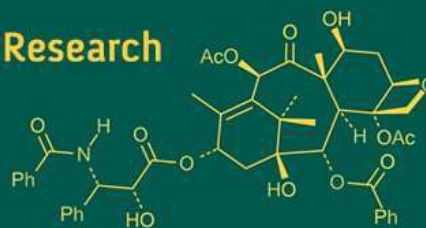


International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2026): 5.29
IJABR 2026; SP-10(4): 486-490
www.biochemjournal.com
Received: 25-01-2026
Accepted: 28-02-2026

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Price spread and marketing efficiency of Ramnad Mundu chilli across marketing channels: Evidence from Ramanathapuram district, Tamil Nadu

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DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i4Sf.8145>

Abstract

Ramnad Mundu Chilli, a Geographical Indication (GI)-certified round chilli variety endemic to Ramanathapuram district of Tamil Nadu, occupies a distinctive position in India's spice economy owing to its exceptional pungency, distinct flavour profile, and established export credentials. Despite its agronomic and cultural significance, the economic efficiency of its marketing system has received limited rigorous scrutiny. This study investigates price spread, marketing cost structure, marketing margin distribution, and marketing efficiency across four operational channels through which Ramnad Mundu Chilli moves from the farm gate to the consumer. Primary data were gathered from farmers, wholesalers, village traders, and retailers using pre-tested interview schedules. Acharya's marketing efficiency index was employed to rank channels. Channel I, which bypasses intermediate traders and involves direct producer-to-retailer transactions, recorded the highest marketing efficiency index of 13.00 and the largest producer share in the consumer's rupee (88.83 percent), while Channel III, incorporating both a wholesaler and a retailer, was the least efficient, with an efficiency index of 4.14 and a producer share of 78.03 percent. The price spread ranged from Rs. 15.64/kg in Channel I to Rs. 34.05/kg in Channel III. These findings demonstrate that market intermediation significantly erodes farm income and argue for institutional interventions, including direct market linkages, producer company strengthening, and digital price information systems, to reduce channel inefficiency and improve farmer welfare.

Keywords: Price spread, marketing efficiency, Ramnad Mundu chilli, agricultural marketing channels, Ramanathapuram

1. Introduction

India occupies a singular position in global spice trade. The country is simultaneously the world's foremost producer, consumer, and exporter of chillies, accounting for approximately 43 percent of world chilli production (Spices Board of India, 2022). Within this landscape, chilli alone contributes around 42 percent of India's total spice export volume and generates substantial foreign exchange earnings. Tamil Nadu participates meaningfully in this economy, with chilli cultivation spread across multiple agro-climatic zones; however, it is Ramanathapuram district that commands singular attention for its cultivation of Ramnad Mundu Chilli, a round-shaped, shiny-skinned variety (*Capsicum annuum* L.) developed and maintained through generations of farmer-led seed stewardship.

The Ramanathapuram Mundu Chilli was conferred Geographical Indication (GI) certification by the GI Registry, Chennai, in 2023, becoming the first chilli variety from Tamil Nadu and the 45th product from the state to receive this designation. The crop is cultivated under semi-arid and drought-prone conditions across taluks, including Tiruvadanai, RS Mangalam, Mudukulathur, Kadaladi, and Kamuthi, where the combination of saline coastal air, low rainfall, and sandy loam soils collectively imparts distinctive pungency and colour intensity that cannot be replicated elsewhere. Exports of this variety reach China, the United States, several European nations, Thailand, and Japan, underscoring its international market appeal. Despite this recognition, the economic position of Ramnad Mundu Chilli farmers within the value chain remains precarious. The structural fragmentation of agricultural markets in India, characterised by multiple layers of intermediaries, asymmetric market information, limited

cold-chain infrastructure, and weak bargaining capacity of small farmers, systematically compresses farm-gate prices relative to what consumers ultimately pay. Understanding exactly how much of the consumer rupee flows back to the producer, and which channel configurations minimise this leakage, is a question of direct policy relevance.

Price spread analysis offers a structured method to quantify this leakage. Price spread, defined as the difference between the price paid by the final consumer and the price received by the producer, captures the combined burden of marketing costs and trader margins across all intermediary stages (Acharya, 2004) ^[1]. When disaggregated by marketing channel, it reveals how different routing arrangements affect the welfare of both producers and consumers. The associated concept of marketing efficiency operationalised here through Acharya's index allows channels to be ranked by their ability to transfer produce at minimum cost and with minimal margin inflation.

Earlier scholarship on chilli marketing in India documents wide variation in producer shares and channel efficiency across geographies. Sowjanya *et al.* (2020) ^[8] reported producer shares of 80.51 percent and 76.72 percent in two channels studied in Guntur, Andhra Pradesh. Kumar & Raj (2022) ^[4] found that shorter channels with fewer intermediaries consistently yield higher efficiency in dry chilli marketing. Studies on other spice crops reinforce the pattern: in black pepper marketing in Kolli Hills, Tamil Nadu, direct marketing channels achieved producer shares above 89 percent, while multi-tier channels brought this down to under 70 percent (Malarkodi, 2022) ^[5]. For Ramnad Mundu Chilli specifically, the literature is sparse; the study by Kiruthika (2024) ^[3] on the economics of Ramanathapuram Mundu Chilli confirmed cultivation costs of approximately Rs. 84,550 per hectare and a benefit-cost ratio of 1.65, but did not systematically evaluate marketing channel performance.

This study fills that gap. Its objectives are threefold: (i) to document and compare the cost structure incurred by each marketing functionary across four operational channels; (ii) to estimate price spread, marketing margin, and producer share at each channel level; and (iii) to compute and compare marketing efficiency indices across channels to identify the most remunerative arrangement for producers of Ramnad Mundu Chilli.

2. Materials and Methods

2.1 Study Area and Sampling

The study was conducted in the Ramanathapuram district of Tamil Nadu, which accounts for virtually the entire acreage under Ramnad Mundu Chilli cultivation in India. Farmers were selected from the blocks of Kadaladi, Paramakudi, and Ramnad using stratified random sampling, proportional to the area under cultivation in each block. In addition to farmers, channel-specific functionaries, including village traders, wholesalers, and retailers, were identified through snowball sampling and personally interviewed using pre-tested structured schedules. Primary data collection was conducted during the 2020-2021 crop year.

2.2 Identification of Marketing Channels

Through field reconnaissance and interaction with local market agents, four distinct marketing channels were identified for Ramnad Mundu Chilli:



Fig 1: Marketing Channels of Ramnad Mundu Chilli in Ramanathapuram District

2.3 Analytical Framework

Marketing costs were aggregated for each channel participant, encompassing grading, packaging material, packaging labour, weighing, loading, unloading, transport, and other miscellaneous charges. Price spread was computed as:

$$\text{Price Spread} = \text{Consumer price (PC)} - \text{Net Producer Price (PF)}$$

where PF is the gross price received by the producer minus production-level marketing costs. Marketing margin for each channel is the residual of price spread after deducting actual marketing costs. Producer's share in the consumer's rupee is expressed as:

$$\text{Producer's share} = (\text{Net Producer Price (PF)} / \text{Consumer price (PC)}) \times 100$$

Marketing efficiency was assessed using Acharya's modified index (Acharya, 2004) ^[1]:

$$\text{Marketing Efficiency (ME)} = (\text{Net Producer Price (PF)} / (\text{Marketing Cost} + \text{Marketing Margin})) \times 100$$

A higher ME value indicates a more efficient channel, one in which the ratio of value delivered to the farmer relative to total marketing overheads is maximised. All price and cost data are expressed in Indian Rupees per kilogram (Rs/kg).

3. Results and Discussion

3.1 Cost Structure at the Producer Level

The cost profile borne by the producer at the farm gate reveals notable differences between Channel I and the remaining three channels (Table 1). In Channel I, where the producer engages directly with a retailer, total producer-level marketing cost amounted to Rs. 5.64/kg, the highest among all channels. This elevated cost reflects the full burden of market preparation assumed by the producer in the absence of intermediary handling: grading costs of Rs. 0.60/kg, packaging material at Rs. 1.50/kg, packaging labour at Rs. 1.10/kg, weighing at Rs. 0.85/kg, loading at

Rs. 0.70/kg, and transport at Rs. 0.89/kg were all incurred directly by the farmer. In Channels II, III, and IV, producer-level costs were uniformly Rs. 4.05/kg, as downstream functionaries absorb certain tasks. The higher self-borne

cost in Channel I is, however, more than offset by the elimination of intermediary margins and the consequent rise in net realisation, as discussed below.

Table 1: Price Spread and Marketing Cost of Ramnad Mundu Chilli Across Marketing Channels (Rs/kg)

S. No	Particulars	Channel I (Rs/kg)	Channel II (Rs/kg)	Channel III (Rs/kg)	Channel IV (Rs/kg)
1	Producer Price (Rs/kg)	130.00	125.00	125.00	125.00
A	Marketing Cost-Producer				
i	Grading	0.60	1.05	1.05	1.05
ii	Packaging material	1.50	0.80	0.80	0.80
iii	Packaging labour	1.10	0.85	0.85	0.85
iv	Weighing	0.85	0.30	0.30	0.30
v	Loading	0.70	0.25	0.25	0.25
vi	Transport	0.89	0.80	0.80	0.80
	Sub-total: Producer Cost	5.64	4.05	4.05	4.05
B	Marketing Cost-Wholesaler				
viii	Grading, Packaging, Weighing, Loading, Unloading, Transport, Other	---	---	4.20	---
	Sub-total: Wholesaler Cost	---	---	4.20	---
C	Marketing Cost-Retailer				
ix	Grading, Packaging, Weighing, Loading, Unloading, Transport, Other	---	5.81	5.81	---
	Sub-total: Retailer Cost	---	5.81	5.81	---
D	Marketing Cost-Village Trader				
xs	Packaging, Weighing, Loading, Transport	---	---	---	3.80
	Sub-total: Village Trader Cost	---	---	---	3.80
2	Total Marketing Margin (Rs/kg)	4.36	14.49	16.12	11.20
3	Consumer Price/Retailer Selling Price (Rs/kg)	140.00	145.00	155.00	140.00
4	Producer's Net Price Received (Rs/kg)	124.36	120.95	120.95	120.95
5	Producer's Share in Consumer's Rupee (%)	88.83	83.41	78.03	86.39

Source: Primary survey data, 2020-21

3.2 Cost Structure at Intermediary Levels

Channel III, which is the most complex routing arrangement in the study, incorporates a wholesaler between the producer and the retailer. Wholesaler-level costs in this channel totalled Rs. 4.20/kg, distributed across grading (Rs. 0.50), packaging material (Rs. 0.65), packaging labour (Rs. 0.42), weighing (Rs. 0.25), loading (Rs. 0.40), unloading (Rs. 0.38), transport (Rs. 0.55), and other expenses (Rs. 1.05). The 'other expenses' sub-item, the largest single item at the wholesale level, likely encompasses market cess, commission charges, and storage fees, consistent with findings from Gujarat chilli markets where spoilage and commission charges constituted the dominant share of wholesaler costs (Sindhu *et al.*, 2022) ^[7].

Retailer-level costs were identical in Channels II and III at Rs. 5.81/kg. The composition of these costs-grading (Rs. 1.02), packaging material (Rs. 0.85), packaging labour (Rs. 0.65), weighing (Rs. 0.35), loading (Rs. 0.40), unloading (Rs. 0.38), transport (Rs. 1.15), and other expenses (Rs. 1.01)-reveals that transport and other charges together account for over 37 percent of retail-level costs, pointing to the inadequacy of cold-chain and last-mile delivery infrastructure in distributing fresh and dried chilli to terminal markets. In Channel IV, village traders incurred a combined cost of Rs. 3.80/kg, consisting of packaging (Rs. 1.10 + Rs. 0.80), weighing (Rs. 0.40), loading (Rs. 0.50), and transportation (Rs. 1.00). The relatively lean cost profile of village traders reflects their operational proximity to farm gates and their limited scale of logistics.

3.3 Price Spread, Marketing Margin, and Producer Share

The producer price at the farm gate was Rs. 130/kg in Channel I and Rs. 125/kg in Channels II, III, and IV. The Rs. 5/kg differential in initial price favouring Channel I likely reflects the premium that direct-dealing retailers are willing to pay for assured supply from known producers. Consumer-end prices ranged from Rs. 140/kg in Channels I and IV, to Rs. 145/kg in Channel II, to Rs. 155/kg in Channel III, the last being the highest, and explicable by the layering of wholesaler and retailer margins in this route.

Price spread, the aggregate gap between what the consumer pays and what the producer nets, was narrowest in Channel I at Rs. 15.64/kg and widest in Channel III at Rs. 34.05/kg. Channel II recorded a spread of Rs. 24.05/kg, and Channel IV Rs. 19.05/kg. The pattern is instructive: each additional intermediary layer in the supply chain adds disproportionately to the price spread, a finding consistent with Rajur & Patil (2015) ^[6] for Karnataka chilli and with Sowjanya *et al.* (2020) ^[8] for Guntur chilli, both of whom found that longer channels amplify the divergence between farm-gate and consumer prices.

Marketing margins, the profit component retained by channel intermediaries, were Rs. 4.36/kg in Channel I (retained entirely at the retailer level), Rs. 14.49/kg in Channel II, Rs. 16.12/kg in Channel III, and Rs. 11.20/kg in Channel IV. The substantial margin in Channel III relative to the product price implies that roughly 10.4 percent of the consumer price in that channel constitutes pure intermediary

profit, over and above legitimate marketing costs, a rent extraction that occurs at the expense of the farmer's net realisation.

The net price received by the producer (after deducting producer-level marketing costs from the farm-gate price) was highest in Channel I at Rs. 124.36/kg, while it was Rs. 120.95/kg in Channels II, III, and IV. Correspondingly, the producer's share in the consumer's rupee was 88.83 percent in Channel I-the most farmer-favourable outcome, followed by Channel IV at 86.39 percent, Channel II at 83.41 percent, and Channel III at 78.03 percent. These figures compare favourably with reported producer shares in other chilli markets: Sowjanya *et al.* (2020) ^[8] found 80.51 percent in a Guntur two-tier channel, and Sindhu *et al.* (2022) ^[7] reported 92.31 percent in a direct channel and 76.94 percent in a three-tier arrangement for Gujarat chilli-a pattern closely mirroring the gradient observed here.

Table 2: Comparative Summary of Price Spread and Marketing Efficiency Across Channels

Indicator	Channel I	Channel II	Channel III	Channel IV
Producer's Price (Rs/kg)	124.36	120.95	120.95	120.95
Total Marketing Cost (Rs/kg)	5.64	9.86	14.06	7.85
Total Marketing Margin (Rs/kg)	4.36	14.49	16.12	11.20
Price Spread (Rs/kg)	15.64	24.05	34.05	19.05
Marketing Efficiency Index	13.00	5.13	4.14	6.56
Producer's Share in Consumer Rupee (%)	88.83	83.41	78.03	86.39

Source: Computed from primary data, 2020-21

3.4 Marketing Efficiency Across Channels

The marketing efficiency index, computed using Acharya's formula, yielded values of 13.00, 5.13, 4.14, and 6.56 for Channels I, II, III, and IV, respectively (Table 2). Channel I is thus the most efficient marketing arrangement by a substantial margin, generating Rs. 13.00 of net producer realisation for every rupee spent on marketing costs and margins combined. Channel III, with the most intermediaries and the highest total marketing overhead, was the least efficient at 4.14.

This finding accords with the general principle, well-documented in the Indian agricultural marketing literature, that intermediation adds cost and margin burden that is not proportionally offset by the services intermediaries provide (Acharya, 2004; Chand & Raju, 2009) ^[1, 2]. In the specific context of Ramnad Mundu Chilli, the efficiency advantage of Channel I also reflects the GI-associated quality premium and brand recognition that allows this variety to command direct-retail prices, reducing the farmer's dependence on wholesale intermediaries. The relatively strong performance of Channel IV (ME = 6.56) compared to Channels II and III deserves note: village traders, despite their informal organisational status, operate with a lean cost structure and return a higher share to the producer than formal wholesale-retail chains. This efficiency, however, comes at the cost of limited market reach and volume, constraining the scalability of this arrangement.

Discussion

The cross-channel comparison of price spread, marketing margin, and efficiency indices collectively reveals a market

structure in which shorter supply chains deliver substantially better outcomes for Ramnad Mundu Chilli farmers, while longer multi-tier arrangements primarily benefit intermediaries at the cost of producer welfare. This structural diagnosis is not unique to this commodity: the broader Indian spice marketing literature consistently documents that the number of marketing intermediaries is the single most powerful predictor of price spread and channel inefficiency (Kumar & Raj, 2022; Thakur *et al.*, 2023) ^[4, 9].

What distinguishes Ramnad Mundu Chilli from generic commodity chilli, however, is its GI status. In principle, GI certification should expand market access, create brand equity, and enhance the farmer's price-setting leverage. The data suggest that Channel I, which already bypasses the wholesale layer, achieves the highest producer share (88.83%) and the highest efficiency (13.00), implying that when GI-certified produce is directly connected to informed retailers, value retention is superior. The untapped potential lies in extending this direct-linkage model more broadly: currently, a substantial proportion of Ramnad Mundu Chilli production still moves through Channels II and III, where combined marketing costs of Rs. 9.86/kg and Rs. 14.06/kg respectively, impose a heavy logistical burden on the supply chain.

The significant positive marketing margin in Channels II (Rs. 14.49/kg) and III (Rs. 16.12/kg) also signals the absence of effective market competition at the intermediary stage. In oligopolistic chilli wholesale markets where a small number of buyers face a large number of atomistic sellers, the buyer's bargaining power keeps farm-gate prices depressed below competitive equilibrium levels. Strengthening farmer collectives, including the Ramnad Mundu Chilli Producers Company Limited (RMCPCL) that spearheaded the GI application, is a direct instrument for redressing this imbalance. Evidence from other GI-certified agricultural commodity groups in India indicates that producer organisations, when adequately capitalised and professionally managed, can negotiate higher prices meaningfully by aggregating supply, ensuring grading consistency, and directly engaging with institutional and retail buyers.

From the consumer's perspective, the wide variation in consumer prices across channels-Rs. 140/kg (Channels I and IV) versus Rs. 155/kg (Channel III)-implies that intermediation does not merely redistribute income within the supply chain but also inflates the cost of access for end consumers. This welfare loss is avoidable: a shift toward shorter, more transparent supply chains would simultaneously benefit producers (through higher net realisations) and consumers (through lower retail prices). Digital agricultural market platforms, which have demonstrated their capacity to compress price spreads in other high-value horticultural commodities, are a particularly promising tool in this regard.

Conclusion

This study has provided a systematic empirical account of how the price of Ramnad Mundu Chilli-a GI-certified, internationally traded spice variety of Ramanathapuram district, Tamil Nadu-is distributed across four marketing channels, and how efficiently each channel translates consumer expenditure into farmer income. The findings establish, with consistency across multiple performance

indicators, that Channel I (Producer-Retailer-Consumer) is the optimal channel from the standpoint of producer welfare, yielding an efficiency index of 13.00 and retaining 88.83 percent of the consumer rupee at the farm level. Channel III (incorporating both wholesaler and retailer) is the most inefficient, with a price spread of Rs. 34.05/kg, a marketing efficiency index of 4.14, and a producer share of only 78.03 percent.

Based on these findings, the following policy actions are recommended. First, the institutional capacity of the Ramnad Mundu Chilli Producers Company Limited should be strengthened through equity support, marketing infrastructure grants, and training in direct retail outreach, so that a larger share of production is routed through Channel I-type arrangements. Second, e-NAM (National Agriculture Market) integration and real-time price dissemination through mobile-based platforms should be actively promoted in Ramanathapuram mandis to reduce information asymmetry that currently enables intermediaries to exercise disproportionate market power. Third, value addition activities, particularly GI-labelled chilli powder, oleoresin, and dried flake packaging targeted at premium domestic and export markets, should be incentivised through the Tamil Nadu Agribusiness Promotion scheme, as processed product channels are less susceptible to intermediary margin inflation than fresh produce channels. Fourth, the state agricultural marketing department should commission a periodic price spread monitoring exercise for GI-certified commodities, given that the economic rationale for GI protection is significantly undermined when farmers cannot capture even a quarter of the value addition occurring in the post-farm supply chain.

Future research should extend this analysis to include seasonal price spread variation, assess the impact of the recently conferred GI tag on farm-gate prices in a before-and-after framework, and examine the role of digital market platforms in restructuring the channel efficiency profile of Ramnad Mundu Chilli.

Acknowledgements

The authors are grateful to the farmers, traders, wholesalers, and retailers of Ramanathapuram district who participated in the primary survey. The assistance of the District Agriculture Office and local cooperative societies in facilitating data collection is gratefully acknowledged.

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