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Economic analysis of value-added products of orange in Vidarbha region

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Abstract

This study examines the economic viability of orange processing in the Vidarbha region of Maharashtra, focusing on cost structures, returns, break-even points, marketing mechanisms, and overall profitability of processing units. Primary data were collected from selected small, medium, and large-scale orange processing units during the year 2020-21. Products studied include orange squash, juice, and marmalade. Analysis reveals that the average capital investment across units stood at Rs. 14.85 lakh. The average quantity of oranges processed per unit was 4,200 kg, which yielded approximately 2,520 liters of processed juice. The average per liter cost of production was Rs. 83, while the sale price averaged Rs. 120 per liter, generating gross returns of Rs. 3,02,400 and net returns of Rs. 93,400. The benefit-cost ratio of 1.45 suggests the activity is financially sustainable. Major marketing channels include retail outlets, wholesalers, and institutional buyers.

Keywords: Orange, juice, squash, processing, value addition, marketing, economic

Introduction

India is one of the largest producers of citrus fruits in the world, and oranges form a significant part of this production, especially in the Vidarbha region. The region is renowned for its Nagpur oranges, characterized by rich flavour and high juice content. Despite abundant production, the sector faces issues like glut during peak season, low price realization for farmers, and post-harvest losses. Value addition through processing offers an effective strategy to mitigate these issues. Processed products such as orange juice, squash, and marmalade provide year-round availability, extended shelf life, and improved income opportunities for producers and processors**.**

Methodology

This study, "Economic Analysis of Value-Added Products of Orange in Vidarbha", adopted a structured approach to analyse cost structures, economic returns, and marketing efficiency associated with orange-based value-added products.

The study was carried out in the Vidarbha region of Maharashtra, encompassing processing units of varying sizes. Units were classified based on their annual turnover:

- Small-scale units: Turnover less than Rs. 20 lakhs
- Medium-scale units: Turnover between Rs. 20-40 lakhs
- Large-scale units: Turnover above Rs. 40 lakhs

Four processing units were selected, and primary data were collected through personal interviews using a structured schedule. Analytical methods included cost-return analysis, break-even analysis, and computation of benefit-cost ratios. The break-even quantity was computed using the formula:

$$Q = \frac{TFC}{(P\text{-}AVC)}$$

Where,

Q = Quantity of processed product in quintals required for break-even.

TFC = Total fixed cost

P = Price (Processing charges) per quintal

AVC= Average variable cost of processing per quintal

Results and Discussion

Orange processing enterprises require substantial capital, with an average total investment of ₹55.37 lakh. Investments varied by scale: ₹6.49 lakh (small), ₹33.64 lakh (medium), and ₹115.41 lakh (large). Building infrastructure represented the largest share (54.40%), followed by machinery (23.46%), indicating the capital-intensive nature of the sector.

Capital Investment in Orange Processing

Orange processing enterprises require significant capital investment, with total investment averaging ₹55.37 lakh.

Investments vary by enterprise size: small (₹6.49 lakh), medium (₹33.64 lakh), and large (₹115.41 lakh). Buildings account for the largest share (54.40%), followed by machinery (23.46%), emphasizing the capital-intensive nature of the sector.

Table 1: Capital investment in processed products of orange. (Value: Rs Lakh.)

Sr. No.	Particulars	Groups of Units			
		Small	Medium	Large	Overall
		Orange Marmalade	orange Juice	Orange Juice	
1	Land	1.12	2.23	5.65	2.96
		(18.39)	(18.23)	(22.61)	(21.31)
2	Building	2.25	3.56	6.52	4.01
		(36.95)	(29.13)	(26.09)	(28.87)
3	Machinery	1.56	3.96	7.99	4.25
		(25.62)	(32.37)	(31.97)	(30.60)
4	Vehicle	0.35	0.85	1.85	1.02
		(5.75)	(6.95)	(7.40)	(7.34)
5	Furniture	0.25	0.52	0.75	0.35
		(4.11)	(4.25)	(3.00)	(2.52)
6	Other fixed	0.56	1.11	2.23	1.30
	capital	(9.20)	(9.07)	(8.92)	(9.36)
	Total	6.09	12.23	24.99	13.89
		(100.00)	(100.00)	(100.00)	(100.00)

Raw Material Utilization in Orange Processing

The table 2 details the quantity and cost of raw materials used in the production of orange marmalade (small units) and orange juice (medium and large units). The data highlight that the largest share of raw material cost across all unit sizes was attributed to orange fruits, followed by sugar and preservatives.

Table 2: Per unit raw material used for processing of orange in to various products (Value: Rs.)

Sr. No.	Particulars	Groups of Units					
		Small (Marmalade)		Medium (Juice)		Large (Juice)	
		Qty	Value	Qty	Value	Qty	Value
1	Orange fruits (Tonnes)	12.32	468160	60.25	2530500	140.25	5750250
			(48.02)		(95.92)		(96.31)
2	Preservatives	4.93	33510	0.04	28595	0.08	57054
	- Kms (Kg)		(3.44)		(1.08)		(0.96)
3	Sugar (tonnes)	12.44	472842	1.39	55430	2.66	103925
			(48.50)		(2.10)		(1.74)
4	Water (Kilolit)			117.43	23485	294.38	58877
					(0.89)		(0.99)
5	Citric Acid (Kg)	0.04	369.60	0.02	181	0.04	421
			(0.04)		(0.01)		(0.01)
	Total		974882		2638191		5970527
			(100.00)		(100.00)		(100.00)

(Figures in parentheses indicate percentages total)

Orange fruits represent the most significant cost component in all unit categories, particularly in juice processing, where they constitute over 95% of the raw material cost. Sugar usage is substantial in marmalade preparation, contributing nearly half of the input cost.

Production and Returns in Processed Products of Orange

The data highlight that the total income from orange marmalade production (small group) was Rs. 22.89 lakh, while orange juice production yielded Rs. 69.34 lakh in the medium group and Rs. 178.70 lakh in the large group. This demonstrates a significant increase in returns with scale, especially for juice processing.

Table 3: Production and Returns from Processed Products of Orange (Values in Rs.)

Sr. No.	Particulars	Unit	Small (Qty)	Small (Value)	Medium (Qty)	Medium (Value)	Large (Qty)	Large (Value)
1	Orange Marmalade	Kg	7761.6	22,89,672	-	-	-	-
2	Orange Juice	Litre	-	-	117488	69,34,293	294525	1,78,70,094
3	Glass Bottle (1 Kg)	Kg	7761.6	22,89,672	-	-	-	-
4	Plastic Bottle/Can (500 ml)	Litre	-	-	35246.25	19,38,544	120755.25	66,41,539
5	Plastic Bottle/Can (700 ml)	Litre	-	-	32896.5	17,43,515	94248	49,95,144
6	Plastic Bottle (1 Litre)	Litre	-	-	49344.75	25,16,582	79521.75	43,73,696
7	By-Product	Kg	-	-	19882.5	7,35,653	47685	18,59,715
8	Gross Returns	Rs.	-	22,89,672	-	76,69,946	-	1,97,29,809

Orange juice production, especially in large units, results in significantly higher returns than marmalade, driven by scale and product popularity.

Cost and Returns in Processed Orange Products

The table outlines the breakdown of variable, fixed, and marketing costs associated with the production of orange marmalade (small units) and orange juice (medium and large units). While marmalade production incurred total costs of ₹16.11 lakh and yielded net returns of ₹6.78 lakh, medium and large juice units achieved net profits of ₹32.66 lakh and ₹96.37 lakh, respectively. Input-output ratios improved with scale, emphasizing the economic efficiency of large-scale processing.

Table 4: Cost and Returns in Processed Orange Products (Values in ₹)

Sr. No.	Particulars	Groups		
		Small (Marmalade)	Medium (Juice)	Large (Juice)
A)	**Variable cost**			
1	Orange fruits	468160	2530500	5750250
		(29.05)	(57.47)	(56.98)
2	Preservatives etc.	33510	28595	57054
		(2.08)	(0.65)	(0.57)
3	Sugar	472842	55430	103925
		(29.34)	(1.26)	(1.03)
4	Citric acid	370	181	421
		(0.03)	(0.01)	(0.01)
5	Mineral Water	0	23485	58877
		(0.00)	(0.72)	(0.82)
6	Fuel	10842	852	1667
		(0.67)	(0.02)	(0.02)
7	Packaging material	13583	58744	117810
		(0.84)	(1.33)	(1.17)
8	Electricity	25133	4857	5974
		(1.56)	(0.11)	(0.06)
9	Repairs and	10259	5478	9874
	renewals	(0.64)	(0.12)	(0.10)
10	Wages paid to	58493	187312	310467
	casual labours	(3.63)	94.25)	(3.08)
11	Interest on working	131183	347452	769958
	capital	(8.14)	(7.89)	(7.63)
	Total (A)	1224373	3242885	7186278
		(75.97)	(73.65)	(71.20)
B)	**Fixed Cost**			
10	License fee	1000	800	2300
		(0.06)	(0.02)	(0.02)
11	Salary to permanent	19498	84422	220909
	labours	(1.21)	(1.92)	(2.19)
12	Land rent	3360	6690	16950
		(0.21)	(0.15)	(0.17)
13	Depreciation	5202	11880	21957
		(0.03)	(0.27)	(0.22)
14	Interest on fixed	48720	97872	199920
	capital	(3.02)	(2.22)	(1.98)
	Total (B)	77780	201664	462036
		(4.83)	(4.58)	(4.58)
	Marketing Cost			
15	Transport cost and other marketing cost	34706	126633	299720
		(2.15)	(2.88)	(2.97)
16	GST 12%	274761	832115	2144411
		(17.05)	(18.90)	(21.25)
	Total (C)	309466	958748	2444132
		(19.20)	(21.77)	(24.22)
	Total Cost	1611619	4403298	10092446
		(100.00)	(100.00)	(100.00)
D)	**Returns (Rs.)**			
17	a) Orange Marmalade/Juice	2289672	6934293	17870094
		(100.00)	990.41)	(90.57)
18	b) by product	0	735653	1859715
		(0.00)	(9.59)	(9.43)
19	Gross Returns	2289672	7669946	19729809
		(100.00)	(100.00)	(100.00)
20	Net returns	678053	3266648	9637363
		(29.61)	(42.59)	(48.85)
21	Input output ratio	1.42	1.74	1.95
22	Per quintal cost	20764	3748	3427
23	Cost per kg/Lit	208	37	34
24	Returns per kg.	295.00	65	67

(Figures in parentheses indicate percentages to total cost)

Economies of scale are evident, with the large-scale orange juice processors realizing the highest net returns and the most favourable input-output ratio.

Per Quintal Cost and Returns in Processed Orange Products

The table presents a unit economics comparison across products. Per quintal production cost for orange marmalade was ₹20,764, yielding a gross return of ₹29,500. In contrast, medium and large units processing juice had significantly lower per unit costs—₹3,748 and ₹3,427, respectively—while maintaining strong returns.

Table 5: Per quintal cost and returns in orange marmalade and orange juice (Value-Rs.)

Sr. No.	Particulars	Groups of Units		
		Small (Marmalade)	Medium (Juice)	Large (Juice)
1	Variable cost	15775	2760	2440
2	Orange fruit	6032	2154	1952
3	Fixed Cost	1002	172	157
4	Transport cost	447	108	102
6	Total marketing cost	3987	816	830
7	Total cost	20764	3748	3427
8	**Returns (Rs.)**			
9	a) Orange Marmalde/Juice	29500	5902	6067
10	b) by product		626	631
11	Gross Returns (Rs)	29500	6528	6699
12	Net returns	8736	2780	3272
13	B.C.Ratio	1.42	1.74	1.95
15	Plastic can /bottle 1 kg/500 ml	207.60	18.75	17.15
	Plastic can /bottle 750 ml	0	28.125	25.72
16	Plastic can /bottle 1 lit	0	37.5	34.3
17	Cost per kg.	207.60	37.5	34.3
18	Gross returns per kg.	295	65	67

Per quintal returns are highest for large-scale orange juice production, demonstrating efficiency in both cost control and output recovery.

Discussion

The analysis of processed orange products indicates that orange juice production is significantly more profitable than marmalade, especially at medium and large scales. Capital investment increased with scale, with machinery and building comprising the largest shares (Table 1). Orange fruits accounted for the bulk of raw material costs across all units, particularly in juice processing (Table 2).

Production volumes and returns (Table 3) were substantially higher in juice units, with gross returns of ₹76.70 lakh and ₹197.30 lakh in medium and large units, respectively. Marmalade, by contrast, was more ingredient-intensive, contributing to higher per unit costs.

Cost analysis (Table 4) showed that variable costs dominated, and net returns rose with scale—from ₹6.78 lakh in marmalade units to ₹96.37 lakh in large juice units. Per quintal analysis (Table 5) confirmed that juice production had lower unit costs and higher benefit-cost ratios, peaking at 1:1.95 in large units. Hence, large-scale orange juice processing offers better economic viability than marmalade, driven by lower costs, efficient resource use, and greater market appeal.

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