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Assessment and ranking of marketing constraints among GI-tagged *Zardalu mango* growers in Bhagalpur, Bihar: A Garrett's ranking approach

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Abstract

The premium Geographical Indication (GI)-tagged *Zardalu mango*, which is mostly grown in Bihar's Bhagalpur region, is an important horticulture product with great market and export potential. However, owing to institutional, informational, and infrastructure constraints, the crop's marketing success is still limited despite its distinctive qualitative qualities and customer desire. The goal of the current research, which was carried out during the agricultural year 2024–2025, was to use Garrett's ranking approach to identify and rank the main marketing obstacles that *Zardalu mango* producers observed. 60 randomly chosen producers from four villages in the Sabour and Sultanganj blocks provided primary data. With a Garrett score of 78.08, insufficient cold storage facilities (47.78), inadequate transportation infrastructure (47.15), and reliance on intermediaries (46.91) were found to be the most severe constraints. Limited export routes (45.91), price variations (45.65), a lack of facilities for processing and value addition (44.48), and insufficient market knowledge (42.01) were other significant limitations. In order to increase marketing effectiveness and revenue realization among *Zardalu mango* producers, the findings highlight the critical necessity for bolstering market infrastructure, boosting cold-chain logistics, raising producer knowledge, and encouraging direct marketing techniques.

Keywords: *Zardalu mango*, marketing constraints, Garrett ranking, GI crops, mango supply chain, farmer income.

1. Introduction

Due to its great consumer appeal, nutritional value, and broad range of adaptation, the mango (*Mangifera indica* L.) has a significant position in the fruit economy of tropical and subtropical countries (Pingali, 2012; Rao & BIRTHAL, 2008) ^[21, 23]. India is the world's biggest mango grower and makes a significant contribution to worldwide output. Because of its unusual flavor, appealing golden-yellow color, and high market demand, the *Zardalu mango* from Bihar's Bhagalpur region is one of the country's many mango varieties. This variety's economic significance and possibilities for branding and export marketing have increased since it was recognized with a Geographical Indication (GI) tag. The *Zardalu mango* marketing infrastructure is still comparatively undeveloped, despite favorable agroclimatic conditions and rising customer preferences. Infrastructure, market access, and price realization are just a few of the many obstacles that producers often encounter (Sharma & Singh, 2010) ^[25]. Mango farmers are forced to sell their product fast, sometimes at less than ideal pricing, due to the perishable nature of the fruit and the lack of suitable storage and transportation facilities. Furthermore, the producer's negotiating power is limited and their part of the consumer's rupee is less when there are many middlemen in the marketing chain (Barrett, 2008) ^[3]. The absence of established marketplaces, reliance on intermediaries, price volatility, and a lack of options for value addition are all significant variables influencing farmer income and marketing effectiveness, according to earlier research on mango marketing in various locations. To create suitable policy interventions and development plans in the context of GI-tagged *Zardalu mango*, marketing restrictions must be systematically assessed and prioritized. Therefore, using Garrett's ranking technique, the

current research was conducted to identify and rank the main marketing obstacles encountered by *Zardalu mango* producers in the Bhagalpur area.

2. Materials and Methods
(Marketing Constraints Faced by Mango Growers)

2.1 Study Area and Sampling Design

The current study was conducted in Bihar's Bhagalpur district, which is well known for being the traditional GI-tagged *Zardalu mango* producing region. The area contributes significantly to the regional horticulture industry and offers favorable agroclimatic conditions for mango growing. Two significant *Zardalu mango*-growing blocks, Sabour and Sultanganj, were purposefully chosen for the research based on the level of mango cultivation and commercial activity. The respondents were chosen using a multistage sampling process. Two villages were picked at random from each designated block, for a total of four communities that were part in the research. Then, using simple random selection, 15 mango farmers were chosen from each hamlet, making a total sample size of 60 respondents. A fair coverage of the various socioeconomic and marketing situations prevalent in the research region was guaranteed by the equal participation of farmers from all chosen villages.

2.2 Data Collection

A well-structured and pre-tested interview schedule was used to conduct in-person interviews with the chosen mango producers throughout the agricultural year 2024–2025 in order to gather primary data. The schedule was created to collect comprehensive data on post-harvest handling, price realization, marketing strategies, and particular challenges experienced by *Zardalu mango* growers. The identification of marketing-related obstacles, such as insufficient storage facilities, inadequate transportation infrastructure, lack of access to organized markets, reliance on middlemen, price volatility, restricted export prospects, lack of processing facilities, and insufficient market information, was given special attention. Based on the perceived severity and frequency of occurrence of these restrictions, respondents were asked to rate them. In addition to primary data, pertinent secondary data was gathered from published papers, research publications, and official records of academic institutions and horticultural departments to improve the study's methodological framework and give context for the analysis.

2.3 Analytical Technique — Garrett’s Ranking Method

To prioritize the marketing constraints faced by *Zardalu mango* growers, Garrett’s Ranking Technique was employed. Under this method, each respondent was asked to assign ranks to the identified marketing constraints according to their level of severity. The ranks assigned by individual respondents were converted into percent positions using the following formula:

Percentage Position = 100 (Rij – 0.5) / Nj

Where

Rij = Rank given for the *i*th constraint by the *j*th respondent

Nj= Total number of constraints ranked by the *j*th respondent

The usual Garrett conversion table was then used to translate the computed percent positions into Garrett scores. Each constraint's mean Garrett score was calculated by adding together each score and dividing the result by the total number of respondents. In order to ascertain the restrictions' relative significance and

severity in the marketing of *Zardalu mango*, they were finally ranked in decreasing order according to their mean scores. This analytical method is often utilized in agricultural marketing research for constraint analysis and policy development because it offers a quantitative prioritizing of qualitative judgments.

3. Results and Discussion

To address this, the present study identifies, ranks, and analyzes the major marketing constraints faced by *Zardalu mango* producers in Bhagalpur district using Garrett’s Ranking Technique.

3.1 Assessment and Ranking of Marketing Constraints among Zardalu mango Growers (Garrett Ranking)

Constraint	Garrett Score	Rank
Lack of Market Access	78.08	I
Inadequate Cold Storage	47.78	II
Poor Transport Facilities	47.15	III
Dependence on Middlemen	46.91	IV
Limited Export Channels	45.91	V
Price Fluctuations	45.65	VI
Lack of Value Addition	44.48	VII
Lack of Market Information	42.01	VIII

The marketing of *Zardalu mango* in the study area is influenced by a number of infrastructural, institutional, and market-related constraints that directly affect producers’ income realization and marketing efficiency. The prioritization of these constraints using Garrett’s ranking technique provided a clear understanding of the relative severity of different marketing challenges faced by the growers.

- **Lack of Market Access:** According to the research, this was the most important limitation, ranking first with the highest Garrett score of 78.08. This result suggests that producers in the research region have restricted access to structured marketing platforms, organized procurement processes, and controlled marketplaces. As a consequence, many farmers are forced to sell their goods via unofficial channels or in local marketplaces, which often leads to lower price realization and poor negotiating strength. Inadequate market connection also limits GI-tagged *Zardalu mango*'s ability to reach premium market segments and grow its customer base.
- **Inadequate cold storage facilities:** With a Garrett score of 47.78, this was the second most serious limitation found. Producers are forced to sell their goods right away after harvest, sometimes at distress rates, due to the lack of adequate cold-chain facilities during the busiest harvesting season. Mango fruits are very perishable, therefore a lack of storage facilities increases post-harvest losses and limits selling options (Hodges *et al.*, 2011; FAO, 2019) [12, 8]. The viability and profitability of mango farming in the area are negatively impacted by this circumstance.
- **Poor transport facilities:** Among the restrictions found, poor transportation facilities came in third with a Garrett score of 47.15. Fruit quality declines and market value is decreased as a consequence of ineffective transportation networks, high transportation costs, and delays in scheduling vehicles for market delivery (Minten *et al.* 2014 and Shepherd 2007) [19, 26]. Inadequate road connection and logistical constraints exacerbate this issue in Bhagalpur district's rural districts, increasing farmers' selling risk.
- **Dependence on Middlemen:** Dependency on middlemen,

which placed fourth with a Garrett score of 46.91. According to producers, market discussions and price setting are dominated by middlemen. Farmers often depend on dealers and commission brokers, who take a significant portion of the marketing margin, due to a lack of direct marketing alternatives and restricted access to organized marketplaces. As a result, manufacturers earn a smaller share of the ultimate consumer price and have a worse financial position in the supply chain.

- **Limited Export Channels:** With a Garrett score of 45.91, the fifth key restriction was determined to be limited export outlets. Despite *Zardalu mangos*' superior quality and GI certification, growers lack the infrastructure, institutional support, and expertise necessary to compete in export markets. The crop's export potential is further limited by the lack of infrastructure for grading, packing, and certification, which limits chances for increased revenue generating.
- **Price Fluctuations:** Among the limitations, price fluctuations came in sixth with a Garrett score of 45.65. Farmers are discouraged from making long-term investments in orchard management and modernization due to the fluctuating market pricing caused by seasonal overstock during peak harvesting times. Additionally, producers' confidence in their ability to participate in the market is impacted by price volatility, which therefore diminishes their ability to properly plan marketing plans.
- **Lack of Value Addition:** With a Garrett score of 44.48, the absence of processing and value addition facilities came up at number seven. The potential to turn extra fresh mangoes into value-added goods including pulp, juice, dried slices, and pickles is limited by the lack of local processing facilities. In times of market oversupply, this compels growers to offer their food in its raw form, often at reduced costs. Building infrastructure for agro-processing might greatly increase revenue diversification and lower losses after harvest.
- **Lack of Market Information:** Lastly, with a Garrett score of 42.01, the absence of timely market information came in at number eight, however it is still a significant obstacle. Farmers' capacity to make wise marketing choices is diminished by their lack of knowledge about current market pricing, customer demand patterns, and alternative marketing outlets. This limitation might be addressed and producers' negotiating power increased by bolstering digital market information systems and extension services.

Overall, the findings unequivocally show that insufficient market connections, a lack of institutional support, and inadequate infrastructure are the main causes of marketing inefficiencies in the *Zardalu mango* supply chain. Enhancing marketing efficiency and boosting the economic viability of *Zardalu mango* cultivation in Bhagalpur district requires addressing these limitations through policy interventions, investments in marketing infrastructure, support for farmer producer organizations (FPOs), and the construction of cold-chain and processing facilities.

4. Discussion

The results of this research unequivocally show that marketing-related limitations are critical to the long-term sustainability and economic feasibility of GI-tagged *Zardalu mango* farming in Bihar's Bhagalpur district. Due to inefficiencies in post-harvest management and marketing systems, the significant economic potential of this premium mango variety seems to be underused,

as seen by the predominance of marketing concerns over production-related issues. Lack of market access was shown to be the most important issue affecting farmers' marketing success. This illustrates the fundamental flaws in rural agricultural marketing systems, especially in supply chains for horticulture commodities, where structured market connections and institutional assistance are often insufficient. Similar limitations have been reported in previous research, which showed that producers' bargaining power and price realization are greatly diminished by restricted access to regulated markets, the lack of organized marketing platforms, and weak farmer-buyer relationships (Singh *et al.*, 2020; Rahaman *et al.*, 2020; Dash, 2011) [27, 22, 6]. Farmers in these circumstances are more likely to depend on unofficial market networks and local vendors, which lowers farm-gate pricing and decreases income stability. The next significant obstacles facing *Zardalu mango* producers were found to be inadequate cold storage facilities and inadequate transportation infrastructure. These difficulties are especially important when it comes to extremely perishable agricultural products like mangos. In addition to hastening post-harvest degradation, ineffective cold-chain logistics forces growers to sell their goods right away, sometimes at distress prices. Improvements in storage and transportation infrastructure are crucial for lowering post-harvest losses, prolonging the marketing time, and guaranteeing greater price realization, according to earlier research on mango and other fruit supply chains. Another important factor affecting marketing effectiveness is reliance on intermediaries. The price difference between producer and consumer prices is widened and transaction costs are raised when there are many middlemen in the supply chain. As a result, manufacturers' economic position in the value chain is weakened as their share of the ultimate consumer price decreases. Previous studies on mango marketing systems in various Indian states have also emphasized the ongoing role of middlemen in setting prices and controlling the market, indicating the significance of bolstering cooperative marketing organizations and encouraging direct farmer-to-consumer marketing channels. Producers are unable to fully capitalize on high-value local and international markets despite the *Zardalu mango*'s GI certification and premium quality qualities, as shown by the limitation associated to restricted export options. This restriction is caused by a lack of facilities for grading and packing, a lack of institutional support for market promotion, and a lack of knowledge of export requirements. Therefore, increasing the export competitiveness of region-specific horticulture goods requires strengthening market-oriented extension activities and promoting value-chain integration. Due to the cyclical concentration of supply during the busiest harvesting months, producers also highlighted price volatility as a key issue. During this time, there is a market oversupply, which causes prices to drop and income uncertainty to rise. This problem is made worse by the lack of value-addition and processing facilities in the area, which limits other ways to sell excess product. Establishing agro-processing businesses and promoting value-added goods made from mangos, such pulp, juice, and dehydrated slices, might have a big impact on price stability and farmers' ability to make ends meet.

Lastly, a significant barrier affecting marketing choices was found to be the absence of timely and trustworthy market information. Farmers are less able to bargain successfully and develop market participation plans when they have limited access to real-time pricing knowledge, consumer demand patterns, and alternative marketing channels. Enhancing

institutional market intelligence procedures, mobile-based advising systems, and digital extension services may greatly improve marketing efficiency and enable producers to make well-informed choices. Overall, the conversation shows that improving marketing effectiveness and guaranteeing sustainable livelihood opportunities for *Zardalu mango* growers in Bhagalpur district require addressing infrastructural deficiencies, bolstering institutional mechanisms, and encouraging value-chain development.

5. Policy Recommendations

- Mango mandis and local procurement should be established close to manufacturing clusters.
- Encourage refrigerated transport units, ripening chambers, and cold storage.
- Create value-adding processing units (pulp, pickle, dehydrated mango).
- Advertise "Farm-to-Market Linkage Schemes" and e-marketing platforms.
- Educate farmers on GI-based premium marketing, branding, packaging, and grading.

6. Future Scope

- Future research may examine the *Zardalu mango*'s export potential and viability in foreign markets.
- The function of agri-tech, startups, FPOs, and digital marketing in closing market gaps.
- Look into the possibility of producing processed *Zardalu mango* goods, such as wine, juice, puree, etc.
- Constraint mapping using Value Chain and SWOT analysis.

7. Conclusion

The current research found that the main reasons affecting the profitability and income stability of GI-tagged *Zardalu mango* producers in Bihar's Bhagalpur district are marketing limitations. Lack of market access was found to be the biggest obstacle, followed by poor transportation infrastructure, insufficient cold storage facilities, and a heavy reliance on middlemen. All of these limitations lead to price volatility, post-harvest losses, and a lower producer share of the ultimate consumer price. The results show that boosting institutional support, fortifying post-harvest infrastructure, and establishing marketing ties are critical to boosting marketing effectiveness and guaranteeing long-term financial gains from *Zardalu mango* production in the area.

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