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# Techno-Economic Feasibility Analysis of Tomato Processing Pilot Plant

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**ABSTRACT**
*Tomato (Solanum lycopersicon) is an important commercial vegetable crop. Apart from use in vegetables, its downstream products like tomato concentrate, soup, sauce, puree, ketchup are very popular and they have a longer shelf life unlike fresh tomatoes. Processed tomato products have wide applications in house hold consumption, food processing industry, snacks food, hotels, restaurants and fast food joints. The specific objectives of the study were to study production economics of tomato sauce production process. From the break even analysis it was found that in order to produce 1,20,000 units of 1000g bottle of tomato sauce with identified infrastructure the break even quantity is 147492.06 kg, the break even sales is Rs. 11799364.8=00 and break even period comes out to be 1.01 Years. It can be observed from benefit cost ratio (B/C) that on every one rupee invested in the process of tomato sauce production it is expected to earn 1.14 rupees.*
***Key Words:*** *Processed tomato products, Net profit, Break even analysis, BEP*

## INTRODUCTION

Tomato (*Solanum lycopersicon*) is very popular vegetable throughout the country and it is grown in many states. Apart from use in vegetables, its downstream products like tomato concentrate, soup, sauce, puree, ketchup are very popular and they have a longer shelf life unlike fresh tomatoes. With the advent of new technology many down the line products are made and are consumed around the year, (Bhuvaneswari and Rao, 2012)(1). Figures from 2010 show, India as the world third largest grower of tomatoes, producing nearly 12 million tonnes .The national Horticultural board gives a higher figure, estimating India's production to be closer to 14 million. Tomato ranks third in priority after potato and onion but ranks second after potato in the world. Andhra Pradesh leads tomato growth in India by covering approximately 35 percent of the country's production or almost 6 million tonnes. Other top tomato producing states in India are Orissa, West Bengal, Bihar, Gujarat, Maharashtra, Chhattisgarh, Tamil Nadu and Jharkhand. According to NHB, India, Data Base 2015 the area and production of fruits is 7216 ha and 88977 lakh metric tonnes where as vegetable production area is 9396 ha and vegetable production quantity is 162897 lakh metric tonnes . In that tomato production is 19402 lakh metric tonnes with in an area of 1204 ha. The major tomato producing countries in world are China (30.7%), India (11.5%) followed by USA (8.1%). The percentage of share of major vegetable crops in India are Potato (25.5%) Onion (11.9%), followed by Tomato (11.5%) (Indian horticulture Database, 2014)(2).

India grows several varieties of tomatoes, from the small lively cherry tomato bursting with juice to the large, fibrous beefsteak. The most common tomato varieties are beefsteak, cherry, heirloom, roma and pear. The taste of tomatoes varies greatly between cultivars. Cherry tomatoes tend to both sweeter and sourer than larger varieties. They are also juicer and pulpier than heirloom and beefsteak tomatoes. Roma tomatoes share many characteristics with cherry tomatoes. It too juicy, sweet and tangy. The high pulp makes better suited for sauces and purees than for slicing.

Processed tomato products have wide applications in house hold consumption, food processing industry, snacks food, hotels, restaurants and fast food joints. Tomato products can be grouped into many end-use categories like peeled, concentrated, partially dehydrated, strained and diced tomatoes, tomato juice, pulp, paste, powder, sauce, jam, soups, and ketchup.

**Tomato processing**

Coming to Tomato processing food sector, application of modern technology has helped in enriching the quality of produce. It has tremendous growth opportunities in the country. As per data of department of commerce, India export of value added tomato products increased from 590 tonnes in the year 2002-03 to 991.46 tones in year 2005-06.

In the year 2006-2007 India's export of value added products is estimated at 450.48 tons, which includes 18.46 tones canned tomato products 5.94 tonnes of tomato paste, 2.1 tonnes of tomato juice, and 423.98 tonnes of tomato ketchup.

India's ketchup consumption is estimated as 13000 tonnes a year and its market is estimated around INR 1800 million. "Kissan", "Maggi-Nestle" and "Heninz" are three well known brands engaged in manufacturing a range of tomato products in India . Some Medium and Small Companies are also engaged in its production. Tomato processing in India is still not very significant. Recently, there was a steady rise in production due to the entry of multinationals with better market infrastructure and sales promotion campaigns.

Soluble solids are key parameters in tomato paste production. Tomato paste is produced and sold based on its soluble solids content thus soluble solids dictate the factory yield. Higher soluble solids in the incoming fruit means that fewer tons of tomatoes will be needed to produce a given amount of paste. Furthermore, water removal during evaporation of juice is an energy intensive process..

The agricultural sector in general and the tomato sector in particular have not met their potential. In this sector, production seasonality, the dominance of rain fed agriculture, high perishability of the vegetable, lack of ready market, lack of a reasonable alternative uses of the vegetable and poor pricing are some problems faced by farmers. In addition, it is probable that, poor postharvest practices coupled with poor storage facilities account for the recurrent seasonal postharvest losses of tomatoes.

With high fluctuation in market prices of fresh tomatoes in the urban market, there are good prospects for tomato juice, and tomato puree in place of fresh tomatoes in household sector. Besides the boom in the food service sector including fast food chain, has widened the demand potential for tomato ketchup and soups.

Experiments have shown that advertisement and publicity have influenced the pattern of consumption of tomato products. Besides, tomato products have good export potential especially in the Middle East.

Also, traders may be lacking the appropriate postharvest skills of prolonging the shelf life of tomatoes in commercial quantities. The unavailability of large scale processing factories in the tomato production areas to help preserve the surplus produce for future use, leave farmers with no option but to watch their produce go waste any time there is no ready market.

Indian tomato processing industry is rising from small scale to large one and it is for sure to compete with the international industries. Hence, in this competitive market it is necessary that processing operations become cost effective. As the material/ energy and money required for processing operation considerably bags a high cost, so it is necessary to optimize the technical and economic feasibility of tomato processing operations. This necessitates carrying out as a good guide for planners, financial agencies and small rural entrepreneurs who wish to establish "tomato processing" plant as a commercial viable industry.

It also gives information about the cost of machines, establishment charges, and recurring expenses involved in establishment/preparing the tomato sauce. This study is carried out to develop standards for regulating material and energy consumption and reduce the wastage of material and energy in tomato industry. It is expected that in the end, problems that account for inefficiencies in the local production industry would be identified to help build a stronger industry. The main objective of the study was to To study production economics of tomato sauce production process.

**RESULTS AND DISCUSSION**
**Production Economic Analysis**.
**Basics and Assumptions:**
1. It is proposed the total working days of plant per year = 300 Days
2. Number of working hours per day = 8
3. Total production for 8 hours = 400 kg
4. Total quantity processed throughout the year = 1, 20,000 kg
5. If 1kg of tomato sauce is sold @ Rs.80/- then cost of 1,20,000 kg = 96,00,000/-
6. Labor charges have been taken as per market rates.
7. Different products like tomato juice, tomato sauce, and tomato ketchup are produced from tomato pulp.
8. The rate of interest has been taken 10% on an average both for fixed and working capital.

9. The rates quoted in respect of machinery/equipment, raw material are those prevailing at the time of preparation of report and are likely to vary from place to place and supplier to supplier and changes can be made depending on requirement of user.

**2.2.1 A) Financial Aspects – Fixed Capital**

**Table 2.2.1 Land and Building:**

The unit is located in the marble city of Jabalpur where the transport facilities already exists and there is continues supply of water and electricity.

The required plot area for the project is 36x12 Sq. ft and it can be purchased on the appropriate site.

The investment on land @500 Sq. ft        = 2, 16,000/-

The investment on building @ 2500 Sq. ft       = 10, 80,000/-

Total        =   1296000/-

**Table 2.2.2. Machinery:**

| S.no | Item | Specifications | No of units | Unit price | Total in Rupees |
|------|------|----------------|-------------|------------|-----------------|
| 1 | Tomato processing unit (including boiler) | 50kg/hr | 1 | 20,00,00 | 28,00,00 |
| 2 | Cold room | 10X5 Sq ft | 1 | 11,00,000 | 11,00,000 |
| 3 | Weighbridge | 1. Quintal(cap) L.C= 10g | 1 | 80,000 | 80,000 |
| | | 2.10 kg(cap) L.C= 0.01g | 2 | 10,000 | 20,000 |
| 4 | Carets and Kitchen Utensils | 510mmX 327mmX 280mm | 2 | 10,000 | 10,000 |
| 5 | Crown corking machine | 2000 bottles/day | 1 | 25,000 | 25,000 |
| | | **Total** | | | **32,35,000/-** |

**Table 2.2.3.  Pre Operative Expenses:**                        **Total in Rupees**

| | |
|---|---|
| Registration and documentation | 50,000/- |
| Travelling | 10,000/- |
| Enquiry and consultancy | 20,000/- |
| Others | 20,000/- |
| **Total** | **1, 00,000/-** |

**Table 2.2.4 Office Furniture:**

| S. No | Item | No of units | Unit price | Total in Rupees |
|-------|------|-------------|------------|-----------------|
| 1 | Tables | 02 | 2000 | 4000/- |
| 2 | Chairs | 06 | 500 | 3000/- |
| 3 | Almirah | 01 | 3000 | 3000/- |
| 4 | Fan | 02 | 2500 | 5000/- |
| | | **Total** | | **15,000/-** |

**Total fixed cost = 2.2.1+ 2.2.2+ 2.2.3 + 2.2.4   = Rs. 46, 46,000/-**

**2.2.1 B) Working Capital (per month)**

**Table 2.2.5 Raw Material:**

**Monthly working capital of raw material**       $= 3179 \times \frac{400}{100} \times 25$

**= Rs. 3, 17,900 /-**

**2.2.6 Electricity charges = 30,225/-**

**Table 2.2.7 Staff and Labor Requirement:**

| S.No | Staff | No of Positions | Salary/Month |
|------|-------|-----------------|--------------|
| 1 | Plant Operator | 1 | 8000/- |
| 2 | Helper | 2 | 3000/- |
| | | **Total** | **11,000/-** |

**Table 2.2.8 Other Expenses:**

| S.No | Others | Rupees |
|------|--------|--------|
| 1 | Stationary | 5000/- |
| 2 | Travelling | 5000/- |
| 3 | Repair and Maintenance | 6000/- |
| 4 | Other Miscellaneous | 4000/- |
| | **Total** | **20,000/-** |

Then working capital per month = 2.2.5+ 2.2.6 + 2.2.7 + 2.2.8

= 3, 17,900 + 30,225 + 11,000 + 20,000

**= Rs. 3, 79,125/-**

Therefore then working capital per year = 3, 79,125 x 12

**= 45, 49,500 /-**

**2.2 2 Depreciation cost of machinery @ 10% =**

$$D.C = \frac{M - \frac{M}{10}}{10}$$

$$= \frac{3235000 - 323500}{10}$$

$$= \frac{2911500}{10}$$

=Rs. 2, 91, 150/-

**2.2.3 Depreciation cost of Building @5%** = **Rs. 54,000/-**

**2.2.4 Interest on total investment**   = 10% of F.C per year + 10% of W.C per year

=       464600       +   454950

**= Rs. 9, 19,550 /-**

**2.2.5 Cost of production**

3.2.1. Total working capital per year                 = Rs. 45, 49,500/-

3.2.2. Depreciation on Building @ 5% per year        = Rs. 54000/-

3.2.3. Depreciation on Machinery @ 10% per year      = Rs. 2, 91,150/-

3.2.4 Depreciation on Furniture @ 20% per year       = Rs. 3000/-

3.2.5 Interest on total investment @ 10% per year    = Rs. 9, 19,550/-

          **Total**                                  **= Rs. 58, 17,200/-**

**2.2.6 Turn over sale (per year):**

Tomato Sauce = 1, 20,000 kg @ 80/- =  96, 00,000/-

**2.2.7 Net Profit**     = Sales Cost – Production Cost

= 96, 00,000- 58, 17,200

**= 37, 72,000 /-**

**2.2.8 Net profit ratio**   = $\dfrac{Net\ profit \times 100}{turn\ over\ per\ year}$ ................Eq 2.2.1

     **Or**

**Profit on sell**   = $\dfrac{3772000 \times 100}{9600000}$

     =   **39.2%**

**2.2.9 Total Capital investment:**

2.2.9. a) Fixed capital                     = 46, 46,000/-

2.2.9. b) Working Capital (per month)           = 3, 79,125/-

     **Total**                              **= 50, 25,125/-**

**2.2.10 Rate of return**   = $\dfrac{Net\ profit \times 100}{Total\ investment}$ ................Eq 2.2.2

= $\dfrac{3772000 \times 100}{5025125}$

**= 75.06%**

 **2.3     Break even analysis:**

**2.3.1 a) Fixed costs = Rs.** 4646000/-

     Selling Price of the unit = Rs. 80/-

     Total no of units produced per year = 1,20,000 Kg

**2.3.1 b) Variable costs:  Rs. 5817200/-**

**2.3.2 Break even quantity** = $\dfrac{Fixed\ cost}{selling\ price - \dfrac{Varible\ cost}{No\ of\ units}}$ ....Eq 2.2.3

$$= \frac{4646000}{80 - \frac{5817200}{1,20,000}}$$

= 147492.06 kg

**2.3.3 Break even sales** = 147492.06 x 80

= Rs. 11799364.8/-

**2.3.4 Breakeven percentage** = $\frac{FC}{TR - VC}$ .....Eq 2.2.4

$$= \frac{4646000}{9600000 - 5817200}$$

= 1.22 %

**2.3.5 Breakeven period:**

$$= \frac{Break \ even \ volume}{Total \ number \ of \ units \ produced \ per \ day}$$ ....Eq 2.2.5

$$= \frac{147492.06}{400}$$

= 368.7 Days

$$= \frac{368.7}{365}$$

= 1.01 Years

Table 2.3  The result of cost analysis is tabulated as follows:

| S.No. | Item | Values Rupees |
|---|---|---|
| 1. | Fixed Cost | Rs. 4646000 =00 |
| 2. | Variable Cost | Rs. 5817200=00 |
| 3. | Variable cost per pack of 1000 g | Rs. 48.4 |
| 4. | Break even quantity p.m. | 12291.0 kg of 1000g each |
| 5. | Break even sales p.m. | Rs. 11799364.8=00 |
| 6. | Break even period | 1.01  years |

## CONCLUSIONS

Therefore, from the break even analysis it was found that in order to produce 1, 20,000 units of 1000 g bottle of tomato sauce with identified infrastructure the break even quantity is 147492.06 kg, the break even sales is Rs. 11799364.8 and break even period comes out to be 1.01  Years **.**

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