supply chain consists of multiple stakeholders including farmers, processors, traders, wholesalers, retailers, and consumers. Modernization of processing technologies, improved logistics, digital marketing, and value-added products are transforming the traditional supply chain. However, challenges such as price fluctuations, inadequate storage facilities, dependence on intermediaries, and lack of standardization continue to affect efficiency. The study concludes that strengthening supply chain integration can significantly enhance profitability, competitiveness, and sustainability in the jaggery industry.

Keywords: Supply chain, jaggery industry, marketing, processing, sugarcane, agribusiness

Introduction

Agriculture and agro-based industries play a crucial role in the Indian economy. Among various agro-processing industries, the jaggery industry occupies a unique position because of its close linkage with sugarcane cultivation and rural livelihoods. Jaggery, commonly known as "gur," is a traditional unrefined sweetener produced by concentrating sugarcane juice. Unlike refined sugar, jaggery retains minerals and micronutrients, making it increasingly popular among health-conscious consumers.

India is the world's largest producer of jaggery and contributes more than 70 percent of global production. Nearly 20–30 percent of the country's sugarcane output is utilized for jaggery manufacturing, supporting millions of rural livelihoods and small-scale enterprises. The industry is characterized by decentralized production, low capital requirements, and strong linkages with rural economies. (Press Information Bureau)

The success of the jaggery industry depends not only on production efficiency but also on effective supply chain management. A supply chain refers to the network of activities involved in the movement of goods from the source of production to the final consumer. In the jaggery industry, the supply chain includes sugarcane cultivation, harvesting, transportation, processing, storage, packaging, distribution, and marketing.

Traditionally, jaggery supply chains were highly fragmented and dependent on local traders and intermediaries. However, increasing demand for organic and value-added jaggery products has encouraged modernization and integration within the supply chain. Efficient supply chain management has become essential for reducing costs, minimizing wastage, improving product quality, and increasing profitability.

The present study aims to analyze the supply chain structure of the jaggery industry and examine the interrelationships among production, processing, and marketing activities.

Objectives of the Study

The major objectives of the study are:

1. To examine the supply chain structure of the jaggery industry.
2. To analyze the production and processing stages in jaggery manufacturing.
3. To study the marketing channels used in the jaggery industry.
4. To identify major challenges affecting supply chain efficiency.

Research Methodology

The present study is descriptive and analytical in nature. The research is based on secondary data collected from various sources.

Sources of Data

The required information was collected from:

- Government reports and publications.
- Ministry of Food Processing Industries reports.
- Research journals and articles.
- Agricultural economics studies.
- Industry reports and publications.
- Books on supply chain management and agribusiness.
- Websites related to food processing and agricultural marketing.

The collected data were systematically classified and analyzed to understand the supply chain structure and operational dynamics of the jaggery industry.

Concept of Supply Chain Management

Supply Chain Management (SCM) refers to the planning, coordination, and control of activities involved in sourcing, production, processing, transportation, storage, and distribution of products. The objective of SCM is to ensure that products reach consumers efficiently while minimizing costs and maximizing value.

In agro-based industries, supply chain management is particularly important because agricultural products are often perishable and subject to seasonal fluctuations. Effective supply chain management helps improve product quality, reduce post-harvest losses, enhance market access, and increase profitability.

The jaggery supply chain is a complex system involving multiple stakeholders who contribute to value creation at different stages.

Supply Chain Structure of the Jaggery Industry

The jaggery supply chain consists of the following major participants:

Input Suppliers

Input suppliers provide:

- Sugarcane seeds
- Fertilizers
- Irrigation equipment
- Farm machinery
- Agricultural chemicals

These inputs are essential for sugarcane cultivation and influence productivity and quality.

Farmers

Farmers are the primary producers of sugarcane. They cultivate, harvest, and supply sugarcane to jaggery processing units. The quality and availability of sugarcane significantly affect jaggery production.

Transporters

Transporters play a critical role in moving harvested sugarcane from farms to processing units. Timely transportation is essential because delays can reduce sugar content and affect product quality.

Processing Units

Processing units convert sugarcane juice into jaggery through crushing, clarification, boiling, concentration, and molding operations.

Wholesalers and Traders

Wholesalers purchase jaggery in bulk quantities and distribute it to retailers and institutional buyers.

Retailers

Retailers sell jaggery products directly to consumers through shops, supermarkets, and online platforms.

Consumers

Consumers represent the final stage of the supply chain. Their preferences significantly influence production and marketing decisions.

Production Stage in the Jaggery Supply Chain

Production is the first stage of the supply chain and begins with sugarcane cultivation.

Sugarcane Cultivation

The success of jaggery production depends on the availability of quality sugarcane. Important factors affecting sugarcane production include:

- Soil fertility
- Irrigation facilities
- Climatic conditions
- Quality seed varieties
- Farm management practices

Maharashtra is one of the leading sugarcane-producing states in India, particularly in districts such as Kolhapur, Sangli, Satara, Solapur, Dharashiv, and Ahmednagar.

Harvesting Operations

Sugarcane is harvested manually or mechanically. Proper harvesting is important because damaged cane can reduce juice quality and jaggery yield.

Transportation of Sugarcane

Freshly harvested sugarcane must be transported quickly to processing units to prevent deterioration of sugar content. Transportation delays can adversely affect processing efficiency and product quality.

Processing Stage in the Jaggery Supply Chain

Processing is the core activity of the jaggery supply chain and involves converting sugarcane into a value-added product.

Sugarcane Crushing

Sugarcane is crushed using mechanical crushers to extract juice. The extracted juice is filtered to remove impurities.

Juice Clarification

Clarification removes suspended particles and improves product quality. Traditional and natural clarifying agents are often used during this stage.

Boiling and Concentration

The clarified juice is heated in large pans until the desired concentration is achieved. This stage requires significant energy input and skilled supervision.

Molding and Cooling

The concentrated syrup is poured into molds and allowed to cool. The final product is shaped into blocks, cubes, powder, or liquid forms.

Packaging

Packaging has become increasingly important due to changing consumer preferences. Modern packaging methods help maintain quality, extend shelf life, and improve market appeal.

Recent technological improvements such as energy-efficient furnaces, improved boiling systems, and mechanized processing equipment have enhanced productivity and reduced production costs. (ARCC Journals)

Marketing Stage in the Jaggery Supply Chain

Marketing is the final stage where jaggery reaches consumers through various channels.

Traditional Marketing Channels

Historically, jaggery marketing involved several intermediaries.

The most common channels include:

Channel I

Producer → Commission Agent → Wholesaler → Retailer → Consumer

Channel II

Producer → Cooperative Society → Wholesaler → Retailer → Consumer

Research indicates that cooperative-based marketing channels often provide better returns to producers compared to channels dominated by intermediaries. (Hind Research Journal)

Modern Marketing Channels

Recent developments have introduced new marketing channels such as:

- Direct marketing
- Farmer Producer Organizations (FPOs)
- E-commerce platforms
- Online marketplaces
- Supermarket chains
- Export marketing networks

These channels reduce dependence on intermediaries and improve market efficiency.

Role of Value Addition in the Supply Chain

Value addition increases the economic value of jaggery products and improves profitability.

Popular value-added products include:

- Organic jaggery
- Jaggery powder
- Jaggery cubes
- Liquid jaggery
- Herbal jaggery
- Flavored jaggery

Value-added products help producers access premium markets and meet evolving consumer demands.

Government initiatives such as PMFME and ODOP have promoted value chain development and market expansion for jaggery products. (Press Information Bureau)

Challenges in the Jaggery Supply Chain

Despite its economic importance, the jaggery supply chain faces several challenges.

Raw Material Constraints

Irregular availability of sugarcane affects production planning and operational efficiency.

Price Fluctuations

Jaggery prices fluctuate due to variations in supply, demand, and market conditions.

Lack of Standardization

Inconsistent production practices result in variations in quality, color, and shelf life.

Storage Problems

Inadequate storage facilities often lead to quality deterioration and product losses.

Transportation Issues

High transportation costs and poor infrastructure increase supply chain expenses.

Dependence on Middlemen

Multiple intermediaries reduce producers' share in the final consumer price.

Limited Market Information

Many producers lack access to timely market intelligence and price information.

Food Safety Concerns

Issues related to adulteration and quality control can negatively affect consumer confidence. (The Times of India)

Emerging Trends in Jaggery Supply Chain Management

Several modern trends are transforming the jaggery supply chain.

Digital Marketing

Social media and online platforms are helping producers reach wider markets.

E-Commerce

Online sales channels facilitate direct interaction between producers and consumers.

Supply Chain Digitization

Digital technologies improve inventory management, logistics, and market information systems.

Sustainable Production

Eco-friendly processing methods and renewable energy utilization are gaining importance.

Export-Oriented Supply Chains

Growing international demand is encouraging producers to adopt global quality standards.

Farmer Producer Organizations

FPOs help small producers improve bargaining power, reduce marketing costs, and strengthen supply chain coordination.

Suggestions for Improving Supply Chain Efficiency

To strengthen supply chain management in the jaggery industry, the following measures are recommended:

1. Promote contract farming and producer cooperatives.
2. Improve transportation and storage infrastructure.
3. Encourage adoption of modern processing technologies.
4. Strengthen quality control and standardization systems.
5. Expand digital marketing and e-commerce platforms.
6. Provide market intelligence and price information services.
7. Support branding and packaging initiatives.
8. Facilitate export promotion and certification programs.
9. Increase financial assistance for small processing units.
10. Promote value-added jaggery products.

Conclusion

The jaggery industry represents one of the most important agro-processing sectors in India and contributes

significantly to rural employment, income generation, and agricultural development. Effective supply chain management is essential for ensuring smooth coordination among farmers, processors, traders, retailers, and consumers.

The study reveals that production, processing, and marketing activities are closely interconnected and collectively determine supply chain performance. Modernization of processing technologies, digital marketing, value addition, and improved logistics have created new opportunities for enhancing efficiency and profitability. However, challenges such as price volatility, storage limitations, inadequate infrastructure, and dependence on intermediaries continue to affect supply chain performance.

A well-integrated supply chain supported by modern technology, efficient logistics, quality assurance, and market-oriented strategies can significantly strengthen the competitiveness and sustainability of the jaggery industry. Therefore, policymakers, producer organizations, researchers, and industry stakeholders should work collaboratively to develop resilient and efficient supply chain systems that support long-term growth and rural development.

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