

**253. PROFILE ON PRODUCTION OF APPLE
JUICE AND SYRUP**

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I. SUMMARY

This profile envisages the establishment of a plant for the production of apple juice and syrup with a capacity of 300 tonnes per annum.

The present demand for the proposed product is estimated at 328 tonnes per annum. The demand is expected to reach at 534 tonnes by the year 2017.

The plant will create employment opportunities for 40 persons.

The total investment requirement is estimated at Birr 5.94 million, out of which Birr 2.5 million is required for plant and machinery.

The project is financially viable with an internal rate of return (IRR) of 21 % and a net present value (NPV) of Birr 3.88 million discounted at 8.5 %.

II. PRODUCT DESCRIPTION AND APPLICATION

Apple juice is the unfermented juice obtained from sound, ripe apples, with or without parts. Concentrated apple juice may be added, provided that any added apple juice concentrate shall not contribute more than one-fourth of the total apple juice solids in the finished apple juice. No water may be added directly to the finished food.

Apple juice drinks have a fruit content ranging between 6 and 30 percent, and also include water, fruit aromas, sugar and, in some cases, food acids. Food acids are organic acids and are used to give the desired sourness to food and drinks. Examples of food acids are malic or citric acid.

Apple syrup can be used as a garnish; tenderizer and meat marinade, or drizzled as a topping on desserts, pancakes or cereals. It is also excellent in drinks as a flavorsome additive to give an apple zing. It can be added directly to a wide range of ingredients to enhance flavors and create a point of difference to baking.

Processing of Apple juice and syrup should comply with Ethiopian Standard (ES 360:2001). The raw materials, additives and the processing procedures should be selected as per the Standard.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

The source of supply for fruit juice in general is mainly from import supported by some local production. Upper Awash Agro Industry (Merit) was the only sole domestic producer of fruit juice. The fruit juice produce by Merit was mainly orange. However, currently a few private companies have stated to process fruit juice that includes apple, mango, peach and the like. Nevertheless, the Manufacturing Industries Survey shows data only for orange juice. In the absence of data for domestic production of pineapple juice and syrup the import data obtained from Customs Authority is utilized to analyze the unsatisfied demand for the product (See Table 3.1.).

Table 3.1
IMPORT OF PINE-APPLE PRESERVE & JUICE

Year	Import (Tonnes)
2000	241.5
2001	152.0
2002	369.9
2003	142.5
2004	294.1
2005	167.1
2006	524.7

Source: - Customs Authority

Table 3.1 reveals that import of pine apple juice fluctuates highly during the past seven years. During the period 2000-2005 the lowest level of import was 142.5 tonnes (year 2004) while the highest 369.9 tonnes (year 2002). A substantial increase of import has been registered during year 2006 which amounts 524.7 tonnes.

In the absence of a trend in the data set the recent three years average is taken to fairly reflect the current demand. Accordingly, current unsatisfied demand for the product is estimated at about 328 tonnes.

2. Projected Demand

The future demand for processed and canned apple juice and syrup is a function of urbanization, income and change in the consumption habit of the population. Considering the above three main factors demand for the product is forecasted to grow by 5% per annum (See Table 3.2)

Table 3.2
FORECASTED UNSATISFIED FOR APPLE JUICE & SYRUP

Year	Import (Tonnes)
2008	344
2009	362
2010	380
2011	399
2012	419
2013	440
2014	462
2015	485
2016	509
2017	534

3. Pricing and Distribution

Currently, fruit juices of various types sell for a price ranging from Birr 6 to Birr 10 per 500 millilitre in the retail market. The average is therefore about Birr 8.00. Taking this as a reference and allowing a 25% margin for wholesaler and retailers, a factory gate price of Birr 6.40 per 500 milli litres is proposed.

The product will find its market outlet through the existing food stores, supermarkets and groceries throughout the country

B. PLANT CAPACITY AND PRODUCTION PROGRAMME

1. Plant Capacity

Based on the demand projection indicated in Table 3.2, capital requirement and minimum economy of scale, the proposed plant will have production capacity 300 tonnes of apple juice and syrup per annum. The plant is envisaged to operate in a single shift of 8 hours for 300 days per year. However, production capacity can be double, if the plant is operated double shift of 16 hours a day based on actual market conditions.

2. Production Programme

The production programme is indicated in Table 3.3. At the initial stage of the production, the plant requires some years to penetrate into the market and develop skill in production. Therefore, in the first and second year of production, the capacity utilization rate will be 75% and 85%, respectively. In third year and thereafter, full capacity (100%) production shall be attained.

Table 3.3**PRODUCTION PROGRAMME**

No.	Description	Unit	Production Year		
			2008	2009	2010-2017
1.	apple juice	Tonnes	225	255	300
2.	Capacity utilization	%	75	85	100

IV. MATERIALS AND INPUTS**A. RAW & AUXILIARY MATERIALS**

According to Ethiopian Standard, ES 360:2001, fruits used for canning shall be sufficiently ripe, fresh, wholesome and sound, free from traces of spoilage, insects, parts of insects and foreign matters. The additives shall be clean and shall not be harmful to human health.

The principal raw materials, additives and packing material required by the project are indicated in Table 4.1. The major raw material, apple fruit can be grown in the region or sourced from neighboring regions. The total cost of raw material is estimated at Birr 1,369,500.

Table 4.1**RAW & AUXILIARY MATERIALS REQUIREMENT AND COST**
(AT FULL CAPACITY)

No.	Description	Unit	Qty.	Cost ('000 Birr)		
				FC	LC	Total
1.	Apple Fruits	Tonnes	450	-	1,125	1,125
2.	Sugar	Kg	3,000	-	19.5	19.5
3.	Plastic bottles	Pcs.	300,000	-	150	150
5.	Plastic sheet	Tonnes	5	-	75	75
Grand Total					1369.5	1369.5

B. UTILITIES

The major utilities of the envisaged project are electricity, furnace oil and water. The annual consumption and cost of utilities is indicated in Table 4.2. The total annual cost of utilities is estimated at Birr 414,432.

Table 4.2
ANNUAL UTILITIES REQUIREMENT AND COST

No.	Description	Unit	Qty.	Total cost
1	Electricity	kWh	120,000	56,832
2	Water	m ³	6,000	33,000
3	Furnace	Lt.	60,000	324,600
	Total			414,432

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Production Process

The production process involved in processing apple juices are:

a) Selection and preparation of apple fruits

After the apple fruits have undergone a quality inspection, i.e. after fresh, sound and suitable varieties have been properly selected, they are first washed by rotary brusher to remove soil and dirt from the grove and stems and leaves need to be removed from the fruit.

b) Extraction of juice

The selected apple fruits must be crushed to a pulp before pressing, the result of this being what is known as the pomace. Pulping is often followed by the addition of enzymes, which break down the cell walls of the fruit and thus increase the amount of juice extracted. The pomace is finally pressed out in large presses. The solid matter left over from the pomace can be used as animal feed (cattle cake).

c) Straining, filtration and clarification

To clarify the apple juice, which is still cloudy, the juice is first centrifuged - during which process the larger particles such as broken fruit tissue, seed and skin, and various gums, peptic substances etc settle to the bottom - and then filtered. This production step can also be supported by enzymes which break down the turbid particles before filtering starts, thus preventing the filters from blocking too quickly.

d) Preservation(for juice production only)

After the juice becomes free from suspended impurities, refrigeration and pasteurization at 75°C for about half a minute be conducted for preserving the juice extracted. Finally, the pasteurized juice shall be cooled, filled, labeled and dispatched.

e) Juice evaporation (for syrup production only)**➤ Evaporation process:**

This is the most critical aspect of making high quality syrup. Evaporation should be done with uniform heating. Initially coagulation starts when juice temperature increases. This scum should be removed during slow heating.

➤ **Judging the end point of the syrup:**

As the syrup density increases, the boiling temperature rises gradually. Slow heating is required when frothing starts, as otherwise the syrup will get burned. When the desired temperature is achieved, heating should be completely stopped.

➤ **Cooling of finished syrup:**

This is an important step followed after making the syrup because if quick cooling is not carried out, the product will have a burnt taste and the color of the syrup will become dark brown. Therefore the syrup should be cooled.

f) **Packing and storage**

➤ **Bottling:**

A vacuum-based bottle filling machine has been used successfully to package the juice/syrup so that its shelf-life is increased. The juice/syrup should be filled in sterilized bottles to avoid fungus problems.

➤ **Capping:**

The bottles filled with the help of the bottling machine should be capped with a crown capping machine to make them air tight.

➤ **Labeling:**

Capped bottles should be labeled properly. The label should give precise information about the juice/syrup ingredients, date of preparation and producer's details. Then, packaging is performed automatically.

2. Source of Technology

The machinery and equipment required by the envisaged project can be obtained from the following companies specialized in manufacture of machinery for juice production.

1. Pomejuice and products,
11, Bayajapur, post-pimpal kothetal,
Satana, Nasik, Mahaashtra,
India – 423204,
Tel -91-2555-242625.

2. Vicent corporation
2810E, 5th Avenue
Tampa, FL 33605
United states
Phone: (813) 248-2650
E-mail: [Sharon@vicent corp.com](mailto:Sharon@vicentcorp.com)

B. ENGINEERING

1. Machinery and Equipment

The list of machinery and equipment of the project is indicated in Table 5.1. The total cost of machinery and equipment is estimated at Birr 2.5 million, out of which Birr 2 million is required in foreign currency.

Table 5.1
LIST OF MACHINERY AND EQUIPMENT

Sr. No.	Item description	Qty.
1.	Receiving line and bins	Set
2.	Inspection, washing, sizing	Set
3.	Rasper	1
4.	Juice extractor	1
5.	Finisher	1
6.	Pasteurizer	1
7.	Filler and sealer	1
8.	Cooling machine	1
9.	Labeler	1
10.	Centrifuge	1
11.	Vessels (with 2 pumps)	Set
12.	Boiler	1
13.	Conveying unit	1
14.	Laboratory equipment	Set

2. Land, Building and Civil works

The total land requirement of the project is about 2000m², out of which built-up area is 1000m². The total construction cost of building assuming a construction rate of Birr 2300 per m² (made of EGA sheet roof, HCB wall, cement screed floor finish) is estimated at Birr 2.3 million. The lease value of land, at the rate of 0.1 Birr / m², and for 80 years of land holding, is Birr 16,000. The total cost of building and civil works is about Birr 2,316,000.

3. Proposed Location and Site

The envisage plant can be located in area where fresh apple fruit can be abundantly supplied and transportation cost to deliver the product to market can be minimized. Taking this in to consideration, Chench, Mareka, West Abaya, Humbo and Misha woredas can be the possible locations for the project.

From the above woredas, Humbo Tebella Town, the capital of Humbo woreda, is selected to be the location of the proposed project.

VI. MANPOWER AND TRAINING REQUIREMENT

A. MANPOWER REQUIREMENT

The envisaged project requires 40 work forces. The list of manpower for the envisaged project is indicated in Table 6.1. The annual cost of labour including fringe benefits is estimated at Birr 361.440 thousand.

Table 6.1**MANPOWER REQUIREMENT AND ANNUAL LABOUR COST**

Sr. No.	Description	Req. No.	Monthly Salary (Birr)	Annual Salary (Birr)
1.	General Manager	1	2,500	30,000
2.	Secretary	1	700	8,400
3.	Marketing Officer	1	1,400	16,800
4.	Purchaser	1	1,200	14,400
5.	Accountant	1	1,400	16,800
6.	Personnel	1	1,400	16,800
7.	Cashier	1	500	6,000
8.	Production Head	1	1600	19,200
9.	chemist	2	1,800	16,800
10.	Mechanic	1	900	10,800
11.	Electrician	1	900	10,800
12.	Store keeper	1	600	7,200
13.	Driver	2	900	10,800
14.	Operators	6	3600	43,200
15.	Laborers	15	4500	54,000
16.	Guards	4	1,200	10,800
	Sub-Total	40	25,100	301,200
	Benefits (20% BS)		5,020	60,240
	Grand Total		30,120	361,440

B. TRAINING REQUIREMENT

The training of production head, quality control chemists, electrician and mechanic will take place for about two weeks by the supplier of machinery during erection. Machine operators shall be trained by in-house staff before commissioning. The cost of training is estimated at Birr 10,000.

VII. FINANCIAL ANALYSIS

The financial analysis of the apple juice and syrup project is based on the data presented in the previous chapters and the following assumptions:-

Construction period	1 year
Source of finance	30% equity 70% loan
Tax holidays	3 years
Bank interest	8.5 %
Discount cash flow	8.5%
Accounts receivable	30 days
Raw material local	30 days
Work in progress	2 days
Finished products	30 days
Cash in hand	10 days
Accounts payable	30 days

A. TOTAL INITIAL INVESTMENT COST

The total investment cost of the project including working capital is estimated at Birr 5.94 million, of which 17 per cent will be required in foreign currency. The major breakdown of the total initial investment cost is shown in Table 7.1.

Table 7.1
INITIAL INVESTMENT COST

Sr. No.	Cost Items	Total Cost (‘000 Birr)
1	Land lease value	16
2	Building and Civil Work	2,300.00
3	Plant Machinery and Equipment	2,500.00
4	Office Furniture and Equipment	100
5	Vehicle	250
6	Pre-production Expenditure*	453.97
7	Working Capital	328.63
	Total Investment cost	5,948.6
	Foreign Share	17

* *N.B Pre-production expenditure includes interest during construction (Birr 303.97 thousand) training (Birr 10 thousand) and Birr 140 thousand costs of registration, licensing and formation of the company including legal fees, commissioning expenses, etc.*

B. PRODUCTION COST

The annual production cost at full operation capacity is estimated at Birr 3 million (see Table 7.2). The material and utility cost accounts for 59.42 per cent, while repair and maintenance take 3.83 per cent of the production cost.

Table 7.2**ANNUAL PRODUCTION COST AT FULL CAPACITY ('000 BIRR)**

Items	Cost	%
Raw Material and Inputs	1,369.50	45.62
Utilities	414.43	13.80
Maintenance and repair	115	3.83
Labour direct	180.72	6.02
Factory overheads	60.24	2.01
Administration Costs	120.48	4.01
Total Operating Costs	2,260.37	75.29
Depreciation	455.8	15.18
Cost of Finance	285.92	9.52
Total Production Cost	3,002.09	100

C. FINANCIAL EVALUATION**1. Profitability**

According to the projected income statement, the project will start generating profit in the first year of operation. Important ratios such as profit to total sales, net profit to equity (Return on equity) and net profit plus interest on total investment (return on total investment) show an increasing trend during the life-time of the project.

The income statement and the other indicators of profitability show that the project is viable.

2. Break-even Analysis

The break-even point of the project including cost of finance when it starts to operate at full capacity (year) is estimated by using income statement projection.

$$\text{BE} = \frac{\text{Fixed Cost}}{\text{Sales} - \text{Variable Cost}} = 34 \%$$

3. Pay Back Period

The investment cost and income statement projection are used to project the pay-back period. The project's initial investment will be fully recovered within 5 years.

4. Internal Rate of Return and Net Present Value

Based on the cash flow statement, the calculated IRR of the project is 21 % and the net present value at 8.5 % discount rate is Birr 3.88 million.

D. ECONOMIC BENEFITS

The project can create employment for 40 persons. In addition to supply of the domestic needs, the project will generate Birr 2 million in terms of tax revenue. The establishment of such factory will have a foreign exchange saving effect to the country by substituting the current imports.