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Study of the market segmentation of tapioca based on product type and usage

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Abstract

Tapioca (*Manihot esculenta* Crantz), commonly known as cassava, has emerged as an important commercial crop owing to its diverse food and industrial applications. The increasing demand for value-added tapioca products has created distinct market segments based on product type and end-use, making market segmentation essential for understanding the commercial potential of the crop. The present study was undertaken to analyze the market segmentation of tapioca based on product type and usage in India using secondary data collected from reports of ICAR-Central Tuber Crops Research Institute (CTCRI), APEDA, Directorate of Economics and Statistics, published literature and government reports. Tapioca products were classified into different market segments according to their physical form and end-use applications. The analysis identified six major product categories, namely fresh tubers, tapioca starch, sago, tapioca flour, chips and dried cassava pellets. Among these, tapioca starch constituted the largest and most valuable market segment because of its extensive utilization in food processing, textile, pharmaceutical, paper, adhesive and biodegradable product industries. Sago and tapioca flour primarily catered to food and household consumption, whereas chips and dried pellets served as livestock feed and export-oriented products. The study further revealed that the diversification of tapioca into multiple product categories has expanded market opportunities and enhanced value addition across the supply chain. Product-based segmentation also demonstrated that industrial demand contributes significantly to the commercial value of tapioca compared with traditional fresh root consumption. The findings suggest that promoting value-added processing, strengthening market linkages and expanding industrial applications can improve farmers' income, enhance processing efficiency and increase the competitiveness of the Indian tapioca sector in domestic and international markets.

Keywords: Market segmentation, tapioca, tapioca starch, sago, export, value chain

Introduction

Tapioca (*Manihot esculenta* Crantz), commonly known as cassava, is one of the most important tropical root crops cultivated in India. Traditionally consumed as a food crop, tapioca has evolved into a commercially important industrial commodity due to its versatility and wide range of applications. The crop is processed into several value-added products, including starch, sago, flour, chips and modified starch, which cater to diverse consumer and industrial markets. The expanding utilization of tapioca in food processing, pharmaceuticals, textiles, paper, adhesives and biodegradable products has substantially increased its economic importance.

India records the highest cassava productivity in the world, with cultivation concentrated mainly in Tamil Nadu, Kerala and Andhra Pradesh. The well-developed starch and sago industries in southern India have transformed tapioca into a high-value commercial crop. Growing industrial demand

and export opportunities have further diversified the market, creating distinct product segments based on processing level and end-use applications.

Market segmentation is an important marketing tool that classifies products according to their characteristics, consumer groups and usage patterns. In the case of tapioca, different products serve different market segments. Fresh tubers and flour are mainly consumed as food, while starch, modified starch and sago are widely utilized in industrial processing. Chips and dried pellets are primarily used for livestock feed and export markets. Understanding these product segments helps identify high-value markets, improve marketing efficiency and promote value addition throughout the supply chain.

Previous studies have emphasized the importance of cassava processing and industrial utilization. Krishnakumar *et al.* reported that starch and sago dominate the Indian cassava value chain and recommended diversification into higher-

value industrial products. Vilpoux and Junior highlighted the segmentation of cassava starch into food and non-food industries, while Mamat *et al.* [1] discussed the functional applications of cassava flour and starch in food products. However, comprehensive studies focusing specifically on the market segmentation of tapioca based on product type and usage in India remain limited.

Therefore, the present study aims to analyze the market segmentation of tapioca based on product type and usage by classifying major tapioca products according to their commercial applications and end-use sectors. The findings are expected to provide valuable information for farmers, processors, marketers and policymakers in identifying profitable market opportunities and promoting sustainable development of the tapioca industry.

Materials and Methods

The study was based entirely on secondary data collected from ICAR–Central Tuber Crops Research Institute (CTCRI), APEDA, Directorate of Economics and Statistics (DES), Ministry of Agriculture and Farmers Welfare, National Horticulture Board (NHB), published research articles, books, government reports and other authentic online databases. Tapioca products were identified and classified based on their product type and end-use applications. The products were grouped into different market segments such as food, industrial, livestock feed and export markets. Descriptive analysis was employed to classify the products and examine their commercial importance, industrial utilization and market characteristics. Information obtained from different sources was systematically compiled and interpreted to understand the product-wise market structure and usage pattern of tapioca in India.

Results and Discussion

Market Segmentation of Tapioca Based on Product Type and Usage

The analysis revealed that the tapioca market in India is highly diversified, with distinct product categories serving different consumer groups and industrial sectors. Market segmentation based on product type and usage provides a clear understanding of value addition, marketing channels and end-use applications of tapioca products. The increasing industrial demand for tapioca has transformed the crop from a traditional food commodity into an important industrial raw material, creating opportunities for product diversification and market expansion.

Segmentation Based on Product Type

Tapioca products can be classified into six major market segments based on the level of processing and commercial utilization.

Raw Tapioca (Fresh Tubers)

Fresh tubers constitute the primary product marketed immediately after harvest. Due to their highly perishable nature, they are sold mainly through local markets and consumed as a staple food, particularly in Kerala, Tamil Nadu and the northeastern states of India.

Sago (Sabudana): Sago is produced by processing tapioca

starch into pearl-shaped granules. It is widely consumed during religious fasting and is extensively used in traditional Indian food preparations such as khichdi, vada and kheer. The major processing units are concentrated in Salem and Namakkal districts of Tamil Nadu, which serve as the principal production hubs.

Tapioca Starch

Tapioca starch represents the most valuable product segment owing to its extensive industrial applications. It functions as a thickening, binding and gelling agent in food products, while also serving important roles in textile sizing, pharmaceutical tablet manufacturing, paper coating and adhesive production. Its diversified industrial applications make starch the highest value-added product in the tapioca value chain.

Tapioca Flour

Tapioca flour is produced from dried cassava roots or extracted starch and has gained increasing importance due to the growing demand for gluten-free food products. It is widely used in bakery products, confectionery and health foods and is marketed through supermarkets, retail chains and online platforms.

Tapioca Chips

Tapioca chips are prepared by slicing and drying fresh roots and are utilized both as snack foods and as raw material for industrial processing. The product also serves as livestock feed and is exported for starch extraction and fermentation industries.

Dried Cassava Pellets

Cassava pellets are primarily produced for industrial and export markets. They are utilized in bioethanol production, biodegradable plastics, animal feed and modified starch industries. Production of pellets requires standardized processing and quality control and is generally undertaken by organized processors and exporters.

The results indicate that products with higher levels of processing, particularly starch and flour, generate substantially greater value addition than fresh tubers, highlighting the importance of processing industries in enhancing the profitability of the tapioca sector.

Segmentation Based on Usage

Market segmentation based on end-use revealed three major consumer segments.

The household segment primarily consumes fresh tubers and sago as traditional food products. Consumption is concentrated in southern and northeastern India, where tapioca forms part of the regular diet. Demand for sago increases considerably during religious fasting periods.

The industrial segment constitutes the largest market for tapioca products. Food processing industries utilize tapioca starch and flour in noodles, bakery products, sauces and confectionery. Textile industries employ starch as a sizing agent, while pharmaceutical industries use it as a tablet binder and coating material. Paper and adhesive manufacturers also depend extensively on tapioca starch as a raw material. These industries generally procure standardized products from organized processing units.

The export market mainly imports tapioca starch, flour, chips and dried pellets for food processing, animal feed, biofuel production and biodegradable polymer manufacturing. The increasing international demand for gluten-free products and eco-friendly industrial materials has strengthened India's export potential for processed tapioca products.

Distribution and Marketing Channels

The marketing channels differ according to the level of processing and perishability of each product (Table 1).

Table 1: Marketing Channels of Tapioca Products Based on Product Type

Product	Marketing Channel
Raw Tubers	Farmer → Trader → Retailer → Consumer
Sago	Farmer → Processor → Distributor → Wholesaler → Consumer
Tapioca Starch	Farmer → Industrial Processor → Trader/Exporter → Industrial Buyer
Tapioca Flour	Processor → Retail Chain/Exporter → Supermarket/Online Platform
Tapioca Chips	Processor → Exporter → Food Industry/Snack Market
Dried Cassava Pellets	Aggregator → Processor → Exporter → Global Industrial Buyer

Product-wise Export Market Segmentation

The export analysis showed that India exported 12.27 million kg of tapioca products valued at USD 9.21 million during 2023. Bangladesh emerged as the largest export destination, accounting for 41.30% of total exports, followed by the United Arab Emirates (13.40%), the United States (9.30%), the United Kingdom (5.50%) and Saudi Arabia (4.50%). These five countries together accounted for nearly three-fourths of India's total tapioca exports.

The export pattern indicates that neighbouring countries such as Bangladesh import large quantities of food-grade and industrial-grade tapioca products, whereas developed markets such as the United States and the United Kingdom mainly demand gluten-free food ingredients and processed starch products. The United Arab Emirates functions as an important distribution hub for the Middle East.

Overall, tapioca starch and flour dominated India's export basket due to their extensive industrial applications, while chips and sago catered mainly to food and snack markets. These findings suggest considerable opportunities for expanding exports of branded, value-added tapioca products through improved processing, quality certification and product diversification. Similar observations were reported by Krishnakumar *et al.* (2024), who emphasized that starch-based products constitute the dominant value-added

Fresh tubers generally move through the channel Farmer → Trader → Retailer → Consumer whereas value-added products pass through processors before reaching wholesalers, exporters or industrial users. Industrial products such as starch and pellets are predominantly marketed through organized supply chains involving processors, exporters and large industrial buyers. The increasing role of processors demonstrates that value addition significantly enhances market efficiency and product competitiveness.

segment of the Indian tapioca industry.

Product-wise and Country-wise Export Segmentation of Tapioca from India

India's exports of tapioca and substitutes prepared from starch in 2022–23 recorded a total value of USD 9,212.61 thousand with a quantity of 12,265,900 kg during the study period. Among the major importing countries, Bangladesh emerged as the leading destination with an export value of USD 3,804.36 thousand (6,450,200 kg), followed by the United Arab Emirates (USD 1,237.81 thousand, 1,646,080 kg), the United States (USD 860.72 thousand, 597,747 kg), the United Kingdom (USD 508.39 thousand, 469,913 kg) and Saudi Arabia (USD 417.52 thousand, 529,087 kg).

[Weblink:<https://wits.worldbank.org/trade/comtrade/en/country/ALL/year/2023/tradeflow/Imports/partner/WLD/product/190300>] [Visited on 1 June, 2026]

India exported various tapioca-based products such as starch, sago, tapioca flour and dried chips to multiple countries. The export structure reflected the segmented global demand based on product functionality ranging from food and snack industries to industrial and pharmaceutical applications. To understand India's position in the international tapioca trade, an analysis of product-wise exports by destination countries was presented below.

Table 2: Export Data of Tapioca Products from India during 2023-24

S. No.	Country	Quantity (kg)	Export Value (USD '000)	Share in Total Export (%)
1	Bangladesh	6,450,200	3,804.36	41.30
2	United Arab Emirates	1,646,080	1,237.81	13.40
3	United States	597,747	860.72	9.30
4	United Kingdom	469,913	508.39	5.50
5	Saudi Arabia	529,087	417.52	4.50
6	Sri Lanka	680,400	415.94	4.50
7	Nepal	356,975	307.21	3.30
8	Oman	361,858	296.56	3.20
9	Canada	205,376	291.57	3.10
10	Australia	202,890	257.70	2.80
11	Other Countries	656,374	565.49	6.10
Total		12,265,900	9,212.61	100.00

[Weblink:<https://wits.worldbank.org/trade/comtrade/en/country/All/year/2023/tradeflow/Imports/partner/IDN/product/190300>] [Visited on 1 June, 2026]

From Table 2, the export performance data for 2023 showed a geographically diverse market base for Indian tapioca-based products. However, a significant share was concentrated among a few importing countries.

- Bangladesh accounted for the largest share with over 6.4 million kg (41.3 per cent), reflecting strong bilateral demand in the neighbourhood for both food-grade and industrial-grade tapioca products.
- The United Arab Emirates emerged as the second-largest importer (13.4 per cent), acting as a re-export hub or distribution point for the Middle East.
- The United States (9.3 per cent) and United Kingdom (5.5 per cent) demonstrated growing interest in Indian tapioca products, possibly driven by increased demand for gluten-free and plant-based ingredients.
- Countries like Sri Lanka, Nepal and Oman represented smaller but consistent markets for Indian starch and flour-based products.

Conclusion

The present study demonstrated that the tapioca market in India is highly diversified and can be effectively segmented based on product type and end-use applications. Six major product categories fresh tubers, sago, tapioca starch, tapioca flour, tapioca chips and dried cassava pellets were identified, each catering to distinct consumer and industrial markets. Among these, tapioca starch emerged as the most valuable product segment due to its extensive applications in the food, textile, pharmaceutical, paper and adhesive industries, while tapioca flour has gained increasing demand in the gluten-free food market. The study also revealed that household consumption, industrial utilization and export markets constitute the three major usage segments of tapioca products.

The analysis of marketing channels indicated that value-added products follow organized supply chains involving processors, exporters and industrial buyers, whereas fresh tubers are largely marketed through traditional channels. Export analysis showed that Bangladesh, the United Arab Emirates and the United States are the major destinations for Indian tapioca products, highlighting the growing international demand for processed and value-added products. The findings suggest that strengthening processing infrastructure, promoting product diversification, improving quality standards and expanding export-oriented marketing strategies can enhance value addition, improve farmers' income and increase the global competitiveness of the Indian tapioca industry. Overall, effective market segmentation provides a valuable framework for identifying high-potential market opportunities and supporting the sustainable growth of the tapioca sector in India.

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