

**109. PROFILE ON THE PRODUCTION OF SHEET
GLASS**

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I. SUMMARY

This profile envisages the establishment of a plant for the production of sheet glass with a capacity of 15,000 tons per annum. The product is widely applicable in building construction for doors and windows as well as for furniture, show cases, green houses mirrors and the like.

The demand for sheet glass is met through domestic production and import. The present (2012) unsatisfied demand for sheet glass is estimated at 23,815 tons. The demand for sheet glass is projected to reach 38,354 tons and 61,770 tons by the year 2017 and 2022, respectively.

The principal raw materials required are sand, soda ash, limestone, dolomite, cullet and additives. All the materials are available locally except additives which have to be imported.

The total investment cost of the project including working capital is estimated at Birr 286.66 million. From the total investment cost, the highest share (Birr 251.27 million or 87.66%) is accounted by fixed investment cost followed by pre operation cost (Birr 30.94 million or 10.80%) and initial working capital (Birr 4.43 million or 1.55%). From the total investment cost, Birr 193.41 million or 67.47% is required in foreign currency.

The project is financially viable with an internal rate of return (IRR) of 29.16% and a net present value (NPV) of Birr 256.13 million, discounted at 10%.

The project can create employment for 107 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 forward linkage with the construction and furniture sub sectors and also income for the Government in terms of tax revenue and payroll tax.

II. PRODUCT DESCRIPTION AND APPLICATION

A sheet glass is a rigid, brittle, transparent material which is produced by fusing it mainly with silica, lime and soda ash. It can be produced in a wide range of sizes with a thickness of 2 to 12 mm. The profile envisages production of sheet glass of thickness 3mm - 6mm in different proportion. The product is widely applicable in construction, particularly in building construction for doors and windows as well as for furniture, show cases, green houses mirrors and the like.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

The country's requirement of sheet glass until recently was entirely met through import. However, Chinese investors have established a sheet glass manufacturing plant named Ethiopia Hansom International Glass PLC in year 2007. However, there is no available data on the production level of the new plant. Therefore, for estimating the demand for the product the unsatisfied demand i.e. the demand which is met through import is considered.

Ethiopia imports a variety of sheet glass for use in the construction sector and furniture manufacture. The types of sheet glasses imported include colored throughout the mass (body tinted), non-wired and wired un-worked sheets of cast/rolled glass and plain clear sheet glass. The quantity of sheet glass imported during the period 2002-2011 is given in Table 3.1

Table 3.1
IMPORT OF SHEET GLASS (IN TONS)

Year	Import
2002	5,362
2003	8,257
2004	11,217
2005	8,096
2006	12,721
2007	14,869
2008	16,673
2009	17,766
2010	11,897
2011	19,711

Source: - Ethiopian Revenues & Customs Authority.

As could be observed from Table 3.1, import of sheet glass exhibits a substantial growth especially during the recent six years i.e. 2006 – 2011 where except for the year 2010 import has registered a consistent year to year growth reaching an all time high of the period under consideration (19,711 tons) in 2011. During the period 2002 – 2011 import of the product has registered an average annual growth rate of 20.82%.

To determine the present unsatisfied demand for sheet glass, it is assumed that the annual average growth rate registered by import of the product during the period 2002-2011 will continue at least in the near future. Accordingly, taking the 2011 level of import as a base and applying a growth rate of 20.82%, the present (2012) unsatisfied demand for sheet glass is estimated at 23,815 tons.

2. Demand Projection

The demand for sheet glass is directly related with the growth in the construction sector in general and the housing construction sub sector in particular which in turn depends on the overall economic development of the country.

The contribution of the construction sector to the GDP during the period 2001 – 2010 have been growing at annual average growth rate of 13 percent which is above the average annual growth rate of real GDP during the period under consideration (11.4 %), indicating a rise in the share of the construction sector within the overall economy.

According to the GTP, during the period 2010/11 – 2014/15 the real GDP of the country (at a base case scenario) is expected to grow at an average annual growth rate of 11.2%. Moreover, during the same period the annual average planned targets of growth for the construction sector is 20%.

Accordingly, by considering the above factors the demand for sheet glass is conservatively assumed to grow at a rate of 10%. Accordingly, projected unsatisfied demand is presented in Table 3.2.

Table 3.2**PROJECTED UNSATISFIED DEMAND FOR SHEET GLASS (IN TONS)**

Year	Projected Demand
2013	26,196
2014	28,816
2015	31,698
2016	34,867
2017	38,354
2018	42,189
2019	46,408
2020	51,049
2021	56,154
2022	61,770

2. Pricing and Distribution

The CIF price of imported sheet glass in 2011 was Birr 7,775 per ton. Adding 30% for duty and other import related expenses Birr 10,107 per ton is the recommended factory -gate price for the envisaged project.

The product will find its market outlet through the existing building materials distributing enterprises throughout the country.

B. PLANT CAPACITY AND PRODUCTION PROGRAM**1. Plant Capacity**

The recommended plant capacity is 15,000 tons operating twenty-four hours per day, working for 300 working days. The working days have been estimated by subtracting routine maintenance from calendar days of the year. The process cannot be interrupted once started as stopping and restarting the operation will be extremely expensive.

2. Production Program

The production program is set in away that the plant will attain 70% of its capacity in the first year, 85% in the second year, 90% in the third year and full capacity beginning from the fourth year.

The gradual increase in production is planned because of the complexity of technology which will require considerable amount of time for the operators to grasp the skill.

IV. MATERIALS AND INPUTS

A. RAW MATERIALS

Even though there are so many different glass compositions, the average composition for sheet glasses is as follows:-

- Sand 64%
- Lime stone 7%
- Soda Ash 14%
- Dolomite 14%
- Other refining, colouring and decolorizing chemicals 1%.

During processing of this product, cullet (broken glass) of similar composition is added in the range of 30 to 50% to facilitate the melting process. The annual consumption of raw materials is summarized in Table 4.1. The major auxiliary materials are packing materials. As the products are rigid and brittle, appropriate packing materials which are usually wooden pallets are required.

Table 4.1**ANNUAL CONSUMPTION OF RAW MATERIALS AND AUXILIARY MATERIALS**

Sr. No.	Description	Annual Consumption	Cost in '000 Birr		
			F.C	L.C	T.C
1	Sand	10,800 t	-	4,860	4,860
2	Soda Ash	2,400 t	-	4,212	4,212
3	Limestone	L,200 t	-	722	722
4	Dolomite	2,400 t	1,800	360	2,160
5	Cullet	3,300 t	-	1,485	1,485
6	Additives	150 t	559.875	112	672
Total			2,359.875	11,750	14,110

B. UTILITIES

Utilities required by the project are furnace oil (heavy fuel oil), electricity, compressed air, and potable and industrial water. The annual requirement of utilities and the corresponding cost are given in Table 4.2.

Table 4.2**ANNUAL UTILITIES CONSUMPTION AND COST**

Sr. No.	Description	Annual Consumption	Cost in '000 Birr		
			F.C	L.C	T.C
1	Furnace oil (tonnes)	825	-	11,550	11,550
2	Electric Energy (kWh)	5,000,000	-	2,900	2,900
3	Water (m3)	15,000	-	150	150
	Total		-	14,600	14,600

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Production Process

The ordinary sheet glass is produced by the vertical drawing method. The procedure is as follows.

The major ingredients, from their storage bins, are proportioned by the adjustable automatic weigher and fed to the batch mixer. The small ingredients are dosed on the belt conveyor which feed the ingredients to the batch mixer. The mixed batch from the storage bin is fed to the furnace via a belt conveyor with the batch distributor so that it can be distributed uniformly in the furnace. There it melts and the molten glass is homogenized as it slowly flows through the regaining vessel, and then its viscosity gradually drops. This molten glass is drawn vertically from the furnace through a so called "debiteuse" by means of a drawing machine.

The glass is continuously drawn upward in ribbon form and its' surface is chilled by adjacent water coils. Then it passes through the annealing chamber. After cooling down completely it is cut to required size and packed in appropriate way.

2. Environmental Impact

The environmental impact associated with glass manufacturing is related to emission and waste water. Glass manufacturing is a high-temperature, energy-intensive activity, resulting in the emission of combustion by-products (sulphur dioxide, carbon dioxide, and nitrogen oxides) and the high-temperature oxidation of atmospheric nitrogen. Furnace emissions also contain particulate matter (PM) and may contain some levels of metals. The method used to control emission levels include reducing the amount of fine particles in a batch by humidification with water or with alkali solutions (for example, sodium hydroxide, [NaOH], sodium carbonate [Na₂CO₃]) or by presintering, briquetting or palletizing.

The most significant water use occurs during cooling and cullet cleaning. Aqueous emissions will consist of contact cooling water system purges, cleaning waters, and surface water runoff. Closed-

water process systems should be used to minimize losses. Amounts of liquid effluents discharged from glass manufacturing are marginal in comparison with other industrial sectors and are limited to particular processes (e.g. hot gob quenching and water-cooled shears). Discharges may be affected by glass solids, some soluble glass-making materials (e.g. Sodium sulphate), some organic compounds caused by lubricant oil used in the cutting process, and treatment chemicals (e.g. dissolved salts and water treatment chemicals) for the cooling-water system.

Techniques for treating industrial process wastewater include oil water separators, flow and load equalization with pH adjustment; screening and sedimentation for suspended solids reduction using settling basins or clarifiers, multimedia filtration for reduction in non-settle-able suspended solids, dewatering and disposal of residuals in landfills or if hazardous in designated hazardous waste disposal sites.

Accordingly, the cost of waste water treatment system is included in the cost of machinery and equipment.

B. ENGINEERING

1. Machinery and Equipment

The total cost of machinery and equipment is estimated at Birr 233.88 million of which Birr 193.4 million is required in foreign currency. The required machinery and corresponding costs are provided in Table 5.1 below.

Table 5.1**LIST OF MACHINERY AND EQUIPMENT & COST**

Sr.	Description	Cost in '000 Birr		
		F.C	L.C	T.C
1	Sand preparation and refining unit	5,480	1087.5	6,567.5
2	Storage and mix preparation	16,291.50	3,258	19,549.5
	2.1 Storage bins			
	2.2 Automatic batch dozer			
	2.3 Batch mixer			
	2.4 Batch feeder			
	2.5 Batch distributor			
3	Melting furnace and utilities	63,354	12,672	76,026.0
4	Cooling system	18,100.50	3,621	21,721.5
5	Finishing line	19,911	3,981	23,892.0
	5.1 Dibiteuse and draw bar			
	5.2 Drawing machine			
	5.3 Automatic Cutler			
	5.4 Lay down machine			
	5.5 Annealing chamber			
6	Compressor station	3,619.50	724.5	4,344.0
7	Central control panel	27,151	5,430	32,581.0
8	Handling facilities	26224.5	5,245.50	31,470.0
9	Waste treatment unit	450.50	215.00	665.5
10	Transformer station	5,533.50	1107	6,640.5
11	Erection	7,295.50	3,127	10,422.5
	Grand Total	193,411.50	40,468.50	233,880

2. Land, Building and Civil Works

For the construction of such a plant, an estimated land area of 15,000 square meters is required of which the building covers a total floor area of 3,000 square meters. Enough open space has been assumed for bulky raw material storage and ease of material movement during operation and possible future expansion. The total cost of building and civil work at the rate of Birr 5,000 per m² is estimated at Birr 15 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 3,990,000 of which 10% or Birr 399,000 will be paid in advance. The remaining Birr 3,591,000 will be paid in equal installments with in 28 years i.e. Birr 128,250 annually.

VI. HUMAN RESOURCE AND TRAINING REQUIREMENTS

A. HUMAN RESOURCE REQUIREMENT

The total human resource requirement for sheet glass processing plant is 107 persons. Annual cost of labour is estimated at Birr 2,838,000. The details of human resource by job type and monthly and annual salary is given in Table 6.1.

Table 6.1**HUMAN RESOURCE REQUIREMENT AND COST(BIRR)**

Position	Reqd.No.	Salary Per Month	Salary Per Year
A. Plant Management			
1. Plant Manger	1	8,000	96,000
2. Secretary	1	2,500	30,000
B. Production Staff			
1. Production manager	1	6,000	72,000
2. Production clerk	1	1,250	15,000
3. Process engineer	3	4,000	144,000
4. Shift leader	3	2,600	93,600
5. Control room attendant	6	1,650	118,800
6. Operators	9	1,350	145,800
7. Production inspectors	6	1,650	118,800
8. Packers	6	1,050	75,600
9. Labourers	24	750	216,000
C. Maintenance & Laboratory			
1. Maintenance & Utility Manager	1	4,500	54,000
2. Quality Manger	1	4,500	54,000
3. Quality Controller	9	2,500	270,000
4. Mechanic	6	2,500	180,000
5. Electrician	6	2,500	180,000
6. Instrument technician	3	1,650	59,400
D. Others			
1. Head for finance & admin	1	4,500	54,000
2. Marketing Manager	1	4,500	54,000
2. Personnel Officer	1	2,500	30,000
3. Accountant	1	2,500	30,000
4. Cashier	1	1,650	19,800
5. Purchaser & transistor	1	1,650	19,800
6. Sales man	1	1,650	19,800
7. Stores' clerk	1	850	10,200
8. Time Keeper	3	800	28,800
9. Security guard	6	750	54,000
10. Messenger/cleaner	3	750	27,000
Benefits (25% of Basic Salary)			567,600
Total	107		2,838,000

B. TRAINING REQUIREMENT

All other production personnel shall be trained for processing technique and operation of machinery and equipment of their respective work areas during the commissioning period of the plant. The cost of such training is estimated at Birr 500,000.

VII. FINANCIAL ANALYSIS

The financial analysis of the sheet glass 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	5 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 286.66 million (see Table 7.1). From the total investment cost, the highest share (Birr 251.27 million or 87.66%) is accounted by fixed investment cost followed by pre operation cost (Birr 30.94 million or 10.80%) and initial working capital (Birr 4.43 million or 1.55%). From the total investment cost, Birr 193.41 million or 67.47% 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	399.00		399.00	0.14
1.2	Building and civil work	15,000.00		15,000.00	5.23
1.3	Machinery and equipment	40,468.50	193,411.50	233,880.00	81.59
1.4	Vehicles	1,500.00		1,500.00	0.52
1.5	Office furniture and equipment	500.00		500.00	0.17
	Sub -total	57,867.50	193,411.50	251,279.00	87.66
2	Pre operating cost *				
2.1	Pre operating cost	12,194.00		12,194.00	4.25
2.2	Interest during construction	18,753.61		18,753.61	6.54
	Sub- total	30,947.61		30,947.61	10.80
3	Working capital **	4,435.75		4,435.75	1.55
	Grand Total	93,250.87	193,411.50	286,662.37	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 6.31 million. However, only the initial working capital of Birr 4.43 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 110.37 million (see Table 7.2). The cost of depreciation account for 45.45% of the production cost. The other major components of the production cost are financial cost, utility, and raw material cost which account for 14.02%, 13.23% and 12.78%, respectively. The remaining 14.52% is the share of labor, labor overhead, repair and maintenance and administration cost. For detail production cost see Appendix 7.A.2.

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

Items	Cost (000 Birr)	%
Raw Material and Inputs	14,110.00	12.78
Utilities	14,600.00	13.23
Maintenance and repair	11,694.00	10.59
Labor direct	2,270.40	2.06
Labor overheads	567.60	0.51
Administration Costs	500.00	0.45
Land lease cost	-	-
Cost of marketing and distribution	1,000.00	0.91
Total Operating Costs	44,742.00	40.54
Depreciation	50,164.80	45.45
Cost of Finance	15,471.73	14.02
Total Production Cost	110,378.53	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 20.71 million to Birr 73.13 million during the life of the project. Moreover, at the end of the project life the accumulated net cash flow amounts to Birr 555.41 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.

$$\text{Break- Even Sales Value} = \frac{\text{Fixed Cost} + \text{Financial Cost}}{\text{Variable Margin ratio (\%)}} = \text{Birr } 72,227,221$$

$$\text{Break- Even Capacity utilization} = \frac{\text{Break -even Sales Value}}{\text{Sales revenue}} \times 100 = 48\%$$

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 3 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 29.16% 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 256.13 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 107 persons. The project will generate Birr 173.49 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 construction and furniture sub sectors and also generates other income for the Government.

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	9,877	11,288	12,699	14,110	14,110	14,110	14,110	14,110	14,110	14,110
Utilities	10,220	11,680	13,140	14,600	14,600	14,600	14,600	14,600	14,600	14,600
Maintenance and repair	8,186	9,355	10,525	11,694	11,694	11,694	11,694	11,694	11,694	11,694
Labour direct	1,589	1,816	2,043	2,270	2,270	2,270	2,270	2,270	2,270	2,270
Labour overheads	397	454	511	568	568	568	568	568	568	568
Administration Costs	350	400	450	500	500	500	500	500	500	500
Land lease cost	0	0	0	0	128	128	128	128	128	128
Cost of marketing and distribution	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Total Operating Costs	31,619	35,994	40,368	44,742	44,870	44,870	44,870	44,870	44,870	44,870
Depreciation	50,165	50,165	50,165	50,165	50,165	650	650	650	650	650
Cost of Finance	0	20,629	18,050	15,472	12,893	10,314	7,736	5,157	2,579	0
Total Production Cost	81,784	106,787	108,583	110,379	107,928	55,835	53,256	50,677	48,099	45,520

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	105,000	127,500	135,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Less variable costs	30,619	34,994	39,368	43,742	43,742	43,742	43,742	43,742	43,742	43,742
VARIABLE MARGIN	74,381	92,506	95,632	106,258	106,258	106,258	106,258	106,258	106,258	106,258
in % of sales revenue	70.84	72.55	70.84	70.84	70.84	70.84	70.84	70.84	70.84	70.84
Less fixed costs	51,165	51,165	51,165	51,165	51,293	1,778	1,778	1,778	1,778	1,778
OPERATIONAL MARGIN	23,216	41,342	44,467	55,093	54,965	104,480	104,480	104,480	104,480	104,480
in % of sales revenue	22.11	32.42	32.94	36.73	36.64	69.65	69.65	69.65	69.65	69.65
Financial costs		20,629	18,050	15,472	12,893	10,314	7,736	5,157	2,579	0
GROSS PROFIT	23,216	20,713	26,417	39,621	42,072	94,165	96,744	99,323	101,901	104,480
in % of sales revenue	22.11	16.25	19.57	26.41	28.05	62.78	64.50	66.22	67.93	69.65
Income (corporate) tax	0	0	0	11,886	12,622	28,250	29,023	29,797	30,570	31,344
NET PROFIT	23,216	20,713	26,417	27,735	29,450	65,916	67,721	69,526	71,331	73,136
in % of sales revenue	22.11	16.25	19.57	18.49	19.63	43.94	45.15	46.35	47.55	48.76

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	263,473	129,004	127,616	135,116	150,000	150,000	150,000	150,000	150,000	150,000	150,000	34,466
Inflow funds	263,473	24,004	116	116	0	0	0	0	0	0	0	0
Inflow operation	0	105,000	127,500	135,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	0
Other income	0	0	0	0	0	0	0	0	0	0	0	34,466
TOTAL CASH OUTFLOW	263,473	55,623	83,147	84,943	98,625	96,184	109,221	107,415	105,610	103,805	76,214	0
Increase in fixed assets	263,473	0	0	0	0	0	0	0	0	0	0	0
Increase in current assets	0	5,250	738	738	738	12	0	0	0	0	0	0
Operating costs	0	30,619	34,994	39,368	43,742	43,870	43,870	43,870	43,870	43,870	43,870	0
Marketing and Distribution cost	0	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	0
Income tax	0	0	0	0	11,886	12,622	28,250	29,023	29,797	30,570	31,344	0
Financial costs	0	18,754	20,629	18,050	15,472	12,893	10,314	7,736	5,157	2,579	0	0
Loan repayment	0	0	25,786	25,786	25,786	25,786	25,786	25,786	25,786	25,786	0	0
SURPLUS (DEFICIT)	0	73,381	44,469	50,174	51,375	53,816	40,779	42,585	44,390	46,195	73,786	34,466
CUMULATIVE CASH BALANCE	0	73,381	117,850	168,024	219,399	273,216	313,995	356,580	400,969	447,164	520,950	555,416

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	105,000	127,500	135,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	34,466
Inflow operation	0	105,000	127,500	135,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	0
Other income	0	0	0	0	0	0	0	0	0	0	0	34,466
TOTAL CASH OUTFLOW	267,909	32,241	36,615	40,990	56,641	57,492	73,120	73,893	74,667	75,441	76,214	0
Increase in fixed assets	263,473	0	0	0	0	0	0	0	0	0	0	0
Increase in net working capital	4,436	622	622	622	12	0	0	0	0	0	0	0
Operating costs	0	30,619	34,994	39,368	43,742	43,870	43,870	43,870	43,870	43,870	43,870	0
Marketing and Distribution cost	0	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	0
Income (corporate) tax		0	0	0	11,886	12,622	28,250	29,023	29,797	30,570	31,344	0
NET CASH FLOW	-267,909	72,759	90,885	94,010	93,359	92,508	76,880	76,107	75,333	74,559	73,786	34,466
CUMULATIVE NET CASH FLOW	-267,909	-	-	-10,255	83,104	175,612	252,493	328,599	403,932	478,492	552,277	586,744
Net present value	-267,909	66,144	75,111	70,631	63,765	57,440	43,397	39,055	35,143	31,620	28,448	13,288
Cumulative net present value	-267,909	201,764	126,653	-56,022	7,744	65,184	108,581	147,636	182,779	214,400	242,847	256,135

NET PRESENT VALUE 256,135
INTERNAL RATE OF
RETURN 29.16%
NORMAL PAYBACK 3 years

