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Cost Analysis Study of Mango Fruit Processing Industry in Southern India

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Abstract: *Mango is one of the most highly priced dessert fruits of the tropics. India is the major mango growing country, contributing nearly 49.62 per cent of world's area in cultivation and 42.06 per cent of world's production. Major value products prepared from mango are pulp, pickles, bars/strips and jelly. The problems of post-harvest losses and availability of raw material, lack of infrastructural facilities creating hurdles to establish mango pulp processing industry in the study area. Present study aims to quantify cost and return and economic feasibility of starting mango processing industry. The mango pickle making units are being tiny and small scale pickle units are being operated in the study area. In southern India mango is being processed by small and medium scale mango pulp processing units. The B:C ratio 1.51 and IRR 19.50 per cent for mango pulp industries and IRR 21.0 percent and B:C ratio 1.87 for mango pickle units indicates the investment on mango pulp and pickle processing industry is financial viable.*

Keywords: *Mango, aseptic, pulp, variable cost, pickles.*

INTRODUCTION

Mango *(Mangiferaindica L.)* is the National fruit of India, known as the 'King of Fruits'. It is one of the most important and popular Asian fruits. The fruit is consumed in both forms raw and ripe. The fruit is very popular among the consumers due to its wide range of adaptability, high nutritive value, and richness in variety, delicious taste and excellent flavour.

India is the major Mango growing country, contributing nearly 49.62 per cent of world's area under cultivation of mango and 42.06 per cent of world's mango production respectively (Narendra Bhushan 2013). Mango is perishable in nature and due to insufficient storage ambience and absence of appropriate temperature requirements in the cold storage units, considerable amount of mango goes wasted every year. One of the methods to avoid such losses of mango fruits is to process the fresh mangoes into different value added products.

Large number of mango processing industries operating in Andhra Pradesh, Tamil Nadu and Karnataka accounting the largest share of mango fruit processing in the country. Various types of processed products are prepared from mango are pickles, chutneys, squash, jam, juices, mango leather and mango pulp.

Mango processing industry generates income and employment opportunities in India are facing problems like middlemen menace in procurement of fruits, huge post harvest losses during transportation and marketing, lack of support by the concerned nodal bodies, high cost of production, low capacity utilization and fluctuation in profitability of processing firms creating hurdles to establish mango pulp processing industry in the study area. Present study aims to quantify cost and return and economic feasibility of starting mango processing industry.

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METHODOLOGY

Mango growing regions of Karnataka, Andhra Pradesh and Tamil Nadu were chosen as the geographic region for the study. The study area selected is a major mango growing states and best represents the country as a good mango production and processing clusters of the country. Random sampling techniques were employed for the research study. Primary data were collected from the selected processing units using pre-tested interview schedule.

The relevant information such as investment pattern, labour use, processing cost and production techniques were collected from the owners of the industry during 2012-13.

The cost and returns in the selected processing units of three states were estimated. The costs involved were grouped into fixed and variable operating costs. The gross returns of units were estimated by adding revenues from the sale of the main products and by-products. The net profit was derived by deducting total costs from total returns.

Income and capital ratios were estimated using the formulas below:

(i) $$\text{Operating ratio} = \frac{\text{Total operating expenses}}{\text{Gross Income}} \quad (1)$$

(ii) $$\text{Fixed Ratio} = \frac{\text{Fixed Expenses}}{\text{Gross Income}} \quad (2)$$

(iii) $$\text{Gross Profit Ratio} = \frac{\text{Gross Expenses}}{\text{Gross Income}} \quad (3)$$

(iv) Rate of return on investment

$$= \frac{\text{Total capital invested on processing Industry}}{\text{Gross income from processing Industry}} \quad (4)$$

Economic feasibility of mango pulp processing unit was measured using discounted measures such as NPV, BCR and IRR.

Net Present Value (NPV)

Positive value of NPV obtained when discounted at the opportunity cost of capital, then the investment is considered viable.

Benefit-Cost ratio (BCR)

It shows how much benefits can be generated per rupee of investment. The BCR is the ratio of sum present value of benefit to sum of present value of cost for a given discount rate. If the B:C ratio is more than one which indicates the viability of investment.

$$\text{Benefit Cost Ratio} = \frac{\text{Sum total of discounted benefit}}{\text{Sum total of discounted costs}} \quad (5)$$

Internal Rate of Return (IRR)

IRR is the discount rate which just makes the net present worth of cash flow equal to zero. The investment is considered viable if the calculated IRR is greater than that of the bank interest rate (opportunity cost of capital).

RESULTS AND DISCUSSION

The investment pattern of establishing 5000 ton capacity mango pulp processing and one ton capacity raw mango pickle units in southern India are worked out as per the existing market prices and presented in Table 1. The data indicates that initial investment required for establishing mango pulp processing unit of 5000 ton capacity pulp production was Rs. 233.65 lakhs of which cost of machinery alone accounted for around 82.88 per cent of the total investment. The cost invested in building and land value accounted for 14.97 per cent and 1.49 per cent of the total investment. Whereas the initial investment required for establishing mango pickle processing unit of one ton capacity

Table 1
Indicative establishment cost of mango pulp and pickle processing units

		Mango pulp processing unit		*Raw mango pickle unit*	
Sl. No.	*Particulars*	*Amount (in lakhs)*	*Percentage to the total*	*Amount (in lakhs)*	*Percentage to the total*
1.	Land Value	3.50	1.49	2.50	44.01
2.	Buildings	35.00	14.97	1.30	22.88
3.	Machinery	193.65	82.88	1.78	31.33
4.	Furniture and Deposits	1.50	0.64	0.10	1.76
	Total	233.65	100.00	5.68	100.00

will cost over Rs. 5.58 Lakh taking into consideration of the prevailing market price of the land, building and cost of machineries/equipment available locally.

The data on average variable operating costs incurred for 500*t* capacity pulp processing units are given in Table 2. The Total Variable Cost incurred per year for 5000*t* capacity mango pulp unit was Rs. 1016.78 lakhs with processing capacity of the industry was taken as 5000-5400 tons per year. In the pulp processing industry raw material (fruits) alone costs 66.38 per cent of the total variable cost (Table 2). The next major variable cost (12.23%) was aseptically processing which includes blanching, pulping, deseeding, centrifuged, homogenizing and thermally processing. The share of packing material and aseptically filling accounted 10.31per cent is the next major component of variable cost. The cost incurred for conveying and storage of processed product accounted to 04.39 per cent and the 0.39 per cent wages to total variable cost. It is clear from the data that on an average the cost of mango pulp processing through aseptic packing system (Including cost of ripe mangoes and processing charges will be Rs. 40.28/ kg of pulp from the medium scale processing unit.

The data on average variable operating costs incurred by one ton capacity raw mango pickle units are presented in Table 3. The total variable cost incurred per year for one ton capacity raw mango pickle unit was Rs. 75200. The pickle processing industry is labour intensive with 23.93 per cent of the total variable cost. The share of bottle filling and packing materials accounted for 21.94 per cent is the next major component of variable cost. The cost incurred on consumables (power, water, gas, cloths, gloves, head covers, etc), Salt and other ingredients accounted to 15.95 per cent and 12.89 percent respectively. The cost of raw mango accounts to 11.96 per cent of the total variable cost.

The cost incurred and returns realized in mango pulp processing are presented in Table 4. The data shows that total cost of Rs. 1113.68 lakh was incurred in processing units for production of pulp. Operational variable cost extended to 91.29 per cent and The fixed cost of establishment of processing plant was 96.90 lakhs and accounts for 8.70 per cent including salaries to the staff, repairs, interest, taxes, depreciation on buildings, machineries, equipment's and miscellaneous. The returns realized per kg of Mango Pulp processed amounted to Rs. 16.69. The result of the overall study revealed that processing of Mango Pulp is a profitable venture in this southern part of India. Further the financial analysis ratios are presented in Table 4.

To further understand the operational efficiency of these firms, the operating ratio of 0.60 indicates that for every rupee of gross income a substantial portion of operation cost is incurred. The fixed ratio of 0.05 indicates that relatively larger

Table 2
Per unit variable operational cost incurred by the sample mango pulp industry

Particulars	*Amount (in Lakhs)*	*Percentage to the total*
Mango Fruits	675.00	66.38
Handling and ripening	37.80	3.71
Cleaning,washing and sorting	7.36	0.78
Pulpingand Aseptic processing line	124.41	12.23
Aseptic filling and Packing material	143.77	10.31
Conveying, storage	5.52	04.39
Electricity/fuel/water charges/fire wood	18.90	1.85
Wages	4.02	0.39
Total	1016.78	100.00

Table 3
Operational varitable cost of raw mango pickle production unit (per tonne)

Particulars	*Amount (in Rs.)*	*% age to the total*
Raw mango fruits	9000	11.96
Salt and Ingredients	9700	12.89
Labour wages	18000	23.93
Bottle filling and Packing materials	16500	21.94
Consumables (power, water, gas, cloths, gloves, head covers, etc)	12.000	15.95
Miscellaneous expenditure (telephone, post, Insurance, tax etc)	10000	13.29
Total	75200	100.00

Table 4
Cost and returns from mango pulp processing unit

Particulars	*Amount (in Lakhs)*	*Percentage to the total*
Total Establishment cost	233.65	20.97
Total fixed cost (salaries to the staff, repairs, interest on working capital, taxes, depreciation on buildings, machineries, equipment's and miscellaneous)	96.90	8.70
Total variable cost	1016.78	91.29
Total cost (variable + fixed)	1113.68	100.0
Gross returns	1686.55	–
Net returns	572.87	–
Cost of production/Kg (Rs/Kg.)	44.31	–
Gross income/Kg (Rs/Kg.)	61.00	–
Profit/kg (Rs/Kg)	16.69	–
Income expense ratio		
Operating ratio	0.60	–
(a) Fixed ratio	0.05	–
(b) Gross ratio	0.66	–
Capital ratios		
Capital per unit of gross income	0.13	–

share of gross income is used for meeting the fixed expenses. The gross ratio (0.66) is less than one signifying the efficient operation of the firms. The rate of return on investment gives a better picture of operational efficiency.

The data on average operational variable costs of raw mango pickle processing unit's one ton capacity were estimated and presented in Table 5. It is clear from the data that on an average the cost of mango pickle production (Including cost of raw mangoes and ingredients will be about Rs. 75,200/ ton by small scale mango pickle processing unit.

Table 5
Cost and returns and Profitability of raw mango pickle units (per ton)

Sl. No.	*Particulars*	*Raw mango pickle unit (Rs.)*
1.	Operational cost of pickle production/ton	75200
2.	Fixed cost	13900
3	Total cost of mango pickle production (per/ton)	89100
4.	Gross Returns	148000
5.	Net profit	58900
6.	Operating ratio	0.50

Table 6
Economic feasibility of mango processing industries

Particulars	*Mango pulp processing unit*	*Raw mango pickle unit*
	Value	*Value*
Net present worth (lakh Rs.)	765	1.72
Benefit–cost ratio	1.51	1.87
Internal rate of return (Percentage)	19.50	21.0

Economic Feasibility of Mango Processing Industries

The economic feasibility analysis for mango processing industry per annum was worked out and presented in Table 6. To evaluate the economic feasibility of investment the project evaluation criteria of Net Present Value (NPV), Benefit Cost Ratio (BCR) and Internal Rate of Return (IRR) were employed. The net present value for mango pulp industry was Rs. 765 lakh which indicated the soundness of investment in mango pulp industry. The benefit- cost ratio 1.51 which is greater than one and internal rate of return was found to be 19.50 per cent indicates the investment on mango pulp processing industry is financially viable. The net present value for raw mango pickle industry was Rs. 1.72 lakh which indicated the soundness of investment in mango pickle industry. The benefit-cost ratio 1.87 which is greater than one and internal rate of return was found to be 21.0 per cent indicates the investment on mango pickle processing unit is financially viable.

Constraints in Establishing Mango Processing Units

Even though mango pulp processing is highly profitable venture, it has its own problems. The major constraints voiced by the processors are the frequent power cuts during the processing period and wide fluctuations in the prices of mangoes due to lean year in mango production. The processing

sector is labour intensive, with majority of them coming from within the region. In recent years hike in the wages of laborers raise the cost of production. Therefore women labour was engaged more than men labour to reduce the cost of processing. However, inadequate supply of labor is affecting raw mango pickle processing operations. To overcome the labour shortage during peak season processors bringing the labours from outside the state and entrusted work on contract basis during the peak season of mango pulp and pickle processing.Bank loans for establishment of processing industries and rate of interest is another major constraint in the region.

For working capital the Banks charging 12% to 14% as rate of interest which amounts to lakhs of rupees and which is more than the profit margin earned some times. The heavy burden of interest accumulated month after month has become a big liability, the processors felt. The inadequate supply of raw material is the next important constraint. The mango fruit is available for processing only 90 to 120 days due to which the underutilization of processing machinery capacity and labour force. Thus, the processing operation of these units is seasonal. With a view to increasing the operational days and the profit ratios, some of the units have been exploring the possibilities of processing other fruits and vegetables, such as papaya, tomato, guava, etc. This has implication on overall capacity utilization of mango processing industries. In the study area as a whole, declining mango export and competition in international market price of mango pulp from the other countries were the major constraints faced by the processors.

Table 7
Problems encountered by the mango fruit processing industries in southern India

Sl. No.	*Problems*	*No. of Respondent units (12)*	*Percent*
1.	Availability of quality raw material and price fluctuation of mangoes	2	16.66
2.	Difficult in obtaining Bank Loans and higher rate of interest	3	25.00
3.	Electricity supply	3	25.00
4.	Price competition and fluctuation in market demand	1	8.33
5.	Frequent replacement and under-utilization of processing equipment and machinery	1	8.33
6.	Low domestic market demand for processed products	1	8.33
7.	Disposal of mango waste	1	8.33
	Total	12	100.00

CONCLUSION

The growth of the mango processing industries in southern India will bring large benefits to the people of this region by way of employment and income to producers and processors. Contract farming of mango among growers and mango processors should be promoted to ensure timely and adequate supply of raw material to the processing industry to carry out the processing activities for extended periods. Government should promote the production of mango and other fruits and vegetables in the region to promote adequate supply of raw material throughout the year for increasing the capacity utilization of the processing units in southern region.

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