



PROJECT PROFILE ON MANGO PROCESSING PLANT

MANGO PULP FILLING LINE



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ADDIS ABEBA CITY ADMINISTRATION INVESTMENT COMMISSION

PROJECT PROFILE ON MANGO PROCESSING PLANT

TABLE OF CONTENT

I. EXECUTIVE SUMMARY	4
1. BACKGROUND INFORMATION	6
1.1. INTRODUCTION	6
1.2. PRODUCT DESCRIPTION.....	7
1.2.1. <i>Mango Pulp</i>	7
1.3. PROJECT LOCATION AND JUSTIFICATION	9
1.3.1. <i>Location of Addis Ababa</i>	9
1.3.2. <i>Demography of Addis Ababa</i>	9
1.3.3. <i>Economic activity of Addis Ababa</i>	9
1.4. WHY IS IT BENEFICIAL TO INVEST IN ADDIS ABABA?	11
1.4.1. <i>The city benefit from the investment</i>	13
2. MARKETING STUDY	16
2.1. MARKET ANALYSIS SUMMARY.....	16
2.2. THE SUPPLY OF PROCESSED MANGO	16
2.2.1. <i>Local processed Mango Supply</i>	16
2.2.2. <i>Import</i>	17
3. TECHNOLOGY AND ENGINEERING	22
3.1. TECHNOLOGY	22
3.1.1. <i>Mango fruit production and preserving process</i>	23
3.1.2. <i>Lists of machinery suppliers</i>	25
3.1.3. <i>Environmental and social impact assessment of the project</i>	26
3.1.4. <i>Production Capacity and Production Program</i>	27
3.2. ENGINEERING.....	28
3.2.1. <i>Building Design</i>	28
3.2.2. <i>Land, buildings and civil works</i>	29
3.2.3. <i>Plant layout</i>	29
4. ORGANIZATIONAL STRUCTURE FOR FRUITS PROCESSING PLANT	33
4.1. MANPOWER REQUIREMENT AND ESTIMATED ANNUAL COSTS	33
5. FINANCIAL ANALYSIS	34
5.1. <i>General</i>	34
5.2. INITIAL FIXED INVESTMENT COSTS.....	35
5.3. WORKING CAPITAL.....	36
5.4. PROJECT FINANCING.....	36
5.5. PRODUCTION COSTS	37
5.5.1. <i>Material inputs</i>	37
5.5.2. <i>Utilities</i>	38
5.5.3. <i>Over heads</i>	39
5.5.4. <i>Financial costs</i>	40

PROJECT PROFILE ON MANGO PROCESSING PLANT

5.5.5. Depreciation	40
5.6. BREAK EVEN POINT AND ROI.....	41
5.6.1. Break Even point (BEP)	41
5.6.2. Return on investment	42
5.7. PROJECT BENEFITS	42
ANNEX	45

LIST OF TABLES

Table 1 Lists of fruits and vegetables processing factories in Ethiopia	15
Table 2 Volume of imported Mangoes, Guavas from 2012 to 2021	17
Table 3 Future forecast of import of processed mango by trend adjusted exponential smoothing method	18
Table 4 Projected Demand for mango juice in Ethiopia.....	20
Table 5 Demand supply gap Analysis.....	21
Table 6 Production program of the project for the coming five	27
Table 7 Construction costs.....	31
Table 8 Land lease period in Addis Abeba	32
Table 9 Land lease floor price in Addis Abeba	32
Table 10 Manpower requirement and salary costs	33
Table 11 Initial Fixed investment costs.....	35
Table 12 Utilities of the factory'000'Birr	38
Table 13 Overhead costs	39
Table 14 Depreciation in Birr"000"	40
Table 15 Source of revenue in Birr	43
Table 16 Material input for mango puree production.....	46
Table 17 Materials input for reprocessing line	48
Table 18 Annual total production costs'000"	49
Table 19 Projected Sales Revenue in Birr"000"	51
Table 20 Projected Net income statement "000"	52
Table 21 Debt services schedule and computation.....	53
Table 22 Projected Cash flow statement	54
Table 23 Total investment costs'000"	55
Table 24 Total Assets	55
Table 25 Sources of finance.....	56
Table 26 Summary of financial efficiency tests	56
Table 27 Calculation of payback period'000"	57
Table 28 Calculation of NPV at 17% D.F.....	58

LIST OF FIGURES

Figure 1 mango fruit process flow diagram	24
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I. Executive summary

This project profile is prepared to assess the viability of running Mango processing factory, in Addis Abeba city administration. Hence Market, Technical, Organizational and Financial study was made to investigate the viability of the envisaged project.

This project profile on Mango processing factory has been developed to support the decision – making process based on a cost benefit analysis of the actual project viability. This profile includes marketing study, production and financial analysis, which are utilized to assist the decision-makers when determining if the business concept is viable. Ethiopia has a private sector driven Mango processing industry. According to the latest data sourced from the ministry of Trade and industry here are more than 17 registered Fruits and vegetables processing factories in Ethiopia.

The location of the plant will be decided on the basis of access to raw materials, infrastructure namely power, water, transport and telecom to easy access to international market. The most locally available raw materials for the factory are Mango.

The factory at full capacity operation can process 83,200 quintals to produce 40,726 quintals of Mango paste, per year based on 260 working days and their shifts of 24 hours per day.

The total investment capital including establishing the factory is Birr 533 million. Out of the total investment capital, the owners will cover Birr 160 million (30 %) while the remaining balances amounting to Birr 373 million (70 %) will be secured from bank in the form of term loan.

PROJECT PROFILE ON MANGO PROCESSING PLANT

As indicated in the financial study, the cash flow projection of the project shows surplus from the first year on. The net cash flows of the project range from Birr 88 Million in the first year to Birr 133 million at the end of the 10th year of operation. At the end of the 10th year of operation period the cumulative cash balance reaches Birr 1.28 billion. The Benefit-cost ratio and Net present value (NPV) have been calculated at 17% discount factor (D.F) for 10 years of the project activity. Accordingly, the project has NPV of 724 million Birr at 17%D.F. and the benefit-cost ratio of 1.12 at 17% D.F.

Therefore, from the aforementioned overall market technical and financial analysis we can conclude that the Mangoes processing factory business is a viable and worthwhile.

1. Background information

1.1. Introduction

Food processing is one of the strategic sectors where developing countries can use their natural base in agriculture to reach the next level of economic development. Food processing in our countries was, until one or two decades ago, and increased the competitiveness of the structure of the food industry, thereby contributing to more rapid food product and process innovations. In developing countries like Ethiopia, population increase, rapid urbanization, rise of the middle class and changing food habits led to a gradual increase in demand for processed, nutritious and healthy food products. This has in turn contributed to the rise of micro, small, and medium scale food processing enterprises that process a diversity of healthy and nutritious food products as a sustainable way to reduce postharvest losses and food waste, extend shelf life of food, boost food security, and contribute to national employment and national gross domestic product. The small-scale nature of these food processing enterprises and low level of bureaucracy enables them to rapidly make strategic decisions to respond to demand or change in the local market.

One of the most important fruits with a greater potential for food processing in our country is the mango. Mango fruit is the second most traded tropical fruit globally and ranks seventh in terms of production. Mango, “also referred to as the ‘king of fruits’”, is a major fruit of the tropics and subtropics. Although the fruit is mainly consumed in its fresh state, mango can be processed into many nutritious and shelf-stable products.

Processing of mango fruit into diverse shelf-stable products makes the seasonal fruit conveniently available to consumers all year round. Some of the common processed products from mango fruit are derived from the pulp. Apart from the primary products from mango pulp, derivatives of mango

pulp can be used to enrich or flavor secondary products such as yoghurt, ice cream, beverages, and soft drinks. Byproducts of mango processing such as the peel and kernel have been shown to be rich in bioactive compounds including carotenoids, polyphenols, and dietary fibers. The byproducts of mango processing can be used in food fortification and manufacture of feeds, thereby gaining greater value from the fruit while reducing wastage. Although mango is amenable to processing into all these products, smallholder farmers and processors in developing countries have not fully exploited this potential. Over the years, research and food product development have contributed substantially to a number of unique and diverse processed mango products with specific qualities and nutritional attributes that are in demand by a wide array of consumers. These mango products are derived from appropriate food processing and value-addition technologies that transform fresh mango into shelf-stable products with ideal organoleptic, nutritional, and other quality attributes.

1.2. Product description

1.2.1. Mango Pulp

Depending on the cultivar, mango pulp constitutes about 40–60% of the total fresh fruit weight, and is the main consumable part of the fruit due to the presence of nutritional and functional compounds. The nutritional compounds and bioactive composition of mango are factors of the cultivar, the agro-ecological condition of the region, and the maturity of the fruit. Sucrose, fructose, and glucose (in decreasing order of their concentration) comprise the principal carbohydrates present in mature and ripe mango. The carbohydrates content of pulp averages about 15 g/100 g, total dietary fiber (pectins, hemicellulose, and celluloses) averages 1.6 g/100 g while the protein content is about 0.8 g/100 g.

PROJECT PROFILE ON MANGO PROCESSING PLANT

The pulp also contains important micronutrients, vitamins, and bioactive compounds. The vitamin C of mango pulp ranges between 98 mg to 18 g/kg depending on variety and stage of maturity. Mango pulp is a good source of many micro- and macro-minerals such as calcium, sodium, copper, iron, phosphorus, manganese, magnesium, zinc, boron (0.6–10.6 mg/kg), and selenium. The pulp is also rich in organic acids including citric acid, malic acid, oxalic acid, succinic acid, ascorbic acid, and tartaric acid, and bioactive compounds such as phenolic acids, sterols, and alkaloids.

Mango pulp serves as the base for the processing of a variety of mango products including the following.

1.2.1.1. Mango Juice

Mango pulp can be mixed with a specific ratio of water to produce mango juice of a final TSS ranging between 12 and 15% of °Brix and 0.4 and 0.5% acidity. The mango juice can be used as a single strength juice or blended with other fruit juices as juice blends or incorporated in fruit smoothies/shakes.

1.2.1.2. Mango Juice Concentrate

Mango juice concentrate is processed from mango juice or pulp as the base material. When the concentrate is derived from pulp, the pulp is subjected to polygalacturonase, pectinase, or cellulase enzymes to break down the pectins and cellulose. The juice concentrate has a sugar content of between 28 and 60% of °Brix).

1.2.1.3. Mango Squash

Mango squash is a concentrated drink consisting of 25% juice, 45% TSS and 1.2 to 1.5% acidity with either sulfur dioxide or sodium metabisulfite as a preservative.

1.3. Project Location and Justification

1.3.1. Location of Addis Ababa

Addis Ababa is the seat of the Ethiopian federal government. It is located on the central highlands of Ethiopia in the middle of Oromia Region. The absolute location is around the intersection point of 9°14'48''N latitude and 38°44'24''E longitudes. This is very near to the geographical center of the country. It is, therefore, equidistant to the peripheral areas or is equally accessible to almost all parts of Ethiopia. Addis Ababa is located on a well-watered plateau surrounded by hills and mountains. The city is in the highlands on the edge of the Ethiopian rift valley or the eastern slopes of the Entoto Mountain ranges bordering the Great Rift Valley. The total area of Addis Ababa is about 540 km² of which 18.2 km² are rural. Addis Ababa's built-up urban area spans 474 km². It is also the largest city in the world located in a landlocked country.

1.3.2. Demography of Addis Ababa

According to the CSA (2013) population projection, Ethiopia's total population reaches about 105 million people in 2022. Of the total population 22.9% (24 million people) live in urban areas. Ethiopia's urban population is expected to triple by 2037 (World Bank, 2015). Addis Ababa hosts an estimated 3,859,638 people. Currently, Addis Ababa is experiencing an annual growth rate of 3.8% and is estimated to reach 4,696,629 inhabitants by 2032 (CSA, 2015).

1.3.3. Economic activity of Addis Ababa

The transformation of Addis Ababa has especially been rapid since 1991. According to the data from the city's Bureau of Finance and Economic Development (2006), per capital income of Addis Ababa has grown from USD 788.48 in 2010 to USD 1,359 in 2015. The city also achieved a decline

PROJECT PROFILE ON MANGO PROCESSING PLANT

in the poverty index from a high of 29.6 in 2012 to 22.0 in 2014. Moreover, the current poverty headcount index for Addis Ababa is estimated at 18.9 while the poverty severity account for 5 and 1.8 index points respectively. Even though, the poverty status of Addis Ababa has an improvement over previous years, there is still much work to be done to curb both the incidence and severity of poverty.

The major contributor to the economic growth of the city is the implementation of publicly financed mega urban projects like condominium housing, the Light Rail Transit, the international airport and industrial zone development (The state of Addis Ababa, 2017). The existence of international large and medium-size enterprises in and around Addis Ababa have also significant role in creating huge opportunity for employment and technology transfer. Furthermore, there are strong demand for goods and services following the existence of many embassies and inter-governmental organizations like the African Union, the United Nations Economic Commission for Africa.

The manufacturing sector's contribution to Addis Ababa's GDP is high. Despite the fact that 86% of the industries in the city are micro and small scale (cottage and handicrafts, and small-scale), the majority of the country's large and medium scale industries are found in the city. Noticeable increases are also registered currently in other aspects of industrial growth.

The service sector is both the largest contributor to the city's economy and the largest employer. It contributes to 76.4% of the city's GDP while industry's share makes up (almost all) the rest. This sector is dominated by three major sub-sectors: Transport and communication; Real estate, Renting and Business services; and Trade, Hotel and Restaurants. According to the state of Ethiopian Cities 2015 report, the service sector has also been responsible for more than 50% of

PROJECT PROFILE ON MANGO PROCESSING PLANT

the growth in the estimated annual growth of the city's GDP. Although 75% of employment in the city is also generated in the service sector, a large proportion of the employed work in low skill and low paying jobs as shop salespersons, petty and 'gullit' traders, sales workers in small shops, domestic helpers or doorkeepers and restaurant service workers.

Analysis of the economic structure of Addis Ababa reveals that the services sectors (63%) dominates with industry (36%) in second place indicating that these sectors account for almost all of the Addis Ababa's GDP (The State of Addis Ababa, 2017).

Addis Ababa has a great share in the economy of the country due to its attractiveness to businesses, companies, individuals and foreign direct investment. Overall primacy index of the city is 24.8 based on urban employment and unemployment survey (CSA 2015). According to the State of Addis Ababa 2017 report, the simultaneous high rates of economic growth and urbanization in Addis Ababa indicates a likely further rising dominance of the city in Ethiopia's economy as well as growing agglomeration of economic activities in and around the city.

1.4. Why is it beneficial to invest in Addis Ababa?

Addis Ababa is the largest and most economically significant city in the country. Ethiopia's urban population share is only 17 percent (as of 2012, World Bank 2015). The city is the only urban area in Ethiopia capable of delivering scale economies in terms of concentrated demand, specialization, diversity and depth of skills, innovation, and technology transfers. Thus, investors will be benefited in getting capable human power from the market.

The capital is the country's main industrial hub. The city dominates industrial capacity in almost all the braches of light manufacturing that Ethiopia prioritizes. As a result Addis Ababa completely

PROJECT PROFILE ON MANGO PROCESSING PLANT

dominates production in various subsectors. This can be taken as the political and social stability of the city.

Overall, the city has a beautiful environment, favorable location, and strong industrial base. Its advantage as an economic powerhouse of the country and human resource center are the most attractive features for local and overseas investors.

Moreover, investors will be getting a comprehensive set of incentives for priority sectors. These include:

- Customs duty free privilege on capital goods and construction materials, and on spare parts whose value is not greater than 15% of the imported capital goods' total value.
- Investors have the right to redeem a refund of customs duty paid on inputs (raw materials and components) when buying capital goods or construction materials from local manufacturing industries.
- Income tax exemption of up to 6 years for manufacturing and agro-processing, and up to 9 years for agricultural investment.
- Additional 2-4 years income tax exemption for exporting investors located within industrial parks and 10-15 years exemption for industrial park developers.
- Loss Carry forward for half of the tax holiday period. Several export incentives, including Duty Draw-Back, Voucher, Bonded Factory, and Manufacturing Warehouse, and Export Credit Guarantee schemes.

1.4.1. The city benefit from the investment

The city will be benefited from investment. These are discussed below.

- **Employment opportunity**

Investment is expected to provide direct and indirect employment. These range from unskilled casual workers, semi-skilled and skilled employees.

- **Improving growth of the economy**

Through the use of locally available materials and exporting products, the investment contributes towards growth of the economy by contributing to the growth of domestic product. These eventually attract taxes including VAT which will be payable to the government hence increasing government revenue while the cost of local materials will be payable directly to the producers. In addition, domestic products save foreign exchange and exports also bring money to the country.

1.5. The current Status of fruit processing industry in Ethiopia

Ethiopia's wide range of agro-climatic conditions and soil types make it suitable for the production of diverse varieties of fruits and vegetables, including temperate, tropical and sub-tropical crops. Most of the soil types in fruits and vegetables producing regions of the country range from light clay to loam and are well suited for horticultural production. The source of varieties of fruits and vegetables in Ethiopia can be categorized into two major groups: exotic and endemic ones. State farms and newly emerged private commercial farms usually use exotic varieties, while the small farm holders are mainly confined to local or traditional varieties.

PROJECT PROFILE ON MANGO PROCESSING PLANT

According to information obtained from the central statics agency (CSA), the total area cultivated under fruits, vegetables and root crops is about 712,334 hectares in 2020/21. Out of which 43% is under root crops while vegetables and fruits occupy 34 % and 23 %, respectively. Production in quintals are 9,067,871 vegetables, 56,216,815 quintals root crops and 14,192,409 quintals of fruit crops. During peak harvest seasons, fruit and vegetables are sold at throw away price because of lack of means to preserve and store the products. Therefore, in order to prolong the shelf life of the post harvested produce, processing is necessary. Processing contributes towards expansion of market of the processed products in availing it during off-seasons and also increasing its value. Producers of fruit and vegetables will increase production if there is a market for their produce. In Ethiopia, fruits and vegetables processing sector is underutilized. Currently, there are 11 licensed investors are on the pipe line to invest on fruit processing and only 17 fruits and vegetables processing plants in the country. Table 8 describes the location, major products and production capacity of the current fruits and vegetables processing plants in Ethiopia. These plants presently process limited products: Mango paste, orange marmalade, guava nectar, vegetable soup, canned vegetables and Mango juice. In general, processed products are mainly geared to domestic markets.

PROJECT PROFILE ON MANGO PROCESSING PLANT

Table 1 Lists of fruits and vegetables processing factories in Ethiopia

No	Name of Investor	Country of Origin	Investment Activity	Investment Status	capacity in quintals	types of products
1	ABEDESH KADER HUSSAN	Ethiopia	Fruit and Vegetable Processing	Operation		
2	Estifanos Hailu Melaku	USA	Processing Of Fruit And Vegetable /Expansion/	Operation		
3	Feleke Mekonnen	Ethiopia	Fruit, milk, honey Processing	Operation		
4	Lance Frederick Reynaud	Australia	Farming & Processing of vegetable & Fruits	Operation		
5	Ethio Takamol Industry PLC	UAE/Ethiopia	Processing of Mango Paste & Fruit Juice	Operation		
6	Africa Juice Tibila Share Company	Britain/Ireland /Netherlands/Ethiopia	Fruit & Vegetable Production & Processing for Export	Operation	78,000	Mango juice
7	Cool ICE Food Complex PLC /Zhao Dawu gm/	China	Production of ICE Tea, Soda Soft Drinks and Fruit Juice /Expansion/	Operation		
9	Valleverde Foods PLC	Spain	Growing & processing of fruit & vegetable	Operation		
10	Senselet Food Processing PLC	Netherlands	Processing of fruits and vegetables (potato crisps)	Operation		
11	Guli Food PLC	China	Processing of Fruit	Operation		
12	Aries Agro Industry PLC	India/Ethiopia	Fruit and Vegetable processing	Operation		
13	MEAZA HAILEMARIAM TEDLA	Ethiopia	Fruit and Vegetable Processing	Operation	50,000	Mango juice
14	LEIPT FOOD PROCESSING PLC	Ethiopia	Fruit and Vegetable Processing	Operation		
15	Melge- wendo food processing			Operation	32,760	Mango products
16	Gonder food processing factory			Operation	13,000	Mango paste, orange juice
17	Upper Awash agro processing factory			Operation	48,000	Mango products
	TOTAL					

2. Marketing study

2.1. Market analysis summary

The current drive and emphasis by the government on the diversification of the industrial base away from the other sector presents an opportunity for production industry to a valuable contribution towards achieving goal. Having undertaken a thorough and comprehensive research of the market we realized that there was a vast opportunity for domestic products. Aware of the fact operating in such a market is largely dependent on good networking, the promoter intends to establish networks and strategic relationships with various wholesalers and retailers to ensure a steady stream of orders. In so doing the owner intend to ensure that the products they produce are of extremely high quality and fully serve the customers purpose.

2.2. The Supply of processed Mango

2.2.1. Local processed Mango Supply

In Ethiopia there are, medium and small scale fruits processing plant. The number and processing capacity of household level Mango processing enterprises is not known. The final products of the existing fruits processors plants are estimated to be about 210,000 quintals per year of different types of fruits product. However, due to various problems, the large and medium mills not operate at full capacity.

PROJECT PROFILE ON MANGO PROCESSING PLANT

2.2.2. Import

The supply of corn Mango has been met both through import and domestic production. Although there is no apparent trend in the growth of import corn Mango has continuously been appearing in the import statistics.

2.2.2.1. Imported processed Mangoes, Guavas

As it has been shown in table 1 import of Guavas, mangoes which was 600 kg at the beginning of the period (2012) has increased to 206,477 kg by the end of, 2021. A closer observation at the data set reveals that imported Guavas, mangoes juice over the study period has shown varying patterns that is, fluctuation from 2012 to 2021.

Table 2 Volume of imported Mangoes, Guavas from 2012 to 2021

years	Gross Wt. (Kg)	Net Wt. (Kg)	CIF Value (ETB)	CIF Value (USD)	Total tax (ETB)	Total tax (USD)
2012	609.00	600.00	3,000.00	167.92	877.05	49.09
2013	0.00	0.00	0.00	0.00	0.00	0.00
2014	205,631.05	183,701.80	3,516,937.47	174,593.29	1,347,055.05	66,872.61
2015	685,327.00	608,440.00	14,405,638.22	693,178.63	5,473,434.08	263,373.79
2016	8,667.00	8,667.00	226,369.19	10,480.78	86,887.73	4,022.86
2017	1,090,011.00	985,455.00	17,526,167.24	723,716.38	8,493,473.68	350,725.06
2018	148,960	137,600	3,322,489		1,262,546	
2019	0.00	0.00	0.00	0.00	0.00	0.00
2020	0.00	0.00	0.00	0.00	0.00	0.00
2021	227,597	206,477	10,469,328		6,092,688	

Source: Ethiopia customs Authority

PROJECT PROFILE ON MANGO PROCESSING PLANT

2.2.2.2. Forecasted future import of processed fruit(Mango)

Table 3 Future forecast of import of processed mango by trend adjusted exponential smoothing method

Year	Actual	Trend Adjusted exponential smoothing method
2012	600.00	
2013	0.00	
2014	183,701.80	
2015	608,440.00	
2016	8,667.00	
2017	985,455.00	
2018	137,600	
2019	0.00	
2020	0.00	
2021	206,477	
2022		206,477
2023		227,065
2024		247,652
2025		268,240
2026		288,828
2027		309,416
2028		330,003
2029		350,591
2030		371,179
2031		391,766
2032		412,354

Compiled: - by consultant

2.2.2.3. Processed Mangoes Fruit Juice Demand Projection

The demand for fruit can be influenced by a number of factors. The size of population and its growth rate, disposable income prices and culture are few among many variables. However, data on some of these parameters are not readily available in Ethiopia. Consequently, it is difficult if not impossible to objectively quantify the actual demand. Nevertheless, for the purpose of this study, attempts have been made to forecast the likely future demand for fruit on the basis of the following assumptions:

- i. Local supply of processed fruit assumed to be increased by 2.5% every year
- ii. Ethiopian urban population is 21%
- iii. Ethiopia population is estimated to be 120,202,679 in 2022
- iv. Annual growth of population is taken to be 2.5%
- i. Per capital consumption = $\frac{\text{Effective demand}}{\text{Urban population}}$
- v. The WHO/FAO (2013) recommends a minimum of 400g of fruit and vegetables per day (excluding potatoes and other starchy tubers) for the prevention of chronic diseases such as heart disease, cancer, diabetes and obesity. However, Fruits and vegetable consumption in Sub-Saharan African countries including Ethiopia show that consumption ranges from 27 to 114 kg per person per year, which is far below the recommended amount, and let assume out of total fruit consumption 10% will be processed.

PROJECT PROFILE ON MANGO PROCESSING PLANT

Table 4 Projected Demand for mango juice in Ethiopia

Year	Population	Per capital consumption of processed fruit is 2.7kg per year	Total demand for processed fruit in kg,
2022	120,202,679	2.7	324,547,233
2023	123,207,746	2.7	332,660,914
2024	126,287,940	2.7	340,977,438
2025	129,445,138	2.7	349,501,873
2026	132,681,267	2.7	358,239,421
2027	135,998,298	2.7	367,195,405
2028	139,398,256	2.7	376,375,291
2029	142,883,212	2.7	385,784,672
2030	146,455,292	2.7	395,429,288
2031	150,116,675	2.7	405,315,023
2032	153,869,592	2.7	415,447,898

As it is indicated above the effective demand for maize Mango in 2021 is 324,547,233kg. This volume will increase to 415,447,898kg in the year 2029.

2.2.2.4. Demand-Supply Gap Analysis

When we see the historical supply volume of corn Mango in Ethiopia there is no apparent trend in the growth. Because both the import and production data are found to be erratic. Hence, it is found difficult to objectively forecast the future supply volume. Single exponential smoothing method was used, for forecasting purposes. A 2.5% growth rate, equivalent to population growth of our country, is also assumed for local production increase, for new as well as expansion projects for domestic manufacturers though most of the existing corn Mango factories.

PROJECT PROFILE ON MANGO PROCESSING PLANT

Table 5 Demand supply gap Analysis

Year	Domestic production in (kg)	Import in (kg)	Total supply in (kg)	Demand (kg)	Excess demand(kg)
2022	21,000,000	206,477	21,206,477	324,547,233	303,547,233
2023	21,525,000	227,065	21,752,065	332,660,914	311,135,914
2024	22,063,125	247,652	22,310,777	340,977,438	318,914,313
2025	22,614,703	268,240	22,882,943	349,501,873	326,887,170
2026	23,180,071	288,828	23,468,899	358,239,421	335,059,350
2027	23,759,572	309,416	24,068,988	367,195,405	343,435,833
2028	24,353,562	330,003	24,683,565	376,375,291	352,021,729
2029	24,962,401	350,591	25,312,992	385,784,672	360,822,271
2030	25,586,461	371,179	25,957,640	395,429,288	369,842,827
2031	26,226,122	391,766	26,617,888	405,315,023	379,088,901
2032	26,881,775	412,354	27,294,129	415,447,898	388,566,123

As shown in the above table, the project will have unsatisfied demand for the coming 10 years period. The projected demand will continue to be positive until 2032. It can be clearly noted that there is a huge gap between supply and demand figures, which can really be taken as the apparent demand-supply gap for processed fruit in Ethiopia. This is really the actual unsatisfied demand as imports have to be substituted that also helps in saving the foreign currency outflow from the country. The unsatisfied demand for processed fruit for the year 2032 estimated at 388,566,123kg.

3. Technology and engineering

3.1. Technology

There are two different technologies in fruits processing-concentration: hot break and cold break. Hot-break and cold-break fruits pastes possess different attributes, which allow them to be used for different applications. The major difference between hot-break and cold-break fruits is the amount of pectin present in the finished product. Pectin contributes to the firmness of the fruits. Enzymes are deactivated in the hot-break process by means of high temperature processing (about 93°C). Precise control of the break temperature is necessary to minimize scorching or browning the product, and to minimize the flavor changes which take place during heating. Properly broken hot-break fruits juice possesses acceptable colour and thickness, and no residual enzyme activity, thereby making it stable for storage.

Cold-break fruits juice is subjected to lower temperatures (about 60°C) during processing. As a result, the colour and flavor changes are less severe than they are during the hot-break process. However, cold-break fruits contain residual enzymes which contribute to product separation during storage. This separation is caused by the breakdown of the pectin in the fruits.

Italy is currently the worldwide leader in machinery for fruits processing in the Middle East Africa, the EU, Eastern Europe, and Latin America, led by Fenco, Rossi & Catelli and FMC Food Tech. Competitive machinery is also available in Turkey. It is on average 25% cheaper than Italian equipment and reportedly has similar performance. Indian manufacturers are 35-40% cheaper than Italian equipment, but with admittedly lower quality and performance.

3.1.1. Mango fruit production and preserving process

After harvesting, fruits are transported to the processing plant as soon as possible. Once at the plant, they should be processed immediately, or at least stored in the shade. Fruit quality deteriorates rapidly while waiting to be processed. To unload, either fruits are off-loaded onto an inclined belt, or the gondolas are filled with water from overhead nozzles. If water is used, gates along the sides or undersides of the gondolas are opened, allowing the fruits to flow out into water flumes. Mere rinsing of fruits in water is not enough, because of mold filaments and other micro-organisms found in their cracks, wrinkles, folds and stem cavities are not easily dislodged. For thorough cleaning they should be washed in running water. For large scale, rotary washers are used.

The production process involves the following main processes.

1. Receiving
2. Washing of the fresh fruits
3. Sorting
4. Chopping/Crushing
5. Preheating
6. Pulping and Refining
7. Evaporation /concentration
8. Packaging

PROJECT PROFILE ON MANGO PROCESSING PLANT

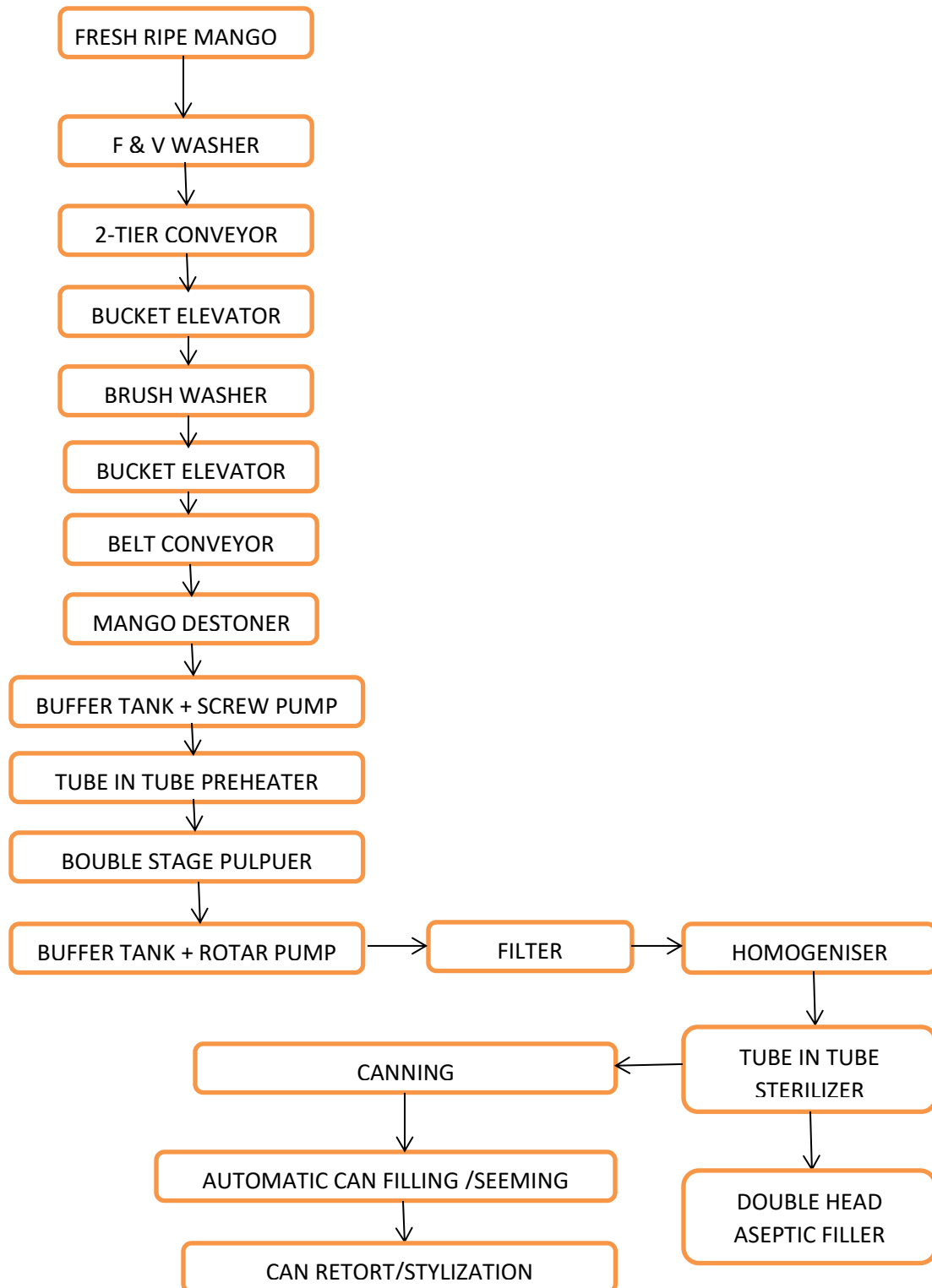


Figure 1 mango fruit process flow diagram

3.1.2. Lists of machinery suppliers

FENCO Food Machinery

Via Prampolini, 40 43044 Lemignano, Emilia-Romagna, Italy

TEL:- +39 0521 303429

EMAIL: contact@fenco.it



Huafood Machinery Technology Co..Ltd Company

E-mail: info@huafoodmachine.com

Whatsapp: +8618703684501

Tel: +8618703684501

Fax:+8618703684501

3.1.3. Environmental and social impact assessment of the project

Typically, any developmental projects also trigger a set of environmental and social impacts. These environmental and social due to development projects occur in different forms. An Environmental and Social Impact Assessment (ESIA) has to be carried out to study the potential environmental and social impacts due to the production processed fruits. Potential environmental and social impacts due to the production of fruit based products on attributes like air quality, noise, water quality, soil, flora, socio-economic, etc. have to be assessed as part of the ESIA study. Appropriate mitigation measures to help minimize/avoid impacts from the development have to be recommended in the study. The measures include avoidance measures, mitigation measures and environmental enhancement measures. For the purpose of including environmental costs, the costs of wastewater treatment plant and solid waste incineration systems are included in the cost of machinery and equipment. Social responsibility cost estimated to be 1% of fixed investment costs.

3.1.4. Production Capacity and Production Program

3.1.4.1. Plant capacity

The annual production capacity of the plant in full capacity is 83,200 quintals per year. The production capacity is based on projected demand and realistic market share that could be captured. The production commences two shift and 260 working days a year. The production program does not include Sundays and national and public holidays. It was also considered that the plant would conduct annual maintenance for 12 days when the supply of raw materials is low.

3.1.4.2. Production program

The plant initially produces 70 % of its annual rated capacity bound to initial operating problems such as machine set up and marketing. The production capacity will increase by 10 % and attain its full capacity by the four year of its commencement.

Table 6 Production program of the project for the coming five

	Period	Percentage of products	Unit of measure	Start-up			Full Capacity	
	Capacity utilization			70%	80%	90%	100%	100%
	Project year			1	2	3	4	5
	Product type							
1	Mango Juice	40%	Quintals	58,240	66,560	74,880	83,200	83,200

3.2. Engineering

3.2.1. Building Design

During construction of the building of the processing plant the following aspects should be addressed. The processing room contains a considerable heat that evolves from jam boiling. Therefore, the roof should be over hanged and roof vents should be included to allow heat and steam to escape and create a flow of fresh air through the processing room. The vent must be screened with mesh to keep insects and birds out of the room. A paneled ceiling should be fitted in the processing and storage rooms to prevent dust accumulation and contaminate products. There should be no holes in the paneling, in the roof and where the roof joins the walls to inhibit access to birds' rodents and insects. Floors should be made of good quality concrete, without holes or cracks. The floor should be curved up to meet the wall to prevent dirt collecting in corners. The floor should slope to a drainage channel, fitted with metal grating that are easily removed for cleaning. A wire mesh should be fitted over the drain to prevent rats and crawling insects from entering the room.

All interior walls should be plastered or rendered with concrete. They should have no cracks that could harbor dirt or insects. The lower parts of the walls are most likely to get dirty and they should be tiled or painted with white gloss water proof paint at least one and half meter above the floor. Higher parts of walls can be painted with emulsion paints. All windows should be screened with mosquito mesh to prevent access for flying insects. The windows should also be made to slope so that they do not accumulate dust. Processing room doors should be fitted with thin metal chains or strips of plastics hanged from door lintels. Store room doors should not have gaps beneath them and should be kept closed to prevent insects and rodents.

3.2.2. Land, buildings and civil works

The required area (m²) and construction cost for the production facilities essential for the successful operation of the processing plant is shown in Table 7. A total area for the processing plant is 12,500m² out of which 6,520m² is to be covered by building while uncovered area of 5,980 m² is left open for parking, storage of waste materials and future expansions. In order to estimate the land lease cost of the project profiles it is assumed that all the project will be located in different land level from level 1/1 to level 4/3, their current market lease price is from 39,073.31 birr per M² to 2,800.71 birr per M² respectively. Therefore, for the profile a land lease rate of birr 3,885 per M² have been taken, which is between the ranges and 10% will be paid in the first year. The cost of construction of building should be appropriate to the size and expected profitability of business, costs of building generally differs by the type of construction materials used, the type of foundation, wall height and location. The current building cost for simple storage and processing room is from 1,800.00 Birr per m² to 25,000.00 Birr per m². The total construction cost of buildings and civil works, at a rate of Birr 20,000 per m² is estimated at Birr 191.68million. Therefore, the total cost of land lease and construction of buildings and civil works is estimated at Birr 240.24 million.

3.2.3. Plant layout

Plant layout is the plan of optimum arrangement of an industrial facility. It embraces the physical arrangement of various departments, machines, equipment and services for economical, efficient and effective functioning while planning the production of any goods. The food processing plant layout has been developed taking into consideration international and national code of hygienic practices. Recommended international hygienic practices for fruit processing plant construction,

PROJECT PROFILE ON MANGO PROCESSING PLANT

layout and sanitary facilities have been covered in Codex code of hygienic practice for dried fruits Codex (Agri business handbook, 2009).The processing plant layout is shown in Figure 19. In setting up the plant layout the following points were considered. Machineries and equipment are arranged in a continuous line without a path crossing to step up efficiency and avoid cross contamination. The ‘dirty’ area where the raw material is washed, peeled and cored is separated physically from the clean area where pulp extraction, slicing, boiling and packaging is carried out. This layout reduces the risk of contaminating semi processed and finished products by incoming raw materials. A separate building is arranged for storage of ingredients, final products and packaging materials. Sanitary facilities were provided in plant layout for preserving health and sanitary standards. The sanitary facilities are located in separate area from the area where the raw materials are received and processed to prevent possible contamination. Hand washing basin is also provided at entrance to the toilets. Special emphasis is taken in locating a dryer and bottle washing facility. A dryer is placed outside the processing room in open shade because the processing room is humid area which requires a great amount of heat to dry the air. Bottle washing is placed outside the processing room to avoid the risk of glass splinters mixed with the final product.

The proposed plant layout comprises the following buildings and structures.

- I. Main Buildings
 - a. Raw materials store
 - b. Production process room
 - c. Finished product store
 - d. By-product store
 - e. Packing materials store
- II. Auxiliary Buildings
 - a. Offices and toilet
 - b. Water treatment plant
 - c. Cloth changing room
 - d. Canteen

PROJECT PROFILE ON MANGO PROCESSING PLANT

- e. Guard house
- f. Parking

Table 7 Construction costs

S/No	Descriptions	Total area in M ²	Estimated cost per square meter (in Birr)	Total estimated cost (in Birr)
1	Raw materials receiving and store	1,000	20,000	20,000,000.00
2	Raw materials preparation room	1,000	20,000	20,000,000.00
3	Crushing /chopping room	200	20,000	4,000,000.00
4	Concentration unit	150	20,000	3,000,000.00
5	Pasteurization unit	150	20,000	3,000,000.00
6	Ingredients store	500	20,000	10,000,000.00
7	Filling and packing room	500	20,000	10,000,000.00
8	Packing materials store	500	20,000	10,000,000.00
9	Final products store	500	20,000	10,000,000.00
10	Finished products delivery veranda	100	20,000	2,000,000.00
11	Boiler room	100	20,000	2,000,000.00
12	workshop	120	20,000	2,400,000.00
13	Generator room	20	20,000	400,000.00
14	Power station room	20	20,000	400,000.00
15	Waste water treatment section	1,000	20,000	20,000,000.00
16	Administration office 5,360=13,400,000	300	20,000	6,000,000.00
17	Production and technical office	200	20,000	4,000,000.00
18	Toilet and shower for female	40	20,000	800,000.00
19	Room for cloth changing for female	40	20,000	800,000.00
20	Toilet and shower for male	40	20,000	800,000.00
21	Room for cloth changing for male	40	20,000	800,000.00
22	for expansion		20,000	50,000,000.00
23	parking	3,480	2,000	6,960,000.00
24	Fence	1,800	2,400	4,320,000.00
	TOTAL	12,500		191,680,000.00

PROJECT PROFILE ON MANGO PROCESSING PLANT

Table 8 Land lease period in Addis Abeba

Sector of development activity	Period of lease	Down payment
Education, health, culture and sports	90	10%
Industry (manufacturing)	70	10%
commerce	60	10%
For urban agriculture	15	10%
For others	60	10%

Sources: - city government of Addis Abeba land development and management bureau

Table 9 Land lease floor price in Addis Abeba

S/No	Land level	Current land lease floor price per M ²	Current lease price per M ² (Market price)
1	1/1	2,213.25	39,073.31
2	1/2	2,165.47	36,825.73
3	1/3	1,900.19	34,578.15
4	¼	1,552.93	31,119.21
5	1/5	1,531.91	29,096.45
6	2/1	1327.39	27,073.71
7	2/2	1,221.18	25,050.96
8	2/3	1,191.17	23,028.21
9	2/4	1,074.39	21,005.46
10	2/5	1,027.84	18,982.71
11	3/1	994.71	16,959.96
12	3/2	960.21	14,937.21
13	3/3	927.84	12,914.46
14	¾	904.77	10,891.71
15	3/5	873.74	8,868.96
16	4/1	814.06	6,846.21
17	4/2	786.45	4,823.46
18	4/3	748.80	2,800.71

PROJECT PROFILE ON MANGO PROCESSING PLANT

4. Organizational structure for fruits processing plant

The selection of structure of the envisaged project is made based on the existing structure of manufacturing plants operating in the country, the capacity, complexity and technology mix of the plant. Organizational structure principles such as specialization, coordination, and departmentalization are also considered for design of structure that best suits the envisaged project

4.1. Manpower Requirement and Estimated Annual costs

The manpower requirement and the salary and benefits, based on the current market conditions is estimated to be 57 employees to be paid for birr 7.836 million per annum, including benefits.

Table 10 Manpower requirement and salary costs

Description	Number	Monthly salary	Annual salary, Birr
General manager	1	45,000.00	540,000.00
Administration and finance manager	1	30,000.00	360,000.00
Human resource manager	1	25,500.00	306,000.00
Secretary	1	12,500.00	150,000.00
Marketing and sales officer	2	15,000.00	360,000.00
Sales manager	3	20,000.00	720,000.00
Accountant	2	15,000.00	360,000.00
Production and technical head	1	30,000.00	360,000.00
Mechanic	3	17,500.00	630,000.00
Electrician	3	17,500.00	630,000.00
Purchaser	2	17,500.00	420,000.00
Operator	6	10,000.00	720,000.00
Ass. Operator	3	7,500.00	270,000.00
Laboratory technician	3	15,500.00	558,000.00
Boiler technician	3	13,000.00	468,000.00
Guard	6	4,000.00	288,000.00
Driver	4	7,000.00	336,000.00
Cleaners	12	2,500.00	360,000.00
Grand total	57		7,836,000.00

5. Financial Analysis

5.1. General

The financial analysis evaluation of Mango project, are mainly consisted of capital investment as well as operating and maintenance costs. The capital investment costs include fixed investment costs (initial fixed investment and replacement costs) and working capital, while operating and maintenance costs comprise current expenses related to material inputs, manpower cost, utility, repair and maintenance costs, spare parts, Overheads, Sales and distribution, interest and depreciation expenses.

The financial analysis and evaluation has been conducted taking assumptions:

1. It is assumed that about 70% of the total capital investment costs including the working capital requirement could be covered through development bank loans of short and long-term credits. The remaining balance 30% will be covered by equity capital contribution of the project owner.
2. Even though the project might secure loans under different term and conditions as well as from different financial sources, for the purpose of calculation of debt service scheduling, the current development bank of Ethiopia credit terms and conditions have been used. Consequently. It is assumed that the project will secure loan facility on the basis of 11.5 % annual interest rate.
3. Even though the estimated project production life is more 10 years, the financial analysis has been undertaken for a period interval covering the first 10 years only, during which time most of the capital assets are assumed to be depreciated, debts recovered and pay-back period accomplished.

PROJECT PROFILE ON MANGO PROCESSING PLANT

4. It is assumed that the project will be start up production activity at 70 % capacity. During years 2 & year 3 the projects is anticipated to gradually increase capacity utilization to reach 100% in year 4. Therefore, starting from year 4 the project will be operational at full capacity.
5. Loading and unloading costs will be paid on piece rate (10 Birr per quintals)
6. For the project under reference promotional, sales and distribution expenses have been estimated at 3% of the sales revenue.
7. Maintenance and spare parts costs are 1.5% of the fixed investment costs.
8. Furniture and fixture costs assumed to be 500,000.00

5.2. Initial Fixed investment costs

Table 11 Initial Fixed investment costs

S/No	Fixed investment type	Unit of measurement	Quantity	Unit price	Total Amount	Remarks
1	Land	Square meter	12,500	3,885 birr/M ²	48,562,500.00	The period of land lease will be 70 years and 10% of the total lease amount will be paid in the first year
2	Buildings and civil works	Square meter	5,100	lump sum	191,680,000.00	
	Sub total				240,242,500.00	
3	Machineries	set	2	Lump sum	150,000,000.00	
4	Transformer	set	1	Lump sum	2,000,000.00	
5	Weighbridge	Set	1	Lump sum	4,000,000.00	
6	Truck and vehicles	Pcs	2	Lump sum	6,000,000.00	
7	Furniture and fixture	Pcs			500,000.00	
	SUB TOTAL				162,500,000.00	
	Fixed capital investment costs				402,742,500.00	
8	pre-operational expenses				2,000,000.00	
	Working capital				128,364,000.00	
	TOTAL INVESTMENT COSTS				533,106,500.00	

5.3. Working capital

Working capital is the financial means required for smooth operation and maintenance of a project mathematically, it is a difference between current assets and current liabilities. In the particular case of the project under consideration, the current assets comprise receivables, inventories (local and imported material inputs, spare parts, work in progress, and products ready for delivery) and cash in hand, while current liabilities comprise accounts payable to creditors.

5.4. Project Financing

Fixed capital investment costs and working capital requirements are assumed to be financed by equity capital of the owner and through loans of short and long-term credits.

The company obtains loans under different terms and condition as well as from different sources, for the purpose of calculation of debt service scheduling the current development bank of Ethiopia credit terms and conditions have been used. Accordingly, it is assumed that the company will be able to obtain loan 70% of the total investment costs for construction of different buildings for purchase of machineries. The remaining balance that of the total investment costs will be expected to be covered by equity contribution of the project promoter.

5.5. Production costs

As it is depicted in Annex Table 18 major categories of the total production costs are assembled into the following cost elements.

5.5.1. Material inputs

In the project under study the basic material inputs are Mango, chemicals and packing materials etc. Therefore, the current prevailing local and international market prices have been used for estimation of material inputs costs. At full capacity operation the material inputs costs are estimated at Birr 675.974 million per annum.

PROJECT PROFILE ON MANGO PROCESSING PLANT

5.5.2. Utilities

In estimating costs of utility expenses for operation and maintenance of the project, Costs of fuel, oil and lubricant, electricity and water consumptions have been taken in to consideration, the rates of which have been estimated on the basis of the proposed capacity utilization program of the project and at the current official charging rates. At full capacity operation the project will have the following utility expense per annum which amounts to Birr 5.60 million.

Table 12 Utilities of the factory'000''Birr

Utility'000''Birr		Start-up			Full Capacity
		70 %	80 %	90 %	
Capacity utilization		70 %	80 %	90 %	100 %
Project year		1	2	3	4
Item description	Unit of measurement				
Fuel					
Gasoline for service vehicle	50km*260days*32Birr/LIT*8km/Li	29.575	33.80	38.025	42.250
Gasoline for transport truck	(200km*300days*32Birr/LIT*5km/Li)*3	655.20	748.80	842.40	936.00
Sub-Total		684.775	782.6	880.425	978.25
Change of oil and lubricant	10% of the fuel consumption	68.48	78.26	88.04	97.83
Sub-Total		753.25	860.86	968.47	1076.08
Electricity	260days*24 hrs*650kwh* 0.4736Birr/kwh	2,839	3,245	3,650	4,056
Sub- Total		2,839	3,245	3,650	4,056
Water	365days*100m ³ /day*15 Birr/m ³	255.50	292.00	328.50	365.00
Sub -Total		255.50	292.00	328.50	365.00
Telecommunication					
Telephone	5 lines* 1,500Birr/month/line+18Birr/line/month	31.08	31.08	31.08	31.08
Mobile	5 lines*1,500 Birr/month/line	30.00	30.00	30.00	30.00
Fax	2line*1,000Birr/month + 17 Birr/line/month	12.40	12.40	12.40	12.40
Internet	2,500 Birr/month	30.00	30.00	30.00	30.00
Sub-Total		103.48	103.48	103.48	103.48
TOTAL		<u>3,951.23</u>	<u>4,501.34</u>	<u>5,050.45</u>	<u>5,600.56</u>

PROJECT PROFILE ON MANGO PROCESSING PLANT

5.5.3. Over heads

In the expenses under this title have been included land and building taxes, buildings, vehicles as well as machinery and equipment insurance, vehicles annual inspection; postage, telephone and e. mail, stationery and office supplies; printing and copying; audit fee; cash indemnity etc. The overhead costs and divided in to direct overheads and administration overheads.

Table 13 Overhead costs

<u>Direct Overhead"000"Birr</u>		Year 1	Year 2	Year 3	Year 4
Annual land lease Payment		6,937.50	6,937.50	6,937.50	6,937.50
Insurance					
Building and Civil works	0.10%	191.68	191.68	191.68	191.68
Machinery and Equipment	0.20%	300.00	300.00	300.00	300.00
Motor vehicle and Truck	1%	60.00	60.00	60.00	60.00
Vehicles annual inspection and registration	25,000 Birr per annum per vehicle	50.00	50.00	50.00	50.00
Work cloth	Two times per annum per workers at 800 Birr	91.20	91.20	91.20	91.20
Cleaning and sanitation	An estimate of 300 Birr/day	78.00	78.00	78.00	78.00
Sub Total		770.88	770.88	770.88	770.88
Grand Total		7,708.38	7,708.38	7,708.38	7,708.38
<u>Administration Overhead "000' Birr</u>					
Audit fee	40,000 Birr per annum	40.00	40.00	40.00	40.00
Office cleaning and sanitation	2,000 Birr per month	24.00	24.00	24.00	24.00
Stationery and office supplies	2,000 Birr per month	20.00	20.00	20.00	20.00
Printing and Copy	2,000 Birr per month	24.00	24.00	24.00	24.00
Sub Total		108.00	108.00	108.00	108.00
GRAND TOTAL		7,816.38	7,816.38	7,816.38	7,816.38

PROJECT PROFILE ON MANGO PROCESSING PLANT

5.5.4. Financial costs

As it has been outlined earlier under” project Financing” the current Development Bank of Ethiopia credit terms and conditions for newly establishing projects have been used to compute the financial costs, estimated to be incurred in connection with that of the total investment costs assumed to be covered through loan financing. The amount of the loan capital to be obtained and the financial costs to be incurred thereof have been determined depending on the amount of fixed investment cost and pre-production expenses.

5.5.5. Depreciation

Table 14 Depreciation in Birr"000"

Period			Start-up			
			70 %	80 %	90 %	100 %
Capacity utilization			70 %	80 %	90 %	100 %
Project year			1	2	3	4
Item description	Original Value					
Structure and civil works	191,680,000.00	5% of original value	9,584	9,584	9,584	9,584
Machinery and equipment	150,000,000.00	15 % of original value	22,500	22,500	22,500	22,500
Transformer	2,000,000.00	15% of original value	300	300	300	300
Motor vehicles and trucks	6,000,000.00	15 % of original value	900	900	900	900
Weighbridge	4,000,000.00	15 % of original value	600	600	600	600
Office equipment and furniture	500,000.00	20 % of original value	100	100	100	100
Pre-production expenses	2,000,000.00	25 % of original value	500	500	500	500
Total			34,484	34,484	34,484	34,484

5.6. Break Even point and ROI

5.6.1. Break Even point (BEP)

Three kinds of break-even point

- A. BEP Sales Revenue(BR)
- B. BEP production (Volume)
- C. BEP Percentage (%)

A. Break-even point(BEP) Sales

To determine BEP Annual Sales, multiply annual sales found in income statement by the annual fixed cost, and divided by Annual sales less Annual variable cost.

$$\text{BEP (sales)} = \frac{\text{Annual sales} \times \text{Annual fixed costs}}{\text{Annual sales} - \text{Annual variables costs}}$$

Annual sales = 1,468,665,000 Birr

Unit selling price = 23 Birr/0.5liter

$$\text{BEP (sales)} = \frac{\text{Annual sales} \times \text{Annual fixed costs}}{\text{Annual sales} - \text{Annual variables costs}} = \frac{1,468,665 \times 129,206}{1,468,665 - 782,802}$$

BEP (Sales) = 276,674,000 Birr

B. BEP production

To determine BEP production volume, divided BEP sales by the unit selling price (USP)

BEP production = 276,674,000/23 = 12,029,304

$$\begin{aligned} \text{c. BEP percentage} &= \frac{\text{Annual fixed costs} \times 100\%}{\text{Annual sales} - \text{Annual variables costs}} \\ &= \frac{129,206 \times 100\%}{1,468,665 - 782,802} \\ &= 18.84\% \end{aligned}$$

5.6.2. Return on investment

Return on investment = Net profit /Total capital requirement

$$= 75,438,000/533,106,500$$

$$= 14.15\%$$

The return on owners' investment (ROOI)

= Annual net profit /owners' investment

$$= 75,438,000/159,931,950$$

$$= 47\%$$

5.7. Project benefits

For financial analysis and evaluation of the given project, the current corn price, and packing materials buying price and final packed corn Mango price at the project gate has been taken as a basis. Consequently, based on the recent market survey, Mango buying price per quintal at the nearby market pints is estimated at Birr 5birr and delivery price of processed Mango price has been indicated in table 16.

As it has been stated earlier the project is envisaged to reach full capacity operation four years after commencement of production activities which are assumed to begin with 70% of the estimated total capacity.

At full capacity operation the project is envisaged to have the following revenue components.

PROJECT PROFILE ON MANGO PROCESSING PLANT

Table 15 Source of revenue in Birr

Period			Start up			Full Capacity
Capacity utilization		Unit price	70 %	80 %	90 %	100%
Item description						
Project year			1	2	3	
Mango juice	50 % will be Packed in 500gm(1/2 lit)	23	1,028,065,500	1,174,932,000	1,321,798,500	1,468,665,000
TOTAL			1,028,065,500	1,174,932,000	1,321,798,500	1,468,665,000

Thus, according to the computation in Annex Table 20 and Annex Table 22, the net income and cash flow statements analysis revealed that at full capacity operation the project will generate a total income (gross revenue) amounting to 1.46 billion Birr per annum. The corresponding Annex Table 20 of “Net Income Statement” shows a steady growth of gross profit starting from 116 million Birr in year 1 reaching the peak of 269 million Birr in year 10. In its 10 years of manufacturing activities, the project is expected to generate a total net profit of 1.3 billion Birr and contribute 748.82 million Birr to the government treasury in form of 35% income tax.

According to the current investment Law, machinery and equipment are anticipated to be imported duty-free. The liquidity position of the project is very strong. The corresponding Annex Table 22 of “Cash Flow Statement” shows the positive cumulative cash balance of Birr 1.2 billion and the project will not face any cash shortage throughout its production life.

The computation of the pay-back period as depicted in Annex table 27 indicates that the project will be able to reimburse itself from its net cash-income within five years after commencement of production activities, the period which is considered to be very good for the project of this nature.

PROJECT PROFILE ON MANGO PROCESSING PLANT

In Annex Table 28 of the Benefit-cost ratio and Net present value (NPV) have been calculated at 17% discount factor (D.F) for 10 years of the project activity. Accordingly, the project has NPV of 724million Birr at 17%D.F. and the benefit-cost ratio of 1.12 at 17% D.F. These results are most appreciable, especially, when related to the external capital borrowing interest rate which ranges from 8.50% to 18.5 % for newly establishing projects.

Break-even point (BEP) have been undertaken the project under study when implemented will have BEP at about 18.84% operation of the estimated full capacity

In addition to this, finally, summary of financial efficiency tests have been conducted in Annex table 26, Accordingly, all efficiency ratios indicated positive trends and consequently, it can be inferred that the project can operate in the frame work of free market mechanism on commercially and financially viable basis and is remunerative.

ANNEX

PROJECT PROFILE ON MANGO PROCESSING PLANT

ANNEX I
MATERIALS INPUT

Table 16 Material input for mango puree production

						YEAR 1	YEAR 2	YEAR 3	YEAR 4
S/No.	Cost Centers	Unit	Quantity Consumed during Daily Working Hour	Unit Cost (Birr)	Total Cost for 16hr (Birr)	Total costs for 70% capacity (for 72.80 days and 16hrs per day)	Total costs for 80% capacity (for 83.20 days and 16hrs per day)	Total costs for 90% capacity (for 93.6 days and 16hrs per day)	Total costs for 100% capacity (for 104 days and 16hrs per day)
Direct Material									
1	Mango	Kg	80,000	5	2,400,000.00	174,720,000.00	196,680,000	224,640,000	249,600,000
2	Aseptic bag	Pcs	196	116	24,034.27	1,749,694.86	1,999,651.26	2,249,607.67	2,499,564.08
3	Drums	Pcs	182	568	109,079.06	7,940,955.57	9,075,377.79	10,209,800.02	11,344,222.24
4	Polyethylene Liner	Pcs	206	17	3,406.92	248,023.78	283,455.74	318,887.71	354,319.68
5	Sample Bag	Pcs	38	26	1,014.15	73,830.12	84,377.28	94,924.44	105,471.60
Sub Total 1					2,537,534	184,732,504	208,122,862	237,513,220	263,903,578
Indirect Material									
6	Confidence 10(for boiler)	Liter	2.5	313	781	56,856.80	64,979.20	73,101.60	81,224.00
7	Salt (Na Cl)(for boiler)	Kg	2	3	5	364.00	416.00	468.00	520
8	Calcium hypochlorite (Cl)(for water treatment)	Kg	0.5	45	22	1,601.60	1,830.40	2,059.20	2,288.00
9	Largo (Liquid Soap) and detergents	Liter	0.2	22	4	291.20	332.80	374.40	416
10	Oil (for machines)	Liter	0.25	53	13	946.40	1,081.60	1,216.80	1,352.00
11	Grease(for machines)	Kg	0.5	200	100	7,280.00	8,320.00	9,360.00	10,400.00

PROJECT PROFILE ON MANGO PROCESSING PLANT

12	Superdilac(for hand cleaning)	Liter	5	135	1080	78,624.00	89,856.00	101,088.00	112,320.00
13	Caustic soda (cip)	Kg	30	19	380	27,664.00	31,616.00	35,568.00	39,520.00
14	Diesel Fuel for the Boiler	Liter	1,280	19	24000	1,747,200.00	1,996,800.00	2,246,400.00	2,496,000.00
15	Diesel Fuel for the Generator	Liter	180	17	3027.6	220,409.28	251,896.32	283,383.36	314,870.40
16	Cleaning Materials (Broom, Mop and Wiper)		1	40	40	2,912.00	3,328.00	3,744.00	4,160.00
SUB TOTAL					29,452.60	2,144,149.28	2,450,456.32	2,756,763.36	3,063,070.40
TOTAL					2,566,987	186,876,654	210,573,318	240,269,983	266,966,648
CONTENGENCY 20%					513,397	37,375,331	42,114,664	48,053,997	53,393,330
GRAND TOTAL					3,080,384	224,251,984	252,687,982	288,323,980	320,359,978

REMARKS

	PER DAY	YEAR 1	YEAR 2	YEAR 3	YEAR 4
YIELD (MANGO PUREE)	39,160 KG	2,850,848	3,258,112	3,665,376	4,072,640
NUMBER OF BATCH (ONE BATCH REQUIRES 287KG OF MANGO PUREE)	136.45 BATCH	9,933 BATCH	11,352 MATCH	12,771BATCH	14,190 BATCH

PROJECT PROFILE ON MANGO PROCESSING PLANT

Table 17 Materials input for reprocessing line

S/No	Description	U/M	(a) Qty	(b)Unit Price	YEAR 1	YEAR 2	YEAR 3	YEAR 4
1	Pet Preform (500 ml)	pcs	4,185.00	5	207,848,025	237,540,600	267,233,175	296,925,750
2	Bottle cap	pcs	4,185.00	1.5	62,354,408	71,262,180	80,169,953	89,077,725
3	Label	pcs	4,185.00	1	41,569,605	47,508,120	53,446,635	59,385,150
4	Shrink film	kg	11.63	1.50	173,281	198,036	222,790	247,545
5	Make up solution	pcs	0.02	1,087.21	215,985	246,840	277,695	308,550
6	Make up ink	pcs	0.01	705.94	70,121	80,138	90,156	100,173
7	Cleaning solution	pcs	0.01	547.08	54,341	62,105	69,868	77,631
9	Mango pure	kg	0.00	0.00	-	-	-	-
10	Sugar	kg	220.00	50.00	109,263,000	124,872,000	140,481,000	156,090,000
11	Sodium CMC	kg	0.60	200.00	1,191,960	1,362,240	1,532,520	1,702,800
12	Sodium Benzoate	kg	1.44	250	3,575,880	4,086,720	4,597,560	5,108,400
13	Potassium Sorbate	kg	0.60	500.00	2,979,900	3,405,600	3,831,300	4,257,000
14	Xhanthangum	kg	1.65	240.00	3,933,468	4,495,392	5,057,316	5,619,240
15	Citric acid	kg	3.27	53.00	1,721,488	1,967,415	2,213,342	2,459,269
16	Ascorbic acid	kg	0.10	800.00	794,640	908,160	1,021,680	1,135,200
17	Mango flavour	meter	0.35	700.00	2,433,585	2,781,240	3,128,895	3,476,550
18	Colorant (Beta)	kg	0.01	450.00	44,699	51,084	57,470	63,855
19	Oil, Fuel & Lubricant	Ltr	292.90	40	116,375,028	133,000,032	149,625,036	166,250,040
	TOTAL				554,599,414	633,827,902	713,056,389	792,284,877

PROJECT PROFILE ON MANGO PROCESSING PLANT

ANNEX II

CALCULATION OF ANNUAL PRODUCTION COSTS

Table 18 Annual total production costs''000''

Period	Start-up			Full capacity						
	70 %	80 %	90 %	100 %	100 %					
Project Year	1	2	3	4	5	6	7	8	9	10
Cost category										
I. Material inputs(for mango puree production and reprocessing line)	778,851	886,516	1,001,380	1,112,645	1,112,645	1,112,645	1,112,645	1,112,645	1,112,645	1,112,645
II. Labor	7,836	7,836	7,836	7,836	7,836	7,836	7,836	7,836	7,836	7,836
III. Utility	3,951	4,501	5,051	5,601	5,601	5,601	5,601	5,601	5,601	5,601
IV. Repair and Maintenance (1 % of fixed costs) and spare parts (0.5 % of fixed costs)	5,313	5,313	5,313	5,313	5,313	5,313	5,313	5,313	5,313	5,313
VI Direct overheads	7,708	7,708	7,708	7,708	7,708	7,708	7,708	7,708	7,708	7,708
A. Direct Production costs	803,659	911,874	1,027,288	1,139,103	1,139,103	1,139,103	1,139,103	1,139,103	1,139,103	1,139,103
VII. Administration over head	108	108	108	108	108	108	108	108	108	108
VIII. Marketing and Promotional expense 3 % of sales revenue	30,842	35,248	39,654	44,060	44,060	44,060	44,060	44,060	44,060	44,060
B. Operating costs	834,609	947,230	1,067,050	1,183,271	1,183,271	1,183,271	1,183,271	1,183,271	1,183,271	1,183,271
Interest	42,915	40,410	37,616	34,502	31,029	27,157	22,839	18,026	12,658	6,673
Depreciation	34,484	34,484	34,484	34,484	33,984	33,884	25,792	9,584	9,584	9,584
C. Total production costs	912,008	1,022,124	1,139,150	1,252,257	1,248,284	1,244,312	1,231,902	1,210,881	1,205,513	1,199,528

PROJECT PROFILE ON MANGO PROCESSING PLANT

ANNEX IV CALCULATION OF WORKING CAPITAL REQUIREMENTS

- I. Minimum requirement of current assets and liabilities
- A. Accounts receivable: 26 days at total production costs minus depreciation and interest
 - B. Inventory
 - 1. Material inputs: 26 days
 - 2. Spare parts : 90 days
 - 3. Work under process: two days at direct costs
 - 4. Product ready for delivery: 8 days at direct costs plus administration overheads
 - C. Cash on hand : 360 days
 - D. Accounts payable 26 days for material inputs and utilities
- ii. Working capital requirement

Cost category	Minimum Days of coverage	Coeff-icent of turnover	Project year										
			Start up			Full capacity							
			1	2	3	4	5	6	7	8	9	10	
I. Current asset													
A. A/R	26	10	83,461	94,723	106,705	118,327	118,327	118,327	118,327	118,327	118,327	118,327	118,327
B. Inventory													
1. Material inputs	26	10	77,885	88,652	100,138	111,265	111,265	111,265	111,265	111,265	111,265	111,265	111,265
2. Spare parts	90	4	1,328	1,328	1,328	1,328	1,328	1,328	1,328	1,328	1,328	1,328	1,328
3. Work under process	2	130	6,182	7,014	7,902	8,762	8,762	8,762	8,762	8,762	8,762	8,762	8,762
4. Product ready for delivery	8	32.5	24,836	28,166	31,717	35,157	35,157	35,157	35,157	35,157	35,157	35,157	35,157
C. Cash on hand			12,952	14,053	15,155	16,256	16,256	16,256	16,256	16,256	16,256	16,256	16,256
D. Current assets			206,644	233,936	262,945	291,095	291,095	291,095	291,095	291,095	291,095	291,095	291,095
II. Current liabilities													
A. A/p	26	10	78,280	89,102	100,643	111,825	111,825	111,825	111,825	111,825	111,825	111,825	111,825
III. Working capital													
A. Net working capital			128,364	144,834	162,302	179,270	179,270	179,270	179,270	179,270	179,270	179,270	179,270
B. Increasing in working capital			128,364	16,470	17,468	16,968	0.00	0.00	0.00	0.00	0.00	0.00	0.00

PROJECT PROFILE ON MANGO PROCESSING PLANT

ANNEX V

PROJECTED SALES REVENUE

Table 19 Projected Sales Revenue in Birr"000"

Period		Unit price	Start up			Full Capacity						
			70 %	80 %	90 %	100%						
Capacity utilization												
Item description												
Project year			1	2	3	4	5	6	7	8	9	10
Mango juice	50 % will be Packed in 500gm(1/2 lit)	23	1,028,066	1,174,932	1,321,799	1,468,665	1,468,665	1,468,665	1,468,665	1,468,665	1,468,665	1,468,665
TOTAL			1,028,066	1,174,932	1,321,799	1,468,665	1,468,665	1,468,665	1,468,665	1,468,665	1,468,665	1,468,665

PROJECT PROFILE ON MANGO PROCESSING PLANT

ANNEX VI

PROJECTED NET INCOME STATEMENT

Table 20 Projected Net income statement "000"

Period	Start up			Full capacity						
	70 %	80 %	90 %	100 %						
Project year	1	2	3	4	5	6	7	8	9	10
Item description										
Product sales revenue	1,028,066	1,174,932	1,321,799	1,468,665	1,468,665	1,468,665	1,468,665	1,468,665	1,468,665	1,468,665
Less total production costs	912,008	1,022,124	1,139,150	1,252,257	1,248,284	1,244,312	1,231,902	1,210,881	1,205,513	1,199,528
Gross profit	116,058	152,808	182,649	216,408	220,381	224,353	236,763	257,784	263,152	269,137
Tax	40,620	53,483	63,927	75,743	77,133	78,524	82,867	90,224	92,103	94,198
Net profit	75,438	99,325	118,722	140,665	143,248	145,829	153,896	167,560	171,049	174,939
Accumulated undistributed profit	75,438	174,763	293,484.75	434,150	577,398	723,227	877,123	1,044,683	1,215,731	1,390,670

PROJECT PROFILE ON MANGO PROCESSING PLANT

ANNEX VII DEBT SERVICE SCHEDULE AND COMPUTATION PAYMENT OF EQUAL ANNUAL INSTALLMENTS

Table 21 Debt services schedule and computation

Item description	Project year									
	1	2	3	4	5	6	7	8	9	10
A. Investment and working capital										
1. Investment										
2. Increment working capital										
Total										
B. Loan receipts and balances										
1. Loan receipts	373,174	351,390	327,100	300,016	269,818	236,147	198,604	156,743	110,069	58,027
2. Outstanding balance at end of year	373,174	351,390	327,100	300,016	269,818	236,147	198,604	156,743	110,069	58,027
a. First year loan										
Total										
A. Debt service										
1. First year Loan										
a. Interest	42,915	40,410	37,616	34,502	31,029	27,157	22,839	18,026	12,658	6,673
b. Repayment of principal	21,784	24,290	27,084	30,198	33,671	37,543	41,861	46,674	52,042	51,354

PROJECT PROFILE ON MANGO PROCESSING PLANT

ANNEX VIII CASH-FLOW STATEMENT FOR FINANCIAL PLANING

Table 22 Projected Cash flow statement

Period	Start up				Full capacity					
	70%	80%	90%	100%	5	6	7	8	9	10
Project year	1	2	3	4	5	6	7	8	9	10
Item description										
A. Cash - inflow	1,639,453	1,202,224	1,350,808	1,496,815	1,468,665	1,468,665	1,468,665	1,468,665	1,468,665	1,468,665
1. Financial resource (total)	611,387	27,292	29,009	28,150						
2. Sales revenue	1,028,066	1,174,932	1,321,799	1,468,665	1,468,665	1,468,665	1,468,665	1,468,665	1,468,665	1,468,665
B. Cash – outflow	1,551,315	1,092,705	1,224,686	1,351,864	1,325,104	1,326,495	1,330,838	1,338,195	1,340,074	1,335,496
1. Total assets schedule including replacement	611,387	27,292	29,009	28,150						
2. Operating costs	834,609	947,230	1,067,050	1,183,271	1,183,271	1,183,271	1,183,271	1,183,271	1,183,271	1,183,271
3. Debt service (total)										
a. Interest	42,915	40,410	37,616	34,502	31,029	27,157	22,839	18,026	12,658	6,673
b. Repayment	21,784	24,290	27,084	30,198	33,671	37,543	41,861	46,674	52,042	51,354
4. Tax	40,620	53,483	63,927	75,743	77,133	78,524	82,867	90,224	92,103	94,198
C. Surplus (Deficit)	88,138	109,519	126,122	144,951	143,561	142,170	137,827	130,470	128,591	133,169
D. Cumulative cash balance	88,138	197,657	323,779	468,730	612,291	754,461	892,288	1,022,758	1,151,349	1,284,518

PROJECT PROFILE ON MANGO PROCESSING PLANT

ANNEX XII TOTAL INVESTMENT COSTS

Table 23 Total investment costs''000''

Period	Start up			Full capacity							
Project year	1	2	3	4	5	6	7	8	9	10	11
Investment Category											
1. Fixed investment costs											
a. Initial fixed investment costs	402,743										
b. Replacement											
2. Pre-operational capital expenditure	2,000										
3. Working capital increase	128,364	16,470	17,468	16,968							
Total investment costs	533,107	16,470	17,468	16,968							

ANNEX XIII TOTAL ASSETS

Table 24 Total Assets

Period	Start up			Full capacity								
Project year	1	2	3	4	5	6	7	8	9	10	11	12
Investment Category												
1. Fixed investment costs												
c. Initial fixed investment costs	402,743											
❖ Cost of land												
d. Replacement												
2. Pre-operational capital expenditure	2,000											
3. Current assets increase	206,644	27,292	29,009	28,150								
Total assets	611,387	27,292	29,009	28,150								

PROJECT PROFILE ON MANGO PROCESSING PLANT

ANNEX XIV SOURCES OF FINANCE

Table 25 Sources of finance

Period	Start up			Full capacity							
	1	2	3	4	5	6	7	8	9	10	Total
Project year											
Sources of finance											
1. Equity capital	159,932	16,470	17,468	16,968							
2. Loan capital	373,175										
3. Current liabilities	78,280	10,822	11,541	11,182							
Total finance	611,387	27,292	29,009	28,150							

ANNEX XI SUMMARY OF FINANCIAL EFFECIENCY TESTS

Table 26 Summary of financial efficiency tests

Project year	Project year									
	1	2	3	4	5	6	7	8	9	10
Capacity utilization	70%	80%	90%	100%						
Financial ratio in %										
1. Gross profit : Revenue	11%	13%	14%	15%	15%	15%	16%	18%	18%	18%
2. Net profit : Revenue	11%	13%	14%	15%	15%	15%	16%	18%	18%	18%
3. Net profit : initial investment	14%	18%	21%	24%	25%	25%	26%	29%	29%	30%
4. Net profit : Equity	47%	56%	61%	67%	68%	69%	73%	79%	81%	83%
5. Gross profit : Initial investment	22%	28%	32%	37%	38%	38%	41%	44%	45%	46%
6. Operating costs : Revenue	81%	81%	81%	81%	81%	81%	81%	81%	81%	81%

PROJECT PROFILE ON MANGO PROCESSING PLANT

ANNEX XV CALCULATIONS OF PAYBACK PERIOD

Table 27 Calculation of payback period”000”

Year	Amount Paid Back			Total investment	End of year
	Net Profit	Depreciation	Total		
1	75,438	34,484	109,922	533,107	-423,185
2	99,325	34,484	133,809	16,470	-305,846
3	118,722	34,484	153,206	17,468	-153,206
4	140,665	34,484	175,149	16,968	-11,927
5	145,248	33,984	179,232	0.00	167,305

PROJECT PROFILE ON MANGO PROCESSING PLANT

ANNEX XVI CALCULATIONS OF NET PRESENT VALUE AT 17% D.F.

Table 28 Calculation of NPV at 17% D.F.

Project year	Gross Revenue	1/(1+i) ⁿ At 17%	Present value at 17%	Project costs			
				Total investment	Operating costs	Total	Present value at 17%
1	1,028,066	0.854701	878,689	533,107	834,609	1,367,716	1,168,988
2	1,174,932	0.730514	858,304	16,470	947,230	963,700	703,996
3	1,321,799	0.624371	825,293	17,468	1,067,050	1,084,518	677,142
4	1,468,665	0.53365	783,753	16,968	1,183,271	1,200,239	640,508
5	1,468,665	0.456111	669,874		1,183,271	1,183,271	539,703
6	1,468,665	0.389839	572,543		1,183,271	1,183,271	461,285
7	1,468,665	0.333195	489,352		1,183,271	1,183,271	394,260
8	1,468,665	0.284782	418,249		1,183,271	1,183,271	336,974
9	1,468,665	0.243404	357,479		1,183,271	1,183,271	288,013
10	1,468,665	0.208037	305,537		1,183,271	1,183,271	246,164
Total			6,159,073				5,457,033

A. Benefit- cost ratio At 17% D.F. = 1.12

B. NPV At 17% D.F. = 724,040,000Birr