

73. PROFILE ON THE PRODUCTION OF STARCH

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I. SUMMARY

This profile envisages the establishment of a plant for the production of starch with a capacity of 600 tons per annum. Starch is used as food and has also industrial uses.

The demand for starch is essentially satisfied through imports. The present (2012) demand for starch is estimated at 400 tons. The demand for starch is projected to reach 644 tons and 1,018 tons by the year 2017 and 2022, respectively.

The principal raw material required by the envisaged plant maize, which is locally available, and sulphur dioxide from import.

The total investment cost of the project including working capital is estimated at Birr 23.98 million. From the total investment cost, the highest share (Birr 20.18 million or 84.18%) is accounted by fixed investment cost followed by pre operation cost (Birr 2.29 million or 9.56 %) and initial working capital (Birr 1.49 million or 6.25%). From the total investment cost Birr 11.25 million or 46.69% is required in foreign currency.

The project is financially viable with an internal rate of return (IRR) of 19.26% and a net present value (NPV) of Birr 9.99 million, discounted at 10%.

The project can create employment for 26 persons. The establishment of such factory will have a foreign exchange saving effect to the country by substituting the current imports. The project will also create backward linkage with the agricultural sector and forward linkage with the foods and drinks, textile, paper, printing, adhesives; pharmaceuticals sub sectors and also generate income for the Government in terms of payroll tax.

II. PRODUCT DESCRIPTION AND APPLICATION

Starch is a source of carbohydrate, which is one of the three essential elements of food. It widely occurs in agricultural products, mainly in cereals (such as wheat, maize and rice), and in roots and tubers of potatoes, Sweet potatoes, and Cassava. Maize (Corn) is the leading source of starch both for food and for its use in industries.

The largest single use of for corn starch is as food, about 25% thus consumed. Industrial uses account for the remaining 75%. The paper industry utilizes corn starch as filler and sizing material. Textile, Laundry, foundry, air flotation, oil-well drilling, and adhesives use much starch. Much of it is employed in its natural form, but it is also easily converted to other forms. Glucose, for example, is one of the varieties which can be prepared from starch. Dextrin is the other reaction product which can be made from starch and could be used as adhesive in many industries such as paper printing.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

Starch has both domestic and industrial uses. Industrially, its applications are numerous and are used in various modern industries including the manufacturing of various foods and drinks, textile, paper, printing, adhesives, pharmaceuticals, and such derivatives as dextrin and nitro starch.

The source of supply of starch is local as well as import. However, starch production in the country is insignificant. Currently there is only one privately owned starch production plant from *Enset* so that the demand for the product is essentially satisfied through imports.

Ethiopia imports starches made of different types of crops, which include wheat, maize (corn), potato, manioc (cassava) and others. Of the different types of starches imported in the past 12 years about 89% is the share of maize (corn) starch. Table 3.1 presents the total imported quantity and value of the different types of starches in the past 12 years covering the period 2000 – 2011.

Table 3.1
IMPORT OF STARCH

Year	Qty (Tons)	Value ('000 Birr)
2000	32.2	154.0
2001	386.7	1,503.1
2002	77.3	370.0
2003	457.4	1,964.4
2004	299.1	1431.0
2005	3354.8	14,301.3
2006	310.6	1,603.3
2007	245.6	1,633.0
2008	23,719.6	141,087.8
2009	368.9	2,928.8
2010	460.4	4,884.0
2011	310.5	3,469.2

Source: - Ethiopian Revenues and Customs Authority.

As could be seen from Table 3.1, import of starch was fluctuating from year to year although the general trend is to some extent increasing. During the initial year of the data set, i.e. year 2000, the volume of import was only 32.2 tons, which is the lowest in the past 12 years. But in the following year (2001) it suddenly jumped to 386.7 tons, which is an increase of by twelve fold. Again, it abruptly declined to a very low level of 77.3 tons in the year 2002. The trend continued in a similar way as the preceding years and the imported quantity increased to 457.4 tons and declined to 299.1 tons during the years 2003 and 2004, respectively.

A huge amount of import was registered during 2005, which amounts to 3,354.8 tons. Compared to the total amount of imported quantity in the previous five years (2000-2004), which was

1252.7 tons, year 2005 import alone is higher by more than 2.6 times. By the years 2006 and 2007 the annual average level of import was about 280 tons. The erratic nature of the data has again reflected in the imported quantity of year 2008, which stood at exceptionally high figure of 23,719.6 tons. During the last recent three years (2009-2011) the very high erratic nature of the data has somewhat stabilized and the imported quantity ranged from the lowest 301.5 tone to the highest 460.4 tons with a mean figure of 378 tons.

In the absence of a clear trend in the data set and the existence of outliers, such as the years 2005 and 2008, the present demand is estimated by considering the recent three years average of the imported quantity, which had a relatively smoothed data. Accordingly, the present demand for starch is estimated at 400 tons.

2. Demand Projection

The factors that affect the demand for starch mainly include population growth and industrial development of the country; specifically the food and beverage, textiles, paper and printing, pharmaceuticals and other health and beauty products and adhesives. Hence, by considering the due attention given to the industrial sector in the economic development of the country a conservative annual average growth rate of 10% is taken in forecasting the future demand for starch (see Table 3.2).

As could be seen from Table 3.2, the demand for starch will increase from 440 tons in the year 2013 to 695 tons and 1,120 tons by the years 2018 and 2023, respectively. Since the past supply trend reveals maize (corn) starch to be the highly demanded type the project should concentrate in producing maize starch.

Table 3.2**PROJECTED DEMAND FOR STARCH (TONS)**

Year	Projected demand
2013	440
2014	484
2015	532
2016	586
2017	644
2018	695
2019	765
2020	841
2021	925
2022	1,018
2023	1,120

3. Pricing and Distribution

Based on year 2011 CIF value of imported starch and considering other costs related to import ,a factory- gate price of Birr 18,516 per ton is recommended for sales revenue projection and financial evaluation.

Starch is mainly used as an ingredient in various industrial establishments of the manufacturing sector. Hence, as an industrial input the appropriate channel of distribution is direct sale to the end user industries.

B. PLANT CAPACITY AND PRODUCTION PROGRAM

1. Plant Capacity

Based on the market study, period required for implementation and full capacity attainment, and minimum economies of scale, the envisaged plant is proposed to produce 600 tons of starch per year, in 300 working days and operating in three shifts of 8 hrs each per day. At full capacity operation the plant will also produce 300 tons of gluten (animal feed) as a by product.

2. Production Program

The plant starts operation at 70% of its full capacity operation and progressively grow to 85% and full capacity operation in the second and third year and then after, respectively. The production programme is shown in Table 3.3.

Table 3.3
PRODUCTION PROGRAM

Year	1	2	3-10
Capacity utilisation (%)	70	85	100
Production of starch (tons)	420	520	600
Gluten-animal feed(tons)	210	255	300

IV. MATERIALS AND INPUTS

A. RAW MATERIALS

The major raw materials required for the production of starch are maize, which is locally available, and sulphur dioxide from import. The total annual cost of raw materials is estimated at Birr 4,632,000. The annual material requirement of the plant is shown in Table 4.1.

Table 4.1
ANNUAL RAW MATERIAL REQUIREMENT & COST

Sr.No.	Item	Qty.	Cost in '000 Birr		
			FC	LC	TC
1	Maize(tons)	900	-	4,500	4,500
2	Sulfur dioxide(kg)	600	12	-	12
3	Packing Materials (Polypropylene sacks-50kg)	12,000	12	120	120
	Total Cost		12	4,620	4,632

B. UTILITIES

Utilities such as oil, water and electricity are required by the plant. The total annual cost of utilities is estimated at Birr 713,760. The annual consumption is shown in Table 4.2 below.

Table 4.2
ANNUAL CONSUMPTION OF UTILITIES

Sr. No.	Utility	UOM	Annual Consumption	Cost (Birr)
	Fuel oil	lt	25,000	372,000
	Water	m ³	30,000	300,000
	Electricity	kWh	72,000	41,760
	Total			713,760

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Production Process

The basic process of starch production involves the following steps:

Soaking & preliminary grinding of maize: Starch quantity and quality depends to a large extent on correct maize soaking. The soaking process is carried out by exposing the maize to a sulphur dioxide solution of 0.25-0.30% at a temperature of 52-58 degrees C for a period of 55-70 hours depending on the raw material quality, on the principle of countercurrent. Certain Physico-chemical and microbiological changes occur during soaking. The bonds between the separate components of the maize kernel are weakened, facilitating their separation. The preliminary grinding of the soaked maize is intended to free the germ and for its ensuing separation, and is carried out in special disintegrator disk mills. Following the initial crude grinding of the maize, the freed germ is separated from the hull, bran and starch in special hydro cyclones.

Separation, washing, dehydration: The separation of the germ and its washing with the aid of hydro cyclones and special arc screens is carried out consecutively in three stages under minimal loss of starch.

Drying of Maize Germ - The washed germ is strained in arc screens dehydrated in a worm press and dried in a special drier to 8% moisture contents. After separation of the germ, the maize kernel is finely ground in a special mill of the Condux type. End product yields depend largely on the fineness of grinding. The ground material contains, starch, as well as gluten and cellulose bran.

Fine Grinding, separation, Washing & Dehydration of Bran: The bran is separated and washed on the principle of countercurrent with a battery of arc screens. The washed bran is dehydrated in a non-stop worm press. The chosen scheme ensures effective washing, whereby the content of free starch in the bran is reduced to nil. The freed bran, mixed with gluten condensed in the vacuum filter, is dried in a special drier to 14% moisture and used in the preparation of poultry and animal feed.

Separation & Refining of Starch Milk: In order to ensure a constant and high quality of starch, suitable for the production of glucose, modified starches, etc. the raw starch suspension is refined. Refinement includes concentration of the starch milk to a suitable concentration for dehydration, separation of the undissolved admixtures (gluten and fibers) and the washing of starch with clean water.

Separation is carried out consecutively in three stages on the principle of countercurrent whereby some 70% of the protein is separate. The separated protein suspension (Gluten) is fed to a gluten concentrator for condensation to about 12- 14% dry substance and 65-72% pure protein content, and is used in animal & poultry feed formulation.

Dehydration Drying & Packing of Starch: The dried maize starch is high quality trade product satisfying international market demands. The dried maize starch is pneumatically transported to a collective hopper in a suitable room. A semiautomatic packing installation is used for packing the trade product. During condensation of the soaked maize extraction water with a highly productive vacuum evaporating installation a trade product is obtained which is rich in proteins and inorganic salts. It is used as valuable raw material in the production of antibiotics and as fodder.

2. Environmental Impact Assessment

The only adverse impact associated with the production of starch from corn is sulfur dioxide emission. This can be controlled by selecting a seamless technology. The other by products to be produced by this process such as gluten, fiber and ash are used as animal feed and does not have an adverse impact on environment.

B. ENGINEERING**1. Machinery and Equipment**

The list of machinery and equipment required by the plant is given in Table 5.1. The total cost of this machinery and equipment is estimated at about Birr 15,000,000, out of which Birr 11,250,000 will be required in foreign currency.

Table 5.1
LIST OF MACHINERY AND EQUIPMENT

Sr. No.	Item	Qty.
1	Bend Screen	1
2	Mill Degerunator	1
3	Bend Screen for germ	1
4	Feed Separator	1
5	Bend Screen	1
6	Mill	1
7	Feed Separator	1
8	Bend Screen	1
9	Fine Mill	1
10	Fine Bend Screen	1
11	Auto Brush Strainer for Starch Separator	1
12	Starch Separator	3
13	Middling Separator	2
14	Corn Feed Conveyor	1
15	Shifter	1
16	Feed Conveyor for scale tank	1
17	Scale Tank	1

Sr. No.	Item	Qty.
18	Screw Feeder	1
19	Screw Conveyor for steep tank	1
20	Steep tank	1
21	Shute for steeping maize	1
22	Stand Catcher	1
23	Service tank for No. 1 Mill	1
24	Receive tank for No. 1 Mill	1
25	Receive tank for starch milk and gluten liquid	1
26	Germ Separator	1
27	Dehydrator for feed	1
28	Dryer for Feed	1
29	Air Compressor	1
30	Flotation system	1
31	Service Tank for starch separator	1
32	Floation System	1
33	Gluten Settler	1
34	Dehydrator for Starch	1
35	Dryer for starch	1
36	Steam Boiler	1
37	Gyro Shifter	1
38	Bucket Conveyor for packer	1
39	Packing machine for product starch	1
40	Agitator for tank	1
41	SO ₂ Plant Sulphur Furnace	1
42	SO ₂ storage Tank	1

2. Land, Building and Civil Works

The total land requirement including sewers, storage, open spaces etc. is estimated to be 1,500 m². The major buildings and civil works include buildings for production, offices, workshops and warehouses. The total built up area required is about 1,000 m². Total construction cost is estimated at Birr 4 million.

According to the Federal Legislation on the Lease Holding of Urban Land (Proclamation No 721/2004) in principle, urban land permit by lease is on auction or negotiation basis, however, the time and condition of applying the proclamation shall be determined by the concerned regional or city government depending on the level of development.

The legislation has also set the maximum on lease period and the payment of lease prices. The lease period ranges from 99 years for education, cultural research health, sport, NGO , religious and residential area to 80 years for industry and 70 years for trade while the lease payment period ranges from 10 years to 60 years based on the towns grade and type of investment.

Moreover, advance payment of lease based on the type of investment ranges from 5% to 10%.The lease price is payable after the grace period annually. For those that pay the entire amount of the lease will receive 0.5% discount from the total lease value and those that pay in installments will be charged interest based on the prevailing interest rate of banks. Moreover, based on the type of investment, two to seven years grace period shall also be provided.

However, the Federal Legislation on the Lease Holding of Urban Land apart from setting the maximum has conferred on regional and city governments the power to issue regulations on the exact terms based on the development level of each region.

In Addis Ababa, the City's Land Administration and Development Authority is directly responsible in dealing with matters concerning land. However, regarding the manufacturing sector, industrial zone preparation is one of the strategic intervention measures adopted by the

City Administration for the promotion of the sector and all manufacturing projects are assumed to be located in the developed industrial zones.

Regarding land allocation of industrial zones if the land requirement of the project is below 5,000 m², the land lease request is evaluated and decided upon by the Industrial Zone Development and Coordination Committee of the City's Investment Authority. However, if the land request is above 5,000 m², the request is evaluated by the City's Investment Authority and passed with recommendation to the Land Development and Administration Authority for decision, while the lease price is the same for both cases.

Moreover, the Addis Ababa City Administration has recently adopted a new land lease floor price for plots in the city. The new prices will be used as a benchmark for plots that are going to be auctioned by the city government or transferred under the new "Urban Lands Lease Holding Proclamation."

The new regulation classified the city into three zones. The first Zone is Central Market District Zone, which is classified in five levels and the floor land lease price ranges from Birr 1,686 to Birr 894 per m². The rate for Central Market District Zone will be applicable in most areas of the city that are considered to be main business areas that entertain high level of business activities.

The second zone, Transitional Zone, will also have five levels and the floor land lease price ranges from Birr 1,035 to Birr 555 per m². This zone includes places that are surrounding the city and are occupied by mainly residential units and industries.

The last and the third zone, Expansion Zone, is classified into four levels and covers areas that are considered to be in the outskirts of the city, where the city is expected to expand in the future. The floor land lease price in the Expansion Zone ranges from Birr 355 to Birr 191 per m² (see Table 5.2).

Table 5.2**NEW LAND LEASE FLOOR PRICE FOR PLOTS IN ADDIS ABABA**

Zone	Level	Floor Price/m²
Central Market District	1 st	1686
	2 nd	1535
	3 rd	1323
	4 th	1085
	5 th	894
Transitional zone	1 st	1035
	2 nd	935
	3 rd	809
	4 th	685
	5 th	555
Expansion zone	1 st	355
	2 nd	299
	3 rd	217
	4 th	191

Accordingly, in order to estimate the land lease cost of the project profiles it is assumed that all new manufacturing projects will be located in industrial zones located in expansion zones. Therefore, for the profile a land lease rate of Birr 266 per m² which is equivalent to the average floor price of plots located in expansion zone is adopted.

On the other hand, some of the investment incentives arranged by the Addis Ababa City Administration on lease payment for industrial projects are granting longer grace period and extending the lease payment period. The criteria are creation of job opportunity, foreign exchange saving, investment capital and land utilization tendency etc. Accordingly, Table 5.3 shows incentives for lease payment.

Table 5.3**INCENTIVES FOR LEASE PAYMENT OF INDUSTRIAL PROJECTS**

Scored Point	Grace Period	Payment Completion Period	Down Payment
Above 75%	5 Years	30 Years	10%
From 50 - 75%	5 Years	28 Years	10%
From 25 - 49%	4 Years	25 Years	10%

For the purpose of this project profile, the average i.e. five years grace period, 28 years payment completion period and 10% down payment is used. The land lease period for industry is 60 years.

Accordingly, the total land lease cost at a rate of Birr 266 per m² is estimated at Birr 399,000 of which 10% or Birr 39,900 will be paid in advance. The remaining Birr 359,100 will be paid in equal installments with in 28 years i.e. Birr 12,825 annually.

VI. HUMAN RESOURCE AND TRAINING REQUIREMENT

A. HUMAN RESOURCE REQUIREMENT

The plant will employ a total of 26 persons. The total annual cost of labour is estimated at Birr 979,500. The human resource requirement of the plant and the monthly and annual salary expenditure are shown in Table 6.1.

Table 6.1**REQUIRED HUMAN RESOURCE AND LABOR COST (BIRR)**

Sr. No.	Manpower	No. of Persons	Monthly Salary	Annual Cost
1	General Manager	1	8,000	96,000
2	Secretary	1	1,500	18,000
3	Technical Manager	1	5,000	60,000
4	Personnel	1	3,000	36,000
5	Production Head	1	5000	60,000
6	Supervisor	1	3,000	36,000
7	Chemist	1	2,500	30,000
8	Skilled operators	5	7,500	90,000
9	Semi-skilled Operators	5	5,000	60,000
10	Maintenance crew	3	3,600	43,200
11	Accountant	1	4,000	48,000
12	Sales and purchasing officer	1	2,000	24,000
13	General service workers	4	2,400	28,800
	Sub -total	26		
	Employees benefit (25% of		13,125	157,500
	Total		65,625	787,500

B. TRAINING REQUIREMENT

The technical personnel of the plant should be trained by qualified engineers of the machinery supplier. The cost of training shall be Birr 75,000.

VII. FINANCIAL ANALYSIS

The financial analysis of the starch 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	10%

Discount cash flow	10%
Accounts receivable	30 days
Raw material local	30 days
Raw material imported	120 days
Work in progress	1 day
Finished products	30 days
Cash in hand	5 days
Accounts payable	30 days
Repair and maintenance	5% of machinery cost

A. TOTAL INITIAL INVESTMENT COST

The total investment cost of the project including working capital is estimated at Birr 23.98 million (see Table 7.1). From the total investment cost, the highest share (Birr 20.18 million or 84.18%) is accounted by fixed investment cost followed by pre operation cost (Birr 2.29 million or 9.56 %) and initial working capital (Birr 1.49 million or 6.25%). From the total investment cost Birr 11.25 million or 46.69% is required in foreign currency.

Table 7.1**INITIAL INVESTMENT COST ('000 Birr)**

Sr. No.	Cost Items	Local Cost	Foreign Cost	Total Cost	% Share
1	Fixed investment				
1.1	Land Lease	39.90		39.90	0.17
1.2	Building and civil work	4,000.00		4,000.00	16.68
1.3	Machinery and equipment	3,750.00	11,250.00	15,000.00	62.54
1.4	Vehicles	900.00		900.00	3.75
1.5	Office furniture and equipment	250.00		250.00	1.04
	Sub -total	8,939.90	11,250.00	20,189.90	84.18
2	Pre operating cost *				
2.1	Pre operating cost	725.00		725.00	3.02
2.2	Interest during construction	1,569.04		1,569.04	6.54
	Sub -total	2,294.04		2,294.04	9.56
3	Working capital **	1,499.98		1,499.98	6.25
	Grand Total	12,733.93	11,250.00	23,983.93	100

* *N.B Pre operating cost include project implementation cost such as installation, startup, commissioning, project engineering, project management etc and capitalized interest during construction.*

** *The total working capital required at full capacity operation is Birr 1.66 million. However, only the initial working capital of Birr 1.49 million during the first year of production is assumed to be funded through external sources. During the remaining years the working capital requirement will be financed by funds to be generated internally (for detail working capital requirement see Appendix 7.A.1).*

B. PRODUCTION COST

The annual production cost at full operation capacity is estimated at Birr 12.16 million (see Table 7.2). The cost of raw material account for 38.06 % of the production cost. The other major components of the production cost are depreciation, financial cost and utility which account for 28.84%, 14.18% and 5.86%, respectively. The remaining 13.05% is the share of labor, marketing and distribution,, repair and maintenance, labor overhead and administration cost. For detail production cost see Appendix 7.A.2.

Table 7.2**ANNUAL PRODUCTION COST AT FULL CAPACITY (YEAR THREE)**

Items	Cost (in 000 Birr)	%
Raw Material and Inputs	4,632.00	38.06
Utilities	713.00	5.86
Maintenance and repair	450.00	3.70
Labor direct	630.00	5.18
Labor overheads	158.00	1.30
Administration Costs	100.00	0.82
Land lease cost	-	-
Cost of marketing and distribution	250.00	2.05
Total Operating Costs	6,933.00	56.97
Depreciation	3,510.00	28.84
Cost of Finance	1,725.95	14.18
Total Production Cost	12,168.95	100

C. FINANCIAL EVALUATION**1. Profitability**

Based on the projected profit and loss statement, the project will generate a profit through out its operation life. Annual net profit after tax will grow from Birr 437 thousand to Birr 3.83 million during the life of the project. Moreover, at the end of the project life the accumulated net cash flow amounts to Birr 28.39 million. For profit and loss statement and cash flow projection see Appendix 7.A.3 and 7.A.4, respectively.

2. Ratios

In financial analysis, financial ratios and efficiency ratios are used as an index or yardstick for evaluating the financial position of a firm. It is also an indicator for the strength and weakness of the firm or a project. Using the year-end balance sheet figures and other relevant data, the most important ratios such as return on sales which is computed by dividing net income by revenue,

return on assets (operating income divided by assets), return on equity (net profit divided by equity) and return on total investment (net profit plus interest divided by total investment) has been carried out over the period of the project life and all the results are found to be satisfactory.

3. Break-even Analysis

The break-even analysis establishes a relationship between operation costs and revenues. It indicates the level at which costs and revenue are in equilibrium. To this end, the break-even point for capacity utilization and sales value estimated by using income statement projection are computed as followed.

$$\text{Break- Even Sales Value} = \frac{\text{Fixed Cost} + \text{Financial Cost}}{\text{Variable Margin ratio (\%)}} = \text{Birr } 8,002,460$$

$$\text{Break -Even Capacity utilization} = \frac{\text{Break- even Sales Value}}{\text{Sales revenue}} \times 100 = 64\%$$

4. Pay-back Period

The pay -back period, also called pay- off period is defined as the period required for recovering the original investment outlay through the accumulated net cash flows earned by the project. Accordingly, based on the projected cash flow it is estimated that the project's initial investment will be fully recovered within 5 years.

5. Internal Rate of Return

The internal rate of return (IRR) is the annualized effective compounded return rate that can be earned on the invested capital, i.e., the yield on the investment. Put another way, the internal rate of return for an investment is the discount rate that makes the net present value of the investment's income stream total to zero. It is an indicator of the efficiency or quality of an investment. A project is a good investment proposition if its IRR is greater than the rate of return that could be earned by alternate investments or putting the money in a bank account. Accordingly, the IRR of this project is computed to be 19.26% indicating the viability of the project.

6. Net Present Value

Net present value (NPV) is defined as the total present (discounted) value of a time series of cash flows. NPV aggregates cash flows that occur during different periods of time during the life of a project in to a common measuring unit i.e. present value. It is a standard method for using the time value of money to appraise long-term projects. NPV is an indicator of how much value an investment or project adds to the capital invested. In principle, a project is accepted if the NPV is non-negative.

Accordingly, the net present value of the project at 10% discount rate is found to be Birr 9.99 million which is acceptable. For detail discounted cash flow see Appendix 7.A.5.

D. ECONOMIC AND SOCIAL BENEFITS

The project can create employment for 26 persons. The project will generate Birr 8.14 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. The project will also create forward linkage with the foods and drinks, textile, paper, printing, adhesives; pharmaceuticals sub sectors and also generate income for the Government in terms of payroll tax.

Appendix 7.A

FINANCIAL ANALYSES SUPPORTING TABLES

Appendix 7.A.2
PRODUCTION COST (in 000 Birr)

Item	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Raw Material and Inputs	4,169	4,632	4,632	4,632	4,632	4,632	4,632	4,632	4,632	4,632
Utilities	642	713	713	713	713	713	713	713	713	713
Maintenance and repair	405	450	450	450	450	450	450	450	450	450
Labour direct	567	630	630	630	630	630	630	630	630	630
Labour overheads	142	158	158	158	158	158	158	158	158	158
Administration Costs	90	100	100	100	100	100	100	100	100	100
Land lease cost	0	0	0	0	13	13	13	13	13	13
Cost of marketing and distribution	250	250	250	250	250	250	250	250	250	250
Total Operating Costs	6,265	6,933	6,933	6,933	6,946	6,946	6,946	6,946	6,946	6,946
Depreciation	3,510	3,510	3,510	3,510	3,510	185	185	185	185	185
Cost of Finance	0	1,726	1,510	1,294	1,079	863	647	431	216	0
Total Production Cost	9,775	12,169	11,953	11,737	11,535	7,994	7,778	7,562	7,347	7,131

Appendix 7.A.3
INCOME STATEMENT (in 000 Birr)

Item	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Sales revenue	11,345	12,606	12,606	12,606	12,606	12,606	12,606	12,606	12,606	12,606
Less variable costs	6,015	6,683	6,683	6,683	6,683	6,683	6,683	6,683	6,683	6,683
VARIABLE MARGIN	5,330	5,923	5,923	5,923	5,923	5,923	5,923	5,923	5,923	5,923
in % of sales revenue	46.98	46.99	46.99	46.99	46.99	46.99	46.99	46.99	46.99	46.99
Less fixed costs	3,760	3,760	3,760	3,760	3,773	448	448	448	448	448
OPERATIONAL MARGIN	1,570	2,163	2,163	2,163	2,150	5,475	5,475	5,475	5,475	5,475
in % of sales revenue	13.84	17.16	17.16	17.16	17.06	43.43	43.43	43.43	43.43	43.43
Financial costs		1,726	1,510	1,294	1,079	863	647	431	216	0
GROSS PROFIT	1,570	437	653	869	1,071	4,612	4,828	5,044	5,259	5,475
in % of sales revenue	13.84	3.47	5.18	6.89	8.50	36.59	38.30	40.01	41.72	43.43
Income (corporate) tax	0	0	0	261	321	1,384	1,448	1,513	1,578	1,643
NET PROFIT	1,570	437	653	608	750	3,229	3,380	3,531	3,682	3,833
in % of sales revenue	13.84	3.47	5.18	4.82	5.95	25.61	26.81	28.01	29.21	30.40

Appendix 7.A.4**CASH FLOW FOR FINANCIAL MANAGEMENT (in 000 Birr)**

Item	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Scrap
TOTAL CASH INFLOW	20,915	14,495	12,615	12,606	12,606	12,606	12,606	12,606	12,606	12,606	12,606	5,675
Inflow funds	20,915	3,150	9	0	0	0	0	0	0	0	0	0
Inflow operation	0	11,345	12,606	12,606	12,606	12,606	12,606	12,606	12,606	12,606	12,606	0
Other income	0	0	0	0	0	0	0	0	0	0	0	5,675
TOTAL CASH OUTFLOW	20,915	9,415	10,990	10,601	10,645	10,505	11,350	11,199	11,048	10,897	8,588	0
Increase in fixed assets	20,915	0	0	0	0	0	0	0	0	0	0	0
Increase in current assets	0	1,581	173	0	0	1	0	0	0	0	0	0
Operating costs	0	6,015	6,683	6,683	6,683	6,696	6,696	6,696	6,696	6,696	6,696	0
Marketing and Distribution cost	0	250	250	250	250	250	250	250	250	250	250	0
Income tax	0	0	0	0	261	321	1,384	1,448	1,513	1,578	1,643	0
Financial costs	0	1,569	1,726	1,510	1,294	1,079	863	647	431	216	0	0
Loan repayment	0	0	2,157	2,157	2,157	2,157	2,157	2,157	2,157	2,157	0	0
SURPLUS (DEFICIT)	0	5,080	1,625	2,005	1,961	2,101	1,256	1,407	1,558	1,709	4,018	5,675
CUMULATIVE CASH BALANCE	0	5,080	6,706	8,711	10,671	12,773	14,029	15,436	16,994	18,703	22,721	28,396

Appendix 7.A.5**DISCOUNTED CASH FLOW (in 000 Birr)**

Item	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Scrap
TOTAL CASH INFLOW	0	11,345	12,606	12,606	12,606	12,606	12,606	12,606	12,606	12,606	12,606	5,675
Inflow operation	0	11,345	12,606	12,606	12,606	12,606	12,606	12,606	12,606	12,606	12,606	0
Other income	0	0	0	0	0	0	0	0	0	0	0	5,675
TOTAL CASH OUTFLOW	22,415	6,429	6,933	6,933	7,195	7,267	8,329	8,394	8,459	8,524	8,588	0
Increase in fixed assets	20,915	0	0	0	0	0	0	0	0	0	0	0
Increase in net working capital	1,500	164	0	0	1	0	0	0	0	0	0	0
Operating costs	0	6,015	6,683	6,683	6,683	6,696	6,696	6,696	6,696	6,696	6,696	0
Marketing and Distribution cost	0	250	250	250	250	250	250	250	250	250	250	0
Income (corporate) tax		0	0	0	261	321	1,384	1,448	1,513	1,578	1,643	0
NET CASH FLOW	-22,415	4,916	5,673	5,673	5,411	5,339	4,277	4,212	4,147	4,082	4,018	5,675
CUMULATIVE NET CASH FLOW	-22,415	17,499	-11,826	-6,153	-742	4,597	8,874	13,085	17,232	21,315	25,332	31,007
Net present value	-22,415	4,469	4,688	4,262	3,696	3,315	2,414	2,161	1,935	1,731	1,549	2,188
Cumulative net present value	-22,415	17,946	-13,257	-8,995	-5,299	-1,984	430	2,591	4,526	6,257	7,806	9,994

NET PRESENT VALUE 9,994
INTERNAL RATE OF RETURN 19.26%
NORMAL PAYBACK 5 years