34. FRUIT JUICE

TABLE OF CONTENTS

I. SUMMARY

This profile envisages the establishment of a plant for the production of Fruit Juice with a capacity of 1,300 tonnes per annum.

The present demand for the proposed product is estimated at 645 tonnes per annum. The demand is expected to reach at 1491 tonnes by the year 2010.

The plant will create employment opportunities for 70 persons.

The total investment requirement is estimated at Birr 9.1million, out of which Birr 2.34 million is required for plant and machinery.

The project is financially viable with an internal rate of return (IRR) of 18% and a net present value (NPV) of Birr 3.74 million, discounted at 8.5 %.

II. PRODUCT DESCRIPTION AND APPLICATION

There are many types of fruits with different nature. Fruit juices are mostly sweet having a variety of colours and aroma. Various kinds of drinks can be easily prepared and made available in canned or bottled form for commercial purposes.

Fruit-based drinks are basically prepared by adding water, sugar and possibly acid and flavouring agents to the fruit juice. Depending on the preparation of water added, one may distinguish;

- Reconstituted fruit juices,
- Nectars, and
- Fruit drinks.

Processed fruit-based drinks are usually packed in bottles, plastic pouches or cartonnes.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

Although consumption of fruits and vegetables in Ethiopia is largely in fresh form or as harvested, a considerable amount of industrially processed fruit juice is also consumed. The source of supply is both import and domestic production. Till recent times, the sole domestic supplier was Upper Awash Agro-Industry (Merti Processing Plant) which produces orange juice. A few private sector companies have now, however, commenced fruit-juice processing. The biggest one among these is Sebeta Agro-Industry (Mama Processing Plant), whose products include pin apple juice, Mango Nectar and Peach Nectar.

The apparent consumption of fruit juice, comprising domestic production and imports is shown in Table 3.1.

Table 3.1
APPARENT CONSUMPTION OF FRUIT JUICE (TONNE)

Year	Domestic Production [1]	Import [2]	Total
1993	18	34	52
1994	103	9	112
1995	-	184	184
1996	-	103	103
1997	18	369	387
1998	20	1005	1025
1999	13	465	478
2000	9	511	520
2001	14	709	723
2002	9	682	691

Source: *1. CSA, Survey of the Manufacturing and Electricity Industries, Annual Issues.*
2. Customs Authority, External Trade Statistics, Annual Issues.

Scrutiny of Table 3.1 reveals that the greater share of apparent consumption originates from import. During the most recent three years covered by the data set (2000-2002), for instance, the average domestic production was 11 tonnes while the average imported amount was 634 tonnes. The average total apparent consumption during the same period was 645 tonnes, implying that local production constitutes only about 2% of the aggregate supply. This picture, nonetheless, is bound to change progressively as more and more agro-processing plants enter the business in the course of time. The current apparent consumption estimated above, i.e., 645 tonnes, is, however, assumed to represent current effective demand for industrially processed fruit juice.

2. Projected Demand

A glance at Table 3.1 easily reveals that consumption of agro-industrially processed fruit-juice has exhibited very high growth in the past. The highest level of apparent consumption, i.e., 1,025 tonnes, was attained in 1998; but, this figure appears to be an exception or outlier in the data set as it did not set a trend for subsequent years. Despite this anomaly, however, consumption of fruit juice is characterized by a general growth trend. The average annual growth rate during the time span covered by the data set was 33%.

The future demand for agro-industrially processed fruit juice is mainly a function of income, price and change in the consumption habits of the population. As income rises, there is a shift towards more expensive but conveniently packed and available foods. However, the opportunity that such changes present could be exploited only if price of the items is not prohibitive when compared to fresh fruit, and the quality is competitive enough with similar imported products.

Having considered all the above, demand for fruit juice is forecasted to grow at the rate of 15% per annum, which is about 50% of the historical growth rate mentioned earlier. The demand projected in this manner ranges from 742 tonnes in the year 2005 to 4,564 tonnes by the year 2018 (see Table 3.2).

Table 3.2
PROJECTED DEMAND FOR FRUIT JUICE
(2004 - 2018)

Year	Projected Demand (Tonnes)
2004	645
2005	742
2006	853
2007	981
2008	1128
2009	1297
2010	1491
2011	1715
2012	1973
2013	2269
2014	2609
2015	3000
2016	3451
2017	3968
2018	4564

3. Pricing and Distribution

Currently, fruit juices of various types (Orange, pineapple, peach, mango, etc) sell for a price ranging from Birr 5 to Birr 10 per 500 milliter in the retail market. The average price would, thus, be Birr 7.50. Taking the lowest price as a reference and allowing a 40% margin for wholesalers and retailers, a factory-gate price of Birr 3 is proposed.

A suitable distribution system for fruit juice is one, which relies on wholesalers, who in turn would ensure proper distribution through the existing retail channels (super markets and grocery shops).

B. PLANT CAPACITY & PRODUCTION PROGRAMME

1. Plant Capacity

The envisaged plant will have a capacity of 1,300 tonnes (1.3 million litres), annually. It will operate in three shifts of 8 hours each for a total of 300 days a year (deducting Sundays and public holidays).

Of the total working days, 150 days will be for cold preservation and pre-processing, while extraction bottling and distribution will be carried out in the remaining time.

2. Production Programme

Production capacity build up is designed in such a way that full production capacity will be attained in the third year. For this reason the plant will operate at 75% of its installed capacity in the first year, and then at 85% in the second year, and reach at full capacity in the 3rd year and then after.

As the plant is new and is equipped with new machinery, production build-up is made to start at reduced capacity and gradually raised to full capacity. The low production level at the initial stage is to develop substantial market outlets for the product. Machinery operators will also get enough time to develop the required skills and experience.

IV. MATERIALS AND INPUTS

A. RAW AND AUXILIARY MATERIALS

The principal raw materials for the production of fruit juice are different fruits. Usually, the major source of fruit for industrial processing is the culls from packing-houses. Culls are sound, healthy fruits that cannot meet the requirements of the fresh fruit market because of the standard, irregular shape and superficial peel blemishes. For the project under study, the above method of raw materials supply is not considered because of the large amount of fruits required. Thus, an alternative method of supply, i.e., utilization of the entire crop without sorting the culls has been considered. Preservatives (Potassium metabisulphite), packing materials like bottles or canvas and cases are some of the auxiliary materials demanded by the fruit juice plant. The quantities and costs of the raw and auxiliary materials are shown in Table 4.1.

Table 4.1
RAW & AUXILIARY MATERIALS REQUIREMENT AND COST

Sr. No.	Description	Qty.	Unit price Birr	Costs, ('000 Birr)
1.	Fruits (tonnes)	1500	1000	1500
2.	Bottle (No.)	1,300,000	1	1300
3.	Cases plastic (No.)	58,000	50	2900
	Grand Total			**5700**

B. UTILITIES

The major utilities required for the plant are water and electricity. Water is used for washing the fruits as well as for steam generation. Electric power is used as an energy source for boiler and for driving the motors of the production machinery. Water & Electric consumption is shown in Table 4.2.

Table 4.2

UTILITIES REQUIREMENT AND COST

Sr. No.	Description	Qty	Cost ('000 Birr)
1	Electricity (kWh)	72000	576.00
2	Water (m^3)	3000	6.00
	Total		**582.00**

V. TECHNOLOGY & ENGINEERING

A. TECHNOLOGY

1. Production Process

The production of orange juice comprises of fourteen steps or unit operations. The brief explanation of each operation is given below.

- Cleaning: This is an operation by which the citrus fruit from which juice is to be extracted are washed in two stages by a rotary brusher.

- Warming treatment: A further treatment of the fruit by warm water in a tank in order to facilitate the peeling process.
- Peeling: It is the stage where warmed fruit with peels are trimmed manually to remove the peels.
- Juice Extraction: Peeled fruits are cut into pieces and pressed in a puler in order to extract juice out of them.
- Pre-heating: It is a stage where extracted juice is heated at about 90^oC for the purpose of making inactivate enzyme and bacteria contained in it, and then is cooled down to about 40^oC.
- Centrifugalization: Is the process by which pulp contained in the raw juice is separated.
- Deaeration: The step where the mixed up air during pulping, finishing and centrifuging is removed.
- Seasoning: This is the step at which sweetening is carried out, if there need be.
- Sterilization: Fruit juice, before it is canned or bottled, sterilized at a temperature from 90^o-95^oC for 30 seconds and bottled while it is hot.
- Filling, cooling labeling and boxing: These are all packing operations by which the product is made ready for delivery.

2. Source of Technology

The technology of machinery & equipment required by the fruit juice plant can be obtained from Indian company indicated below.

Pome juice & products,
11, Bayajapur, post - pimpalkothetal,
Satana,Nasik, Mahaashtra,
India - 423204
Phone: 91 - 2555 - 242625.

B. ENGINEERING

1. Machinery & Equipment

Details of the required machinery & equipment and estimated cost are listed in Table 5.1.

Table 5.1
MACHINERY & EQUIPMENT REQUIREMENT AND COST

Sr. No.	Description	Qty. (No)	Costs, ('000 Birr)		
			FC	LC	Total
1	Receiving line & bins	1	61	12	73
2	Inspection, washing, sizing	set	80	16	96
3	Rasper	1	140	28	168
4	Juice Extractors	1	162	32	194
5	Finishes	1	55	11	66
6	Pasteuriser	1	113	23	136
7	Filler and sealer	1	83	17	100
8	Cooling machine	1	152	30	182
9	Labeller	1	124	25	149
10	Centrifuge	1	169	34	203
11	Evaporator	1	95	19	114
12	Vessels 2 pumps		61	12	73
13	Boiler	1	220	44	264
14	Conveying unit	1	125	25	150
15	Laboratory	set	170	34	204
16	Concentrate production machinery & equipment	set	146	29	175
	Grand Total		**2856**	**391**	**3247**

2. Land, Building & Civil Works

The total land area requirement of the plant including provision for open space is 3000 m^2. Of this, about 1000 m^2 is for the production, 1000 m^3 for storage of fresh fruits and about 300 m^2 for offices and laboratory. The remaining will be an open space for parking. Land value will be Birr 252,000 taking 1.2 Birr /m^2 lease value for 70 years land holding and construction cost will be 250,000. So total cost of land, building & civil work assuming that the total land lease cost will be paid in advance is estimated at Birr 502,000.

3. Proposed Location

The envisage plant can be located in area where transportation cost to deliver the product to market can be minimized and source of material is adequate. So Assosa and Bambasi towns are ideal places for the plant.

VI. MANPOWER AND TRAINING REQUIREMENT

A. MANPOWER REQUIREMENT

The total manpower requirement of the envisaged fruit juice plant is 70 persons. The permanent and temporary manpower requirement and corresponding annual labour cost including fringe benefits are given in Table 6.1

B. TRAINING REQUIREMENT

The plant is expected to be operated by competent and experienced production personnel. For this purpose, appropriate training programme has to be designed and conducted for about 15 days.

Training can be carried out during erection and commissioning period. Accordingly, skilled operators, supervisors and quality control personnel will be trained, possibly by an expert from technology supplier. The total cost estimate of such training is Birr 20,000.

Table 6.1
MANPOWER REQUIREMENT AND ANNUAL LABOUR COST

Sr. No.	Description	Req. No.	Salary (Birr)	
			Monthly	Annually
	A. Permanent (Admn.)			
1	Manager	1	1800	30600
2	Secretary	1	700	8400
3	Accountant	1	850	10200
4	Store keeper	1	500	6000
5	Salesman	1	600	7200
6	Guards	3	200	7200
	Sub-Total	**8**		**60600**
	Benefit (20%)			13020
	Total			**72720**
	B. Permanent (Prod)			
1	Production & Tech. Head	1	1500	18000
2	Mechanics	2	650	15600
3	Electricians	1	650	7800
4	Chemist	1	850	10200
	Sub-Total	**5**		**51600**
	Benefit (20%)			**10320**
	Total			**61920**
	C. Temporary (Prod.) (Working for 5 months on average)			
1	Supervisors	2	850	8500
2	Operators	15	400	30000
3	Ass. Operators	10	300	15000
4	Laborers	30	200	30000
	Sub-total	**57**		**83500**
	Benefit (20%)			16700
	Total			**100200**
	Grand Total	**70**		**234840**

VII. FINANCIAL ANALYSIS

The financial analysis of the Fruit Juice project is based on the data presented in the previous chapters and the following assumptions:-

Construction period	1 years
Source of finance	30 % equity
	70 % loan
Tax holidays	3 years
Bank interest	7.5 %
Discounted cashflow	8.5 %
Repair and maintenance	3 % of the total plant and machinery
Accounts receivable	30 days

Raw material, local
- Fruits 3 days
- Others 30 days

Raw materials, import 90 days
Work in progress 1 day
Finished products 15 days
Cash in hand 5 days
Accounts payable 30 days

A. TOTAL INITIAL INVESTMENT COST

The total initial investment cost of the project including working capital is estimated at 9.1 million, of which 20.1 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 ('000 BIRR)
1	Land lease value	252
2.	Building and Civil Work	250
3.	Plant Machinery and Equipment	2,347
4.	Office Furniture and Equipment	65
5.	Vehicle	400
6.	Pre-production Expenditure*	550
7	Working Capital	5,214.06
	Total Investment cost	**9,078.05**
	Foreign share	**20.1%**

B. PRODUCTION COST

The annual production cost at full operation capacity of the plant is estimated at Birr 7.39 million (see Table 7.2). The material and utility cost accounts for 85 per cent while repair and maintenance take 0.45 per cent of the production cost.

** N.B Pre-production expenditure includes interest during construction (Birr 252 thousand), training (Birr 20 thousand), and (Birr 5 thousand) costs of registration, licensing and formation of the company including legal fees, commissioning expenses, etc.*

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

Items	Cost	%
Raw Material and Inputs	5,700	77.16
Utilities	582	7.88
Maintenance and repair	33.1	0.45
Labour direct	195.7	2.65
Factory overheads *	39.1	0.53
Administration Cost **	50.0	0.68
Total Operating Costs	**7,400**	**89.34**
Depreciation	351.3	4.76
Cost of Finance	436.1	5.90
Total Production Cost	**7,387.3**	**100**

C. FINANCIAL EVALUATION

1. Profitability

According to the projected income statement, the project will start generating profit in the second 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 lifetime 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 operates at full capacity (year 3) is estimated by using income statement projection.

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

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 4 years.

**Factory overhead cost includes salaries and wages of supervisors, insurance of factory workers, social costs on salaries of direct labour, etc.*

*** Administrative cost includes salaries and wages, insurance, social costs, materials and services used by administrative staff etc.*

4. Internal Rate of Return and Net Present Value

Based on the cash flow statement, the calculated IRR of the project is 18% and the net present value at 8.5% discount rate is Birr 3.74 million.

D. ECONOMIC BENEFITS

The project can create employment for 70 persons. In addition to supply of the domestic needs, the project will generate Birr 0.35 million per annum in terms of tax revenue when it starts to operate at full capacity. Moreover, the Regional Government can collect employment, income tax and sales tax revenue. The establishment of such factory will have a foreign exchange saving effect to the country by substituting the current imports.