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Production and Marketing of Chilli in Middle Gujarat

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ABSTRACT

Background: Gujarat state has favorable climatic condition for fruits and vegetables cultivation. The study was taken up to find the cost and return from chilli cultivation and their marketing channels.

Methods: The data were collected using primary survey method while cost concept and Acharya's formula were used to analyze the data in this study.

Result: The study revealed that cost C_2 was ₹ 201738.0 per ha in chilli cultivation while gross income was ₹ 485369.6 per ha. The net return was ₹ 278738 per ha and benefit cost ratio over total cost was 2.41 in the study area. Among the three-marketing channel found in the study area, channel III (5.59) was the most efficient marketing channel. This implies that need to encourage the marketing of chilli through channel III in the study area. Labour shortage and higher input prices were the major production constraint while less price received by farmers and labour problems were the major marketing constraint faced by farmers in the study area. This implies that there is need to use advanced mechanical tools and technology while production and marketing which ultimately lead to strengthen supply chain and reduce post-harvest losses.

Key words: Chilli, Cost-concept, Marketing, Vegetables.

INTRODUCTION

Vegetable scenario

Vegetable cultivation and production has shown increasing trend in India, the area under vegetables has increased from 7240.4 thousand hectors in 2005-06 to 10060.8 thousand hectors in 2017-18, while the production has increased from 113542.2 thousand tonnes to 184040.8 thousand tonnes over the years from 2005-06 to 2017-18 and the productivity also increased from 15681.8 kg/ha to 18292.8 kg/ha over the mentioned period (CMIE, 2022).

At Gujarat state level, vegetable production has increased from 6308.3 thousand tonnes to 12265.5 thousand tonnes from 2005-06 to 2017-18. The area under vegetables has also shown an increasing trend, while the productivity also increased from 16592.6 kg/ha to 20004 kg/ha over the period of time (CMIE, 2022).

Chilli scenario

Chilli is one of the most valuable spice crops than other spices which cultivated largely for its fruit purpose all over India (Gade *et al*., 2020). Table 1 shows the area, production and productivity of chilli over the years. The table shows that, at national level, the area under chilli has increased from 140 thousand hectors from 2013-14 to 410.9 thousand hectors in 2020-21. The production also increased from 1687.30 thousand tonnes to 4363.20 thousand tonnes over the years. But the productivity of chilli at national level has decreased from 12048.60 kg/ha to 10618.50 kg/ha from 2013-14 to 2020-21. India ranks second among world chilli exporters and has showed a stedy decline in chilli trade due to domestic consumption (Jorwar *et al*., 2018).

Although, area and production under chilli has increased over the years then also productivity has shown declining trend over the years. This implies that, area and production both increased but not in same proportion and due to this reason productivity has decreased over the years. This signifies the importance to study the economics and marketing of chilli production. It could be benefit to farmers and encourage the cultivation of chilli in the study area.

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Objectives of the study

To study cost and return of chilli cultivation in middle Gujarat.
To study marketing of chili in middle Gujarat.

MATERIALS AND METHODS

Area of survey

The study was conducted in Middle Gujarat which comprises of nine districts namely, Anand, Kheda, Vadodara, ChhotaUdepur, Ahmedabad, Botad, Dahod, Panchmahal and Mahisagar. For chilli, the data was collected from Anand and Vadodara district.

Source of data

Primary Data Primary data was collected through survey method with the help of well-structured pre-tested schedule. For chilli, marketing channels were found during the primary data collections. The secondary data in respect of area and production of chilli crop were collected from

the records and reports of the Directorate of Horticulture and statistics, Government of Gujarat.

Period of study

Primary data was collected in the agricultural year 2016-17. The sampling method was Non-probability sampling under which random sampling technique was used. Farmers, commission agents, village-level traders, pre-harvest contractors, wholesalers, traders and retailers from Middle Gujarat was selected as sampling unit. Table 2 shows the numbers of farmers, traders, wholesalers and retailers, which was selected as sample from selected districts.

Analytical tools and techniques

Cost concepts

The cost concept (CACP approach) was used to calculate cost and return analysis. Here, Cost A is also referred as operating cost or paid-out cost and Cost C_2 is also referred as the total cost.

Cost A = Value of hired human labour+ Value of bullock labour (owned/hired)+ Value of seeds (owned/ purchased)+ Value of manure (owned/ purchased) + Value of fertilizer+ Value of pesticides and insecticides + Irrigation charges+ Charges for machineries (owned/hired) + Other paid-out expenses if any + Depreciation on farm building and implements+ Interest on working capital.

Cost B = Cost A+ Rental value of owned land+ Interest on fixed capital assets (excluding land).

Cost C_1 = Cost B+ Imputed value of family labour.

Cost C_2 = Cost C_1+ 10 per cent of the Cost C_1 as a managerial charge.

Marketing efficiency

Marketing efficiency was calculated using Acharya's Modified measure of Marketing Efficiency (MME) (Acharya and Agarwal, 2006), which states;

$$MME = [RP \div (MC+MM)]-1$$

Where,

MME = Index of marketing efficiency.

RP = Price paid by the consumer.

MC = Total marketing cost.

MM = Net marketing margin.

Producer share in consumer rupee (PS) was calculated as below:

$$PS = \frac{(PF)}{(PR)} * 100$$

Where,

PF= Net price received by the producer.

PR= Retail price (price paid by the consumer).

Price spread

It is the difference between the two prices, *i.e.*, the price paid by the consumer and the price received by the producer. *e.g.*

$$P_1-P_2$$

Where,

P_1 = Price at one level or stage in the market.

P_2 = Price at another level.

Garrett's ranking technique

To find the most significant constraint influencing the stakeholders in the existing fruits commodity system, Garrett's Ranking Technique was employed. It was calculated as percentage score and the scale value was obtained by employing Scale Conversion Table given by Henry Garrett and Woodworth (1971).

The Percentage Score is calculated as:

$$\text{Per cent score} = \frac{100\ (Rij-0.50)}{Nij}$$

Where,

R_{ij} = Rank given for i^{th} constraint by j^{th} individual.

N_j =Number of constraints ranked by j^{th} individual.

The percent position of each rank was converted into scores using Garrett's Table. For each constraint, scores of individual respondents were added together and were divided by total number of respondents who responded. Thus, mean score for each constraint was ranked by arranging them in descending order.

Table 1: Area, production and productivity of chilli in India.

Year	Area '000 hectares	Production '000 tonnes	Yield kg/ha
2013-14	140	1,687.30	12,048.60
2014-15	181.4	1,997.70	11,012.50
2015-16	292.1	2,955.40	10,119.20
2016-17	316.5	3,634.00	11,483.00
2017-18	308.6	3,592.20	11,639.00
2018-19	376.5	3,782.90	10,047.10
2019-20	323.3	3,335.30	10,316.80
2020-21	410.9	4,363.20	10,618.50
CAGR	0.1441	0.1261	-0.0157
Change %	193.500	158.591	-11.869

Source: Commodities.cmie.in (2022).

Table 2: Sampling unit.

Crop	Districts	No of farmers	No of commission agents/village level traders	Wholesalers/ Pre-harvest contractors	Retailers
Chilli	Anand	50	10	10	10
	Vadodara	50	10	10	10
	Total	100	20	20	20

RESULTS AND DISCUSSION

The cost of cultivation presents the cost incurred by farmer while producing chilli in the study area. The average cost of cultivation in chilli was presented in Table 3. The table shows that, among all costs, cost of human was higher which was ₹ 66410.0 per ha which consists of cost of hired labour and family labour which was ₹ 35200 and ₹ 31210.20 pe ha. The study of Jorwar *et al*. (2018), also revealed that, for chilli cultivation, overall human labour cost was accounted 26.54 per cent of total cost of cultivation which was highest among all items included in the cost of cultivation. The cost of machine labour, cost of seeds, cost of fertilizer and manures, cost of pesticide, irrigation charges, depreciation and interest on working capital were ₹ 5960, ₹ 5346.3, ₹ 37991.6, ₹ 11400, ₹ 5664.0, ₹ 1164.8 and ₹ 7966.3 per ha, respectively, in the study area. The cost of rental value of land was found to be at ₹ 43200 per ha while managerial charges was ₹ 18339.82 per ha in chilli production.

Table 4 presents the cost of cultivation of chilli farming. The table revealed that cost A was found to be at ₹ 106744.8 per ha in chilli cultivation, while cost B was ₹ 152188.0 per ha. The total cost or cost C_2 was found to be at ₹ 201738.0 per ha in chilli cultivation which was similar to the findings of Jorwar *et al*. (2018) they also revealed that cost C for chilli cultivation was ₹ 176254.60 per ha while Bhandekar *et al*. (2023) also found ₹ 112317.59 per ha cost for chilli cultivation.

Table 5 shows the yield in chilli cultivation. The results revealed that average yield in chilli cultivation was 534 quintal per ha in the study area. The average price received by farmers in the study area was ₹ 909 per quintal. The gross income was found to be at ₹ 485369.6 in chilli cultivation.

Table 6 revealed the net return received by farmers over the different costs in chilli cultivation. The net return over cost A was ₹ 378624.8 per ha, which represents the return over total working cost. The net return over cost B and cost C_2 was found to be at ₹ 333181.6 and 283631.6 per ha, respectively, in the chilli cultivation. The net return of ₹ 115893.1 per ha was found in the study of Bhandekar *et al*. (2023).

The benefit-cost ratio over total cost or cost C_2 in chilli cultivation was found to be at 2.41 in study area. While benefit-cost ratio over cost A and cost B was found to be at 4.55 and 3.19, respectively in the study area (Table 7), these findings were similar to Jorwar *et al*. (2018) and Rajwadi and Pundir (2022). They also found the similar reults related to vegetable cultivation.

Marketing channels of chilli in middle Gujarat

The prevalent existing marketing channels in Middle Gujarat are shown in Table 8. There were three sells channels that delivered the chilli after harvest. About 52 per cent of chili peppers were supplied *via* Channel I, 33 producers *via* Channel II and the rest *via* Channel III. These channels were direct marketing channels and there were no middlemen.

Channel wise marketing cost of chilli in middle Gujarat (₹/q)

It was revealed from Table 9 that total marketing cost incurred by chilli producer amounted to ₹ 98.59, ₹ 114.84 and ₹ 114.84 per quintal in Channel-I, Channel-II and

Table 3: Average cost of cultivation (₹/ha).

Particulars	Chilli
Value of human labour	35200.00
Value of machine labour	5960.00
Value of seeds	5346.30
Value of fertilizers and manures	37991.60
Value of pesticides	11400.00
Irrigation charges	5664.00
Depreciation	1164.80
Interest on working capital	4018.11
Rental value of land	43200.00
Interest on fixed capital	2243.20
Value of family labour	31210.20
Managerial charges 10%	18339.82

Source: Field survey.

Table 4: Estimation of different costs (₹/ha).

Different costs	Chilli
Cost A	106744.8
Cost B	152188.0
Cost C_1	183398.2
Cost C_2	201738.0

Source: Field survey.

Table 5: Yield, weighted average price and gross income of chilli (q/ha).

Particulars	Chilli
Yield (q)	534
Weighted average price (₹/q)	909
Gross income (₹)	485369.6

Source: Field survey.

Table 6: Net returns over different costs (₹/ha).

Net returns over different costs	Chilli
Cost A	378624.8
Cost B	333181.6
Cost C_1	301971.4
Cost C_2	283631.6

Source: Field survey.

Table 7: Benefit-cost ratio over different costs.

Input-output ratios	Chilli
Cost A	4.55
Cost B	3.19
Cost C_1	2.65
Cost C_2	2.41

Source: Field survey.

Channel-III, respectively. Among the various components of marketing cost incurred by chilli producer in Channel I, labour charges was the highest (₹ 45.75/q), accounting for 17.65 per cent to total cost incurred by producers, followed by packing charges (₹ 25.23/q), loading charges (₹ 4.77/q) and post-harvest loss (₹ 15.25/q). In case of Channel-II and III labour charges was the highest ₹ 45.75/q, followed by packing charges (₹ 25.23/q), transport charge (₹ 12.50/q) and loading charge (₹ 12.36/q).

It can be seen from the table that the marketing cost of chilli borne by commission agent was ₹ 90.98 per quintal. Among various components commission charges accounts 29.18 per cent of total cost incurred by commission agent, followed by transportation charges (4.82%) and other charge (1.10%). The total marketing cost of chilli borne by wholesaler for Channel I and Channel II was ₹ 31.45 per quintal. Among the various cost components, spoilage accounted for ₹ 11.45/q of total cost incurred by wholesaler, followed by transport charge (₹ 11.25) and Loading and unloading charge (₹ 6.30/q). Further, it was observed that the total marketing cost of chilli incurred by retailer in Channel I and Channel II was ₹ 38.15 per quintal and in Channel III was ₹ 27.77 per quintal. Among the various component of marketing cost of spoilage were highest accountings in all three Channels.

Table 8: Marketing channels of chilli in middle gujarat.

Channel No.	Channels
Channel I	Producer-Commission Agent -Wholesaler-Retailer-Consumer(Long distant market)
Channel II	Producer-Wholesaler-Retailer-Consumer
Channel III	Producer- Retailer-Consumer(Short distant market)

Price spread in marketing of chilli in middle Gujarat

All the different marketing services and buying and selling activities increase the cost of the agricultural product when it reaches the end consumer. The price difference thus meant the difference between the price paid by end consumers and the price received by farmers for the equivalent amount. The price difference includes the costs of conducting various marketing activities and the margin of various agencies involved in the product distribution process.

Table 10 revealed the distribution of marketing costs and margins of all intermediaries and producers' share in consumer rupees across all marketing channels for chillies in Middle Gujarat. The lowest price difference was

Table 9: Channel wise marketing cost of chilli in middle Gujarat (₹/q).

Marketing cost	Marketing channel of chilli		
	Channel-I	Channel-II	Channel-III
Cost incurred by producer			
i) Labour cost	45.75 (17.65)	45.75 (24.80)	45.75 (28.78)
ii) Packing charge	25.23 (9.73)	25.23 (13.68)	25.23 (15.87)
iii) Transport charge	-	12.50 (6.78)	12.50 (7.86)
iv) Loading charge	12.36 (4.77)	12.36 (6.70)	12.36 (7.77)
v) Other charge	-	3.75 (2.03)	3.75 (2.36)
vi) Post harvest loss	15.25 (5.88)	15.25 (8.27)	15.25 (9.59)
Total (i to vi)	98.59 (38.04)	114.84 (62.26)	114.84 (72.23)
Cost incurred by the commission agent			
i) Transport charge	12.50 (4.82)	-	-
ii) Commission	75.63 (29.18)	-	-
iii) Other charge	2.85 (1.10)		
iv) Post harvest loss	-	-	-
Total (i to iv)	90.98 (35.10)	-	-
Cost incurred by the wholesaler			
i) Transportation charge	11.25 (4.34)	11.25	-
ii) Loading-unloading	6.30 (2.43)	6.30	-
iii) Other charge	2.45 (0.95)	2.45	
iv) Post harvest loss	11.45 (4.42)	11.45	-
Total (i to iv)	31.45 (12.13)	31.45 (17.05)	-
Cost incurred by the retailer			
i) Transportation	5.60 (2.16)	5.60 (3.04)	5.60 (3.52)
ii) Loading -unloading charge	4.30 (1.66)	4.30 (2.33)	4.30 (2.70)
iii) Post harvest loss	28.25 (10.90)	28.25 (15.32)	34.25 (21.54)
Total (i to ii)	38.15 (14.72)	38.15 (20.68)	44.15 (27.77)
Total marketing cost	259.17 (100.00)	184.44 (100.00)	158.99 (100.00)

*Figures in parenthesis is percentage of total marketing cost.

15.18 per cent on Channel III, when the chilli was distributed directly to the retailer. In this channel, producers receive most of the consumer price (84.82%). The difference in the price of chili sold through Channel I and Channel II was 21.41 per cent and 26.13 per cent. Channel I has 73.87 per cent of the producer's share in the consumer price and channel II has 78.59 per cent, which was lower than channel III. This may be because the chillies were marketed in distant markets where marketing costs and margins for wholesalers, brokers and retailers were higher. Pandey *et al*. (2003) also found that in marketing of potato, producers share in consumers price was around 73 per cent. Jorwar *et al*. (2018) found the three-marketing channel for chilli and revealed that producers share in consumers rupee was higher in direct channel (92.31), while for remaining both channels it was 76.94 and 72.69 per cent. These reveals that in vegetable marketing producers share in consumers rupee was higher in direct channels.

Marketing channels of chilli in middle Gujarat

Table 11 shows marketing efficiency of chilli via all channels in Middle Gujarat. The table also revealed that the channel III was the most efficient marketing channel with marketing efficiency of 5.59, followed by channel II (3.67) and channel I (2.83). her the channel III was the most efficient channel than also only 16 per cent farmers sold through this channel. Pundir *et al*. (2024) also revealed that marketing efficiency of short-distance channel was highest in potato

Table 10: Price spread in marketing of chilli in middle Gujarat (₹/q).

Marketing cost	Marketing channel of chilli		
	Channel-I	Channel-II	Channel-III
Net price received by producer	1890.00 (73.87)	1975.00 (78.59)	2025.00 (84.82)
Marketing cost to producer	88.81 (3.47)	105.06 (4.18)	105.06 (4.40)
Marketing cost to commission agent	66.55 (2.60)	-	-
Marketing cost to wholesaler	39.05 (1.53)	39.05 (1.55)	-
Marketing cost to retailer	38.15 (1.49)	38.15 (1.52)	27.15 (1.14)
Total marketing cost	232.56 (9.09)	182.26 (7.25)	132.21 (5.54)
Marketing margin by commission agent	80.25 (3.14)	-	-
Marketing margin by wholesaler	125.62 (4.91)	125.62 (5.00)	-
Marketing margin by retailer	230.25 (9.00)	230.25 (9.16)	230.25 (9.64)
Total marketing margin	436.12 (17.04)	355.87 (14.16)	230.25 (9.64)
Consumer's purchase price	2558.68 (100.00)	2513.13 (100.00)	2387.46 (100.00)
Price spread			
(Total marketing cost + margins)	668.68 (26.13)	538.13 (21.41)	362.46 (15.18)

*Figures in parenthesis is percentage of producers shares in consumers rupee.

Table 11: Marketing channels of chilli in middle Gujarat.

Particular	Channel-I	Channel-II	Channel-III
Consumer price/retailers selling price	2558.68	2513.13	2387.46
Total marketing cost	232.56	182.26	132.21
Total marketing margin	436.12	355.87	230.25
Net price received by farmers	1890.00	1975.00	2025
Index of marketing efficiency			
Marketing efficiency (Acharya's)	2.83	3.67	5.59

Table 12: Constraints in production of chilli.

Constraints	WAM	Rank
Less extension service	3.74	5
Unavailability of labour	4.64	1
Quality of input	3.87	4
Increasing prices of inputs	4.39	2
Availability on time	4.26	3
Long distance of input market	2.93	7
Insufficient delivery	3.41	6

Table 13: Constraints in marketing and selling of chilli.

Constraints	Garrett score	Mean value	Garrett rank
Spoilage of fruits	12582	52.43	5
Large space required for post-harvest handling	9707	40.45	7
Less price received	19023	79.26	1
Delayed in getting payment	13970	58.21	4
Higher cost of transportation	11083	46.18	6
Distance market	8567	35.70	8
Lack of market information	7470	31.13	9
Labour problem	16828	70.12	2
Commission problem	15373	64.05	3
Infrastructure problem	4917	20.49	10

marketing. Naveen *et al*. (2015) also found the similar results.

Constraints in production of chilli

Table 12 shows the production constraint faced by farmers in chilli cultivation. The main limitations were labour shortage, followed by price, timely availability of inputs, quality of inputs, then poor advisory services, poor delivery and least disruption, *i.e.* inputs It was mentioned that the source was remote from the farm.

Constraints in marketing and selling of Chilli

As it can be seen from the Table 13 that in chilli marketing, the major constraint in chilli marketing was less price received followed by labour problem, commission problem, delayed in getting payment, spoilage of fruits, higher cost of transportation, large space required for post-harvest handling, distance market, lack of market information and infrastructure problem. These findings were similar with Talathi *et al*. (2016).

SUGGESTIONS

The benefit-cost ratio in chilli cultivation is more than one indicating that there is need to encourage the cultivation of this crop so the farmers can get higher returns from the crop. Channel III was the most efficient channel so it is suggested that there is need to focus on channel III, so that farmers can get more return from their produce.

CONCLUSION

Out of total cost of cultivation, cost of human labour was the highest followed by cost of manure and pesticide. The total cost of cultivation in chilli was ₹ 201738.0 per ha while the gross income from chilli production was ₹ 485369.6. Benefit-cost ratio over total cost was 2.41 indicating that if a farmer invests one rupee in chilli cultivation he would be able to get ₹ 2.41 in return. Among all the marketing channels found in study area, channel III was the most efficient marketing channel due to less numbers of intermediaries involved in it. The labour shortage was the major problem in both production and marketing of chilli.

Conflict of interest

Authors have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.

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