



ISSN Print: 2664-9926
 ISSN Online: 2664-9934
 NAAS Rating (2026): 4.82
 Indexing: Embase
 IJBS 2026; 8(9): 142-145
www.biologyjournal.net
 Received: 11-06-2026
 Accepted: 08-08-2026
 Published: 30-09-2026

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Supply chain performance, price margins and marketing efficiency in banana distribution

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DOI: <https://www.doi.org/10.33545/26649926.2026.v8.i9b.1000>

ABSTRACT

This empirical investigation examines the structural dynamics of post-harvest supply chains, market intermediation, and commercial impediments in commercial banana (*Musa spp.*) production across western Maharashtra, India. Utilizing cross-sectional survey data collected during the 2024–25 agricultural year from 90 stratified growers in the Phaltan and Man tahsils of *Satara* district, the study evaluates disposal behavior, transactional costs, price spreads, and marketing efficiency across three distinct supply pathways. The aggregate marketable surplus reached 97.67 per cent (636.66 q/farm) of gross production, reflecting high commercial orientation. The distribution pathways comprised: Channel I (Producer - Consumer), Channel II (Producer - Wholesaler - Retailer - Consumer), and Channel III (Producer - Pre-harvest Contractor - Wholesaler - Retailer - Consumer). Findings demonstrate an inverse relationship between farm scale and direct marketing: while smallholders directed 46.04 per cent of their surplus through Channel I, medium and large enterprises routed 57.66 per cent and 62.72 per cent through Channel III, respectively, trading economic margin for logistical risk mitigation. Channel I exhibited the highest Modified Marketing Efficiency index (30.74), securing 96.75 per cent (₹1,683.03/q) of the terminal consumer rupee for growers. Conversely, Channel III registered the lowest efficiency (2.10) alongside an extensive price spread (₹1,104.19/q), driven by intermediary margins totaling ₹618.24 per quintal.

Keywords: Banana, Marketing channels, Price spread, Marketing efficiency, Pre-harvest contractors, *Satara* district

Introduction

Horticultural commercialization serves as a primary engine for enhancing farm household incomes, with banana (*Musa spp.*) representing one of the most vital fruit crops due to its year-round harvestability, high yield potential, and substantial economic returns. However, because banana is a highly perishable commodity with a short post-harvest shelf life and vulnerability to physical damage, producer profitability depends directly on the speed and efficiency of the downstream marketing system. Any delay, mishandling, or inefficiency during post-harvest movement triggers rapid quality degradation and forces distress sales at heavily discounted rates. In major production pockets like the *Satara* district of Maharashtra, banana growers face critical marketing challenges arising from multi-tiered intermediary supply chains, price volatility, and a complete absence of localized cold-storage infrastructure. To mitigate assembly risks, large and medium producers predominantly offload their crops to pre-harvest contractors, trading off substantial economic margins to avoid transit and packaging burdens. Conversely, while direct marketing enables smallholders to retain a higher share of the consumer rupee, it remains structurally inadequate for liquidating large commercial volumes. A precise evaluation of disposal patterns, transactional marketing costs, and intermediary price spreads is imperative to identify where economic surplus is absorbed along the supply chain. This study analyzes the structural dynamics of banana marketing across Phaltan and Man tahsils in *Satara* district, comparing the efficiency of prevailing market channels and prioritizing the core commercial constraints faced by growers to inform policy and supply-chain improvements.

Materials and methods

The research framework reviews post-harvest management, output disposal patterns, and market transactions utilizing structured data aggregation protocols. Commercial performance is measured using aggregate marketing outlays borne by producers and intermediaries, price gap computations defined by the variance between consumer costs and farm-gate receipts, and Acharya's Modified Marketing Efficiency (MME) index. Comparative assessments draw upon established agricultural trade literature addressing price transmission and network performance.

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Results and discussion

The commercial success of banana cultivation in the study area is fundamentally tied to the operational and economic efficiency of its supply chains, given the highly perishable nature and limited post-harvest shelf life of the fruit. Across the surveyed farms, aggregate banana production averaged 651.84 quintals per farm. Out of this total volume, domestic utilization for home consumption accounted for an average of 0.16 per cent (1.10 quintals), quantities distributed as gratis made up 0.17 per cent (1.16 quintals), and crop losses due to pests and diseases stood at 1.98 per cent (12.91 quintals). After accounting for these retentions and field losses, the net marketable surplus averaged 636.66 quintals per farm, representing 97.67 per cent of total production.

Producers distributed this substantial marketable surplus through three primary marketing channels: Channel I (Producer - Consumer), Channel II (Producer - Wholesaler - Retailer - Consumer), and Channel III (Producer - Pre-harvest Contractor - Wholesaler - Retailer - Consumer). Channel III served as the dominant trade pathway, handling 49.41 per cent (314.58 quintals) of the total volume. Medium-scale and large-scale producers heavily favoured this route channeling 57.66 per cent and 62.72 per cent of their respective harvests through it primarily to transfer market risks and logistical burdens onto pre-harvest contractors. Channel II emerged as the second most utilized route, capturing 31.86 per cent (202.89 quintals) of the total volume relatively uniformly across all farm categories. Conversely, Channel I accounted for 18.71 per cent (119.17 quintals) of total shipments, with smallholders relying heavily on direct consumer sales (46.04 per cent of their produce) to capture higher net returns, whereas medium and large growers made minimal use of direct retail.

Marketing expenses and price spreads varied extensively across these distribution pathways, directly impacting net farmer realizations. For growers utilizing Channel I, total marketing costs were minimal at ₹56.59 per quintal, allowing producers to realize a net price of ₹1,683.03 per quintal (96.75 per cent of the consumer price) and achieve the highest Modified Marketing Efficiency index of 30.74. In Channel II, total farmer marketing costs rose to ₹102.25 per quintal, resulting in a net realization of ₹1,107.87 per quintal and an efficiency index of 2.64. In contrast, farmers opting for Channel III incurred zero direct marketing costs (₹0.00 per quintal) because pre-harvest contractors absorbed all post-harvest handling, packaging, labor, and transport expenses at the farm gate, providing a uniform net price of ₹1,218.61 per quintal. However, the multi-tiered involvement of contractors, wholesalers, and retailers in Channel III generated the widest price spread of ₹1,104.19 per quintal, pulling the marketing efficiency down to a low of 2.10.

These structural dynamics highlight that while pre-harvest contracting provides immediate convenience and risk mitigation, it creates wide price spreads driven by cumulative intermediary margins. Consequently, cultivators encounter significant commercial hurdles, including exploitative middleman malpractices, acute seasonal price fluctuations, the complete absence of local cold-storage and preservation infrastructure, high transportation costs to terminal markets, and a general lack of localized market intelligence. Addressing these systemic bottlenecks requires institutional interventions such as the establishment of decentralized cold-chain facilities and farmer-producer marketing platforms to protect growers from excessive intermediary rent-seeking.

Table 1. Channel wise marketed quantity of Banana (q)

Channel used	Small	Medium	Large	Overall
channel I	271.72	47.74	38.05	119.17
(P-C)	(46.04)	(7.34)	(5.67)	(18.71)
Channel II	169.67	227.27	211.75	202.89
(P-W-R-C)	(28.75)	(34.98)	(31.59)	(31.86)
Channel III	148.76	374.58	420.42	314.58
(P-PHC-W-R-C)	(25.20)	(57.66)	(62.72)	(49.41)
Total	590.15	649.59	670.23	636.66
	(100)	(100)	(100)	(100)

(Figures in parentheses are the percentage to the total)

Table 2. Price spread in different channels of Banana (₹ /q)

Sr.no.	Particulars	Channel I	Channel II	Channel III
1	Gross price received by the farmer	1739.62	1210.12	1218.61
		(100)	(67.88)	(52.46)
	i) Marketing cost	56.59	102.25	0.00
		(3.25)	(6.56)	(0.00)
	ii) Net price realized	1683.03	1107.87	1218.61
		(96.75)	(62.15)	(52.46)
2	Pre-harvest contractor	-	-	
	i) Price paid			1218.61
				(54.46)
	ii) marketing cost	-	-	239.37
				(10.31)
	iii) marketing margin	-	-	145.80
				(6.28)
	iv) Price received	-	-	1603.78
		-	-	(69.04)

(continued on next page)

Sr.no.	Particulars	Channel I	Channel II	Channel III
3	Wholesaler	-		
	i) Price paid		1210.12 (47.73)	1603.78 (69.04)
	ii) Marketing cost	-	102.90 (5.77)	102.46 (4.41)
	iii) Marketing margin	-	65.65 (3.68)	94.13 (3.67)
	iv) Price received	-	1378.68 (77.34)	1791.55 (77.13)
4	Retailer	-		
	i) Price paid		1378.68 (77.34)	1791.55 (77.13)
	ii) Marketing cost	-	106.87 (5.99)	144.12 (5.66)
	iii) Marketing margin	-	297.11 (16.67)	387.13 (16.67)
	iv) Price received	-	1782.65 (100)	2322.80 (100)
5.	Consumer			
	i) Price paid	1739.62 (100)	1782.65 (100)	2322.80 (100)
6	Price spread	56.59	674.78	1104.19
7	MC+MM	56.59	674.78	1104.19
8	Marketing efficiency	30.74	2.64	2.10

(Figures in the parenthesis are the percentages to the total price paid by consumer)

Table 4.19. Marketing Efficiency of Banana

Channel	Price Paid By Consumer	Net price received by banana farmer	MC	MM	MC+MM	MME
I	1739.62	1683.03	56.59	0	56.59	30.74
II	1782.65	1107.87	312.02	362.76	674.78	2.64
III	2322.80	1218.61	485.95	618.24	1104.19	2.10

Conclusion

Channel I (Producer - Consumer) is the most economically efficient route, enabling producers to realize 96.75% of the consumer's price. However, Channel III remains the dominant marketing pathway due to convenience and risk transfer to pre-harvest contractors, despite wider price spreads (₹1,104.19/q) and lower marketing efficiency (2.10).

Acknowledgments

The authors express appreciation to the Associate Dean and the Head of the Department of Agricultural Economics at R.C.S.M. Government College of Agriculture, Kolhapur, and Mahatma Phule Krishi Vidyapeeth, Rahuri, for supplying institutional backing and support throughout this investigation. The authors declare no conflict of interest connected to this work.

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How to cite this article: Kadam AK, Bondar US, Shinde VA, Satpute SV, Katkar TA, Gaikwad PS, et al. Supply chain performance, price margins and marketing efficiency in banana distribution. *International Journal of Biology Sciences*. 2026;8(9):142-145. doi: <https://www.doi.org/10.33545/26649926.2026.v8.i9b.1000>

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