An economic analysis ofcost of production and marketing channels of watermelon in Banaskantha District, Gujarat, India

ABSTRACT

The objective of the study is to analyse the production costs and marketing channels of watermelon in Banaskantha District, Gujarat,India. Owing to maximum areaunder cultivation in the district, Deesa, Dantiwada, and Lakhani were purposefully chosen for the study. A multistage sampling method was applied and a total of 120 watermelon farmers, 20 intermediaries, and 20 consumers were selected for data collection. The basic tabular approach and the percentage method were the statistical tools used for data analysis. To estimate the cost of cultivation of the watermelon crop, the cost concept was applied. The marketing effectiveness of the channel was examined using Shepherd's and Acharya's approaches.The watermelon cultivation required a total of 78 mandays of labour, including 58 family labours and 20 hired labours.Cost A was ₹19671.95, Cost B was₹17172.05, and Cost $C_1$was ₹186087.15, for a total cultivation cost (cost C_2) per hectare of ₹204695.87. This resulted in the overall cost of production per quintal of ₹537.82. According to the findings, the majority of farmers (61.67%) sell to contractors, followed by retailers (22.50%) and direct customers (15.83%). It was found that channel I had the highest marketing efficiency (Shepherd's method) *i.e.,* 33.67, followed by channel II with 9.87 and channel III with 5.97. The most effective channel in terms of marketing efficiency (Acharya's method) was channel I, with an efficiency of 33.67, followed by channels II and III with an efficiency of 1.33 and 0.76 respectively.This demonstrated that watermelon farming was profitable in the research area.

Keywords: Watermelon, Cost of production, Marketing efficiency, Marketing channel

1. INTRODUCTION

Watermelon (*Citrulluslanatus*) is a flowering plant species of Cucurbitaceae family. It is a scrambling, trailing vine-like plant with more than 1,000 different types of fruit that are widely farmed across the world. Watermelon is cultivated worldwide in favourable environments from tropical to temperate locations for its big edible fruit, which is a berry with a hard skin and no internal divisions and is botanically known as a pepo.Although there are kinds without seeds, the delicious, juicy flesh is typically deep red and contains numerous black seeds.With a production of 60.1 MT, China is the leading watermelon producing country in the world.(FAOSTAT 2020).The second-largest producer of watermelons is Turkey (3.49 MT). India is third in the world for watermelon productionproducing2.79 MT of watermelon. In India, Uttar Pradesh produces the most watermelon and contributing 21.91 per cent of the total production and produced 706650 tonnes. Andhra Pradesh contributed 19.49 per cent of the total production with 628570 tonnes(APEDA 2022).

2. MATERIAL AND METHODS

The multistage sampling approach was used to achieve the study's objectives. The Banaskantha district was purposively chosen for the initial phase. Deesa, Dantiwada, and Lakhanitalukas from the Banaskantha district were purposefully chosen for the second stage because they had the greatest area under cultivation in the district *i.e.,* 1000 ha, 400 ha, and 300 ha, respectively. In the third stage, five villages were randomly chosen from each taluka, and eight farmers were randomly chosen from each village. In this manner, 120 farmers from the Banaskantha district were chosen. Twenty intermediaries and twenty customers were chosen at random.The cost concept was utilized to estimate the cost of growing the

watermelon crop to analyses the cost of production of the watermelon crop.Similar methods were used by Lakdan and Stanzen (2017), Parmar *et al.*(2017) andPaled and Guledagudda (2020).The simple tabular approach was employed for the study to examine the watermelon marketing channel and price spread.Similar methods were used by Ahire (2015) and Ahmad *et al.* (2017).The marketing efficiency of the channel was examined using Shepherd's and Acharya's approaches.Similar methods were used by Singh *et al.* (2020) and Chalil *et al.* (2021).

Shepherd's approach:The index of marketing efficiency in each channel is measured by using a modified Shepherd's formula (Shepherd's approach). Higher the ratio, higher the efficiency and vice-versa.

$$ME=(V/I)-1$$

Where,

ME = Index of marketing efficiency

V = Value of the goods sold / consumers price (₹/q)

I = Total marketing cost (₹/q)

Acharya's approach: According to Acharya, an ideal measure of marketing efficiency can be calculated by using the formula.

$$MME=FP/(MC+MM)$$

Where,

MME = Measure of marketing efficiency

FP = Price received by farmer

MC = Total marketing cost

MM = Net marketing margin

3. RESULTS AND DISCUSSION

3.1 Cost of production in watermelon crop

The information on crop profitability and cost per hectare gives an overview of the farmer's technical expertise and capacity to boost farm profit. The next section discusses the details of per hectare operation-wise labour usage, cost of cultivation, and profitability of watermelon.

3.1.1Per hectare operation-wise labour utilization pattern

Table 1 provides information on per-hectare labor usage for growing watermelons. A total of 78 human days were needed to cultivate the watermelon, during which time 58 family labour and 20 hired labour were needed. Out of 78 human days the maximum human days utilized for irrigation was 21 days (two hours per day with a charge of ₹150) followed by harvesting 3 days, plant protection 9 days, weeding 7 days, fertilizer 7 days, manuring 6 days, sowing 5 days, mulching 4 days, ploughing 3 days and harrowing 3 days.

Table 1.Per hectare operation-wise labour utilized (in days) for watermeloncultivation

Sr. No.	Operations	Familylabour	Hiredlabour	Total
1	Ploughing	02	01	03
2	Mulching	03	01	04
3	Harrowing	02	01	03
4	Sowing	03	02	05
5	Manures	02	04	06
6	Fertilizers	05	02	07
7	Irrigation	21	00	21
8	Weeding	04	03	07
9	Plant protection	06	03	09
10	Harvesting	10	03	13
	Total	**58**	**20**	**78**

3.1.2 Per hectare cost of cultivation of watermelon cultivation

The overall cost of cultivation (cost C_2) per ha was calculated to be ₹204695.87, which comprises cost A of ₹119671.95, cost B of ₹171972.05, and cost C_1 of ₹186087.15, respectively. Total cost A was ₹19671.95; this included expenses for seeds (₹27696.61), plant protection (₹18269.51), mulching (₹15054.94), fertilizer (₹14796.12), machinery (₹12271.02), manures (₹8849.07), weeding (₹1486.93), hired labour (₹6111.64), irrigation (₹6306.44), miscellaneous (₹2157.50), interest on working capital (₹3485.57), and depreciation (₹3186.59). Total cost B was ₹171972.05, of which cost on cost A was ₹119671.95, the rental value of owned land was ₹49308.30, and interest on fixed capital was ₹2991.80.Total cost C_1 was ₹186087.15, of which cost on cost B was ₹171972.05 and cost on imputed family labour was ₹14115.11. The total cost C_2 was ₹204695.87, of which cost C_1 (₹189443.51) and management charge (₹18608.72) were incurred. Table 2 shows that the calculated watermelon yield was 380.60 quintals per hectare. The producer received ₹809.8 per quintal. The gross income obtained from watermelon was ₹308176.87 per hectare.

Table 2.Per hectare cost of cultivation for watermelon cultivation

Sr. No.	Particulars	Physical unit	Value (₹ in thousand)	% to C_2
1	Hired labour	20 days	6.11	2.99
2	Bullock labour	-	0.00	0.00
3	Seed	1.15 kg	27.70	13.53
4	Manures	10.11 tonne	8.85	4.32
5	Fertilizer	-	14.80	7.23
6	Mulching	-	15.05	7.35
7	Weeding	-	1.49	0.73
8	Plant protection	-	18.27	8.93
9	Irrigation	-	6.31	3.08
10	Machineries	-	12.27	5.99
11	Miscellaneous	-	2.16	1.05
12	Depreciation	-	3.19	1.56
13	Interest on working capital	-	3.49	1.70
14	Cost A	-	119.67	58.46
15	Rental value of owned land	-	49.31	24.09
16	Interest on fixed capital	-	2.99	1.46
17	Cost B	-	171.97	84.01
18	Imputed Family labour	58 days	14.12	6.90
19	Cost C_1	-	186.09	90.91
20	Managerial charge	-	18.61	9.09
21	Cost C_2	-	204.70	100.00
22	Yield (q/ha)	380.60		
23	Price of product		0.81	
24	Gross Income		308.18	

3.1.3Per hectare profitability of watermelon

Table 3 showed that the returns over cost at Cost A, Cost B, Cost C_1 and Cost C_2 were ₹188504.92, ₹136204.83, ₹122089.72, and ₹103481.00. respectively. Production costs per quintal were ₹495.28, ₹357.87, ₹320.78, and ₹271.89 at Cost A, Cost B, Cost C_1, and Cost C_2 respectively. The benefit-cost ratio was 2.58, 1.79, 1.66, and 1.51 over Cost A, Cost B, Cost C_1, and Cost C_2, respectively. As a result of this, the benefit-cost ratio was 1.50 and the overall cost of production was ₹537.82 per quintal. This demonstrated that watermelon

farming was profitable in the research region.Similar resultsfound in the Kumar and Kulkarni (2018).

Table 3. Per hectare cost of cultivation for watermelon cultivation

Sr. No	Cost	Returns over cost	Cost of production per quintal	Benefit-cost ratio
1	Cost A	188504.92	495.28	2.58
2	Cost B	136204.83	357.87	1.79
3	Cost C_1	122089.72	320.78	1.66
4	Cost C_2	103481.00	271.89	1.51

3.2Marketing channel and price spread of watermelon

A commodity moves through a marketing channel from producer to customer. The channel is selected by the farmers based on their preferences and the amount they will be paid per unit. The following list summarises the primary watermelon marketing channels found in the research region.According to the findings, the majority of farmers (61.67%) sell to contractors, who are then followed by retailers (22.50%), and direct customers (15.83%).

Table 4. Marketing channel of watermelon (n=120)

Sr. No.	Marketing channel	Frequency	Percentage
1	Producer-Consumer	19	15.83
2	Producer-Retailer-Consumer	27	22.50
3	Producer-Contractor-Retailer-Consumer	74	61.67
	Total	**120**	**100.00**

3.2.2Price Spread and Market Efficiency

The price spread is the variation between the total price that the consumer pays and the net price that the producer receives for a comparable amount of farm products. This spread, which is made up of marketing costs and intermediary profit, ultimately determines how successful and efficient a marketing system is as a whole. Table 5 shows the specific price variation per quintal of watermelon across various sources.As shown in Table 5, the consumer paid prices per quintal in Channel I, Channel II, and Channel III of ₹1040, ₹1630 and ₹2020 respectively. The producer's share of the consumer's rupee was highest in channel I at 97.12 per cent, followed by channels II and III at 57.6 per cent and 43.7 per cent, respectively.This leads to the conclusion that the producer's share in the consumer's rupee has significantly fallen as a result of the participation of middlemen, especially contractors and retailers. This further demonstrated that the elimination of intermediaries was not favourable to producers; rather, they were necessary and received a significant portion of the producer's share in the consumer's rupee.Due to the presence of a lengthy chain of intermediaries, channel III and channel III had the lowest producer's share in the consumer's rupee. The producer's net price, which was ₹1010 in channel I, was highest. This was followed by ₹930 in channel II and ₹870 in channel III.The producer and other marketing agencies paid the most per quintal in channel III (₹290 *i.e.,* 14.36 per cent of the consumer price), followed by ₹150 *i.e.,* 9.20 per cent and ₹30 *i.e.,* 3.08 per cent in channels II and I, respectively. Due to producers selling their goods directly to consumers, it was at a minimum on channel I. The conclusion is that a rise in the number of channel intermediaries raises marketing costs and decreases the share of producers in the customer's rupee, and vice versa.Channel III with 42.57 per cent of the consumer price, had the largest overall marketing margin of all intermediaries, followed by channel II with 33.74 percent of the consumer price.

Table 5. Channel wise price spread of watermelon

Sr. No.	Particulars	I	II	III
1	Net price received by producer	1010.00	930.00	870.00

2	Cost incurred by producer	30.00 (2.88)	50.00 (3.07)	60.00 (2.97)
3	Purchase price by contractor			930.00
4	Cost incurred by contractor			80.00 (3.96)
5	Marketing margin by contractor			250.00 (12.38)
6	Purchase price by retailer		980.00	1260.00
7	Cost incurred by retailer		100.00 (6.13)	150.00 (7.43)
8	Marketing margin by retailer		550.00 (33.74)	610.00 (30.20)
9	Total marketing cost	30.00 (2.88)	150.00 (9.20)	290.00 (14.36)
10	Total marketing margin		550.00 (33.74)	860.00 (42.57)
11	Consumers purchase price	1040.00 (100)	1630.00 (100)	2020.00 (100)
12	Price spread	100.00	700.00	1300.00
13	Producer share in consumer rupee (%)	97.12	57.06	43.07
14	Marketing Efficiency (ME)	33.67	9.87	5.97
15	Measure of Marketing Efficiency (MME)	33.67	1.33	0.76

(Figures in parentheses indicate percentage to consumer's purchase price)

The level of market performance may be considered as marketing efficiency. It is regarded as an indicator for assessing the effectiveness of alternative marketing channels. Marketing efficiency is estimated in the marketing of watermelon by using a modified Shepherd's approach and the measure of marketing efficiency is estimated by using Acharya's approach.

Table 5 shows that channel I had the highest marketing efficiency (Shepherd's approach), which was 33.67, followed by channel II with 9.87 and channel III with 5.97. Measure of Marketing efficiency (Acharya's approach) revealed that channel I had the highest *i.e.,* 33.67, followed by channel II with 1.33 and channel III with 0.76. This demonstrated that channel III's poor marketing efficiency was caused by market intermediaries taking a larger portion of the marketing margin from that channel. This showed that the most effective route for marketing watermelon is channel I, which is a direct sale from producer to customer, followed by channels II and III.Similar results were found in the Kumar and Kulkarni (2018).

4. CONCLUSION

An overall cost of production per quintal was ₹537.82 and a benefit cost ratio was 1.5. This demonstrated that watermelon farming was profitable in the research area.It was found that channel III's poor efficiency in marketing watermelon was caused by market intermediaries taking a larger portion of the channel's marketing margin. This demonstrated that channel I, or direct producer-to-consumer sales, is the most effective watermelon marketing method, followed by channels II and III.However, it is difficult to reach every customer directly.Farmers also chose channels II and III despite the existence of intermediaries.

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COMPETING INTERESTS

The authors have declared that no competing interests exist.

AUTHORS' CONTRIBUTIONS

'Author1' carried out the primary survey and collected the data in the region. 'Author 2' managed the analyses of the study. 'Author3','Author4' and 'Author5' were assisted in the survey and research work.

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