



Banana Supply Chain: A Case Study of Vadodara City of Gujarat

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The supply chain begins with acquiring fundamental raw materials and ends with delivering the finished product to the consumer. The growing interest in Agricultural Supply Chain Management (ASCM) can be attributed to two main factors: agricultural industrialization and the uncertainty brought on by differences in product quality and safety. The study objective was to identify different marketing channels of banana in Vadodara city, to estimate the price spread of banana and to identify problems faced by producers and intermediaries. Primary data were collected from 40 farmers, 15 wholesalers and 25 retailers to accomplish these objectives. Secondary data were collected from different private and government publications, review papers, literature, and journals. For the study descriptive type of research design was used. In the research sampling method was non-probability sampling method and sampling technique was convenience sampling technique were used. Channel-IV was the most effective way to reach consumers because it has the shortest route. Channel-I was less effective than the others because its marketing cost was the highest. The study reveals that the existing supply chain has a serious problem of lower prices faced by farmers. A significant problem for wholesalers is the lack of a ripening chamber. The major problem for retailers is that they suffer from higher post-harvest losses due to the lack of storage facilities,

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forcing them to sell products quickly to maximize profits and minimize losses. After doing certain changes like developing a ripening facility in marketing channel IV company may adopt this channel because its channel has the highest marketing efficiency and more share of producer in consumer rupee. To overcome these problems, there is a need to develop infrastructures, cold storage facilities, set up ripening chambers, processing facilities and use refrigerated vehicles for long-distance transportation, etc.

Keywords: Supply chain; banana; marketing efficiency; price spread.

1. INTRODUCTION

The supply chain begins with acquiring fundamental raw materials and ends with delivering the finished product to the consumer. The growing interest in Agricultural Supply Chain Management (ASCM) can be attributed to two main factors: agricultural industrialization and the uncertainty brought on by differences in product quality and safety [1].

Fresh fruits, vegetables, and root crops collectively referred to as "fresh produce" are by nature perishable goods, and the physical distribution of these products through the marketing system frequently results in large losses. In the fresh produce supply chain in India, it is estimated that quality is lost by about 60% as it is moved from the field to the consumer. High producer profits and low consumer pricing are both benefits of effective supply chain management strategies in the fresh produce supply chain [2]. In fresh produce supply chain, lots of problems are involved like absence of producer's association, long chain of middlemen and absence of marketing intelligence and finance [3,4]. Post-harvest losses differ widely among commodities and varieties, in various geographies, and during various seasons. In India, waste levels can reach from 24 to 40 percent, yet they are just from 4 to 6 percent in developed nations.

India ranks first in the world banana production. India has been claimed to have the highest production (29.78 million tons), followed by China (9.84 million tons) and Philippines (9.1 million tons) [5]. Andhra Pradesh is leading in the production, with a share of 17.65% followed by Maharashtra, Gujarat and Tamil Nadu, with a share of 12.77%, 11.82% and 11.78% respectively [6]. Narmada is the leading bananas producing district of Gujarat with 28.63 % of total Gujarat production followed by Bharuch, Anand and Vadodara with 26.62%, 22.08% and 11.39% respectively [6]. Farmers sell their produce directly to companies in their own way so, they get a better price for their produce as compared

to those who sell through commission agents or other intermediaries [7].

The study was conducted with the following objectives:

- 1) To identify different marketing channels of banana in Vadodara city
- 2) To estimate the price spread of banana
- 3) To identify problems faced by producers and intermediaries

2. MATERIALS AND METHODS

2.1 Research Methodology

- i. Type of Research - Descriptive research
- ii. Sampling method - Non – probability method
- iii. Sampling technique - Convenience Sampling technique
- iv. Sampling unit - Farmers, Wholesalers, Retailers
- v. Sampling size - 40 farmers, 15 Wholesaler, 25 Retailers
- vi. Sampling area - Vadodara district
- vii. Research instrument - Semi-structured schedule

2.2 Analytical Tools

Objective 2: To estimate the price spread of banana

The Acharya method was used to work out the marketing efficiency of bananas [8].

The following formula was used to calculate marketing cost:

$$C = C_f + C_{m1} + C_{m2} + C_{m3} + \dots + C_{mi}$$

Where

- C : total cost of marketing;
 C_f : cost paid by the producer from the time the produce leaves the farm up to sells
 C_{mi}: cost incurred by the Ith intermediary in the process of buying and selling the product

Price spread = MC + MM

$$\text{Marketing Efficiency} = \frac{NPF}{MC+MM}$$

Where,

NPF : Net price received by the farmer
 MC : Total marketing cost
 MM: Total marketing margin

Objective 3: To identify problems faced by producers and intermediaries

The Weighted Average Mean was used to study this objective.

Weighted Mean: Statistically, the weighted mean is calculated using the formula below:

$$\text{Weighted Average Mean (X)} = (F1X1 + F2X2 + F3X3 + F4X4 + F5X5) / Xt$$

Where

F = Weight given to each response
 X= Number of responses
 Xt= Total number of responses

3. RESULTS AND DISCUSSION

3.1 Marketing Channels

Channel-I exists for long-distance whereas channel II exists for a short-distance supply of bananas. Private company sold ripe and raw bananas through channel-III and channel-IV respectively. Channel-IV is only for raw bananas. Channel I, II and III are for the ripped bananas.

3.2 Price Spread of Banana

Channel-IV has the highest marketing efficiency but in the case of only ripped bananas, channel-II has the highest marketing efficiency followed by

channel-III and channel-I because bananas are produced in a nearby area. The marketing efficiency of channels IV, II, III and I are 94 %, 82 %, 70 % and 63% respectively.

The price spread is inversely proportional to marketing efficiency. Channel-I has the highest price spread followed by channel-III, channel-II and channel-IV. The price spread of these channels are 2052.64, 2049.94, 1756.94 and 1600 respectively.

Producer's share in consumer's rupee is highest in channel-IV followed by channel-II, channel-III and channel-I. Producer's share in consumer's rupee are 48%, 45%, 41% and 39% respectively. In supply chain showed that the producer's share in the consumer's rupee decreased with the increase in number of intermediaries [9].

3.3 Problems Faced by Producers and Intermediaries

3.3.1 Problems faced by the farmer

From the Table 4 it can be seen that eight factors were taken for problems faced by farmers in the existing supply chain in the study area. Major problems faced by the farmers were lower prices followed by large no. of intermediaries and lack of storage facility. Due to improper infrastructural and storage facilities farmers were forced to sell their crop produces in the local markets at lower prices just after harvesting [10].

3.3.2 Problems faced by the wholesaler

From the Table 5 it can be seen that eight factors were taken for problems faced by wholesalers in the existing supply chain in the study area. Major problems faced by the wholesaler were lack of a ripening chamber followed by delay in payment & sale proceeds and inadequate transportation facility.

Table 1. Marketing channels of bananas in Vadodara

Channel No	Marketing Channel
Channel I	Farmer - Commission Agent - Local Trader - Wholesaler -Retailer - Consumer
Channel II	Farmer - Commission Agent - Wholesaler - Retailer -Consumer
Channel III	Farmer - Commission Agent - Wholesaler - Private company - Consumer
Channel IV	Farmer - Padra CC (Private company) - Vadodara DC (Private company) - Consumer

Table 2. Marketing cost, marketing margin and price spread of banana for channel I, II, III (Rs. /quintal)

	Channel-I	Channel-II	Channel-III
Net price received by the producer	1,287.36	1,443.06	1,443.06
i) Operation cost	134.00	134.00	134.00
ii) Transaction cost	0.00	0.00	0.00
iii) Post-harvest loss	150.00	150.00	150.00
Total (i to iii)	284.27	284.27	284.27
Commission agents' price	1,571.63	1,727.33	1727.33
Cost incurred by the commission agent			
Commission agents' margin	78.37	86.00	86.00
Local trader price	1,650.00	-	-
Cost incurred by the local trader			
i) Operational cost	83.33	-	-
ii) Transportation cost	183.33	-	-
iii) Post-harvest loss	32.00	-	-
Total (i to iii)	198.67	-	-
Local trader margin	134.67	-	-
Wholesaler price	1,983.33	1,813.33	1,813.33
Cost incurred by the wholesaler			
i) Operational cost	316.67	270.00	300.00
ii) Transportation cost	166.67	206.67	200.00
iii) Post-harvest loss	240.00	227.00	250.00
Total (i to iii)	823.33	703.67	750.00
Wholesaler margin	260.00	383.00	471.67
Retailers price	3,066.67	2,900.00	3,035.00
Cost incurred by the retailer			
i) Operational cost	21.33	27.00	22.50
ii) Transportation cost	10.00	20.00	34.00
iii) Post-harvest loss	12.00	13.00	11.00
Total (i to iii)	43.33	60.00	67.50
Retailers margin	230.00	240.00	390.50
Consumers price	3,340.00	3,200.00	3,493.00
Total marketing cost	1,349.60	1,047.94	1,101.77
Marketing cost (Rs/qtl)			
Total marketing margin	703.04	709.00	948.17
Price spread	2,052.64	1,756.94	2,049.94
Producer's share in consumer's rupee	39 %	45 %	41 %
Marketing efficiency (Acharya's Method)	63 %	82 %	70 %

Table 3. Marketing costs, margins and price spread of banana for channel IV (private company raw banana channel) (Rs. /quintal)

	Channel-IV
Net price received by the producer	1,500.00
i) Operation cost	150.00
ii) Transaction cost	50.00
iii) Post-harvest loss	150.00
Total (i to iii)	350.00
Padra collection center price	1850
The cost incurred by the Padra collection center	
i) Operation cost	100
ii) Post-harvest loss	50
Total (i to ii)	150
Padra collection center margin	50
Private company D.C. Vadodara price	2500

	Channel-IV
The cost incurred by D.C. Vadodara	
i) Operation cost	100
ii) Transportation cost	80
iii) Post-harvest loss	70
Total (i to iii)	200
Private company D.C. Vadodara margin	800
Consumer price	3100
Total marketing cost	750.00
Marketing cost (Rs/QTL)	
Total marketing margin	850
Price spread	1,600.00
Producer's share in consumer's rupee	48 %
Marketing efficiency (Acharya's Method)	94 %

Table 4. Problems faced by the farmer

Problem	Rank
Lower price	I
Large no. of intermediaries	II
Lack of storage facility	III
Lack of contracting agencies	IV
Lack of market information	V
Inadequate transportation facility	VI
Lack of grading facility	VII
Location of selling unit far away	VIII

Table 5. Problems faced by the wholesaler

Problem	Rank
Lack of ripening chamber	I
Delay in payment and sale proceeds	II
Inadequate transportation facility	III
Location of selling unit far away	IV
Lack of storage facility	V
Lower price	VI
Lack of grading facility	VII
Large no. of intermediaries	VIII

The most serious problem for the wholesaler is the lack of a ripening chamber because the study found that only 25% of wholesalers have their own ripening chamber and other wholesalers are ripe bananas on a rent basis.

3.3.3 Problems faced by the retailer

From the Table 6 it can be seen that ten factors were taken for problems faced by retailer in the existing supply chain in the study area. Major problems faced by the wholesaler were lack of storage facility followed by large no. of intermediaries and lower price.

The result from the analysis is lack of storage facilities is the most serious problem for the retailer because there is less availability of infrastructure.

Table 6. Problems faced by the retailer

Problem	Rank
Lack of storage facility	I
Large no. of intermediaries	II
Lower price	III
Inadequate transportation facility	IV
Lack of ripening chamber	V
Lack of market information	VI
Location of selling unit far away	VII
Lack of contracting agencies	VIII

4. CONCLUSIONS

Supply chain management is very important in the case of fruits and vegetables due to their perishable nature and seasonality. The study was mainly concerned with the availability of different channels for the supply chain of bananas. Channel-I exists for long-distance whereas channel II exists for a short-distance supply of bananas. Private company sold ripe and raw bananas through channel-III and channel-IV respectively. Channel-IV was the most effective way to reach consumers because it has the shortest route. Channel-I was less effective than the others because its marketing cost was the highest. The study reveals that the existing supply chain has a serious problem of lower prices faced by farmers, mainly due to farmers are not receiving a fair price for their produce. A significant problem for wholesalers is the lack of a ripening chamber. The major problem for retailers is that they suffer from higher post-harvest losses due to the lack of storage facilities, forcing them to sell products quickly to maximize profits and minimize losses. After doing certain changes like developing a ripening facility in marketing channel IV company may be adopt this channel because its channel has the highest marketing efficiency and more share of producer in consumer rupee. To

overcome these problems, there is a need to develop infrastructures, cold storage facilities, set up ripening chambers, processing facilities and use refrigerated vehicles for long-distance transportation, etc., for the improvement of the connections between the supply chain's components.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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