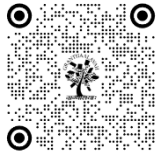


EXPLORING PRODUCT DIFFERENTIATION AND MARKETING APPROACHES FOR ALPHONSO MANGO: EVIDENCE FROM A PILOT STUDY IN PUNE REGION

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ABSTRACT

The Alphonso mango, celebrated for its rich flavor, aroma, and texture, holds a premium position in both domestic and export markets. However, despite its superior qualities, farmers and sellers often face challenges in market positioning, value realization, and combating counterfeit or adulterated varieties. This pilot study explores the product differentiation strategies and marketing approaches adopted for Alphonso mangoes in the Pune region. Through structured interviews with farmers, traders, Farmer Producer Organizations (FPOs), and consumers, as well as field observations, the study identifies key determinants influencing consumer preferences and purchasing behaviors. The findings highlight that geographical indication (GI) tagging, organic certifications, and traceability systems are crucial in enhancing product authenticity and market value. Direct-to-consumer models, such as online sales and farm-to-home delivery, have emerged as effective alternatives to the traditional mandi-based system. Regional challenges such as logistics inefficiencies, lack of cold chain infrastructure, and limited consumer awareness regarding certified Alphonso mangoes are also discussed. Success stories from select FPOs demonstrate that strategic branding, packaging innovations, and quality assurance mechanisms can lead to higher consumer trust and price premiums. The study reveals critical gaps in infrastructure, market access, and digital literacy that hinder the scalability of innovative models. Policy implications include the need for supporting farmer collectives, enhancing rural marketing networks, and incentivizing adoption of digital traceability tools. The research provides a foundation for larger-scale studies and offers actionable insights to enhance the competitiveness of Alphonso mangoes in domestic and global markets.

Keywords: Alphonso Mango, Product Differentiation, Marketing Strategies, Farmer Producer Organizations, Geographical Indication (GI), Consumer Behavior, Traceability Systems

1. INTRODUCTION

The Alphonso mango, often referred to as the "King of Mangoes," is renowned for its rich aroma, vibrant color, smooth texture, and distinct sweetness. Primarily grown in the Konkan region of Maharashtra, particularly in Ratnagiri, Devgad, and parts of Sindhudurg, Alphonso mangoes hold a prominent place in India's premium fruit market and have a strong presence in international exports due to their superior quality and taste profile [1]. The fruit has been granted Geographical Indication (GI) status, underscoring its unique identity tied to a specific region. Despite its celebrated status, Alphonso mangoes face stiff market competition, issues of counterfeit produce, inconsistent quality, and fluctuating prices, all of which necessitate a deeper understanding of how differentiation and marketing strategies can protect and elevate its value.

Product differentiation in the horticulture sector, particularly for high-value crops like Alphonso mango, plays a pivotal role in determining consumer perception and market price. In agricultural markets where price volatility and

perishability are high, differentiation strategies such as GI tagging, organic certification, traceability, and branding serve to create a niche market and build consumer trust [2][3]. For products with strong sensory and aesthetic appeal, differentiation helps establish brand loyalty and reduces the likelihood of substitution. Unlike staple crops, high-value horticultural produce often caters to a selective, quality-conscious segment, making it essential for producers and marketers to adopt robust value-adding mechanisms [4]. Moreover, with the rise of digital platforms and increasing consumer awareness of food safety and origin, differentiated products are more likely to thrive in premium segments [5]. The Pune region offers a unique context for studying the marketing and differentiation of Alphonso mangoes. Located relatively close to the Konkan belt and being a rapidly urbanizing and economically vibrant city, Pune serves as a key consumption hub for Alphonso mangoes. The city exhibits diverse consumer preferences ranging from traditional bulk purchases through mandis to more modern preferences for curated, home-delivered, and certified mangoes [6]. Additionally, Pune hosts a significant number of Farmer Producer Organizations (FPOs) and agri-startups that are experimenting with novel branding, packaging, and direct-to-consumer marketing approaches, making it a fertile ground for examining product differentiation strategies [7]. However, this transition is not without challenges. Farmers and small traders often lack access to grading infrastructure, digital marketing tools, or the knowledge to communicate the authenticity and superiority of their produce effectively [8]. Hence, understanding these localized dynamics is critical to proposing scalable solutions for enhancing Alphonso mango value chains. This figure 1 illustrates the dual strategy of product differentiation and marketing for Alphonso mangoes, highlighting key elements such as GI tagging, certifications, branding, and direct-to-consumer models to enhance market value and authenticity.

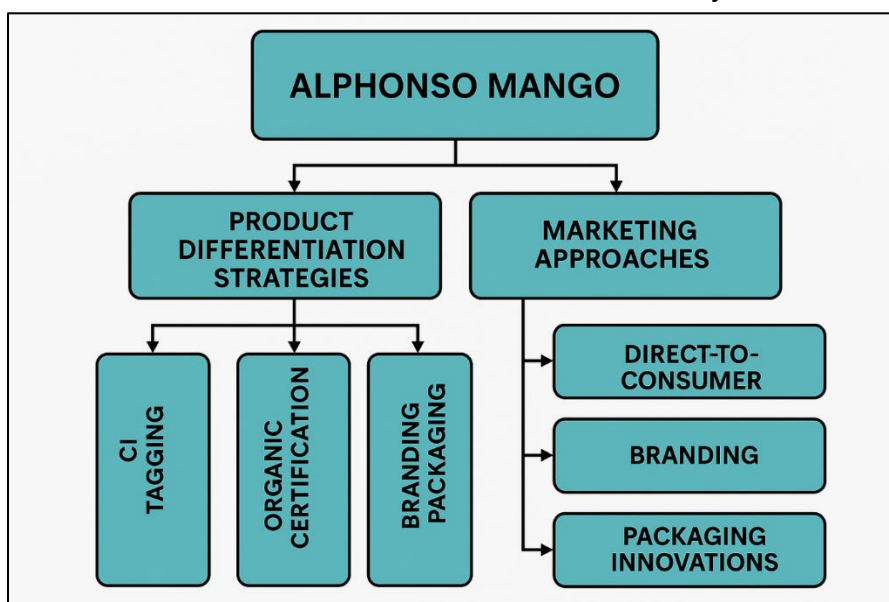


Figure 1 Process of Product Differentiation and Marketing Approaches for Alphonso Mango

This pilot study aims to analyze how product differentiation and marketing strategies are currently being adopted and perceived in the Pune mango market. It seeks to uncover the effectiveness of approaches like GI-based branding, organic labels, traceability mechanisms, and consumer education in driving sales and building consumer loyalty. By using a mixed-methods approach that includes field interviews, case studies, and consumer surveys, the study generates context-specific insights that can inform broader interventions across similar horticultural markets in India [9][10]. The results of this study aim to contribute to both academic discourse and practical policy recommendations for improving the competitiveness and sustainability of premium fruit marketing in India.

2. LITERATURE REVIEW

Product differentiation in agricultural markets is a widely recognized strategy to enhance value realization, reduce price volatility, and build consumer trust. Theoretically grounded in microeconomic principles of monopolistic competition and branding, product differentiation allows producers to distinguish their goods based on intrinsic attributes (e.g., taste, nutritional quality) or extrinsic features (e.g., certifications, branding, origin) [8]. In agri-markets,

particularly for perishable and high-value commodities, differentiation has a direct impact on price premiums and consumer loyalty. According to Lancaster’s theory of consumer demand, agricultural products are viewed by consumers not only for their physical form but also for the “bundles of attributes” they deliver, which supports the case for branding, GI-tagging, and organic labeling in fresh produce [9]. Furthermore, the growing trend of health-conscious and ethically aware consumers makes differentiation through sustainable and traceable practices even more relevant. Marketing strategies for perishable and premium agricultural produce are fundamentally shaped by their shelf-life, quality variations, and supply chain sensitivity. Scholars have highlighted that traditional mandi-based supply chains often fail to deliver consistent quality, prompt payments, and transparency, particularly for fruits and vegetables [10]. As a result, direct marketing approaches such as farmer markets, subscription models, digital platforms, and e-commerce have gained traction. Traceability and certification are increasingly becoming marketing tools, especially in fruits like apples and pomegranates where consumers demand proof of origin and safety standards [11]. These strategies not only help command better prices but also reduce the risk of product substitution with inferior or counterfeit items. Branding—once limited to packaged goods—is now emerging as a key marketing differentiator even in fresh produce, with success stories seen in FPOs branding grapes, bananas, and even jackfruit in India [12].

Several successful case examples further illustrate the role of differentiation and marketing innovation in premium agri-value chains. For instance, the Nasik grape cluster leveraged GI certification, pre-cooling, and packaging standards to penetrate export markets and reduce post-harvest losses [13]. Similarly, Himachal apples have employed color sorting, branding, and orchard-level quality assurance to fetch better prices and reduce dependence on commission agents [14]. The saffron industry in Kashmir has also adopted QR-based traceability and GI-based branding to combat adulteration and build authenticity, leading to increased export viability and improved farmer incomes [15]. These examples reveal that differentiation and marketing strategies work best when supported by enabling infrastructure, collective action (through FPOs or cooperatives), and digital literacy among producers. However, there are notable gaps in the academic and field literature specific to Alphonso mangoes. While the fruit enjoys a strong brand image globally, empirical studies exploring its market dynamics, consumer perception, and differentiation strategies remain scarce [16]. Much of the available literature focuses on production techniques, post-harvest handling, and export data, rather than marketing innovation or branding practices adopted by farmers and local sellers. Furthermore, there is limited documentation of how consumers perceive certifications like GI tags or residue-free labels in the context of Alphonso mangoes, and whether these influence their purchase decisions. The role of regional markets like Pune in shaping demand patterns and testing new marketing models has also not been adequately explored. Another critical gap is the lack of studies evaluating the role of digital platforms and e-commerce in enhancing Alphonso mango sales, especially post-COVID when consumer behavior has shifted significantly towards online purchasing [17].

Table 1 Summary of Related Work on Product Differentiation and Marketing Strategies in Agri-Markets

Commodity Studied	Differentiation Strategy	Marketing Approach	Key Outcome	Limitation / Gap
Nasik Grapes	GI Tagging, Pre-cooling, Packaging	Export-oriented via APEDA	Enhanced export price, reduced rejection rate	Limited smallholder participation
Himachal Apples	Color sorting, Grading, Cold Chain	Branded wholesale & retail	Improved quality control and shelf life	Lack of end-consumer branding
Kashmir Saffron	QR Code Traceability, GI Tag	Niche exports, Online platforms	Authenticity assurance, price premiums	Adoption cost and technical know-how
Organic Turmeric (Erode)	Organic Certification, Cooperative Label	Farmer cooperative-led marketing	Gained access to premium retail chains	High cost of certification
Ratnagiri Alphonso	GI Tag Only	Mandi and Private Buyers	Geographical identity established	Counterfeit products still prevalent
Indian Pomegranates	Grading and Size Sorting	Online direct-to-consumer (D2C)	Better prices through direct marketing	Digital literacy among farmers
Indian Bananas (Tamil Nadu)	Regional Branding, Grading	Government-supported exports	Recognition in Gulf countries	Logistics bottlenecks
Deccan Jackfruit	Local FPO Branding, Processing	Processed product value chain	Created new market segments	Scale and reach are limited
Alphonso (Devgad FPOs)	Farm-Level Sorting, QR Traceability	Direct online sales, Subscription	Customer loyalty and repeat purchases	High marketing effort required
Indian Mangoes (General)	Residue-Free Labels, GI, Cold Chain	Mixed—Mandi, Export, Retail Chains	Some price gains observed	Lack of uniform standards and poor awareness

3. METHODOLOGY

1) Study Area and Rationale for Choosing Pune Region

The Pune region in Maharashtra was selected for this pilot study due to its strategic relevance as both a high-demand urban consumer hub and a logistical node for Alphonso mango trade from the Konkan region. Pune's rapidly urbanizing population, increasing demand for premium fruits, and growing online consumer base make it an ideal site to evaluate modern marketing and differentiation practices. Additionally, the region houses multiple Farmer Producer Organizations (FPOs) and agri-tech startups experimenting with direct-to-consumer models and digital branding initiatives. Its proximity to Alphonso-producing regions like Ratnagiri and Devgad also facilitates better access to farm-level insights and supply chain actors, making it a suitable choice for a comprehensive market-side analysis.

2) Sampling Strategy (Farmers, FPOs, Traders, Consumers)

A purposive sampling strategy was adopted to capture diverse stakeholder perspectives across the Alphonso mango value chain. The sample included 12 Alphonso mango farmers, 3 active FPOs engaged in mango marketing, 6 traders/commission agents from local mandis, and 30 end consumers across different income and age groups in Pune. The aim was to ensure variation in scale, experience, marketing approach, and buying behavior. Farmers were selected from both Konkan-origin suppliers and those selling through Pune-based agents. Consumers included both offline bulk buyers and online platform users to represent modern and traditional demand patterns.

Table 2 Stakeholder Sampling Summary

Stakeholder Group	Number of Respondents	Selection Criteria
Mango Farmers	12	Alphonso growers supplying Pune market
Farmer Producer Orgs	3	Active in Alphonso marketing
Traders/Commissioners	6	Operating in APMC and private mandis
Consumers	30	Urban, online and offline mango buyers

3) Data Collection Tools: Interviews, Surveys, and Field Observations

Data collection involved a mixed-method approach. Semi-structured interviews were conducted with farmers, FPO representatives, and traders to capture detailed qualitative insights into marketing practices, pricing challenges, and branding efforts. Consumer surveys were used to gather information on preferences, purchase behaviors, and perceptions of GI tags, certification, and quality assurance. Field observations were carried out at mandis, FPO packhouses, and retail points to validate claims and understand ground realities. The tools were piloted for validity and adjusted to local language and context for better respondent engagement.

4) Data Analysis Methods (Qualitative Coding and Statistical Summaries)

The collected qualitative data were analyzed using thematic coding. Key themes were identified around product differentiation elements (e.g., GI awareness, packaging, traceability), marketing practices (e.g., online sales, pricing models), and consumer perception. NVivo software was used for coding and organizing qualitative responses. Quantitative survey data were analyzed using descriptive statistics such as frequency distributions, percentage analysis, and cross-tabulations using Excel and SPSS. The triangulation method was used to validate responses by comparing information from different stakeholders on the same topic.

5) Limitations of the Pilot Study

- Limited sample size restricts generalizability.
- Regional focus may not capture wider national variations.
- Time-bound data collection during one season may affect temporal dynamics.
- Reliance on self-reported data may introduce biases.
- Digital literacy differences affected online consumer survey reach.

4. PRODUCT DIFFERENTIATION STRATEGIES OBSERVED

1) Use of GI Tagging and Branding

Geographical Indication (GI) tagging is a crucial product differentiation tool for Alphonso mangoes, linking the fruit's unique qualities to its place of origin in the Konkan region. The study observed that GI tagging functions not only as a certification of origin but also as a marketing asset that reassures consumers about authenticity and quality. Farmers and FPOs emphasized the use of the GI label on packaging and promotional materials to build brand equity and justify premium pricing. However, while GI tagging was widely recognized among traders and organized buyers, many smallholder farmers and end consumers exhibited limited awareness of its significance. This gap affects the effective capitalization of GI branding in informal markets and local mandis, where counterfeit or non-GI mangoes are sometimes sold under the Alphonso name. The analysis also revealed that GI tagging's impact on price premiums depends on parallel efforts in consumer education and enforcement against misuse. FPOs that combined GI tagging with traceability and quality assurance reported better consumer trust and higher repeat purchase rates. Overall, the study underscores that while GI tagging provides a strong foundation for differentiation, its benefits are maximized only when integrated with comprehensive branding and awareness strategies across the supply chain.

2) Organic Certification and Residue-Free Claims

Organic certification and residue-free claims emerged as significant yet challenging avenues for product differentiation among Alphonso mango producers. The study found that some farmers and FPOs have pursued organic certification to meet the growing consumer demand for chemical-free produce, particularly among urban and health-conscious buyers. Organic Alphonso mangoes are marketed at a substantial price premium, reflecting perceived health benefits and environmental sustainability. However, acquiring and maintaining organic certification involves considerable costs, technical knowledge, and compliance efforts that many smallholder farmers find prohibitive. Additionally, residue testing and monitoring require access to accredited labs, which are often distant or expensive. These barriers limit widespread adoption of organic labels in the region.

Residue-free claims, though less formalized than organic certification, are more commonly used as a marketing tool. Farmers practicing integrated pest management (IPM) and reduced chemical inputs communicate these practices to buyers as a sign of safer fruit. Nevertheless, residue-free labels currently lack standardized verification, reducing consumer confidence. The analysis also noted a lack of consumer awareness about what "residue-free" precisely entails, creating ambiguity in the marketplace. Despite these challenges, organic and residue-free claims have potential as differentiation strategies that align with global trends favoring sustainable agriculture. Strengthening farmer access to certification support, subsidies for residue testing, and consumer education could help mainstream these claims. FPOs that facilitate group certification and transparent supply chains are well positioned to overcome individual farmer limitations, thereby enhancing market reach for certified Alphonso mangoes.

3) Packaging Innovations and Grading Mechanisms

Packaging and grading are vital components of product differentiation that directly influence Alphonso mangoes' marketability, shelf life, and consumer appeal. The study identified that many farmers and FPOs have introduced improved packaging materials such as ventilated cardboard boxes, molded trays, and eco-friendly packaging that protect the fruit during transportation and reduce spoilage. Attractive packaging featuring GI tags, organic logos, and traceability information helps enhance consumer perception of quality and authenticity. Packaging also plays a key role in segmenting markets by offering different pack sizes, catering to household buyers and bulk purchasers alike.

Grading mechanisms have evolved from simple size-based sorting to more sophisticated approaches that consider sugar content, aroma, and ripeness levels. Some FPOs employ trained graders or use portable refractometers to ensure consistent quality standards. This grading enables farmers to command differentiated prices in wholesale and retail markets, as well as meet export quality requirements. The ability to grade and package Alphonso mangoes effectively reduces price spread and post-harvest losses, creating incentives for producers to adopt best practices. The analysis highlighted that grading and packaging innovations are unevenly distributed. Small farmers selling directly in mandis often lack access to grading infrastructure and use traditional, low-cost packaging, limiting their ability to differentiate. Furthermore, inconsistent quality standards and lack of certification for grading procedures reduce buyer confidence in some cases.

4) Use of Digital Traceability (QR Codes, Blockchain)

Digital traceability using QR codes and blockchain technology is emerging as a forward-looking product differentiation strategy for Alphonso mangoes. The study found that some progressive FPOs and agri-tech startups have implemented QR codes on packaging, enabling consumers to scan and access detailed information about the fruit's origin,

farmer profile, harvesting date, and certification status. This transparency builds trust and caters to the increasing consumer demand for food safety and authenticity.

Blockchain-based traceability, though in nascent stages, offers a tamper-proof and decentralized record of the mango supply chain, preventing fraud and counterfeit issues. However, adoption barriers include technological complexity, cost, and digital literacy gaps among small-scale farmers. Nevertheless, early adopters report improved market confidence and potential for premium pricing linked to verified provenance.

5) Counterfeit Challenges and Consumer Awareness

Counterfeiting and mislabeling pose significant challenges to effective product differentiation for Alphonso mangoes. The study identified instances where non-GI mangoes or inferior varieties were marketed under the Alphonso name, particularly in informal markets and traditional mandis, diluting brand value. Consumer awareness about authentic Alphonso mangoes and the significance of GI or certification labels remains limited, undermining differentiation efforts. Without adequate enforcement and consumer education, counterfeit products can erode farmer incomes and consumer trust. Addressing this requires coordinated policy action, consumer outreach campaigns, and strengthening supply chain transparency mechanisms.

5. MARKETING APPROACHES IDENTIFIED

1) Traditional Mandi-Based Marketing and Its Limitations

The traditional mandi-based marketing system has long been the primary channel for selling Alphonso mangoes in India. This system involves farmers bringing their produce to local agricultural markets (mandis) where commission agents and traders facilitate bulk sales. While mandis offer broad market access and aggregation points, they are fraught with limitations that constrain farmers' earnings and market efficiency. One key issue is the lack of direct interaction between producers and consumers, which results in limited price transparency and reduced bargaining power for farmers. Commission agents often take a significant share of profits, and the absence of standardized grading and quality control leads to price fluctuations based on subjective assessments.

Moreover, mandis suffer from infrastructural deficits such as inadequate cold storage, poor handling facilities, and delayed payments, all contributing to post-harvest losses and diminished fruit quality. The mandi system also struggles to cater to niche markets that demand premium, certified, or traceable Alphonso mangoes, as these buyers prefer direct or organized supply chains. Additionally, mandis typically operate during limited hours and are geographically concentrated, limiting access for small farmers located far from the market centers. The rigid structure and bureaucratic procedures of mandi auctions further discourage innovation and adoption of modern marketing tools. This traditional model does not effectively support branding, traceability, or consumer engagement, which are increasingly important in competitive premium fruit markets. While mandis remain critical for volume trade, their limitations highlight the need for alternative marketing channels that enhance farmer incomes, improve quality assurance, and meet evolving consumer preferences.

2) Direct-to-Consumer Channels: Farmgate Sales, E-Commerce, Social Media

Direct-to-consumer (D2C) marketing channels have gained significant traction for Alphonso mangoes, providing farmers and FPOs opportunities to bypass intermediaries and capture greater value. Farmgate sales where consumers purchase mangoes directly from orchards or farm outlets facilitate personal engagement, allowing farmers to showcase fruit quality and educate buyers on authenticity, GI tags, and certifications. This direct interaction builds trust and often results in higher willingness to pay among informed consumers.

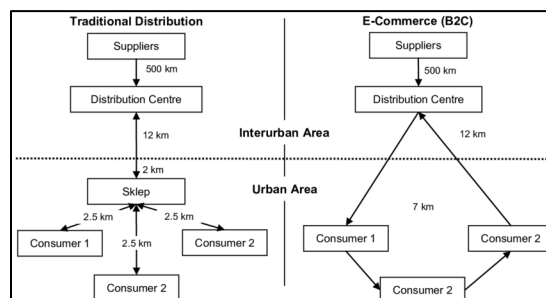


Figure 2 Overview of process for Direct-to-Consumer Channels traditional and E-commerce

The rise of e-commerce platforms dedicated to fresh produce has revolutionized Alphonso mango marketing, especially in urban centers like Pune. Online marketplaces and specialized fruit delivery startups offer consumers convenient access to premium mangoes with transparent pricing, verified quality, and home delivery services. These platforms often highlight certifications, origin details, and traceability information through digital labels or QR codes, aligning with modern consumer demand for food safety and authenticity.

Social media channels like WhatsApp, Instagram, and Facebook have become critical marketing tools for small farmers and FPOs. Through these platforms, sellers create direct communication lines with customers, announce availability, promote offers, and build brand loyalty. Social media also enables peer recommendations and reviews, enhancing consumer confidence.

3) Role of FPOs and Cooperatives in Marketing

Farmer Producer Organizations (FPOs) and cooperatives play a pivotal role in organizing smallholder Alphonso mango growers to overcome market fragmentation and improve collective bargaining power. By aggregating produce, FPOs facilitate economies of scale that enable investments in grading, packaging, and certification processes. These collective efforts help standardize quality, reduce transaction costs, and enhance market access for member farmers.

FPOs often lead marketing initiatives by branding mangoes under a common label, integrating GI tags, and promoting organic or residue-free certifications. This branding enhances product recognition and builds consumer trust, critical for commanding price premiums in competitive markets. Furthermore, FPOs can negotiate better prices and contracts with large retailers, exporters, and online platforms, which individual farmers might find challenging. Besides market linkages, FPOs provide capacity building in digital marketing, traceability adoption, and post-harvest handling, equipping farmers with skills needed to meet modern market requirements. Some cooperatives operate their own packhouses and cold storage facilities, improving shelf life and reducing losses.

4) Case Studies of Successful Local Marketing Initiatives

The pilot study identified several local marketing initiatives that demonstrate innovative approaches to Alphonso mango marketing. One FPO in the Pune region implemented a subscription-based direct delivery model, combining GI tagging, digital traceability, and attractive packaging to build a loyal urban consumer base. Customers appreciated the transparent information on origin and farming practices, resulting in repeat orders and word-of-mouth referrals. Another successful case involved a cooperative that leveraged social media campaigns to educate consumers on differentiating authentic Alphonso mangoes from counterfeit varieties. By conducting tasting events and online webinars, they enhanced awareness and generated trust, leading to improved sales during the mango season.

A third initiative integrated e-commerce platforms with farmer-led quality control mechanisms, ensuring consistent grading and timely deliveries. This model reduced dependence on traditional mandis and intermediaries, increasing farmer incomes by up to 15% during peak season. These case studies underscore the potential of combining technology, consumer engagement, and collective action to overcome traditional market limitations. They also highlight the importance of adaptive marketing strategies tailored to urban consumers' preferences and evolving retail landscapes.

6. CONSUMER INSIGHTS AND PREFERENCES

1) Factors Influencing Purchasing Decisions (Price, Origin, Quality)

Consumers' purchasing decisions for Alphonso mangoes in Pune are influenced primarily by price, origin, and perceived quality. Price sensitivity varies, with many buyers willing to pay premiums for mangoes perceived as authentic and high-quality. Origin plays a vital role, especially for urban consumers who associate Alphonso mangoes from Ratnagiri and Devgad with superior taste and aroma. Quality factors such as ripeness, sweetness, and texture are decisive at the point of sale. Buyers often rely on visual cues like color and size, alongside seller reputation. However, inconsistent grading and packaging can create uncertainty, influencing purchase hesitation. Thus, transparent labeling and trusted sourcing significantly enhance buying confidence and willingness to pay higher prices.

2) Awareness of Alphonso Authenticity and GI Tagging

Awareness of Alphonso mango authenticity and GI tagging among Pune consumers is moderate but growing. While urban consumers and repeat buyers tend to recognize the GI tag as a mark of genuine origin, many casual or first-time purchasers remain unaware of its significance. This lack of awareness limits the GI tag's effectiveness as a differentiation tool in local markets. Educational campaigns and packaging that prominently feature GI information have helped

improve recognition. However, the study found that consumer understanding of how GI certification guarantees quality or protects against counterfeit products is limited. Enhancing consumer education could strengthen demand for certified Alphonso mangoes and discourage purchase of fake or substandard alternatives.

3) Preference for Online vs Offline Buying

Purchasing preferences for Alphonso mangoes show a clear split between online and offline channels. Traditional mandis and local fruit vendors remain popular among older and price-conscious consumers who value in-person inspection and immediate purchase. In contrast, younger, urban, and tech-savvy consumers increasingly prefer online platforms offering convenience, home delivery, and transparent information such as origin, grading, and certifications. Online buyers appreciate subscription models and curated packaging but sometimes express concerns about freshness and delayed deliveries. Despite rapid growth, online sales currently account for a smaller market share but are expanding due to digital adoption and lifestyle changes, suggesting a continuing shift toward e-commerce for premium fruits.

4) Regional Variations Within Pune Urban and Semi-Urban Consumers

Within Pune, consumer preferences show notable regional variations between urban and semi-urban areas. Urban consumers tend to prioritize quality, authenticity, and convenience, often willing to pay higher prices for certified, branded Alphonso mangoes delivered through digital channels. They exhibit greater awareness of GI tags and organic certifications. Semi-urban consumers, while increasingly quality-conscious, still largely rely on traditional mandi purchases and personal relationships with local vendors. Price sensitivity is higher in semi-urban areas, and packaging or traceability information plays a lesser role. These differences suggest that marketing strategies should be tailored regionally, combining modern digital outreach in urban centers with strengthened mandi linkages and local awareness efforts in semi-urban zones.

Table 3 Consumer Insights and Preferences

Parameter	Key Insight	Urban Consumers	Semi-Urban Consumers	Implication for Marketing
Price Sensitivity	Varies widely; some willing to pay premium	Moderate to low price sensitivity	Higher price sensitivity	Tailor pricing strategies regionally
Origin Importance	Strong influence on trust and purchase	High awareness of Ratnagiri/Devgad origin	Moderate awareness	Highlight origin especially in urban areas
Quality Factors	Key purchase driver: ripeness, aroma, texture	High focus on visual and taste cues	Relies on vendor reputation	Ensure quality communication and grading
Awareness of GI Tag	Moderate; growing but not universal	Better awareness, linked to certifications	Low awareness	Enhance consumer education on GI
Authenticity Perception	Important to avoid counterfeit	Concerned about fake products	Less concern but price-sensitive	Use traceability and branding
Buying Channel Preference	Mix of online and offline	Increasing preference for online buying	Predominantly offline buying	Develop dual channel marketing
Online Buying Barriers	Concerns over freshness, delivery delays	Awareness of e-commerce platforms	Limited digital literacy	Improve logistics and digital literacy
Packaging Importance	High—associated with quality and authenticity	Appreciated for convenience and info	Less emphasis	Focus on packaging innovations in urban
Trust Factors	Reliance on certifications and seller credibility	High trust in certified brands	Trust based on vendor relationships	Build trust via FPOs and certifications
Regional Differences	Urban consumers more quality and convenience focused	Price-driven, traditional buying	Customize marketing strategies accordingly	Regional segmentation is essential

7. DISCUSSION

1) Interpretation of Results in Context of Existing Theories

The results of this pilot study align closely with established theories of product differentiation and consumer behavior in agricultural markets. According to Lancaster's theory of consumer demand, buyers value not just the physical product but the attributes and services bundled with it—this is evident in how GI tagging, organic certification, and digital traceability enhance Alphonso mangoes' perceived value beyond their physical qualities. The findings also corroborate the theory of monopolistic competition, where differentiation strategies reduce price competition by creating unique market segments. Consumer preferences for origin, quality, and authenticity confirm the role of

informational asymmetry in perishable goods markets, supporting the use of certifications and branding to reduce uncertainty. Additionally, behavioral economics principles such as trust and perceived risk influence buying decisions, which explains why direct-to-consumer channels and transparent supply chains are gaining popularity. Overall, the study validates that integrating traditional agronomic qualities with modern branding and technological tools is essential for successful market positioning in premium horticulture.

2) Implications for Mango Value Chain Actors

The study's insights have significant implications for various stakeholders across the Alphonso mango value chain. Farmers must increasingly adopt quality standards, certification processes, and post-harvest handling innovations to meet evolving market demands and access premium channels. Farmer Producer Organizations and cooperatives play a crucial role as aggregators, marketers, and facilitators of technological adoption, helping smallholders overcome scale and resource constraints. Traders and commission agents need to adapt by integrating grading, packaging, and transparency mechanisms to retain relevance in changing markets. For exporters, aligning with international quality and traceability standards remains imperative. Finally, retailers and e-commerce platforms should collaborate with producers to build consumer awareness and trust through effective communication of product differentiation features. Policymakers can support these actors by investing in infrastructure, digital literacy programs, and regulatory frameworks to safeguard authenticity and consumer interests.

3) Lessons from the Pilot that Can Inform Larger-Scale Studies

This pilot study underscores the importance of a multi-stakeholder approach combining qualitative and quantitative methods to understand product differentiation in horticulture. It reveals critical gaps in consumer awareness and farmer capacity that require targeted interventions. The limited sample size and regional focus highlight the need for larger-scale, multi-region studies to capture variability in consumer preferences and market dynamics. The pilot also demonstrates the value of integrating technology adoption assessments, such as digital traceability, within market studies. Future research can benefit from longitudinal designs to track seasonal and temporal changes and the impact of policy shifts. Moreover, scaling this approach can inform development of tailored marketing models that balance traditional mandi systems with emerging direct and digital channels, ultimately improving farmer livelihoods and consumer satisfaction in premium fruit markets.

8. CONCLUSION

This pilot study on Alphonso mangoes in the Pune region highlights the critical role of product differentiation and innovative marketing approaches in enhancing the fruit's market value and farmer incomes. Geographical Indication (GI) tagging, organic certification, and digital traceability emerge as key differentiation strategies that build consumer trust and enable premium pricing. However, limited consumer awareness and infrastructural gaps restrict their full potential, particularly among smallholder farmers and informal market segments. Packaging innovations and grading mechanisms further contribute to quality assurance and market segmentation, though access to these facilities remains uneven. Traditional mandi-based marketing, while still dominant, exhibits significant limitations in transparency, price realization, and quality control. Emerging direct-to-consumer channels—through farmgate sales, e-commerce, and social media—offer promising alternatives that foster consumer engagement and reduce intermediaries. Farmer Producer Organizations (FPOs) play a pivotal role in aggregating produce, enabling certifications, and facilitating access to modern marketing platforms. Export-oriented practices demand adherence to stringent quality and traceability standards, driving improvements that also benefit domestic markets. Consumer insights reveal that purchasing decisions are strongly influenced by price, origin, and quality, with notable variations between urban and semi-urban buyers. Awareness of authenticity markers like GI tags is growing but remains limited, underscoring the need for targeted education campaigns. The study validates existing theories on product differentiation and consumer behavior while highlighting practical challenges faced by value chain actors. It calls for coordinated efforts in capacity building, infrastructure investment, and digital literacy to mainstream differentiation strategies effectively. Larger-scale studies are recommended to capture broader regional variations and temporal dynamics. Ultimately, integrating traditional knowledge with modern branding and technology is essential to sustain Alphonso mango's premium market positioning and improve livelihoods across the supply chain.

CONFLICT OF INTERESTS

None.

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None.

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