50. PROFILE ON THE PRODUCTION OF GLUCOSE

TABLE OF CONTENTS

I. SUMMARY

This profile envisages the establishment of a plant for the production of glucose with a capacity of 6,000 tons per annum. Glucose and glucose syrup are used in the manufacture of confectionery, caramel coloring, brewing and wine making, infant foods, canning and baking. It is also used as raw material in the paper and adhesives industry.

The country`s requirement of glucose is met through import**.** The present (2012) demand for glucose is estimated at 5,000 tons. The demand for the product is projected to reach 8,858 tones and 14,266 tons by the year 2018 and year 2023, respectively.

The principal raw materials required are starch, hydrochloric acid, soda ash and activated carbon. Starch is locally available while the other raw materials have to be imported.

The total investment cost of the project including working capital is estimated at Birr 118.25 million. From the total investment cost the highest share (Birr 92.08 million or 77.87%) is accounted by fixed investment cost followed by initial working capital (Birr 14.39 million or 12.17%) and pre operation cost (Birr 11.78 million or 9.97%). From the total investment cost Birr 60 million or 50.74% is required in foreign currency.

The project is financially viable with an internal rate of return (IRR) of 19.15% and a net present value (NPV) of Birr 52.56 million, discounted at 10%.

The project can create employment for 70 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 and backward linkage with the manufacturing sector and also generates income for the Government in terms of tax revenue and payroll tax.

II. PRODUCT DESCRIPTION AND APPLICATION

Glucose, also known as corn syrup or starch syrup, is a concentrated water solution of partially hydrolyzed starch. It contains dextrose, maltose and other higher oligosaccharides derived from starch by acid or enzyme hydrolysis. Glucose is the main type of sugar in the blood and is the major source of energy for the body's cells. As a primary energy source in the body, it requires no digestion and is often provided intravenously to persons in hospitals as a nutrient.

Glucose and glucose syrup have many uses, industrial as well as non industrial. The primary field of utilization is in the manufacture of confectionery, caramel coloring, brewing and wine making, infant foods, canning, baking and dairy factories and pharmaceutical products besides being used as humectants in tobacco and tanning industries. It is also used as raw material in the paper and adhesives industry.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

Glucose is widely employed in the food industry for sweetening and the health sector for treating patients. The current demand for glucose is met through import. Import data covering the years 2001-2011 is provided in Table 3.1.

Table 3.1

IMPORT OF GLUCOSE

Year	Qty. (Tons)	Value ('000 Birr)
2001	505.6	2,556
2002	794.1	2,755
2003	2,217.1	8,331
2004	3,079.1	10,576
2005	3,290.8	11,004
2006	8,705.2	13,194
2007	5,230.2	23,229
2008	6,034.5	30,965
2009	4,113.6	24,898
2010	4,296.3	31,217
2011	3,846.6	36,212

***Source**: - Ethiopian Revenues and Customs Authority.*

As could be seen from Table 3.1, the imported quantity during year 2001--2006 has been consistently increasing from year to year. The imported quantity which was 505.6 tons during year 2001 has increased to 794.1 tons and 2,217.1 tons by the years 2002 and 2003. By the years 2004 and 2005 the annual average has reached to 3,185 tons, which is an increase of 43.7% compared to year 2003.

The volume of import during year 2006 was exceptionally very high, which stood at 8,705.2 tons. Compared to the previous year of 2005 the imported quantity is higher than by 2.65 fold. However, during the period 2007-2011 the annual average quantity imported has declined to 4,722 tons. The trend which is observed with sharp increases of import in some years and a sudden decline in other years could be due to stock carry over from a period in which import was high to the following years.

Based on the trend observed in the past eleven years, the present demand for glucose is estimated at about 5,000 tons.

2. Demand Projection

Glucose in its different form is used as a constituent of foods, medicine, and other applications in the tanning and dyeing. Hence, the demand for glucose depends mainly on the growth of the manufacturing sector particularly the food and pharmaceuticals. Considering the growth of population and the increasing number of food and pharmaceutical manufacturing enterprises demand is projected by applying a 10% annual growth rate (see Table 3.2).

Table 3.2

PROJECTED DEMAND FOR GLUCOSE (TONS)

Year	Projected Demand
2013	5,500
2014	6,050
2015	6,655
2016	7,320
2017	8,052
2018	8,858
2019	9,743
2020	10,718
2021	11,790
2022	12,969
2023	14,266

The demand for glucose will increase from 5,500 tons in the year 2013 to 8,858 tones and 14,266 tons by the year 2018 and year 2023, respectively.

3. Pricing and Distribution

Based on the average CIF price of year 2011 obtained from the Ethiopian Revenues and Customs Authority and other charges, the ex-factory price is estimated at Birr 15,768 per ton.

A combination of both direct and indirect distribution channel is recommended for the product. Direct sale for those end users with bulk purchase and the use of distributors and retailers for other segments of the market is recommended as the appropriate channel of distribution.

B. PLANT CAPACITY AND PRODUCTION PROGRAM

1. Plant Capacity

Based on the market study and period required for project implementation and full capacity attainment, the envisaged plant will have annual production capacity of 6,000 tons. The plant will operate in a single shift of 8 hours a day, and for 300 days a year.

2. Production Program

Production will commence at 75%, and then will grow to 90% and 100% in the second year and third year and then after, respectively. Detail of the production program is shown in Table 3.3.

Table 3.3

PRODUCTION PROGRAM

Year	1	2	3-10
Capacity utilization (%)	75	90	100
Production (tons)	4,500	5,400	6,000

IV. MATERIALS AND INPUTS

A. RAW AND AUXILIARY MATERIALS

The major raw material used to produce glucose and glucose syrup is starch which can be obtained locally. Other raw materials required in small amount to produce Glucose and Glucose syrup are hydrochloric acid, soda ash and activated carbon. The total cost of raw material is estimated at Birr 56,190,000. Annual consumption of raw and auxiliary materials at full production capacity is given in Table 4.1

Table 4.1

RAW AND AUXILIARY MATERIALS REQUIREMENT AND COST

Sr.No.	Description	Qty.	Cost ['000 Birr]		
			LC	FC	TC
1	Starch [tons]	7,500	45,000	-	45,000
2	HCl (30%)[tons]	75	-	600	600
3	Soda ash[tons]	30	90	-	90
4	Activated carbon[tons]	150	-	4,500	4,500
5	Packing material, food grade 1kg bag[pcs]	6,000,000	-	6,000	6,000
	Grand Total		**45,090**	**11,100**	**56,190**

B. UTILITIES

Electricity, water and fuel oil are the utilities required by the envisaged plant. The total cost of utilities is estimated at Birr 3,506,600. Details of utilities are shown in Table 4.2.

Table 4.2

UTILITIES REQUIREMENT AND COST

Sr. No.	Description	Quantity	Unit Price (Birr)	Total Cost, Birr
1	Electricity (kWh)	650,000	0.58	377,000
2	Water (m^3)	60,000	10.00	600,000
3	Furnace oil (lt.)	170,000	14.88	2,529,600
	Grand Total			**3,506,600**

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Production process

Starch is converted into ordinary glucose and glucose syrup through a process called hydrolysis. In this process, the wet starch is mixed with a weak solution of hydrochloric acid and is heated under pressure. The hydrochloric acid and heat breakdown the starch molecules and convert them into a sugar. The hydrolysis can be interrupted at different key points to produce glucose syrup of varying sweetness. The longer the process is allowed to proceed, the sweeter the resulting syrup. This syrup is then filtered or otherwise clarified to remove any objectionable flavor or color by adding activated carbon. It is further refined and evaporated to reduce the amount of water. To produce a glucose syrup powder, the liquid glucose syrup is passed through a vacuum drum or spray dryer to remove 97% of the water. This produces a crystalline corn syrup powder. Then the final product is cooled and packed.

2. Environmental Impact Assessment

The production of glucose from starch does not use significant amount of chemicals except hydrochloric acid which is used in small amount. Hence, the impact on environment due to the production of glucose is negligible.

B. ENGINEERING

1. Machinery and Equipment

The total cost of machinery and equipment with the envisaged capacity is estimated at Birr 75 million, of which Birr 60 million is required in foreign currency. The list of machinery and equipment required by the envisaged plant is given in Table 5.1.

Table 5.1

LIST OF MACHINERY AND EQUIPMENT REQUIREMENT

Sr. No.	Description	Qty. (No.)
1	Hydrochloric acid tank	1
2	Blender/mixer(slurry preparation tank)	1
3	Hydrolysis tank(converter)	1
4	Wooden neutralization vat	1
5	Filter	1
6	Centrifuge	1
7	Vacuum dryer	1
8	Cooling tower	1
9	Baby boiler	**1**
10	Vessels and tanks	10
11	pumps	6

2. Land, Building and Civil Works

The total land requirement, including provision for open space is 5,000 m^2, of which 3,000 m^2 will be covered by building. Estimating unit building construction cost of Birr 5,000 per m^2, keeping into consideration the buildings will be constructed from EGA sheet roof, prefab steel wall and cement tile floor. The total cost of building will be Birr 15,000,000.

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 m^2 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 m^2 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 m^2. 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 m^2 .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 m^2 (see Table 5.2).

Table 5.2

NEW LAND LEASE FLOOR PRICE FOR PLOTS IN ADDIS ABABA

Zone	Level	Floor price/m^2
Central Market District	1st	1686
	2nd	1535
	3rd	1323
	4th	1085
	5th	894
Transitional zone	1st	1035
	2nd	935
	3rd	809
	4th	685
	5th	555
Expansion zone	1st	355
	2nd	299
	3rd	217
	4th	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 m^2 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 criterions 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 m^2 is estimated at Birr 1,330,000 of which 10% or Birr 133,000 will be paid in advance. The remaining Birr 1,197,000 will be paid in equal installments with in 28 years i.e. Birr 42,750 annually.

VI. HUMAN RESOURCE AND TRAINING REQUIREMENT

A. HUMAN RESOURCE REQUIREMENT

The plant requires 70 workers, and their annual expenditure, including fringe benefits, is estimated at Birr 1,746,000. For details see Table 6.1.

Table 6.1

HUMAN RESOURCE REQUIREMENT AND LABOR COST

Sr. No.	Description	Req. No.	Salary, Birr	
			Monthly	**Annual**
1	Plant manager	1	8,000	96,000
2	Secretary	1	2,500	30,000
3	Production and technical manager	1	6,000	72,000
4	Finance and administration manager	1	6,000	72,000
5	Commercial manager	1	6,000	72,000
6	Accountant	3	9,000	108,000
7	Purchaser	2	6,000	72,000
8	Sales man	2	6,000	72,000
9	Production supervisor	1	3,000	36,000
10	Mechanic	2	4,000	48,000
11	Electrician	2	4,000	48,000
12	Chemists	3	9,000	108,000
13	Operators	12	18,000	216,000
14	Assistant operator	12	10,800	129,600
14	laborers	9	5,400	64,800
15	personnel	1	2,000	24,000
16	Time keepers	2	1,800	21,600
17	Clerk	3	1,800	21,600
18	Store keeper	2	2,000	24,000
19	Driver	3	2,700	32,400
20	Guard	3	1,200	14,400
21	Cleaner	3	1,200	14,400
	Sub- total	**70**	**116,400**	**1,396,800**
	Employee benefit (25% BS)	-	29,100	349,200
	Total		**145,500**	**1,746,000**

B. TRAINING REQUIREMENT

The production operators will be trained on the operation and maintenance of machinery for about four weeks during commissioning by the expert of machinery supplier. The total cost of training is estimated at Birr 100,000.

VII. FINANCIAL ANALYSIS

The financial analysis of the glucose 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 118.25 million (see Table 7.1). From the total investment cost the highest share (Birr 92.08 million or 77.87%) is accounted by fixed investment cost followed by initial working capital (Birr 14.39 million or 12.17%) and pre operation cost (Birr 11.78 million or 9.97%). From the total investment cost Birr 60 million or 50.74% 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	133.00		133.00	0.11
1.2	Building and civil work	15,000.00		15,000.00	12.68
1.3	Machinery and equipment	15,000.00	60,000.00	75,000.00	63.42
1.4	Vehicles	1,500.00		1,500.00	1.27
1.5	Office furniture and equipment	450.00		450	0.38
	Sub- total	**32,083.00**	**60,000.00**	**92,083.00**	**77.87**
2	**Pre operating cost ***				
2.1	Pre operating cost	4,050.00		4,050.00	3.42
2.2	Interest during construction	7,736.61		7,736.61	6.54
	Sub -total	**11,786.61**		**11,786.61**	**9.97**
3	**Working capital****	**14,390.01**		**14,390.01**	**12.17**
	Grand Total	**58,259.62**	**60,000.00**	**118,259.62**	**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 19.47 million. However, only the initial working capital of Birr 14.39 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 88.64 million (see Table 7.2). The cost of raw material account for 63.39% of the production cost. The other major components of the production cost are depreciation, financial cost and utility which account for 18.90%, 8.40% and 3.96%, respectively. The remaining 5.35 % is the share of utility, 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	56,190.00	63.39
Utilities	3,506.60	3.96
Maintenance and repair	2,250.00	2.54
Labor direct	1,396.80	1.58
Labor overheads	349.20	0.39
Administration Costs	250.00	0.28
Land lease cost	-	-
Cost of marketing and distribution	500.00	0.56
Total Operating Costs	**64,442.60**	**72.70**
Depreciation	16,755.00	18.90
Cost of Finance	7,446.49	8.40
Total Production Cost	**88,644.09**	**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 ranges from Birr 1.79 million to Birr 20.60 million during the life of the project. Moreover, at the end of the project life the accumulated net cash flow amounts to Birr 152.61 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.

$$\text{Break- Even Sales Value} = \frac{\text{Fixed Cost + Financial Cost}}{\text{Variable Margin ratio (\%)}} = \text{Birr } 53{,}291{,}030$$

$$\text{Break - Even Capacity utilization} = \frac{\text{Break -even Sales Value}}{\text{Sales revenue}} \times 100 = 56\%$$

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 6 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 19.15 % 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 52.56 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 70 persons. The project will generate Birr 45.44 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 and backward linkage with the manufacturing sector and also generates income for the Government in terms of payroll tax.

Appendix 7.A

FINANCIAL ANALYSES SUPPORTING TABLES

Appendix 7.A.1
NET WORKING CAPITAL (in 000 Birr)

Items	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Total inventory	10,535.63	12,642.75	14,047.50	14,047.50	14,047.50	14,047.50	14,047.50	14,047.50	14,047.50	14,047.50
Accounts receivable	4,038.08	4,837.36	5,370.22	5,370.22	5,373.78	5,373.78	5,373.78	5,373.78	5,373.78	5,373.78
Cash-in-hand	44.23	53.08	58.97	58.97	59.57	59.57	59.57	59.57	59.57	59.57
CURRENT ASSETS	**14,617.93**	**17,533.19**	**19,476.69**	**19,476.69**	**19,480.85**	**19,480.85**	**19,480.85**	**19,480.85**	**19,480.85**	**19,480.85**
Accounts payable	227.93	273.51	303.90	303.90	303.90	303.90	303.90	303.90	303.90	303.90
CURRENT LIABILITIES	**227.93**	**273.51**	**303.90**	**303.90**	**303.90**	**303.90**	**303.90**	**303.90**	**303.90**	**303.90**
TOTAL WORKING CAPITAL	**14,390.01**	**17,259.68**	**19,172.79**	**19,172.79**	**19,176.95**	**19,176.95**	**19,176.95**	**19,176.95**	**19,176.95**	**19,176.95**

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	42,143	50,571	56,190	56,190	56,190	56,190	56,190	56,190	56,190	56,190
Utilities	2,630	3,156	3,507	3,507	3,507	3,507	3,507	3,507	3,507	3,507
Maintenance and repair	1,688	2,025	2,250	2,250	2,250	2,250	2,250	2,250	2,250	2,250
Labour direct	1,048	1,257	1,397	1,397	1,397	1,397	1,397	1,397	1,397	1,397
Labour overheads	262	314	349	349	349	349	349	349	349	349
Administration Costs	188	225	250	250	250	250	250	250	250	250
Land lease cost	0	0	0	0	43	43	43	43	43	43
Cost of marketing and distribution	500	500	500	500	500	500	500	500	500	500
Total Operating Costs	**48,457**	**58,048**	**64,443**	**64,443**	**64,485**	**64,485**	**64,485**	**64,485**	**64,485**	**64,485**
Depreciation	16,755	16,755	16,755	16,755	16,755	645	645	645	645	645
Cost of Finance	0	8,510	7,446	6,383	5,319	4,255	3,191	2,128	1,064	0
Total Production Cost	**65,212**	**83,314**	**88,644**	**87,580**	**86,559**	**69,385**	**68,322**	**67,258**	**66,194**	**65,130**

Appendix 7.A.3

INCOME STATEMENT (in 000 Birr)

Item	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Sales revenue	70,920	85,104	94,560	94,560	94,560	94,560	94,560	94,560	94,560	94,560
Less variable costs	47,957	57,548	63,943	63,943	63,943	63,943	63,943	63,943	63,943	63,943
VARIABLE MARGIN	**22,963**	**27,556**	**30,617**	**30,617**	**30,617**	**30,617**	**30,617**	**30,617**	**30,617**	**30,617**
in % of sales revenue	32.38	32.38	32.38	32.38	32.38	32.38	32.38	32.38	32.38	32.38
Less fixed costs	17,255	17,255	17,255	17,255	17,298	1,188	1,188	1,188	1,188	1,188
OPERATIONAL MARGIN	**5,708**	**10,301**	**13,362**	**13,362**	**13,320**	**29,430**	**29,430**	**29,430**	**29,430**	**29,430**
in % of sales revenue	8.05	12.10	14.13	14.13	14.09	31.12	31.12	31.12	31.12	31.12
Financial costs		8,510	7,446	6,383	5,319	4,255	3,191	2,128	1,064	0
GROSS PROFIT	**5,708**	**1,790**	**5,916**	**6,980**	**8,001**	**25,175**	**26,238**	**27,302**	**28,366**	**29,430**
in % of sales revenue	8.05	2.10	6.26	7.38	8.46	26.62	27.75	28.87	30.00	31.12
Income tax	0	0	0	2,094	2,400	7,552	7,871	8,191	8,510	8,829
NET PROFIT	**5,708**	**1,790**	**5,916**	**4,886**	**5,601**	**17,622**	**18,367**	**19,111**	**19,856**	**20,601**
in % of sales revenue	8.05	2.10	6.26	5.17	5.92	18.64	19.42	20.21	21.00	21.79

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	**96,133**	**93,275**	**85,150**	**94,590**	**94,560**	**94,560**	**94,560**	**94,560**	**94,560**	**94,560**	**94,560**	**36,047**
Inflow funds	96,133	22,355	46	30	0	0	0	0	0	0	0	0
Inflow operation	0	70,920	85,104	94,560	94,560	94,560	94,560	94,560	94,560	94,560	94,560	0
Other income	0	0	0	0	0	0	0	0	0	0	0	36,047
TOTAL CASH OUTFLOW	**96,133**	**70,811**	**80,112**	**84,470**	**83,557**	**82,846**	**86,931**	**86,186**	**85,441**	**84,697**	**73,314**	**0**
Increase in fixed assets	96,133	0	0	0	0	0	0	0	0	0	0	0
Increase in current assets	0	14,618	2,915	1,944	0	4	0	0	0	0	0	0
Operating costs	0	47,957	57,548	63,943	63,943	63,985	63,985	63,985	63,985	63,985	63,985	0
Marketing cost	0	500	500	500	500	500	500	500	500	500	500	0
Income tax	0	0	0	0	2,094	2,400	7,552	7,871	8,191	8,510	8,829	0
Financial costs	0	7,737	8,510	7,446	6,383	5,319	4,255	3,191	2,128	1,064	0	0
Loan repayment	0	0	10,638	10,638	10,638	10,638	10,638	10,638	10,638	10,638	0	0
SURPLUS (DEFICIT)	**0**	**22,463**	**5,038**	**10,120**	**11,003**	**11,714**	**7,629**	**8,374**	**9,119**	**9,863**	**21,246**	**36,047**
CUMULATIVE CASH BALANCE	**0**	**22,463**	**27,501**	**37,621**	**48,624**	**60,337**	**67,967**	**76,341**	**85,459**	**95,323**	**116,568**	**152,615**

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**	**70,920**	**85,104**	**94,560**	**94,560**	**94,560**	**94,560**	**94,560**	**94,560**	**94,560**	**94,560**	**36,047**
Inflow operation	0	70,920	85,104	94,560	94,560	94,560	94,560	94,560	94,560	94,560	94,560	0
Other income	0	0	0	0	0	0	0	0	0	0	0	36,047
TOTAL CASH OUTFLOW	**110,523**	**51,327**	**59,961**	**64,443**	**66,541**	**66,886**	**72,038**	**72,357**	**72,676**	**72,995**	**73,314**	**0**
Increase in fixed assets	96,133	0	0	0	0	0	0	0	0	0	0	0
Increase in net working capital	14,390	2,870	1,913	0	4	0	0	0	0	0	0	0
Operating costs	0	47,957	57,548	63,943	63,943	63,985	63,985	63,985	63,985	63,985	63,985	0
Marketing cost	0	500	500	500	500	500	500	500	500	500	500	0
Income tax		0	0	0	2,094	2,400	7,552	7,871	8,191	8,510	8,829	0
NET CASH FLOW	**-110,523**	**19,593**	**25,143**	**30,117**	**28,019**	**27,674**	**22,522**	**22,203**	**21,884**	**21,565**	**21,246**	**36,047**
CUMULATIVE NET CASH FLOW	**-110,523**	**-90,930**	**-65,787**	**-35,670**	**-7,650**	**20,024**	**42,546**	**64,750**	**86,634**	**108,198**	**129,444**	**165,491**
Net present value	-110,523	17,812	20,779	22,628	19,138	17,184	12,713	11,394	10,209	9,146	8,191	13,897
Cumulative net present value	-110,523	-92,711	-71,932	-49,304	-30,167	-12,983	-270	11,124	21,333	30,479	38,670	52,567

NET PRESENT VALUE	52,567
INTERNAL RATE OF RETURN	19.15%
PAYBACK	6 years