



International Journal of Research in Agronomy

E-ISSN: 2618-0618
P-ISSN: 2618-060X
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NAAS Rating (2025): 5.20
www.agronomyjournals.com
2025; SP-8(11): 361-365
Received: 19-09-2025
Accepted: 21-10-2025

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An economic analysis of marketing channels for Zardalu mango in Bhagalpur District, Bihar

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DOI: <https://www.doi.org/10.33545/2618060X.2025.v8.i11Se.4284>

Abstract

The study examines the existing marketing channels utilized for Zardalu mangos in the Bhagalpur district of Bihar, renowned for its high-quality mango variety with GI tags. We used a systematic interview schedule to get primary data from 60 sample producers in the Sabour and Sultanganj blocks. We also looked at secondary sources. We used channel mapping and percentage analysis to find and record the marketing paths. The four main pathways that were found were: Channel I: Producer → Consumer, Channel II: Producer → Retailer → Consumer, Channel III: Producer → Wholesaler → Retailer → Consumer, Channel IV: Producer → Village Trader → Wholesaler → Retailer → Consumer) was the most popular, with 38.3% of the votes. Channel I (Producer → Consumer) came in second, with 36.7%. Farmers preferred shorter routes because they got their money faster, fewer middlemen were involved, and they got better prices. Still, the fact that there are long, multi-tier channels for bulk sales shows that structured marketplaces are hard to get to. The study also found that the choice of marketing channel was affected by things like the amount of production, how easy it was to get to far-off markets, the state of transportation infrastructure, and the need for middlemen. Farmers took part in longer chains because they had to provide in bulk and had less power to negotiate. Shorter routes, on the other hand, meant bigger producer shares and lower marketing costs. The Zardalu mango's GI-tagged status offers significant opportunities for branding, export promotion, and premium pricing; however, commercialization potential is constrained by the lack of farmer collectives, inadequate market infrastructure, and insufficient digital marketing platforms.

Keywords: Channel mapping, digital marketplace integration, farmer cooperatives, marketing channels, producer share & middlemen, Zardalu mango (GI-tagged)

1. Introduction

Mangoes (*Mangifera indica* Linn.) are one of the most important tropical fruits for business. They are known for their taste, health benefits, and economic importance. India is the world's largest producer of mangoes, making up almost 57% of the total. Bihar alone makes up about 11% of the country's total mango production. The Zardalu mango from Bhagalpur, Bihar, is one of the most unique mangoes grown in India. It has a strong smell, bright golden-yellow skin, and is worth a lot of money when sold abroad. It got a Geographical Indication (GI) tag in 2018, which made it easier to sell both in the US and abroad and helped with branding. Bhagalpur district has the perfect weather and soil for growing Zardalu mangoes. It is grown on about 1600 hectares of land in places like Sultanganj, Kahalgaon, and Jagdishpur, and it is thought to produce 7500 metric tonnes a year. Zardalu mango farmers often have a hard time getting fair prices in the market, even though their fruit is very valuable and of high quality because of GI, because they don't have strong connections to the market, their supply chains are disorganized, they can't easily get to wholesale markets, and they rely heavily on middlemen. Marketing channels have a big impact on how well the market works, how much farmers make, and how much they can sell. Numerous studies in different areas have shown that shorter marketing channels that involve direct sales between producers and consumers increase producer shares. This is because they have lower transaction costs and less involvement from middlemen. Longer chains with a lot of middlemen, on the other hand, make the producer's share of the consumer

rupee much smaller. But small and marginal farmers often stay in these long chains because they can't get to organized markets, there aren't any collective marketing structures, and they don't have any way to get around. In Bhagalpur, where most of the Zardalu mango is grown by smallholders, marketing systems are mostly informal. Farmers use different marketing channels depending on the time of year, where they are, how easy it is for buyers to get to them, and how much they produce. Science doesn't do a good job of documenting the structure, dominance, and effectiveness of the actual marketing channels, though. To get more money for this high-value GI-certified fruit, we need to find and evaluate current marketing channels. This will help us set prices that are fair, rely less on middlemen, and make policies that are based on the market.

Policymakers, cooperatives, and agricultural groups can also make distribution systems that are more focused on farmers by learning more about how they market their goods. This will help fair trade, give farmers more power in negotiations, and reduce market exploitation. Evaluating the role of intermediaries, current market pathways, and farmers' preferences toward different marketing channels can also help with the design of digital platforms, farmer producer organizations (FPOs), and contract-based marketing models. More and more, these are being promoted under central schemes like e-NAM, PM-FME, and One District One Product (ODOP). This study enhances market efficiency, supply chain transparency, and income security for Zardalu mango growers in Bihar while also elucidating current marketing strategies.

2. Materials and Methods

2.1. Study Area and Sampling Design

The study collected information from two important Zardalu mango producing blocks of Bhagalpur district in Bihar, namely Sultanganj and Sabour, which are well known for cultivating this variety. From each block, two villages were selected randomly based on the level of mango production, making a total of four villages. For primary data collection, 15 mango growers were chosen from each village through random sampling, resulting in a total sample size of 60 respondents.

2.2 Data Collection

The study utilized both primary and secondary data. In-person interviews were used to collect primary data using a planned, pre-tested schedule. The program included questions about how to make things, how to market them, how to sell them, and how to get involved in wholesale, retail, and direct markets. The secondary data came from journals, government publications, published reports, and statistical databases.

2.3 Analytical Tools

The flow of product from producer to end consumer was used to identify and categorize marketing channels. The order of the intermediaries involved determined the mapping of each channel. The percentage of farmers using each marketing channel was ascertained by percentage analysis.

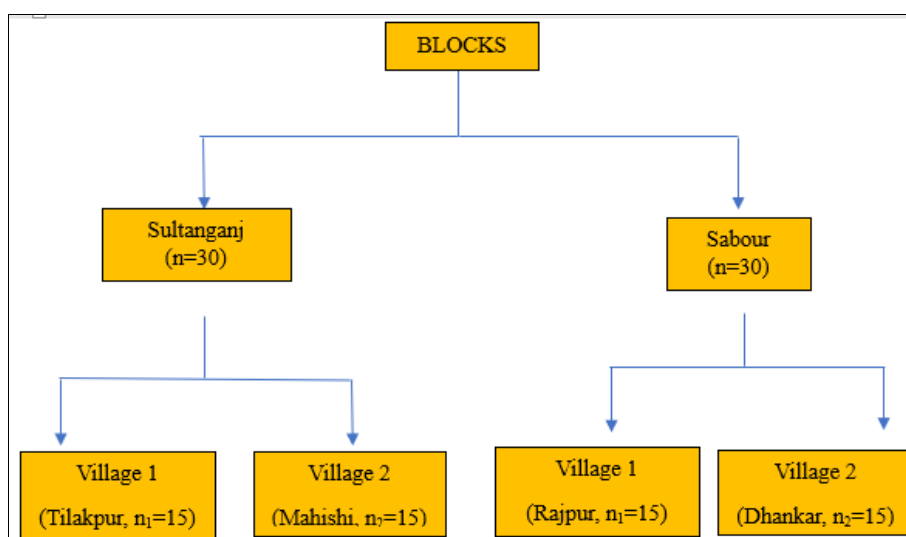


Fig 1: Flowchart showing the sampling frame

2.4 Review and Literature

The information collected from producers were used to identify and map existing marketing channels. Each channel was defined by the sequence of intermediaries involved from producer to consumer. The most commonly followed channels were tabulated and compared based on the volume of produce moved and the prices realized by producers.

Akma *et al.* (2024) ^[1] studied banana farmers in the Palimbang area and found that even though the farmers knew how to sell their bananas, middlemen took advantage of them. The research says that better supply chains and fair pricing could greatly boost farm-level income and make local economies stronger.

Parihat *et al.* (2022) ^[8] studied mango marketing in Nepal's Siraha District. They found that growers sell 54.61% of their fruit to wholesalers, 30.66% to retailers, and 14.73% directly to customers. Wholesalers sold 13.95% of the mangoes to

consumers and 40.66% to retailers. But because they didn't have enough cold storage, farmers often used longer marketing chains to sell their goods quickly during busy harvest seasons.

Santoso *et al.* (2022) examined the Jayapura banana trade and emphasized that the type of channel utilized significantly influences marketing effectiveness. Their research showed that shorter supply chains with fewer middlemen are often more efficient because they cost less to move goods and take less time to handle. Local banana farmers may be able to make more money by using direct and open distribution methods that let them keep more of the final price. Also, having a lot of flexible selling channels makes it easier for producers and consumers to talk to each other, cuts down on wasteful spending, and makes sure that products get to consumers more smoothly.

Vaghasiya *et al.* (2022) ^[12] examined banana supply chains in Gujarat, assessing the effectiveness of various marketing

channels concerning the proximity of production sites to markets. The systems that were closest to industrial areas had the best marketing efficiency, which was between 63% and 94%. These local channels helped farmers get better prices and smaller price spreads. This suggests that profits were shared more fairly between producers and consumers. The study stressed that making it easier for people to get to markets and making them closer to each other are both important for making banana marketing more profitable and efficient.

Sukmaya and Jakiyah (2021) ^[10] looked into the mango selling system by mapping out five common routes that farmers in Majalengka Regency, Indonesia, use. These included long routes with wholesalers and a lot of middlemen, as well as short routes where mangoes go straight from growers to merchants or consumers. Their results showed that farmers got a higher percentage (56.52%) of the final price through shorter pathways, which were clearly more efficient. But many farmers chose longer routes because they knew they could count on getting paid quickly and had good connections with wholesalers.

Teka *et al.* (2019) looked into how mangoes are sold in Ethiopia's Gomma District. They found long channels that included brokers and wholesalers, as well as short channels that went straight from the factory to the store to the customer. The size of the farm, how far it was from the market, and how easy it was to get reliable market information all played a role in choosing a marketing strategy. Because the infrastructure wasn't good enough and mangoes went bad quickly, producers sometimes had to take longer, less profitable routes.

Gousoddin *et al.* (2017) ^[6] studied the situation of mango farmers in Bidar District, Karnataka, India. They found both short channels (Producer → Retailer → Consumer) and long channels (Producer → Pre-harvest Contractor → Commission Agent → Wholesaler → Retailer → Consumer). Even though the shorter channels promised farmers a bigger share, the longer ones won out because pre-harvest contractors often controlled access to the market and set prices.

Gopalakrishnan (2013) ^[5] talked about the old-fashioned way of selling mangoes in India. Because of the following chain, farmers usually got a smaller part of the final price: Grower → Local Middleman → Commission Agent → Wholesaler → Retailer → Consumer. The study also showed that contract marketing (Grower → Contractor → Wholesaler/Retailer → Consumer) has become more popular as an alternative, even though it doesn't directly involve farmers in markets. This is because it helps lower the risks of perishability and inconsistent pricing.

Matin *et al.* (2008) ^[7] discerned five principal channels subsequent to their analysis of mango marketing in several regions of Bangladesh. The shortest path was from Farmer to Retailer to Consumer, while the longest was from Farmer to Bepari to Aratdar to Wholesaler to Retailer to Consumer. The results showed that shorter routes were the most effective for marketing and gave farmers 66.48% of the mango's consumer price. Longer channels, on the other hand, gave farmers 60.78% of the price.

Singh and Saini (2014) ^[9] looked at how much of the consumer rupee goes to Haryana's mango producers. Their research on different marketing channels showed that direct farmer-to-consumer transactions raised the producer's share (62.32%) and channels with commission agents and wholesalers lowered it (43.65%) because of extra costs like commissions, market fees, and transportation. The study focused on three main ways to raise farmers' share of the final consumer price: better market information systems, direct connections between farmers and

retailers, and building better infrastructure.

Chaudhary *et al.* (2012) ^[3] found that farmers who sold directly to customers kept the most of the consumer rupee. On the other hand, when farmers sold their goods through wholesalers, commission agents, or pre-harvest contractors, their marketing costs and the middlemen's profits went up, which cut into their profits. The authors say that encouraging farmer cooperatives and direct selling channels could help lower the costs of middlemen. Mango production and marketing in Faizabad, Uttar Pradesh, with a focus on the differences in producers' shares across marketing channels.

These studies emphasize that shorter, well-organized marketing channels help farmers enhance price realization, profitability, and independence from intermediaries. However, challenges such as limited infrastructure, lack of market information, dependence on pre-harvest contractors, poor transportation, and absence of farmer cooperatives often push them toward longer channels.

The present study recognizes this research gap and aims to systematically document the existing marketing channels used by Zardalu mango growers in Bhagalpur to help improve supply chain efficiency, reduce dependency on intermediaries, and enhance producer profitability.

3. Results and Discussion

3.1 Marketing Channels Followed by Zardalu Mango Producers

The Zardalu mango crop cycle must be understood before proceeding with the marketing channel study. The Zardalu mango, a rare type having Geographical Indication (GI) classification, is renowned for its unusual flavor, fragrance, and vivid golden-yellow hue. The Bhagalpur area of Bihar, where the soil and climate are ideal, is where the crop is primarily grown. Typically, fruit sets in March after flowering starts in January or February. Harvesting takes place mostly in May and June, and the crop takes around 4 to 5 months to mature. Mangoes are important in both culture and food, and marketing takes place during the busiest harvest season, when demand is at its highest.

Marketing channels represent the path followed by Zardalu mango producers to sell their produce and reach the final consumer. The study identified four primary marketing channels used in Bhagalpur district, based on where farmers sold more than 50% of their produce:

Channel I: Producer → Consumer

Channel II: Producer → Retailer → Consumer

Channel III: Producer → Wholesaler → Retailer → Consumer

Channel IV: Producer → Village Trader → Wholesaler → Retailer → Consumer

The selection of these channels depends on multiple factors such as farm size, volume of production, access to buyers, transportation facilities, need for immediate payment, and bargaining power.

Among these, Channel II had the highest number of followers (38.3%) followed closely by Channel I (36.7%). Channel III was used by 23.3% of producers, while Channel IV was preferred by only 1.7% of respondents.

Marketing Channel	No. of Sample Producer	Producer (%)
Channel I	22	36.7
Channel II	23	38.3
Channel III	14	23.3
Channel IV	1	1.7

Farmers prefer intermediate channel length because it offers more pricing options, lower risks, and faster payments. This is why they chose Channel II. Farmers who used Channel I said they made more money, but they still had to deal with problems like time, transportation, and bargaining power. Channel III was used by producers who sold a lot of goods and often sold to markets far away. This made them more reliant on wholesalers. Producers rarely used Channel IV because there were too many middlemen, which meant lower profits and longer wait times for payments. Having village merchants, wholesalers, and retailers led to a bigger price spread and a smaller share for producers.

Channel I was the fastest and most direct route because there were no middlemen. This helped farmers get the best price. But farmers who sold their goods locally, had access to nearby markets, or had regular customers were the ones who liked this route the most. Farmers who used this channel said that even though it made them a lot of money, it was hard to use for bulk sales because it took too long, was hard to transport, had to be graded, and had to deal directly with customers.

Channel III was preferred by medium and large farmers who had more crops than the average farmer. These farmers relied on wholesalers for bulk sales because they didn't always have the time, space, or money to sell directly. Even though this helped large amounts move quickly, their profit margins went down because of higher intermediary deductions for commission, transportation, handling, and packing fees.

Channel IV was the least popular because it had a lot of middlemen, like village traders, wholesalers, and retailers, which cut the producer's share by a lot. Only one person (1.7%) said they watched this channel. People mostly use this channel when they need money right away, are in a distressed sale, don't have much storage space, or don't have much negotiating power. When there are a lot of middlemen, farmers have less say over prices and payment terms, which makes the price spread bigger. This classification approach helps highlight the dominant marketing behaviour of producers based on volume, providing a clearer understanding of their market preferences and operational strategies.

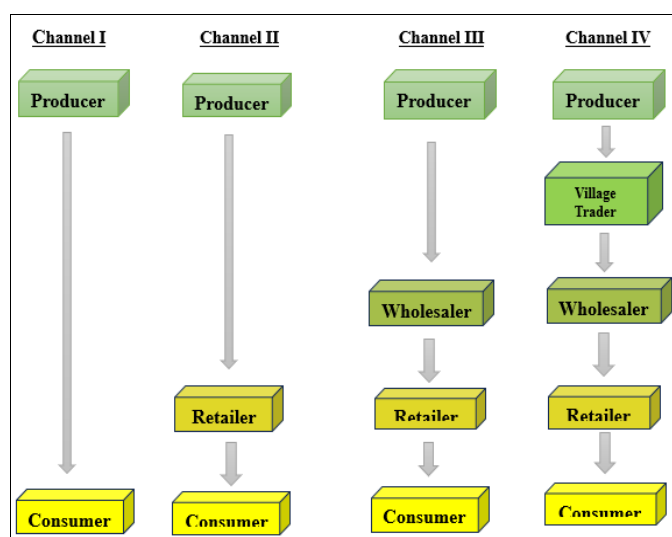


Fig 2: Marketing Channels followed by the Sample Zardalu Mango Producers

3.2 Comparative Analysis with Previous Studies

These findings corroborate those of Matin *et al.* (2008) ^[7], who discovered that shorter marketing routes enhance marketing efficiency and increase producer share. Singh and Saini (2014)

^[9] similarly asserted that direct marketing ensures enhanced price realization and diminished intermediary exploitation. According to Gousoddin *et al.* (2017) ^[6], who found that farmers choose channels that offer modest profits and reliable access to buyers, the fact that Channel II is the most popular means that farmers want to find a balance between making money and being easy to work with. The study's conclusions clearly show how the length of the marketing channel affects the producer's share and the price spread. As the number of middlemen grew, transaction costs and marketing deductions also grew. This made the price gap bigger and the producer's share of the consumer rupee smaller. Farmers can keep a bigger profit margin because Channels I and II are shorter, which means they cost less to handle, store, ship, and take out of their commissions. On the other hand, Channels III and IV have merchants, village traders, and wholesalers who take a cut at each step, which lowers the net share that farmers get. This corroborates the conclusions of Chaudhary *et al.* (2012) ^[3] and Matin *et al.* (2008) ^[7] that the quantity of intermediaries negatively impacts marketing efficiency. Intermediaries are very important when farmers can't get to faraway metropolitan markets, storage facilities, or negotiating power. Many Zardalu mango growers, especially smallholders, said they relied on regional wholesalers and dealers for bulk sales, transportation, and advance payments. Farmers have less freedom because these middlemen often set the price, the way things are weighed, and the payment schedule. Kumar M. *et al.* (2017) found that farmers in Saharanpur district lost money because they had to rely on commission brokers and pre-harvest contractors. This is similar to what happened in this case. These actions make the market less efficient by lowering the producer's share and making the price difference bigger. From an economic point of view, Channel I gives the biggest share to producers because it pays farmers right away and doesn't take any money away. Channel II is still a good option, even though its returns are a little lower, because it has fewer middlemen, a fair cost structure, and cash that is available on time. Channels III and IV helped farmers sell a lot of things, but they also made less money because of commission fees, transportation costs, storage loss, packing, handling, and payment delays. This corroborates the results of Singh and Saini (2014) ^[9], who discovered that the inclusion of wholesalers and local agents in the marketing chain significantly diminishes producers' share. Teka *et al.* (2019) and Santoso *et al.* (2022) say that expanded channels lower economic efficiency because they lead to more losses after harvest, late payments, and exploitation in the middle.

Farmers in Bhagalpur can't fully benefit from the Zardalu mango's GI-certified branding and export potential because there aren't any established markets, collecting centers, or enough help with storage and transportation. Because there aren't any Farmer Producer Organizations (FPOs), farmer cooperatives, or digital market access, farmers have to sell their goods at lower prices in their own areas. Strengthening direct marketing strategies, creating farmer-owned collection centers, and promoting digital trade platforms like e-NAM and mobile-based marketing could help reduce the power of middlemen. These results are similar to those of Kiloes *et al.* (2024), who talked about how important contract farming, structured marketing channels, and farmer cooperatives are for making mango producers more profitable. To enhance producer profitability, ensure equitable pricing, and mitigate intermediary exploitation within the Zardalu mango marketing system in Bhagalpur district, the research underscores the essential importance of establishing shorter, farmer-centric, and structured marketing channels.

4. Conclusion

The study found that the four most common ways for Zardalu mango growers in Bhagalpur to market their fruit are Producer-to-Consumer, Producer-to-Retailer, Producer-to-Wholesaler, and Producer-to-Village Trader. Channel II (Producer→Retailer→Consumer) was the most popular channel, with 38.3% of the votes. Channel I (36.7%), which had the largest producer share, was the next most popular channel. Shorter routes meant more money for the seller, faster payments, less exploitation of middlemen, and cheaper shipping. But a lot of farmers had to take longer routes because there weren't any structured markets, transportation problems, or good storage facilities, which made them less profitable. Strengthening direct market connections could greatly increase farmers' profit margins.

Policy Suggestions

- Build gathering places and controlled mango markets that are owned by farmers.
- Get Farmer Producer Organizations (FPOs) to depend less on middlemen.
- Use digital platforms (e-NAM, apps, direct online trade) to make prices clear.
- Set up local centers for cold chain, grading, packaging, and buying.
- People should learn how to do contract marketing, e-mandi access, and direct marketing.

Extent of the Future

- Future studies might employ the Marketing Efficiency Index and cost-benefit analysis to evaluate channel efficiency.
- Looking into how farmer cooperatives and online channels help sell Zardalu mangos.
- Looking into whether export channels are possible, especially for Zardalu mangos with GI tags.
- Looking into traceability or blockchain technology to get into high-end markets.

Acknowledgment

The authors would like to thank Bihar Agricultural University in Sabour for their help with academics and technology, and the mango farmers in Bhagalpur district for sharing useful marketing information.

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