51. PROFILE ON THE PRODUCTION OF GLYCERIN

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I. SUMMARY

This profile envisages the establishment of a plant for the production of glycerin with a capacity of 1,500 tons of per annum. Glycerin currently has over 1,500 known uses in many different industries ranging from foods, pharmaceuticals, cosmetics, paints, explosives, polymer, printing, botanical extraction, drugs, adhesives, antifreeze, coatings, chemical and other industrial types of applications (technical grade glycerin).

Since there are no local producers of glycerin the demand for the product is entirely met through import. The present (2012) demand for the products is estimated at 921 tons per annum. The demand is projected to reach 1,818 tons and 3,204 tons by the year 2018 and 2023, respectively.

The principal raw material required is crude glycerine which has to be imported.

The total investment cost of the project including working capital is estimated at Birr 89.31 million. From the total investment cost, the highest share (Birr 79.27 million or 88.76 %) is accounted by fixed investment cost followed by pre operating cost (Birr 7.38 million or 8.27%) and initial working capital (Birr 2.65 million or 2.97%). From the total investment cost Birr 51 million or 57.10% is required in foreign currency.

The project is financially viable with an internal rate of return (IRR) of 22.93% and a net present value (NPV) of Birr 53.05 million, discounted at 10%.

The project can create employment for 88 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 manufacturing sector and also generates income for the Government in terms of tax revenue and payroll tax.

II. PRODUCT DESCRIPTION AND APPLICATION

Glycerin (Glycerol) is a simple polyol compound with a clear, odorless, viscous liquid and a naturally sweet taste. It is derived from both natural and petrochemical feed stocks. Glycerin occurs in combined form (triglycerides) in animal fats and vegetable oils and is obtained from these fats and oils during transesterification, such as in biodiesel production.

Glycerol has three hydroxyl groups that are responsible for its solubility in water and its hygroscopic nature. Glycerin currently has over 1,500 known uses in many different industries ranging from foods, pharmaceuticals, cosmetics, paints, explosives, polymer, printing, botanical extraction, drugs, adhesives, antifreeze, coatings, chemical and other industrial types of applications (technical grade glycerin).

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

Glycerol / glycerin as described above have various applications as an input in the manufacturing sector. To meet the requirement of the product the country imports a substantial amount each year. Import data covering the years 2000--2011 is provided in Table 3.1.

Table 3.1 reveals that the supply of glycerin had an increasing trend in the past twelve years although there were minor fluctuations. The average level of import which was 124 tons during the period 2000--2002 has increased to a yearly average of 291 tons and 416 tons during the period 2003--2005 and 2006--2008, respectively. Similarly, the yearly average import volume has increased to 801 tons during the period 2009--2011. The twelve years time series data indicates that on the average the imported quantity of the product has been doubling every three years.

Table 3.1

IMPORT OF GLYCERIN /GLYCEROL

Year	Qty (Tons)	Value ('000 Birr)
2000	57.3	664.6
2001	210.8	2,685.6
2002	103.8	1,138.8
2003	235.2	2,394.1
2004	299.4	3,422.9
2005	338.4	3,333.3
2006	390.4	3,518.1
2007	314.5	3,001.1
2008	544.3	8,145.4
2009	1,048.1	10,645.8
2010	431.8	5,626.2
2011	923.4	14,817.9

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

By taking the recent three years (2009--2011) average as the effective demand for the year 2011 and applying a 15% annual growth rate, which is much lower than the observed trend in the past, the present demand is estimated at 921 tons.

2. Demand Projection

Glycerol / glycerin applications are numerous as an input in the manufacturing sector. This means that its demand will grow parallel with development of the industrial sector of the country. As per the GTP the industrial sector is forecasted to grow by about 20%. To be

conservative an annual growth of 12% is applied to forecast the future demand for glycerin. The demand projection executed on the above methodology is presented in Table 3.2.

Table 3.2

PROJECTED DEMAND FOR GLYCERIN (TONS)

Year	Projected Demand
2013	1,032
2014	1,155
2015	1,294
2016	1,449
2017	1,623
2018	1,818
2019	2,036
2020	2,280
2021	2,554
2022	2,860
2023	3,204

The demand for glycerin will grow from 1,032 tons in the year 2013 to 1,818 tons and 3,204 tons by the year 2018 and 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 29,856 per ton.

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

B. PLANT CAPACITY AND PRODUCTION PROGRAM

1. Production Capacity

The demand for glycerin rises from 1,032 tons in the year 2013 to 3,204 tons in the year 2023. Taking two years of implementation period and four years for full capacity attainment, the envisaged plant is proposed to have a capacity of producing 1,500 tons of glycerin by working three shifts per day and 300 working days is a year. The working days are set by assuming provisions for maintenance and repair works.

2. Production Program

The plant is expected to start operation at 60% of its rated capacity in the first year and progressively increase to 75% , 85% and 100% of its rated capacity during the second, third and fourth year and then after of operation, respectively. Gradual capacity build up is envisaged considering the time required for skill development in operational and market penetration.

IV. MATERIAL AND INPUTS

A. RAW MATERIAL

The raw material required for the production of purified glycerine is crude glycerine which is 80% pure. Crude glycerine can come from many sources, including fat splitting (hydrolysis of fat), saponification (adding caustic soda to fat as part of the neutralization process), and transesterification (biodiesel).

The auxiliary raw material required by the envisaged project is packing material for finished product. The total annual cost of raw material is estimated at Birr 6,812,500. The annual requirement and cost of this raw material is given in Table 4.1.

Table 4.1

ANNUAL REQUIREMENT OF RAW MATERIAL AND COST

Sr.No.	Raw Material	Unit of Measure	Annual Consumption	Cost ('000 Birr)
1	Crude glycerine	Tons	2,000	4,000.0
2	Plastic jerican (240kg)	Pcs	6,250	2,812.5
	Total			**6,812.5**

B. UTILITIES

The utilities required for the production of glycerine are electricity, water and fuel oil. The total annual cost of utilities is estimated at Birr 13,541,400.

Table 4.3

ANNUAL UTILITIES REQUIREMENT AND THEIR RESPECTIVE COST

Sr.No.	Description	Unit of Measure	Quantity	Cost (Birr)
1	Electricity	kWh	750,000	435,000
2	Water	m^3	150,000	1,500,000
3	Fuel	Lt	780,000	11,606,400
	Total			**13,541,400**

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Production Process

The crude glycerin is about 80% pure still containing contaminants like soap, methanol and water. The envisaged plant will collect crude glycerin from biodiesel production plants as well as soap production plants for refining to 99.7% pure glycerin and market it.

The process of refining crude glycerin involves the removal of contaminants such as salts, un-reacted fats, matter organic non-glycerin (MONG), water, and other impurities.

In a typical refining system, glycerin is delivered to the crude still, evaporated, contacted with stripping steam throughout the column, and is recovered in the packed column section.

After being recovered from the crude still, the deodorizer further purifies the glycerin by removing unacceptable volatiles and also reduced the color. The purified product is cooled and passes through activated carbon beds, then through a polishing filter and cooler. Foots from the still are typically pumped to a foot still for additional glycerin recovery. Residue from the foots still, which typically include the salt, MONG, and other non-volatile materials, can be discharged as a feed additive containing 10 - 15% residual glycerin.

2. Environmental Impact

The plant shall be designed with a particular attention to its environmental impact and gives therefore gaseous effluents in an amount remarkably lower than what allowed by even the strictest standard and liquid effluents in very limited amount (about 10kg of liquid effluents per ton of product) and with very low COD values. So the adverse impact on environment due to the production of glycerin from crude glycerin can be controlled due to the selected technology.

B. ENGINEERING

1. Machinery and Equipment

The total cost of machinery and equipment is estimated at about Birr 68 million out of which about Birr 51 million will be required in foreign currency. The major machinery and equipment to be installed in the envisaged plant are listed in Table 5.1.

Table 5.1

LIST OF MACHINERY AND EQUIPMENT

Sr.No.	Item Description	Quantity
1	Deaerator	1
2	Heat exchanger	10
3	Circulation pump	1
4	Vaporization system	1 set
5	Rectification system	1 set
6	Pumps	4
7	Stripping system	1 set
8	Scrubber	1
9	Activated carbon bleacher	2

2. Land, Building and Civil Works

The total land requirement for the plant would be around 3,000 $m^{2,}$ out of which 2,000 m^2 will be built –up area for offices, store and production buildings. The cost of construction is estimated to be Birr 10,000,000.

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 798,000 of which 10% or Birr 79,800 will be paid in advance. The remaining Birr 718,200 will be paid in equal installments with in 28 years i.e. Birr 25,650 annually.

VI. HUMAN RESOURCE AND TRAINING REQUIREMENT

A. HUMAN RESOURCE REQUIREMENT

The total human resource requirement is 88. The total annual cost of human resource including fringe benefit is estimated at Birr 1,932,000. The annual and monthly salaries and wages are summarized in Table 6.1.

Table 6.1

HUMAN RESOURCE REQUIREMENT AND LABOUR COST (BIRR)

Sr. No.	Position	Required Number	Monthly Salary	Annual Cost
1	General Manager	1	8,000	96,000
2	Secretary	1	2,000	24,000
3	Production Manager	1	5,000	60,000
4	Administration and Finance Manager	1	5,000	60,000
5	Technical Manager	1	5,000	60,000
6	Accountants	2	6,000	72,000
7	Purchaser	2	6,000	72,000
8	Sales Person	1	3,000	36,000
9	Store Keeper	2	3,000	36,000
10	Cashier	1	1,000	12,000
11	Operators	20	30,000	360,000
12	Assistant Operators	20	20,000	240,000
13	Chemists	3	6,000	72,000
14	Mechanic	8	12,000	144,000
15	Electrician	8	12,000	144,000
16	Messenger and cleaner	4	1,200	14,400
17	Guards	12	3,600	43,200
	Total	**88**	**128,800**	**1,545,600**
	Employees benefit(25% of basic salary)		32,200	386,400
	Grand total		**161,000**	**1,932,000**

B. TRAINING REQUIREMENT

Training on the production process, quality control and operation and maintenance of machinery should be given by respective experts of machinery and equipment supplier for two months during erection and commissioning of the plant. The cost of training is included in the cost of machinery and equipment. Miscellaneous costs in relation to the training such as stationery; reception etc is estimated at Birr 30,000.

VII. FINANCIAL ANALYSIS

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

Construction period	1 year
Source of finance	30 % equity and 70% loan
Tax holidays	3 years
Bank interest	10%
Discount cash flow	10%
Accounts receivable	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	2% of machinery cost

A. TOTAL INITIAL INVESTMENT COST

The total investment cost of the project including working capital is estimated at Birr 89.31 million (see Table 7.1). From the total investment cost, the highest share (Birr 79.27 million or 88.76 %) is accounted by fixed investment cost followed by pre operating cost (Birr 7.38 million

or 8.27%) and initial working capital (Birr 2.65 million or 2.97%). From the total investment cost Birr 51 million or 57.10% 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	79.80		79.80	0.09
1.2	Building and civil work	10,000.00		10,000.00	11.20
1.3	Machinery and equipment	17,000.00	51,000.00	68,000.00	76.13
1.4	Vehicles	900.00		900.00	1.01
1.5	Office furniture and equipment	300.00		300.00	0.34
	Sub -total	**28,279.80**	**51,000.00**	**79,279.80**	**88.76**
2	**Pre operating cost ***				
2.1	Pre operating cost	1,540.00		1,540.00	1.72
2.2	Interest during construction	5,843.26		5,843.26	6.54
	Sub -total	**7,383.26**		**7,383.26**	**8.27**
3	**Working capital ****	**2,655.30**		**2,655.30**	**2.97**
	Grand Total	**38,318.36**	**51,000.00**	**89,318.36**	**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 3.53 million. However, only the initial working capital of Birr 2.65 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 44.38 million (see Table 7.2). The cost of raw material and utility account for 45.85% of the production cost. The other major components of the production cost are depreciation and financial cost which account for 32.71% and 12.67%, respectively. The remaining 8.77 % is the share of 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 four)

Items	Cost (in 000 Birr)	%
Raw Material and Inputs	6,812.50	15.35
Utilities	13,541.40	30.51
Maintenance and repair	1,360.00	3.06
Labor direct	1,545.60	3.48
Labor overheads	386.40	0.87
Administration Costs	250.00	0.56
Land lease cost	-	-
Cost of marketing and distribution	350.00	0.79
Total Operating Costs	**24,245.90**	**54.62**
Depreciation	14,518.00	32.71
Cost of Finance	5,624.13	12.67
Total Production Cost	**44,388.03**	**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 1.18 million to Birr 17.94 million during the life of the project. Moreover, at the end of the project life the accumulated net cash

flow amounts to Birr 131.25 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.

$$\text{Break- Even Sales Value} = \frac{\text{Fixed Cost + Financial Cost}}{\text{Variable Margin ratio (\%)}} = \text{Birr } 28{,}303{,}293$$

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

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 4 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 22.93% 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 53.05 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 88 persons. The project will generate Birr 40.33 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 manufacturing sector and also generates income for the city administration in terms of tax revenue and 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	1,277.34	1,447.66	1,703.13	1,703.13	1,703.13	1,703.13	1,703.13	1,703.13	1,703.13	1,703.13
Accounts receivable	1,522.66	1,721.79	2,020.49	2,020.49	2,022.63	2,022.63	2,022.63	2,022.63	2,022.63	2,022.63
Cash-in-hand	36.90	41.82	49.19	49.19	49.55	49.55	49.55	49.55	49.55	49.55
CURRENT ASSETS	**2,836.90**	**3,211.26**	**3,772.81**	**3,772.81**	**3,775.30**	**3,775.30**	**3,775.30**	**3,775.30**	**3,775.30**	**3,775.30**
Accounts payable	181.60	205.81	242.13	242.13	242.13	242.13	242.13	242.13	242.13	242.13
CURRENT LIABILITIES	**181.60**	**205.81**	**242.13**	**242.13**	**242.13**	**242.13**	**242.13**	**242.13**	**242.13**	**242.13**
TOTAL WORKING CAPITAL	**2,655.30**	**3,005.45**	**3,530.68**	**3,530.68**	**3,533.17**	**3,533.17**	**3,533.17**	**3,533.17**	**3,533.17**	**3,533.17**

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	5,109	5,791	6,813	6,813	6,813	6,813	6,813	6,813	6,813	6,813
Utilities	10,156	11,510	13,541	13,541	13,541	13,541	13,541	13,541	13,541	13,541
Maintenance and repair	1,020	1,156	1,360	1,360	1,360	1,360	1,360	1,360	1,360	1,360
Labour direct	1,159	1,314	1,546	1,546	1,546	1,546	1,546	1,546	1,546	1,546
Labour overheads	290	328	386	386	386	386	386	386	386	386
Administration Costs	188	213	250	250	250	250	250	250	250	250
Land lease cost	0	0	0	0	26	26	26	26	26	26
Cost of marketing and distribution	350	350	350	350	350	350	350	350	350	350
Total Operating Costs	**18,272**	**20,662**	**24,246**	**24,246**	**24,272**	**24,272**	**24,272**	**24,272**	**24,272**	**24,272**
Depreciation	14,518	14,518	14,518	14,518	14,518	430	430	430	430	430
Cost of Finance	0	6,428	5,624	4,821	4,017	3,214	2,410	1,607	803	0
Total Production Cost	**32,790**	**41,607**	**44,388**	**43,585**	**42,807**	**27,915**	**27,112**	**26,308**	**25,505**	**24,702**

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	37,755	42,789	50,340	50,340	50,340	50,340	50,340	50,340	50,340	50,340
Less variable costs	17,922	20,312	23,896	23,896	23,896	23,896	23,896	23,896	23,896	23,896
VARIABLE MARGIN	**19,833**	**22,477**	**26,444**	**26,444**	**26,444**	**26,444**	**26,444**	**26,444**	**26,444**	**26,444**
in % of sales revenue	52.53	52.53	52.53	52.53	52.53	52.53	52.53	52.53	52.53	52.53
Less fixed costs	14,868	14,868	14,868	14,868	14,894	806	806	806	806	806
OPERATIONAL MARGIN	**4,965**	**7,609**	**11,576**	**11,576**	**11,550**	**25,638**	**25,638**	**25,638**	**25,638**	**25,638**
in % of sales revenue	13.15	17.78	23.00	23.00	22.94	50.93	50.93	50.93	50.93	50.93
Financial costs		6,428	5,624	4,821	4,017	3,214	2,410	1,607	803	0
GROSS PROFIT	**4,965**	**1,182**	**5,952**	**6,755**	**7,533**	**22,425**	**23,228**	**24,032**	**24,835**	**25,638**
in % of sales revenue	13.15	2.76	11.82	13.42	14.96	44.55	46.14	47.74	49.33	50.93
Income tax	0	0	0	2,027	2,260	6,727	6,968	7,209	7,451	7,692
NET PROFIT	**4,965**	**1,182**	**5,952**	**4,729**	**5,273**	**15,697**	**16,260**	**16,822**	**17,385**	**17,947**
in % of sales revenue	13.15	2.76	11.82	9.39	10.48	31.18	32.30	33.42	34.53	35.65

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	**80,820**	**46,435**	**42,813**	**50,376**	**50,340**	**50,340**	**50,340**	**50,340**	**50,340**	**50,340**	**50,340**	**15,456**
Inflow funds	80,820	8,680	24	36	0	0	0	0	0	0	0	0
Inflow operation	0	37,755	42,789	50,340	50,340	50,340	50,340	50,340	50,340	50,340	50,340	0
Other income	0	0	0	0	0	0	0	0	0	0	0	15,456
TOTAL CASH OUTFLOW	**80,820**	**26,952**	**35,498**	**38,466**	**39,128**	**38,586**	**42,247**	**41,685**	**41,122**	**40,560**	**31,963**	**0**
Increase in fixed assets	80,820	0	0	0	0	0	0	0	0	0	0	0
Increase in current assets	0	2,837	374	562	0	2	0	0	0	0	0	0
Operating costs	0	17,922	20,312	23,896	23,896	23,922	23,922	23,922	23,922	23,922	23,922	0
Marketing cost	0	350	350	350	350	350	350	350	350	350	350	0
Income tax	0	0	0	0	2,027	2,260	6,727	6,968	7,209	7,451	7,692	0
Financial costs	0	5,843	6,428	5,624	4,821	4,017	3,214	2,410	1,607	803	0	0
Loan repayment	0	0	8,034	8,034	8,034	8,034	8,034	8,034	8,034	8,034	0	0
SURPLUS (DEFICIT)	**0**	**19,483**	**7,315**	**11,910**	**11,212**	**11,754**	**8,093**	**8,655**	**9,218**	**9,780**	**18,377**	**15,456**
CUMULATIVE CASH BALANCE	**0**	**19,483**	**26,798**	**38,709**	**49,921**	**61,675**	**69,768**	**78,423**	**87,641**	**97,421**	**115,798**	**131,254**

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**	**37,755**	**42,789**	**50,340**	**50,340**	**50,340**	**50,340**	**50,340**	**50,340**	**50,340**	**50,340**	**15,456**
Inflow operation	0	37,755	42,789	50,340	50,340	50,340	50,340	50,340	50,340	50,340	50,340	0
Other income	0	0	0	0	0	0	0	0	0	0	0	15,456
TOTAL CASH OUTFLOW	**83,475**	**18,622**	**21,187**	**24,246**	**26,275**	**26,532**	**30,999**	**31,240**	**31,481**	**31,722**	**31,963**	**0**
Increase in fixed assets	80,820	0	0	0	0	0	0	0	0	0	0	0
Increase in net working capital	2,655	350	525	0	2	0	0	0	0	0	0	0
Operating costs	0	17,922	20,312	23,896	23,896	23,922	23,922	23,922	23,922	23,922	23,922	0
Marketing cost	0	350	350	350	350	350	350	350	350	350	350	0
Income tax		0	0	0	2,027	2,260	6,727	6,968	7,209	7,451	7,692	0
NET CASH FLOW	**-83,475**	**19,133**	**21,602**	**26,094**	**24,065**	**23,808**	**19,341**	**19,100**	**18,859**	**18,618**	**18,377**	**15,456**
CUMULATIVE NET CASH FLOW	**-83,475**	**-64,342**	**-42,740**	**-16,646**	**7,419**	**31,228**	**50,569**	**69,669**	**88,528**	**107,146**	**125,523**	**140,979**
Net present value	-83,475	17,394	17,853	19,605	16,437	14,783	10,918	9,801	8,798	7,896	7,085	5,959
Cumulative net present value	-83,475	-66,082	-48,228	-28,624	-12,187	2,596	13,514	23,315	32,113	40,009	47,094	53,053

NET PRESENT VALUE	53,053
INTERNAL RATE OF RETURN	22.93%
PAYBACK	4 years