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Production and marketing of papaya (*Carica Papaya* L.). "The melon of health": An economic analysis in Bharuch District of South Gujarat

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Abstract

Papayas are one of the healthiest, most delicious fruits of all times. It is reputedly called the "Fruit of the Angels". It is also sometimes referred to the "melon of health" as it is widely used as a folkloric herbal medicine. Almost all of its plant parts including fruit, root, bark, peel, seeds and pulp are also known to have medicinal properties. It is a quick earning and employment generating crop. Considering the economic and medicinal importance of this crop as well as the dearth of information on the cost of cultivation as well as the efficiency of resources in context of papaya especially with reference to Bharuch district, the present investigation was undertaken. From the study, the total cost of cultivation of papaya crop (Cost C₂) per hectare was worked out to be Rs 242124. The major items of cost of cultivation were human labour (17.69%), followed by chemical fertilizers (9.15%), seedlings (8.04%), bullock labour and tractor charges (6.14%), manures (3.93%), irrigation (2.46%), insecticides/pesticides (1.80%) and miscellaneous costs (0.42%). The net return per hectare was found to be positive in papaya crop. The input-output ratio over cost C₂ was 1: 2.28 which implies that on investment of one rupee, farmers gave Rs. 2.28 during the period of study. Moreover, the high cost of inputs and planting material, non-availability of labour in time, absence of regulated markets, low and fluctuating market prices as well as high transportation costs were the major constraints faced by the papaya growers.

Keywords: Cost of cultivation, papaya, input-output ratio and cost C₂

Introduction

The major fruit growing states in the country are Maharashtra, Andhra Pradesh, Tamil Nadu, Kerala, Gujarat, Karnataka, Bihar, U.P., West Bengal, Orissa, J&K and Himachal Pradesh. Among the fruits, papaya occupies a special place. Like banana it is available throughout the year and it is easy to cultivate. It produces more income per unit area only next to banana and has high nutritive and medicinal value. It is used as ripened fruit and vegetable and easy to digest. Papain prepared from dried latex of its raw fruits is used in meat tendering, manufacturing chewing gum and cosmetics, for degumming silk and to give shrink resistance to wool. In addition, it is also used in textiles, garment, cleaning paper and adhesive manufacturing, sewage disposal and so on.

Papayas are one of the healthiest, most delicious fruits of all times. No wonder papaya is reputedly called the "Fruit of the Angels". It is sometimes referred to the "melon of health" as it is widely used as a folkloric herbal medicine. Almost all of its plant parts including fruit, root, bark, peel, seeds and pulp are also known to have medicinal properties. The many benefits of papaya are owed due to high content of vitamin A, B and C, proteolytic enzymes like papain and chymopapain which have antiviral, antifungal and antibacterial properties. Papaya can be used for treatment of a several diseases like warts, corns, sinuses, eczema, cutaneous tubercles, glandular tumors, blood pressure, dyspepsia, constipation, amenorrhoea, general debility, expel worms and stimulate reproductive organs and many, as a result papaya can be regarded as a neutraceutical.

Considering the economic and medicinal importance of this crop as well as the dearth of information on the cost of cultivation/production as well as the efficiency of resources in context of papaya especially with reference to Bharuch district, the present investigation was undertaken with the following specific objectives:

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1. To work out the cost of cultivation and returns per hectare of papaya.
2. To Study the price spread in different marketing channels of papaya.
3. To elicit the problems faced by the papaya growers in the production and marketing.

Methodology

For the present investigation, primary data were collected for papaya. The papaya growers of Bharuch and Valia talukas of Bharuch district were selected for the present investigation. From Bharuch taluka, one village was selected and 10 villages from Valia taluka were selected. The primary data on various inputs and output were collected from 20 papaya growers from Bharuch and 30 farmers will be selected from Valia taluka for the year 2016-17. In this way, 50 farmers will be selected in total from both the talukas.

The market related data were collected from papaya growers as well as traders. The details of sample selection of papaya growers given in Table 1.

Table 1: Distribution of Papaya Sample Farmers of Bharuch District

Sr. No.	Taluka	Village	No. of Farmers
1.	Bharuch	Nikora	20
2.	Valia	Jamniya	1
3.		Kandwari	4
4.		Seval	2
5.		Zarna Kabirgam	2
6.		Navapara	1
7.		Mokhadi	2
8.		Itkala	8
9.		Bhamadiya	5
10.		Bharadiya	2
11.		Vithalgam	3
Total			50

Mathematical Models

Average and ratio methods were extensively used for data analysis. The cost of cultivation and return will be estimated using various cost concepts *viz*: cost A, cost B, cost C1, cost C2.

Results and Discussion

The details of overall cost of cultivation and yield of papaya crop are presented in Table 2.

It can be revealed from the table that the average total cost (cost C2) of papaya crop per hectare was Rs. 242124. The expenditure share of operating cost in the total cost was 54.59 per cent. Among the different items of expenditure, the human labour ranked first with 17.69 per cent of the total cost, followed by chemical fertilizers (9.15%), seedlings (8.04%), bullock labour and tractor charges (6.14%), manures (3.93%), irrigation (2.46%), insecticides/pesticides (1.80%), Miscellaneous costs (0.42%) *etc.* As the papaya cultivation is highly labour intensive which utilized large numbers of human laborers in various operations like planting of papaya, weeding, pruning, irrigation, harvesting *etc.* The share of human labour in total cost is higher.

The table further showed that the average yield of papaya crop was 819.01 quintals per hectare. The average gross return was Rs. 551095 per hectare. It can be concluded from the table that the average returns per hectare over cost C2 was Rs. 308971. The cost of production (cost C2) of papaya crop was Rs. 295.63/ qn. The average farm harvest price was estimated to be Rs 672.88/qn. The average farm harvest price was observed higher than the cost of production indicating the

profitability of all the papaya cultivation. The input-output ratio worked out was 1: 2.28 which implies that on investment of one rupee, farmers got Rs. 2.28 during the period of study.

Table 2: Details of cost of cultivation of Papaya crop per hectare in Gujarat, 2016- 17

Sr. No.	Items	Physical unit	Value Rs.	% to Cost C2	
1	Human labour:				
	A: Family (man days)	34.25	5901	2.44	
	B: Hired (man days)	199.25	36891	15.25	
2	Bullock labour (pair days) and Tractor charges (Rs)	---	14864	6.14	
3	Seedlings	2429	19466	8.04	
4	Manures (kgs)	27	9552	3.93	
5	Chemical fertilizers (kgs)	N	161	22160	9.15
		P	262		
		K	197		
6	Irrigation		5954	2.46	
7	Insecticides/pesticides		4355	1.80	
8	Micronutrients		475	0.20	
9	Miscellaneous costs		1025	0.42	
10	Depreciation cost		385	0.16	
11	Interest on working capital		17044	7.04	
12	Rental value of owned land		81286	33.57	
13	Interest on owned fixed capital		755	0.32	
14	Management cost		22011	9.09	
15	Cost A		132171	54.59	
16	Cost B		214212	88.47	
17	Cost C1		220113	90.91	
18	Cost C2		242124	100.00	
19	Yield: A: Main product (qn/ha)	819.01	551095		
	B: By-product (qn/ha)	-	-		
20	A: Farm harvest price of main product (Rs/qn)	-	672.88		
	B: Income from by-product (Rs/ha)	-	-		
21	Gross income: main product + by-product (Rs/ha)		551095		
Summary results					
Sr. No	Costs	Returns/ha over Costs (Rs.)	Costs/qn (Rs.)	Input-output ratio over costs	
1	Cost A	418924	161.38	1 : 4.17	
2	Cost B	336883	261.55	1 : 2.57	
3	Cost C1	330982	268.75	1 : 2.50	
4	Cost C2	308971	295.63	1 : 2.28	

Marketing Channels

Selected farmers adopted following mainly two channels in marketing of their papaya

1. Papaya Growers - Post Harvest Contractor - Commission agent - Wholesaler - Retailer - Consumer market (Manoj Fresh Fruit Center, Janta Market, Jaipur)
2. Papaya Growers - Post Harvest Contractor - Commission agent - Wholesaler - Retailer - Consumer (At fruit and vegetable market, Surat)

Marketing costs, Margins and Price spread

The detail about marketing cost incurred by post harvest contractor in the marketing of papaya was depicted in Table 3. It can be seen from Table 3 that the total marketing cost borne by post harvest contractor for papaya was Rs 259.88 per quintal. Among the various cost components, the major marketing cost was transportation cost which accounted as 25.01 per cent of total marketing cost, followed by cleaning, grading and packing cost (21.16 per cent), wastage (12.85 per cent), loading-unloading charges (11.92 per cent), market cess (1.73 per cent) and weighing charges (0.88 per cent). The higher marketing cost was due to high transportation cost

incurred by post harvest contractor as a buyer while buying from distant places.

Table 3: Marketing Cost Incurred By Post Harvest Contractor (At Rajasthan Mandi)

Sr. No.	Particulars	Cost (₹/Qtl.)	Per cent to total cost
1	Cleaning, grading and packing cost	55.00	21.16
2	Loading and unloading charges	31.00	11.92
3	Transportation cost	65.00	25.01
4	Weighing charges	2.29	0.88
5	Wastage	33.42	12.85
6	Market cess	4.50	1.73
7	Others(Including commission charge)	68.67	26.42
	Total marketing cost	259.88	100.00

Source: Field survey.

The details about marketing cost incurred by wholesaler in the marketing of papaya were depicted in Table 4. It can be inferred from the table that the total marketing cost borne by wholesaler in channel- I was Rs. 158.37 per quintal. The breakup of the cost components of papaya marketing at wholesaler level indicates that the post harvest losses ranked first which accounted as 35.83 per cent of the total marketing cost, followed by transportation cost (22.89 per cent), Miscellaneous charges (22.87 per cent), loading and unloading charges (13.27 per cent), market cess (3.88 per cent) and weighing charges (1.26 per cent). In channel- II wholesaler incurred Rs 145.83 in marketing of papaya at Surat market. The major cost component was post-harvest losses, transportation and miscellaneous charges.

Moreover, the marketing cost incurred by wholesaler was higher in papaya because of high transportation cost and high magnitude of wastage.

Table 4: Marketing Cost Incurred By Wholesaler

Sr. No.	Particulars	Channel-I		Channel-II	
		Cost (₹/Qtl.)	Percent to total cost	Cost (₹/Qtl.)	Percent to total cost
1	Loading and unloading charges	21.00	13.27	18.00	12.34
2	Transportation cost	36.25	22.89	30.50	20.91
3	Weighing charges	2.00	1.26	1.00	0.69
4	Wastage	56.75	35.83	51.35	35.21
5	Market cess	6.15	3.88	7.20	4.94
6	Miscellaneous	36.22	22.87	37.78	25.91
	Total marketing cost	158.37	100.00	145.83	100.00

Source: Field survey.

Generally, retailers operating in selected markets area purchase papaya from wholesaler and sell to consumers through their retail shops/hawkers. The result on costs incurred by retailers in the marketing of papaya was presented in Table 5.

In Channel -I, retailers incurred Rs. 177.5 as total marketing cost per quintal. Among different items of expenditure, the maximum share was noticed for wastage and spoilage (57.18 per cent to total marketing cost). The other important components were the cost of transport (27.61 per cent to total marketing cost) and the cost of loading and unloading (11.83 per cent to total marketing cost). Similar trend was also observed in channel - II.

Table 5: Marketing Cost Incurred By Retailer

Sr. No.	Particulars	Channel-I		Channel-II	
		Cost (₹/Qtl.)	Percent to total cost	Cost (₹/Qtl.)	Percent to total cost
1	Loading and unloading charges	21.00	11.83	19.00	11.47
2	Transportation cost	49.00	27.61	31.00	18.73
3	Wastage	101.50	57.18	111.56	67.38
4	Others	6.00	3.38	4.00	2.42
	Total marketing cost	177.5	100.00	172.56	100.00

Source: Field survey

The extent of price spread helps policy makers in devising suitable policies for increasing marketing efficiency either by way of reducing the marketing costs or eliminating unwanted middlemen from the marketing process or by both. The marketing costs, margins and price spread in marketing of papaya through major channel have been presented based on the data collected from farmers and market functionaries.

The costs, margins and price spread in marketing of papaya through Channel- I and channel- II are given in Table 6.

Table 6: Cost, Margin and Price Spread in Marketing of Papaya

Sr. No.	Particulars	Channel -I		Channel-II	
		₹/Qtl.	Share in consumer's rupee (Per cent)	₹/Qtl.	Share in consumer's rupee (Per cent)
1	Producer's net price	681.25	35.95	671.25	38.25
	Cost incurred by				
	(a) Producer	-	-	-	-
	(b) Post harvest Contractor	259.88	13.71	54.41	3.10
2	(c) Wholesaler	158.37	8.36	145.83	8.31
	(d) Retailer	177.5	9.37	172.56	9.83
	Total	595.75	31.44	372.80	21.24
3	Margins of				
	(a) Post harvest contractor	73.25	3.87	57.25	3.26
	(b) Wholesaler	179.45	9.47	258.5	14.73
	(c) Retailer	365.15	19.27	395.35	22.53
	Total	617.85	32.61	711.10	40.52
5	Retailers sale price/ consumers purchase price	1894.85	100.00	1755.15	100.00

Source: Field survey

The marketing cost incurred by different functionaries was Rs 595.75 per quintal of papaya, accounting for 31.44 per cent of the consumer's price. Out of total marketing cost, the highest cost (13.71 per cent) was incurred by post harvest contractor, followed by retailers (9.37 per cent) and wholesaler (8.36 per cent).

In channel - I, papaya farmers got a net price of Rs. 681.25 per quintal or 35.95 per cent of the price paid by the consumers. Middlemen in sale of papaya earned a margin of Rs. 617.85 or 32.61 per cent of the price paid by the consumers. Among the various middlemen, retailer's got highest margin of Rs. 365.15 per quintal (19.27 percent) compared to wholesaler Rs. 179.45 quintal (9.47 per cent) and post harvest contractor got a margin of Rs. 73.25 per quintal (3.87 per cent).

In channel - II papaya growers got a net price of Rs. 671.25 per quintal or 38.25 per cent of the price paid by the consumer in sale of papaya at Surat mandi. Marketing costs incurred by the middlemen has been Rs. 372.80 or 21.24 per cent of consumer's price. Intermediaries earned a total margin of Rs.711.10 or 40.52 per cent of the price paid by the consumer in sale of papaya.

Production and Marketing Constraints

The perception of papaya growers about various constraints pertaining to marketing and production of papaya are given in Table 7. It is evident from the results that the high cost of inputs (seeds, fertilizers, pesticides etc), non-availability of labour in time, high cost of planting materials and inadequate credit facilities were the major production constraints perceived by 96.00, 94.00, 88.00 and 60.00 percent of total papaya growers, respectively. The absence of regulated markets, low prices, fluctuation in market prices, high cost of transportation were the major marketing constraints perceived by 100.00, 98.00, 86.00 and 84.00 percent of total papaya growers, respectively. To sum up, the high cost of inputs and planting material, non-availability of labour in time, absence of regulated markets, low and fluctuating market prices as well as high transportation costs were the major constraints faced by the papaya growers.

Table 7: Production and Marketing constraints faced by the Papaya growers

Sr. No.	Constraints	No. of farmers facing constraints	Percent
Production Constraints			
1	High cost of inputs (seeds, fertilizers, pesticides)	48	96.00
2	Non-availability of labour in time	47	94.00
3	High cost of planting materials	44	88.00
4	Inadequate credit facility	30	60.00
5	Non-availability of desired variety in time	25	50.00
6	Attack of diseases and pest	17	34.00
7	Lack of knowledge about production technology	12	24.00
Marketing Constraints			
1	Absence of regulated markets	50	100.00
2	Low prices	49	98.00
3	Fluctuation in market prices	43	86.00
4	High cost of transportation	42	84.00
5	Distant market	26	52.00
6	Lack of storage facility	23	46.00
7	Delayed payment	20	40.00
8	Lack of grading and packing	15	30.00

Summary and Conclusions

Production and marketing of papaya is quick earning and employment generating as they are labour intensive crops. There is an increased demand for raw as well as ripened papaya due to its high nutritive and medicinal value. Papain derived from dried latex of its raw fruits is used in meat tendering, manufacturing chewing gum and cosmetics, for degumming silk and to give shrink resistance to wool. In addition, it is also used in pharmaceutical industries, textiles, garment, cleaning paper and adhesive manufacturing, sewage disposal and so on.

The recent development in rural road linkage would definitely increase marketable and exportable surplus, and also minimize the spoilage losses during the transition period.

These all go in favour of bright future of papaya farming. At this juncture, it would be worthy to study the economics of marketing of papaya and constraints associated with this.

The primary data were collected from 50 papaya farmers of Bharuch and Valia Taluka in Bharuch district for the year 2016-17.

The important findings are given below:

1. The total cost of cultivation of papaya crop (Cost C2) per hectare was Rs 242124.
2. The major items of cost of cultivation in papaya crop were human labour (17.69%), followed by chemical fertilizers (9.15%), seedlings (8.04%), bullock labour and tractor charges (6.14%), manures (3.93%), irrigation (2.46%), insecticides/pesticides (1.80%) and miscellaneous costs (0.42%).
3. The net return per hectare was found to be positive in papaya crop. The input-output ratio over cost C2 was 1: 2.28 which implies that on investment of one rupee, farmers gave Rs. 2.28 during the period of study.
4. The total marketing cost borne by post harvest contractor for papaya was Rs 259.88 per quintal. The higher marketing cost was due to high transportation cost incurred by post harvest contractor as a buyer while buying from distant places.
5. The total marketing cost per quintal incurred by wholesaler was Rs 158.37. Moreover, the marketing cost incurred by wholesaler was higher in papaya because of high transportation cost and high magnitude of wastage.
6. The retailers incurred Rs. 177.5 as total marketing cost per quintal. Among different items of expenditure, the maximum share was noticed for wastage and spoilage (57.18 per cent to total marketing cost).
7. In channel - I, papaya farmers got a net price of Rs. 681.25 per quintal or 35.95 per cent of the price paid by the consumers. Middlemen in sale of papaya earned a margin of Rs. 617.85 or 32.61 per cent of the price paid by the consumers. Among the various middlemen, retailer's got highest margin of Rs. 365.15 per quintal (19.27 percent) compared to wholesaler Rs. 179.45 quintal (9.47 per cent) and post harvest contractor got a margin of Rs.73.25 per quintal (3.87 per cent).
8. The high cost of inputs and planting material, non-availability of labour in time, absence of regulated markets, low and fluctuating market prices as well as high transportation costs were the major constraints faced by the papaya growers.

Policy implications

The following suggestions have emerged out from the study.

- (1) Suitable measures for spread of technology and management practices relating to papaya cultivation may improve the productivity and profitability of papaya cultivation.
- (2) Enough provisions for credit facilities for farmers should be made to encourage them to undertake papaya cultivation.
- (3) There is a need to take measures to strengthen marketing institutions for efficient marketing of papaya fruit.
- (4) Encouragement of papaya processors will help to stabilize price fluctuation.

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