BANANA SUPPLY CHAIN IN NAVI MUMBAI

ABSTRACT

This study investigates the banana supply chain in Navi Mumbai,aiming to identify existing supply channels, analyze their efficiency, problems faced by producers and anayse the market potential of banana in the study area. Primary data were collected from respondents to accomplish these objectives. Secondary data were obtained from private and government publications, and review papers.Utilizing a descriptive research design and employing a probability sampling method, the study surveyed 50 farmers, 5 village traders, 5 pre-harvest contractors, 10 wholesalers cum commission agents, and 10 retailers using a semi-structured schedule. Three marketing channels were identified. Among them channel-III(Farmer - Wholesaler cum commission agent - Retailer - Consumer) was the most efficient option, offering the highest producer's share in the consumer's rupee (40.05%) and the highest marketing efficiency (0.67), with a price spread of Rs. 1711.55 per quintal. In the study area, banana producers face challenges such as high input costs, delayed availability of planting materials, and losses due to diseases and pests. Marketing hurdles include lower prices, distant selling unit locations, delayed payments, and inadequate transportation and storage facilities. Village traders, preharvest contractors, wholesalers cum commission agents, and retailers also encounter various obstacles such as price fluctuation, handling and transportation losses, low-quality produce, and labour shortages.As the total market demand for banana in Navi Mumbai was estimated to be ₹ 62.26 crore, addressing these challenges is vital for enhancing the efficiency and profitability of banana marketing in the study area, necessitating coordinated efforts from policymakers, agricultural stakeholders, and market participants.Establishing FPOs and FPCs can ease access to affordable planting materials and address marketing challenges, benefiting all banana market stakeholders.

Keywords: *marketing channel; marketing cost; marketing margin; marketing efficiency; price spread; producer'sshareinconsumer's rupee, banana,*

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1. INTRODUCTION

Supply chains are primarily concerned with the movement of products and information between supply chain member organizations, acquisition of resources, transformation of commodities into completed products, and distribution of those products to end users [1].The supply chain for fruits and vegetables (F&V) in India involves various stakeholders including farmers, wholesalers, and retailers, aiming to move produce from farms to consumers efficiently. Challenges like perishability, seasonality, and consumer preferences for freshness make marketing F&V complex, emphasizing the need for effective strategies to enhance distribution and economic growth[2].India is the leading global producer of a wide variety of fruits and vegetables, ranking second in the world after China in terms of production. In 2021-22, the country produced 107.24 million metric tons of fruits and 204.84 million metric tons of vegetables. India is the largest producer of ginger and okra,

and ranks highly in the production of potatoes, onions, cauliflowers, brinjal, cabbages, bananas, mangoes papayas etc.[3].

Banana (Musa *sp*.) is the second most important fruit crop in India next to mango. All social classes like banana because of its year-round availability, low cost, taste, and nutritional therapeutic benefits [4]. It's originated in the tropical regions of Southeast Asia. It's are a nutritional goldmine. They are abundant in vitamin B6, which aids in infection prevention and is required for the formation of heme, the iron-containing component of hemoglobin. They include high levels of potassium and fiber. Recently, the country has seen an increase in organic banana production due to concerns about the negative impact of chemical overuse. "Green Foods" is the new term for this[5].

India ranks first in the world banana production. India produced the most bananas globally, with a share of 25.55 per cent followed by China and Indonesia, with a share 8.71 and 6.84 per cent, respectively [6]. Maharashtra is leading inproduction, with a share of 16.77 per cent followed by Andhra Pradesh, Tamil Nadu, Uttar Pradesh, and Gujarat with a share of 16.37, 12.90, 11.14, and 10.56 per cent, respectively[7].In Maharashtra during 2022-2023, total production of banana was 5626.36 thousand MT having 101.1 thousand hectares area with the productivity of 55.64 t/ha [8].Jalgaon is the leading bananas producing district of Maharashtra followed by Nanded, Satara, Ahmednagar, Solapur, Akola, Pune etc.[9]. The total production and total demand have shown increasing trend in the study area. However, supply chain of perishable commodity is of major concern. With the view of these, the study with specific objectives were carried out. Which includes identify of supply chain, analyse the distribution channel, problems faced by intermediaries and market potential of banana in Navi Mumbai.

2. METHODOLOGY

Research Methodology

Primary data were collected from respondents to accomplish these objectives. Secondary data were obtained from private and government publications, and review papers.This study employed a descriptive research design, utilizing a probability sampling method and simple random sampling technique to select the respondents. The sampling unit consisted of farmers, preharvest contractors, wholesalers cum commission agents, and retailers, with a total sample size of 80 respondents, comprising 50 farmers, 5 village traders, 5 preharvest contractors, 10 wholesalers, and 10 retailers. The study was conducted in Navi Mumbai, and data was collected using a semi-structured schedule. The analytical tools employed included Acharya's method, Garrett's ranking technique, and Armstrong's and Kotler's formula. These tools enabled the researcher to analyze the distribution channels of banana, identify production and marketing constraints, evaluate marketing practices, and analyze the market potential of banana in the study area.

Analytical Tools

Analyse distribution channels of banana

Several parameters, including price spread, marketing cost and margin were

calculated for each channel to assess and compare the marketing efficiency of various out.

Marketing cost

This encompasses the overall expenses accrued by farmers and intermediaries involved in the marketing channel. It was estimated by considering various factors and using the following formula[10]:

$C = CF + CM_1 + CM_2 + CM_3 + \text{----------} + CM_n$

Where, C = Total cost of marketing

CF = Cost borne by the producer from the time the produce leaves the farm till it is sold,

CM_1, …., CM_n = Cost incurred by different market intermediaries

Marketing margin

The marketing margin of market intermediaries is computed as the difference between the total cost incurred by the intermediaries in purchasing the produce from the producer along with the cost of marketing and selling price of the market intermediaries and was calculated as[10]:

$A_{mi} = P_S - (P_p + M_{Ci})$

Where, A_{mi} = Absolute marketing margin of the i^{th} market intermediaries

P_S = Selling price of the i^{th} market intermediaries

P_p = Purchase price of the i^{th} market intermediaries

M_{Ci} = Marketing cost incurred by the i^{th} market intermediaries

Price Spread

Price spread in the context of agricultural marketing refers to the difference between the price paid by the final consumer for a specific quantity of farm produce and the price received by the producer for the same amount of the product.[10]

Price spread (P_{sd}) = $P_c - P_F$

Where, P_{sd} = Price spread

P_c = Price paid by the consumer

P_F = Price received by the farmers for equivalent quantity of the produce

Marketing efficiency

The evaluation of marketing efficiency in various channels in the study area was calculated using Acharya's approach (2011) [10].

$$\text{MarketingEfficiency} = \frac{P_f}{Mc + Mm}$$

Where, P_f = Net price received by the farmer

Mc = Total marketing cost

Mm = Total marketing margin

Identify problems faced by producers and intermediaries

The Garrett Ranking Technique (1969) was used [11]

$$\text{Per cent position} = 100\ \frac{(Rij - 0.5)}{Nj}$$

Where:- Rij = Rank given for the i^{th}variable by j^{th} respondents

Nj = Number of variables ranked by j^{th} respondents

Analyse the market potential of banana

The analyse the market potential of banana in the study area was calculated using Armstrong's andKotler's formula (2018) [12][13].

$Q = n * q * p$

Where, Q = total market demand

n = number of buyers in the market

q = quantity purchased by an average buyer per year

p = price of an average unit

3. RESULTS AND DISCUSSION

3.1 Supply Chain of Banana

The banana supply chain in Navi Mumbai began with the farms in Maharashtra, where bananas were grown and harvested. These bananas were transported to the APMC Market in Vashi, one of the largest markets for fruits and vegetables in the area. At this market, the bananas were sorted and graded based on their quality and size. After this process, they were sent out to various retailers across Navi Mumbai through efficient road transport, ensuring the bananas remained fresh. There were three main marketing channels in this supply chain, involving different stakeholders like farmers, village traders, pre-harvest contractors, wholesalers, commission agents, and retailers, each playing a key role in delivering bananas to consumers in Navi Mumbai's urban and suburban areas (Table 1).

Table1 Marketing Channels of Banana in Navi Mumbai

Channel No	Marketing Channel
Channel I	Farmer - Village Trader - Wholesaler cum commission agent-Retailer–Consumer
Channel II	Farmer – Pre harvest Contractor - Wholesaler cum commission agent-Retailer–Consumer
ChannelIII	Farmer -Wholesaler cum commission agent - Retailer -Consumer

3.2 Price Spread and Marketing Efficiency of Identified Marketing Channels of Banana

Table2 Channel Wise Marketing Cost and Marketing Margin of Banana in Navi Mumbai (₹ /q)

Particulars	Channel-I	Channel-II	Channel-III
Netprice receivedbythe producer	1089.63	1000.00	1143.38
Costincurredbythe producer			
i) Loading and Unloading cost	-	-	90.00
ii) Transportation cost	-	-	300.00
iii) Weighing charges	-	-	10.00

iv)Wastage Loss	57.50	-	82.50
v) Miscellaneous cost	2.88	-	24.13
Total cost (i to v)	60.38	-	506.63
Village Traders' price	1150.00	-	-
Costincurredbythe village trader			
i) Loading and Unloading cost	90.00	-	-
ii)Transportation cost	300.00	-	-
iii) Weighing charges	10.00	-	-
iv) Wastage Loss	34.50	-	-
v) Miscellaneous cost	21.73	-	-
Total cost (i to v)	456.23	-	-
Village trader margin	115.00	-	-
Preharvest contractors' price	-	1000.00	-
Costincurredby the Preharvest contractor			
i) Harvesting cost	-	150.00	-
ii) Cleaning, grading and sorting cost	-	60.00	-
iii) Loading and Unloading cost	-	90.00	-
iv) Weighing charges	-	10.00	-
v) Transportation cost	-	300.00	-
vi) Wastage Loss	-	50.00	-
vi) Miscellaneous cost		33.00	-
Total marketing cost (i to vi)	-	693.00	-
Preharvest contractor margin	-	150.00	-
Wholesaler cum commission agents'price	1721.23	1843.00	1650.00
CostincurredbytheWholesaler cum commission agent			
i) Labour cost	80.00	80.00	80.00
ii) Ripening cost	100.00	100.00	100.00
iii) Wastage Loss	86.06	55.29	82.50
iv) Miscellaneous cost	26.61	23.53	26.25
Total cost (i to iv)	292.67	258.82	288.75
Wholesaler cum commission agent margin	206.55	221.16	198.00
Retailers' price	2220.45	2322.98	2136.75
CostincurredbytheRetailer			
i) Loading and Unloading cost	40.00	40.00	40.00

ii) Transportation cost	200.00	200.00	200.00
iii) Market fee	22.20	23.23	21.37
iv) Wastage Loss	111.02	116.15	106.84
v) Miscellaneous cost	29.86	30.35	29.46
Total marketing cost (i to v)	403.08	409.73	397.66
Retailer margin	333.07	348.45	320.51
Consumers'price	2956.59	3081.15	2854.92
Totalmarketingcost	**1212.35**	**1361.55**	**1193.04**
Totalmarketingmargin	**654.61**	**719.61**	**518.51**

Table 2 provides detailed the Channel wise marketing cost and marketing margin of banana in Navi Mumbai. In Channel-I, the net price received by the producer was ₹ 1089.63, with a minimal total production cost of ₹ 60.38 primarily due to wastage loss and miscellaneous costs. This channel involved village traders who added their own costs and margin, eventually leading to a consumer price of ₹ 2956.59. The total marketing cost and margin in this channel reached ₹ 1866.96, which included the various stages from village traders to retailers.

Channel-II operated exclusively through preharvest contractors who purchased directly from producers at ₹ 1000.00. The contractors incurred significant costs amounting to ₹ 693.00, covering everything from harvesting to transportation. The subsequent stages via wholesalers and retailers amplified the final consumer cost to ₹ 3081.15. This channel had a relatively high total marketing cost of ₹ 1361.55 and a marketing margin of ₹ 719.61, demonstrating substantial additions through the supply chain but also indicating higher operational costs compared to other channels.

Channel-III presented an efficient model with the producer receiving the highest net price of ₹ 1143.38 despite incurring the highestcosts of ₹ 506.63. The costs covered extensive ground from loading to miscellaneous expenses, indicating comprehensive handling and transportation processes. However, the total marketing costs and margins added up to ₹ 1711.55, resulting in the lowest consumer price among the three channels at ₹ 2854.92.

Table3 Price Spread, Producer'sShareinConsumer's Rupeeand Marketing Efficiency of Identified Marketing Channels of Banana (₹ /q)

Particulars	Channel-I	Channel-II	Channel-III
Totalmarketingcost	1212.35	1361.55	1193.04
Totalmarketingmargin	654.61	719.61	518.51
Pricespread (MC + MM)	1866.96	2081.15	1711.55
Producer'sshareinconsumer's rupee	36.85 %	32.46 %	40.05 %
Marketingefficiency(Acharya'sMethod)	0.58	0.48	0.67

Table 3 provides detailedPrice spread, Producer's share in consumer's rupee and marketing efficiency of identified marketing channels of banana. Based on the comparative analysis, Channel-III stood out as the most advantageous for producers primarily due to its

superior marketing efficiency and the proportionate share that producers retained from the consumer's rupee. The channel not only secured the highest net price for producers at ₹ 1143.38 but also offered the highest producer's share in consumer spending at 40.05%. Furthermore, its marketing efficiency, scored at 0.67 according to Acharya's method, indicated a more cost-effective distribution and lower relative costs throughout the supply chain compared to the other channels. Consequently, for banana farmers in Navi Mumbai looking to optimize both their earnings and the efficiency of their marketing channel, Channel-III was unequivocally the most recommended option.

3.3Problems Faced by Banana Producers and Intermediaries

Table 4Problems Faced by Farmers in Banana Production

Problems	Average score	Rank
High cost of inputs	66.62	I
Non availability of planting materials on time	54.20	II
Losses due to attack of diseases and pests	50.30	III
Non availability of labour on time	48.62	IV
Damage due to unfavorable weather conditions	44.64	V
Lack of technical guidance	35.62	VI

Table 4shows that the problems faced by farmers in banana production, ranked according to their severity. The high cost of inputs and non-availability of planting materials on time were the major problem faced by farmers in production of banana followed by losses due to attack of diseases and pests, non-availability of labour on time, damage due to unfavorable weather conditions, and lack of technical guidance.

Table5 Problems Faced by Farmers in Banana Marketing

Problems	Average score	Rank
Lower price	61.48	I
Location of selling unit far away	60.82	II
Delay in payment	47.90	III
Lack of market information	45.62	IV
Inadequate transportation facility	43.00	V
Lack of storage facility	41.18	VI

Table 5 presents the problems faced by farmers in banana marketing, ranked according to their severity. The lower price and location of selling unit far away were the major problem faced by farmers in marketing of banana followed by delay in payment, lack of market information, inadequate transportation facility, and lack of storage facility.

Table 6 Problems Faced by Village Traders in Banana Marketing

Problems	Average score	Rank
Price fluctuation	67.00	I
Loss during handling and transportation	61.00	II
Location of selling unit far away	48.00	III

Low quality produce	39.00	IV
Lack of storage facility	35.00	V

Table 6 highlights the problems faced by village traders in banana marketing. The price fluctuation and loss during handling and transportation were the major problem faced by village traders in marketing of banana followed by location of selling unit far away, low quality produce, and lack of storage facility.

Table7 Problems Faced by Preharvest Contractors in Banana Marketing

Problems	Average score	Rank
Price fluctuation	66.20	I
Unavailability of labour on time	57.80	II
Loss during handling and transportation	57.40	III
Location of selling unit far away	47.60	IV
Low quality produce	39.40	V
Lack of storage facility	36.60	VI

Table 7 illustratesthe problems faced by preharvest contractors in banana marketing. The price fluctuation and unavailability of labour on time were the major problem faced by preharvest contractors in marketing of banana followed by loss during handling and transportation, location of selling unit far away, low quality produce, and lack of storage facility.

Table8 Problems Faced by Wholesalers Cum Commission Agentsin Banana Marketing

Problems	Average score	Rank
Price fluctuation	76.80	I
High labour cost	62.00	II
Lack of ripening chamber	58.80	III
Loss during handling and transportation	52.30	IV
Location of selling unit far away	38.50	V
Delay in payment and sale proceeds	31.90	VI
Lack of storage facility	31.70	VII

Table 8 presents the problems faced by wholesalers cum commission agents in banana marketing, ranked according to their severity. The price fluctuation and high labour cost were the major problem faced by wholesalers cum commission agentsin marketing of banana followed by lack of ripening chamber, loss during handling and transportation, location of selling unit far away, delay in payment and sale proceeds, and lack of storage facility.

Table9 Problems Faced by Retailers in Banana Marketing

Problems	Average score	Rank
Price fluctuation	62.50	I
Loss during handling and transportation	60.60	II
Lack of market information	48.50	III
Location of selling unit far away	46.10	IV

Lack of storage facility	43.10	V
High labour cost	39.20	VI

Table 9 provides the problems faced by retailers in banana marketing, ranked based on their average score. The price fluctuation and loss during handling and transportation were the major problem faced by retailersin marketing of banana followed by lack of market information, location of selling unit far away, lack of storage facility, and high labour cost.

3.4 Market potential of banana in Navi Mumbai

Based on a secondary survey, the current estimated population of Navi Mumbai in 2024 is 1,589,000 [14] and the per capita consumption of bananas is 13.06 kg [15].

According to a primary survey, the price of 1 kg of banana is 30 rupees.

Market Potential (Market Demand)

$Q = n * q * p$

Where, n = 1,589,000

q = 13.06 Kg

p = 30 Rs.

$Q = 1,589,000 * 13.06 * 30$

= ₹ 622,570,200

= ₹ 62.26 Crore

Total market potential of banana in Navi Mumbai was estimated to be ₹ 62.26 crore.

4. CONCLUSION

The study identified three marketing channels in the study area. The analysis of banana marketing channels in the Navi Mumbai revealed that Channel III proved most efficient for farmers compared to Channel I and II due to fewer intermediaries, highest marketing efficiency (0.67), and greater producer share in consumer rupees. To promote its adoption, incentives, improved market information, transportation, and storage facilities are recommended.The analysis of problems faced by banana producers and intermediaries on critical challenges within the banana supply chain in Navi Mumbai. Farmers primarily struggled with the high cost of inputs and non-availability of planting materials, while marketing issues included lower prices and distant selling locations. Village traders and preharvest contractors faced price fluctuations and handling losses. Wholesalers cum commission agents dealt with high labor costs and lack of ripening chambers, whereas retailers faced similar issues with price fluctuation and handling losses. To address these issues, the establishment of Farmer Producer Organizations (FPOs) and Farmer Producer Companies (FPCs) is recommended. These entities would facilitate the easy availability of planting materials at lower costs and alleviate marketing problems, benefiting all stakeholders in the marketing of banana.Total market potential of banana in Navi Mumbai was estimated to be ₹ 62.26 crore.

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