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Marketing channels, price spread, and socio-economic profile of tomato growers in Jaipur District, Rajasthan

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Abstract

This research paper examines two primary objectives drawn from a broader dissertation study on tomato marketing and post-harvest losses in Jaipur district, Rajasthan. The first objective analyses the socio-economic profile of tomato growers in the study area, encompassing age distribution, educational qualifications, income levels, occupational patterns, and land-holding size. The second objective investigates the marketing channels available to growers, including price spread analysis, marketing costs, market margins, and the producer's share in the consumer's rupee. Data were collected from 100 farmers across different farm-size categories in Chomu block, Jaipur district, using structured interview schedules. The study finds that the majority of respondents are smallholders in the 30–50 age group with moderate levels of education and income. Four distinct marketing channels were identified, with Channel I (direct sale) yielding the highest producer share and Channel IV (through wholesaler and retailer) resulting in the highest consumer price. Marketing costs were significantly higher for small farmers, largely driven by transportation, commission, and packaging charges. Modified Marketing Efficiency (MME) was highest in Channel IV, yet producers benefited most from shorter channels. These findings highlight the need for infrastructure improvements, market linkage programmes, and collective marketing initiatives to enhance farmer profitability in the tomato value chain.

Keywords: Tomato marketing, socio-economic profile, marketing channels, price spread, marketing efficiency, Jaipur, Rajasthan

1. Introduction

Horticulture constitutes an indispensable component of Indian agriculture, and within the horticultural sector, tomato occupies a position of particular economic and nutritional significance. As one of the most widely cultivated vegetables across the country, tomato contributes substantially to farm incomes, provides employment in rural areas, and meets an extensive consumer demand in both fresh and processed forms. Rich in vitamins A and C and in essential minerals, tomato features prominently in everyday Indian diets and has increasing relevance to the food-processing industry through products such as ketchup, puree, paste, and sauces.

India ranks as the second-largest global producer of tomatoes, yet the sector remains constrained by persistent inefficiencies in post-harvest management and marketing. National-level estimates suggest that post-harvest losses in tomato can range from 20 to 35 percent, attributable to the crop's inherent perishability, inadequate cold-chain infrastructure, poor road connectivity, improper packaging, and the participation of multiple intermediaries in traditional supply chains. These factors collectively reduce the net income received by producers while inflating the price borne by consumers.

Jaipur district of Rajasthan presents a particularly instructive case for analysis. With its diversified agro-climatic zones,

expanding peri-urban markets, and growing commercial tomato cultivation—especially in Chomu block—Jaipur is both a representative and strategically important site for understanding the challenges facing tomato growers. Despite noteworthy growth in production volumes, farmers in the district continue to grapple with price volatility, limited storage, dependence on intermediaries, and inadequate access to institutional credit and market information.

Against this backdrop, this paper focuses on two specific objectives from a larger dissertation study: (i) to profile the socio-economic characteristics of tomato growers, and (ii) to examine the prevailing marketing channels, price spread, marketing costs, market margins, and the producer's share in the consumer's rupee. Together, these objectives provide a foundational understanding of who the tomato farmers are and how the marketing system operates, both of which are prerequisites for designing targeted interventions to improve supply-chain efficiency and farm profitability.

1.1 Significance of Tomato in Indian Horticulture

Tomato (*Solanum lycopersicum* L.) belongs to the family Solanaceae and is cultivated extensively across Andhra Pradesh, Karnataka, Maharashtra, Uttar Pradesh, Madhya Pradesh, and Rajasthan. The crop is characterised by a short growth cycle, relatively high yield potential, and strong

domestic demand throughout the year. In Rajasthan, tomato cultivation has expanded steadily over the past two decades, with Jaipur district emerging as one of the primary production zones in the state. The assured urban demand from the Jaipur metropolitan area, combined with favourable soil and irrigation conditions in blocks such as Chomu, Samod, and Kaladera, has incentivised a shift from traditional cereals to commercial tomato cultivation among farmers of varying landholding sizes.

Despite these advantages, the tomato sector in the district faces structural challenges that undermine its potential. The highly perishable nature of the commodity—combined with the near-total absence of cold storage at the village level, the use of inadequate packaging materials, and the dominance of traditional, multi-intermediary marketing structures—exposes farmers to significant price and quantity risks. Understanding the socio-economic conditions of growers is therefore the essential first step in appreciating why these vulnerabilities persist and how they might be addressed.

2. Review of Literature

A substantial body of research has examined the socio-economic conditions of vegetable growers and the efficiency of marketing channels in different parts of India. Sharma *et al.* (2016) ^[17] found that most tomato growers in Rajasthan are small and marginal farmers with limited formal education, restricted access to credit, and low adoption of improved technologies—conditions that directly constrain their marketing performance. Rathore *et al.* (2021) ^[15] similarly documented that smallholder tomato farmers in Rajasthan lack access to modern cold storage and extension services, impairing their ability to respond to market signals effectively.

On the marketing side, Kumar and Singh (2015) ^[5] demonstrated that the presence of multiple intermediaries in vegetable supply chains in Uttar Pradesh significantly reduces farmers' share in the consumer's rupee. Their study emphasised that direct and shorter marketing channels consistently improve price realization for producers. Patel and Patel (2016) ^[11], examining tomato marketing in Gujarat, confirmed that retailers and wholesalers capture a disproportionate share of the price spread, with transportation costs and commission charges being the principal drivers of marketing costs for small producers.

Meena *et al.* (2019) ^[8] specifically analysed marketing efficiency in Rajasthan's tomato sector and found heavy dependence on middlemen as the most critical structural bottleneck, one that severely limits farmers' bargaining power. Chand and Kumar (2018) ^[1] reinforced this finding for Haryana, showing that transportation, packaging, and commission charges together account for the largest share of total marketing costs incurred by growers. Mishra and Pandey (2022) ^[10] further documented that wholesalers and retailers capture the majority of profits in vegetable value chains, underscoring the need for reforms that redistribute economic gains more equitably toward producers.

Saini *et al.* (2022) ^[16] identified cold storage constraints, high transportation costs, price volatility, and inadequate market infrastructure as the four most prominent challenges confronting vegetable growers across multiple Indian states. Singh *et al.* (2024) ^[20] showed that improved storage,

standardised grading, and better packaging can measurably reduce post-harvest losses, while Shukla *et al.* (2023) ^[18] concluded that reducing intermediary participation and strengthening supply-chain management are the most effective levers for improving marketing efficiency and enhancing farmers' incomes in horticultural crops.

Taken together, this body of literature establishes that smallholder socio-economic characteristics and marketing-channel structure are closely interrelated: the vulnerabilities arising from limited education, small landholdings, and constrained resources translate directly into weak bargaining positions within traditional, intermediary-dominated marketing systems. The present study builds on this foundation by applying these frameworks to the specific context of Jaipur district.

3. Research Methodology

3.1 Study Area

The study was conducted in Jaipur district of Rajasthan, specifically in Chomu block, which was selected purposively on account of its prominence in commercial tomato cultivation and its proximity to major urban wholesale and retail markets. From the approximately 180 villages in Chomu block, five percent were selected through random sampling to ensure adequate geographical representation.

3.2 Sample Design and Data Collection

A total of 100 respondents were selected using a combination of purposive and stratified random sampling. Farmers were categorised by landholding size into marginal (up to 2.5 acres), small (2.5–5 acres), semi-medium (5–7.5 acres), medium (7.5–10 acres), and large (above 10 acres) categories, and five percent of growers from each category in the selected villages were chosen for the final sample. Primary data were collected through structured interview schedules that covered socio-economic characteristics, production practices, marketing channel utilisation, costs, and price realization. Secondary data were drawn from government agricultural publications, horticultural board records, and peer-reviewed research.

3.3 Analytical Tools

Descriptive statistical methods—including frequency distribution, percentages, and weighted means—were employed to summarise the socio-economic profile of respondents. Marketing channel analysis was conducted using the Modified Measure of Marketing Efficiency (MME), price spread computation, and marketing cost-margin analysis. The following formulae were applied:

(i) Modified Marketing Efficiency (MME) = $FP / (MC + MM)$, where FP is the price received by the farmer, MC is the marketing cost, and MM is the marketing margin.

(ii) Price Spread = $[(\text{Consumer Price} - \text{Net Price of Producer}) / \text{Consumer Price}] \times 100$

(iii) Producer's Share in Consumer's Rupee (PNR) = $(PS_i / PC_i) \times 100$, where PS_i is the producer's share and PC_i is the consumer price in channel i.

4. Results and Discussion

Objective 1: Socio-Economic Profile of Tomato Growers

4.1 Age Distribution of Respondents

The age profile of sampled tomato growers is presented in Table 1. The data reveal that the largest cohort—comprising 45 farmers (38 percent)—falls within the 30–50 year age bracket, a group generally associated with greater physical productivity, better access to institutional inputs, and a higher propensity to adopt commercially-oriented farming practices. Farmers below 30 years of age constitute 34 respondents (28 percent), suggesting meaningful participation by younger agriculturalists in tomato cultivation. The remaining 21 respondents (18 percent) are

above 50 years of age.

Across farm-size categories, marginal farmers dominate all age groups, reflecting the overall prevalence of smallholders in the sample. The concentration of active cultivators in the middle-age group is consistent with findings from Sharma *et al.* (2016) ^[17] and Rathore *et al.* (2021) ^[15], who similarly observed that commercially-oriented vegetable farming in Rajasthan is predominantly undertaken by farmers in the prime working-age range. The relatively low representation of elderly farmers (above 50 years) in larger farm categories may be attributable to generational land transfers or declining physical capacity for the labour-intensive practices associated with tomato cultivation.

Table 1: Age Distribution of Respondents

S. No.	Age Group	Marginal	Small	Semi-Medium	Medium	Large	Total (%)
1	Below 30 years	11	8	5	6	4	34 (28%)
2	30 – 50 years	15	12	8	4	6	45 (38%)
3	Above 50 years	8	5	3	3	2	21 (18%)
Total		34	25	16	13	12	100 (100%)

Source: Primary survey data.

4.2 Educational Profile of Respondents

The educational attainment of respondents is summarised in Table 2. High-school-educated farmers constitute the largest single group (27 percent), followed by those with intermediate (20 percent) and middle-school-level (19 percent) education. Graduate-level farmers and those with only primary schooling each account for 12 percent of the sample, while illiteracy and post-graduate education are relatively rare at 6 and 4 percent, respectively.

This educational distribution carries direct implications for marketing behaviour. Farmers with secondary and higher levels of education are generally better equipped to access

market-price information, evaluate the terms offered by commission agents, and engage with formal credit institutions. Conversely, the 18 percent with primary-level or no education—predominantly concentrated in the marginal farmer category—are more likely to be disadvantaged in price negotiations, less aware of alternative marketing channels, and more susceptible to exploitation by intermediaries. These findings align with Gupta *et al.* (2018) ^[3], who established that educational attainment significantly mediates the adoption of improved farming and marketing practices among vegetable growers in central India.

Table 2: Educational Profile of Respondents

S. No.	Education	Marginal	Small	Semi-Med.	Medium	Large	Total	%
1	Illiterate	2	1	2	1	0	6	6%
2	Primary Level	4	4	2	2	0	12	12%
3	Middle School	7	3	5	3	1	19	19%
4	High School	6	5	4	9	3	27	27%
5	Intermediate	9	4	2	3	2	20	20%
6	Graduate	2	2	1	4	3	12	12%
7	Post Graduate	0	1	0	1	2	4	4%
	Total	30	20	16	23	11	100	100%

Source: Primary survey data.

4.3 Annual Income Distribution of Respondents

The income distribution of sampled farmers is presented in Table 3. The modal income category—represented by 41 percent of respondents—falls in the Rs. 1,00,001 to Rs. 1,50,000 range annually, positioning most tomato growers in a lower-middle-income bracket relative to national benchmarks. An additional 29 percent earn between Rs. 50,001 and Rs. 1,00,000, while 15 percent report incomes between Rs. 1,50,001 and Rs. 2,00,000. Only 5 percent earn above Rs. 2,00,000 annually, and 10 percent fall below Rs. 50,000—a category largely coinciding with marginal and small landholders.

The income data underscore the economic vulnerability of smallholder tomato farmers in the study area. Limited disposable income constrains investment in improved storage, better-quality packaging materials, transportation, and post-harvest handling equipment—all of which are prerequisites for reducing post-harvest losses and improving marketing outcomes. This finding corroborates Das and Dutta (2020) ^[2], who demonstrated that low income and small landholdings create a self-reinforcing cycle of limited investment capacity and poor marketing performance among vegetable farmers in eastern India.

Table 3: Annual Income Distribution of Respondents (Rs/Year)

S. No.	Income (Rs/Yr)	Marginal	Small	Semi-Med.	Medium	Large	Total	%
1	Below 50,000	5	3	1	1	0	10	10%
2	50,001 – 1,00,000	8	9	3	7	2	29	29%
3	1,00,001 – 1,50,000	12	7	8	9	5	41	41%
4	1,50,001 – 2,00,000	3	2	3	4	3	15	15%
5	Above 2,00,000	0	0	1	2	2	5	5%
	Total	28	21	16	23	12	100	100%

Source: Primary survey data.

4.4 Occupational Pattern of Respondents

Table 4 documents the primary occupations of respondents. Horticulture—encompassing tomato cultivation alongside other vegetable and fruit crops—is the primary occupation of 33 percent of the sample, confirming the commercial significance of the sector in the study area. Pure agriculture (including cereal and oilseed cultivation) accounts for 26 percent, while animal husbandry engages 16 percent. Business and professional activities together account for 15 percent, and salaried employment for 10 percent. The prominence of horticulture as the leading occupational category reflects the economic incentives that have driven

farmer diversification away from traditional rain-fed crops toward commercially-oriented vegetable production. This trend is consistent with broader national patterns documented by the Ministry of Agriculture and Farmers' Welfare, wherein rising profitability of horticultural crops has encouraged cultivation expansion. Nonetheless, the diversity of income sources across the sample—with a substantial share drawing income from animal husbandry, business, and salaried work—suggests that most farming households maintain mixed livelihood strategies, partially insulating them against the price volatility inherent in tomato markets.

Table 4: Occupational Pattern of Respondents

S. No.	Occupation	Marginal	Small	Semi-Med.	Medium	Large	Total	%
1	Agriculture	11	5	3	4	3	26	26%
2	Horticulture	8	10	5	6	4	33	33%
3	Animal Husbandry	6	4	2	4	0	16	16%
4	Salaried	2	2	1	3	2	10	10%
5	Business/Profession	4	2	5	3	1	15	15%
	Total	31	23	16	20	10	100	100%

Source: Primary survey data.

4.5 Land Holding Distribution of Respondents

The distribution of respondents by farm size is shown in Table 5. An overwhelming majority—71 percent—are marginal farmers holding between 1 and 2.5 acres, while 16 percent are small farmers (2.5–5 acres). Medium and large farmers represent 11 and 2 percent of the sample, respectively. This pronounced smallholder dominance is not merely a demographic characteristic; it has substantive consequences for marketing outcomes, bargaining power, and access to improved infrastructure.

Small and marginal farmers typically lack the marketable surplus required to negotiate directly with processors or large wholesalers, are disproportionately reliant on commission agents who charge higher fees per unit sold, and incur higher per-unit transportation costs because they cannot fill vehicles to capacity. The near-absence of large farmers in the sample reflects the general land-distribution pattern of the region and highlights the structural challenge of organising an efficient, competitive marketing system when the seller base is highly fragmented. Collective marketing models—including Farmer Producer Organisations (FPOs) and cooperative aggregation platforms—have been proposed as potential responses to this structural fragmentation in the literature (Patil and Naik, 2020; Shukla *et al.*, 2023) [12, 18].

Table 5: Distribution of Respondents by Land Holding Size

S. No.	Type of Farmer	Frequency	Percentage
1	Marginal Farmers (1–2.5 acres)	71	71%
2	Small Farmers (2.5–5 acres)	16	16%
3	Medium Farmers (5–10 acres)	11	11%
4	Large Farmers (>10 acres)	2	2%
	Total	100	100%

Source: Primary survey data.

Objective 2: Marketing Channels, Price Spread, Marketing Costs, and Producer's Share

4.6 Identification and Structure of Marketing Channels

Field investigation identified four distinct marketing channels through which tomato reaches consumers in the study area. Each channel differs in the number and type of intermediaries involved, the associated marketing costs, and the final price borne by consumers.

Channel I — Direct Sale (Producer to Consumer): The farmer sells directly to the consumer, eliminating all intermediaries. This channel operates primarily in local weekly markets (haats) or through roadside selling near farm gates. It offers the highest producer share in the consumer's rupee but is limited by the farmer's inability to access large urban markets and the time and effort required

for retail selling.

Channel II — Through Retailer (Producer–Retailer–Consumer): The farmer sells to a local retailer who subsequently sells to the end consumer. One intermediary is introduced, leading to modest marketing costs and a reasonable producer share. This channel is common for farm-gate transactions in peri-urban villages.

Channel III — Through Wholesaler (Producer–Wholesaler–Consumer): Produce moves from the farmer to a commission agent or wholesaler in the primary market, who then sells directly to consumers or institutional buyers such as canteens and hospitals. Transportation costs and commission charges are significant at this stage.

Channel IV — Through Wholesaler and Retailer (Producer–Wholesaler–Retailer–Consumer): The most complex and prevalent channel, involving both a wholesaler (in the APMC mandi) and a retailer before the commodity reaches the consumer. While this channel provides farmers access to the largest markets, the accumulation of intermediary margins and costs results in the highest consumer price and the lowest relative producer share.

4.7 Marketing Cost Incurred by Tomato Growers

Table 6 presents the per-kilogram marketing costs incurred

by small, medium, and large farmers. The weighted mean marketing cost across all categories was Rs. 7.38 per kilogram. Small farmers bear the highest cost burden at Rs. 8.50/kg, followed by medium farmers at Rs. 7.30/kg and large farmers at Rs. 6.35/kg.

Transportation is the single largest cost component across all farm-size categories, representing Rs. 2.20/kg for small farmers and Rs. 1.50/kg for large farmers. The disparity arises because smaller producers cannot generate sufficient volumes to fill vehicles, resulting in higher per-unit freight charges. Commission charges constitute the second most significant cost component, ranging from Rs. 1.80/kg for small farmers to Rs. 1.30/kg for large farmers. Packaging and weighing costs show less variation across categories, reflecting relatively standardised input prices.

The inverse relationship between farm size and per-unit marketing cost confirms the operation of economies of scale in tomato marketing. Large farmers benefit from bulk negotiating power, better access to dedicated transport, and stronger relationships with commission agents. These advantages are structurally unavailable to marginal and small farmers operating in isolation, reinforcing the argument for collective marketing mechanisms.

Table 6: Marketing Cost Incurred under Various Categories of Tomato Growers (Rs/Kg)

Cost Particulars (Rs/Kg)	Small	Medium	Large	Weighted Mean
Packaging and Weighing	1.60	1.50	1.40	1.50
Washing of Tomato	0.90	0.85	0.80	0.85
Sorting and Grading	0.40	0.35	0.30	0.35
Transportation	2.20	1.80	1.50	1.83
Loading and Unloading	0.40	0.30	0.25	0.32
Commission Charges	1.80	1.50	1.30	1.53
Miscellaneous	1.20	1.00	0.80	1.00
Total	8.50	7.30	6.35	7.38

Source: Primary survey data; weighted mean calculated across all sample categories.

4.8 Marketing Cost, Market Margin, and Marketing Efficiency across Channels

Table 7 provides a comprehensive breakdown of marketing costs, margins, and efficiency across the four identified channels. Several important patterns emerge from this analysis.

Price received by farmers varies from Rs. 25/kg in Channel I to Rs. 30/kg in Channel III. While this might appear to favour longer channels, the higher farm-gate price in Channel III reflects the greater market reach facilitated by wholesalers rather than a genuine improvement in marketing terms for farmers; the producer's net margin, after deducting marketing costs, must be assessed relative to the consumer price paid at the end of the channel.

Consumer prices escalate sharply as the number of intermediaries increases: from Rs. 25/kg in Channel I to Rs. 37.30/kg in Channel II, Rs. 45.80/kg in Channel III, and Rs. 50/kg in Channel IV. This price escalation reflects the cumulative addition of intermediary margins and handling costs at each stage of the supply chain, with neither the farmer nor the consumer being the primary beneficiary of channel length—rather, the benefit accrues to wholesalers and retailers.

The producer's net margin was highest in Channel III at Rs.

23.40/kg; however, when expressed as a share of the consumer price, the producer's proportion declines substantially as channel length increases. In Channel I, the farmer captures 100 percent of the consumer rupee (Rs. 25 of Rs. 25). In Channel IV, the farmer retains Rs. 21.68 as net income but the consumer pays Rs. 50/kg—a producer share of approximately 43 percent. This significant price-spread analysis underscores how intermediary participation progressively transfers value away from producers.

Modified Marketing Efficiency (MME) values increase from 2.80 in Channel I to 9.20 in Channel IV. This apparently counter-intuitive result arises from the mathematical structure of the MME formula, in which longer channels generate larger absolute price differences (denominator values of MC+MM increase less proportionally than the farm-gate price FP does in some interpretations); however, the practical implication must be interpreted with care. Higher MME in longer channels does not imply that farmers are better off—indeed, the evidence on producer share demonstrates the opposite. These efficiency metrics are best understood as indicators of how well the marketing system functions in linking producers to consumers, not as measures of farmer welfare.

Table 7: Marketing Cost, Market Margin, and Efficiency across Marketing Channels (Rs/Kg)

S. No.	Particulars	Channel I	Channel II	Channel III	Channel IV
1	Price Received by Grower (Rs/Kg)	25	27	30	28
2	Grower: Washing	0.50	0.50	0.50	0.50
3	Grower: Sorting & Grading	0.30	0.30	0.30	0.30
4	Grower: Packing & Packaging	1.20	1.20	1.20	1.20
5	Grower: Transportation	1.50	1.70	2.00	1.80
6	Grower: Loading/Unloading	–	–	0.40	0.40
7	Grower: Commission	–	–	1.50	1.40
8	Grower: Miscellaneous	0.80	0.75	0.70	0.72
	Grower Marketing Cost (Sub-total)	4.30	4.45	6.60	6.32
9	Net Margin of Grower (Rs/Kg)	20.70	22.55	23.40	21.68
10	Wholesaler Cost (Rs/Kg)	–	–	2.80	2.60
11	Wholesaler Margin (Rs/Kg)	–	–	5.00	5.50
12	Retailer Cost (Rs/Kg)	–	7.30	–	6.80
13	Retailer Margin (Rs/Kg)	–	3.00	–	3.20
14	Consumer Price (Rs/Kg)	25	37.30	45.80	50.00
15	Marketing Efficiency (MME)	2.80	4.10	6.90	9.20

Source: Primary survey data. Channel I: Direct; Channel II: Producer–Retailer–Consumer; Channel III: Producer–Wholesaler–Consumer; Channel IV: Producer–Wholesaler–Retailer–Consumer.

4.9 Price Spread Analysis

Price spread—defined as the difference between the consumer price and the net price received by the producer,

expressed as a percentage of the consumer price—provides a concise summary of marketing system performance.

Table 8: Price Spread Analysis across Marketing Channels. Source: Computed from primary survey data.

Indicator	Channel I	Channel II	Channel III	Channel IV
Consumer Price (Rs/Kg)	25.00	37.30	45.80	50.00
Net Price to Producer (Rs/Kg)	20.70	22.55	23.40	21.68
Price Spread (Rs/Kg)	4.30	14.75	22.40	28.32
Price Spread (% of Consumer Price)	17.2%	39.5%	48.9%	56.6%
Producer's Share in Consumer's Rupee	82.8%	60.5%	51.1%	43.4%

The price spread increases monotonically from 17.2 percent in Channel I to 56.6 percent in Channel IV. In Channel IV, the farmer retains only 43.4 percent of the price ultimately paid by the consumer—a stark illustration of how value is extracted at successive stages of the supply chain. This finding is consistent with Kumar *et al.* (2019) ^[6], who reported that producers in vegetable value chains frequently receive less than half the consumer price when multiple intermediaries are involved, and with Mishra and Pandey (2022) ^[10], who documented large marketing margins accruing to wholesalers and retailers in Indian vegetable markets.

The high price spread in longer channels is driven by: (i) transportation costs borne by multiple channel actors; (ii) handling and packaging costs incurred at each stage; (iii) commission charges levied by mandis and commission agents; and (iv) the profit margins of wholesalers and retailers. Reducing price spread requires either shortening channels—through direct marketing platforms, farmer markets, or contract arrangements—or improving the infrastructure and logistics of longer channels so that costs are reduced without sacrificing market reach.

5. Discussion

The findings from both objectives are mutually reinforcing: the socio-economic vulnerabilities of smallholder tomato farmers in Jaipur district—characterised by limited landholdings, modest education levels, and restricted financial resources—create structural conditions that make dependence on longer, intermediary-dominated marketing

channels difficult to escape. Small and marginal farmers, who constitute 87 percent of the sample, typically lack the individual production volumes necessary to negotiate directly with wholesalers or processors on favourable terms, the financial capital to invest in cold storage or improved packaging, and the market information needed to identify and utilise shorter, more remunerative channels consistently. Simultaneously, the marketing channel analysis demonstrates that the existing multi-intermediary system imposes significant costs on producers. In the most prevalent channel—Channel IV—farmers capture less than half of the final consumer price, with the remainder absorbed by transportation costs, mandi charges, commission agents' fees, and the margins of wholesalers and retailers. This outcome is not merely an efficiency failure; it represents a distributional problem in which the risks of perishability, price volatility, and logistical uncertainty are borne primarily by producers, while a disproportionate share of the marketing surplus accrues to intermediaries who face comparatively lower risks.

The marketing cost analysis further reveals that small farmers pay materially more per kilogram than their larger counterparts—a reflection of diseconomies of small-scale production in marketing rather than in cultivation. Per-unit transportation costs are higher because vehicles cannot be filled to capacity; per-unit commission is effectively non-negotiable for small sellers; and the absence of sorting, grading, and packaging infrastructure at the village level forces farmers to accept discounted prices for mixed-quality produce. These disadvantages compound over time, limiting

reinvestment capacity and perpetuating the cycle of smallholder vulnerability.

These findings are consistent with and extend the conclusions of prior research in Rajasthan and adjoining states. Meena *et al.* (2019)^[8], Rathore *et al.* (2021)^[15], and Rajput *et al.* (2023)^[13] collectively establish that tomato marketing in Rajasthan is characterised by high intermediary dependence, inadequate infrastructure, and marked information asymmetries favouring traders over farmers. The present study adds granular empirical data from Jaipur district specifically, demonstrating that these systemic challenges are not merely chronic background conditions but actively translate into measurable losses in farmer income and in marketing efficiency as experienced by producers.

6. Conclusion and Policy Recommendations

6.1 Key Conclusions

This study reaches the following principal conclusions with respect to the two stated objectives:

- The socio-economic profile of tomato growers in Jaipur district is characterised by smallholder dominance (71 percent marginal farmers), moderate educational attainment concentrated at the high-school level, annual incomes predominantly in the Rs. 1,00,001–1,50,000 range, and horticulture as the primary livelihood activity for the largest single occupational group.
- The marketing system for tomatoes in the study area operates through four channels of varying length and intermediary involvement. Channel IV (Producer–Wholesaler–Retailer–Consumer) is the most prevalent but yields the lowest producer share (43.4 percent) and the highest consumer price (Rs. 50/kg).
- Marketing costs decline systematically with farm size, reflecting economies of scale in transportation, commission, and logistics. The weighted mean marketing cost of Rs. 7.38/kg for the sample as a whole imposes a significant burden on small and marginal farmers.
- Price spread increases from 17.2 percent in Channel I to 56.6 percent in Channel IV, confirming that longer marketing chains primarily benefit intermediaries at the expense of producers and consumers alike.
- Modified Marketing Efficiency values are highest in longer channels but do not translate into improved farmer welfare; producer's absolute net margin and share in consumer price are both maximised under shorter channels.

6.2 Policy Recommendations

Based on the empirical findings, the following policy and programmatic interventions are recommended:

- **Promotion of Farmer Producer Organisations (FPOs):** Aggregating small and marginal farmers into FPOs would generate the combined marketable surplus necessary to negotiate directly with large buyers, reducing dependence on commission agents and improving bargaining power.
- **Investment in Village-Level Cold Storage and Grading Infrastructure:** The construction of low-cost, decentralised cold rooms—potentially co-managed by FPOs—would extend the shelf life of harvested

tomatoes, reduce distress sales, and allow farmers to time their market entry more strategically.

- **Strengthening Direct Marketing Platforms:** Expansion of Direct-to-Consumer channels, including e-NAM (National Agriculture Market) integration, Kisan Mandis, and contract farming arrangements with processing units, would provide alternatives to the traditional APMC structure and reduce price spread.
- **Targeted Extension and Market Literacy Programmes:** Given the moderate-to-low levels of formal education among respondents, extension services should focus on practical training in improved harvesting, sorting, grading, and packaging techniques, alongside financial literacy and market information access.
- **Transparent Market Information Systems:** Real-time dissemination of mandi prices through mobile platforms and radio broadcasts would reduce information asymmetries between farmers and traders, enabling more informed selling decisions.
- **Credit Access for Post-Harvest Infrastructure:** Financial institutions and government schemes such as MIDH (Mission for Integrated Development of Horticulture) should be leveraged to provide affordable credit specifically earmarked for cold chain, packaging, and logistics investment at the farm and village level.

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