47. PROFILE ON THE PRODUCTION OF FORMALDEHYDE

TABLE OF CONTENTS

I. SUMMARY

This profile envisages the establishment of a plant for the production of formaldehyde with a capacity of 230 tons per annum. Formaldehyde is used in the manufacturing of particle board, urea formaldehyde resin, melamine resin, phenol formaldehyde resin, polyoxymethylene plastics, 1,4-butanediol, and methylene diphenyl diisocyanate. Moreover, the textile industry uses formaldehyde-based resins as finishers to make fabrics crease-resistant.

Since there are no local producers of formaldehyde the demand for the product is entirely met through import. The present (2012) demand for the products is estimated at 143,000 kg per annum. The demand is projected to reach 253,303 kg and 407,996 kg by the year 2018 and 2023, respectively.

The principal raw materials required are methanol and metallic oxide catalyst which have to be imported.

The total investment cost of the project including working capital is estimated at Birr 15.61 million. From the total investment cost the highest share (Birr 13.23 million or 84.81%) is accounted by fixed investment cost followed by pre operating cost (Birr 1.51 million or 9.72%) and initial working capital (Birr 853.70 thousand or 5.47%). From the total investment cost Birr 7.38 million or 47.32% is required in foreign currency.

The project is financially viable with an internal rate of return (IRR) of 19.18% and a net present value (NPV) of Birr 6.41 million discounted at 10%.

The project can create employment for 22 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

Formaldehyde, HCHO or CH_2O is the simplest of aldehydes. At ordinary temperature it is a gas with a very pungent odor. Formalin is a trade name for a solution containing 40% formaldehyde and 60% water or water and methyl alcohol.

In photography, formaldehyde is used in low concentrations for process C-41 (color negative film) stabilizer in the final wash step, as well as in the process E-6 pre-bleach step, to obviate the need for it in the final wash.

Formaldehyde is used extensively in the woodworking and cabinet-making industries. Urea-formaldehyde is used in the glues that bond particle board together. The particle board is used underneath wood veneer and plastic laminate. Cabinets, bank counters, and veneered and laminated woodwork all use particle board containing urea-formaldehyde under the plastic laminate and wood veneer.

Formaldehyde is a common building block for the synthesis of more complex compounds and materials. Products generated from formaldehyde include urea formaldehyde resin, melamine resin, phenol formaldehyde resin, polyoxymethylene plastics, 1,4-butanediol, and methylene diphenyl diisocyanate. The textile industry uses formaldehyde-based resins as finishers to make fabrics crease-resistant. Formaldehyde-based materials are key to the manufacture of automobiles, and used to make components for the transmission, electrical system, engine block, door panels, axles and brake shoes.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

Since formaldehyde is not produced locally the entire requirement of the country is met through import. Imported quantity of formaldehyde in the past ten years is given in Table 3.1.

Table 3.1

IMPORT OF FORMALDEHYDE

Year	Import (Kg)	Value (Birr)
2002	3,017	52,349
2003	3,215	79,334
2004	2,095	61,147
2005	8,551	98,757
2006	19,661	126,698
2007	269,073	1,913,219
2008	1,693	159,949
2009	3,358	214,013
2010	219,515	3,444,917
2011	66,399	1,181,227

Source: - *Ethiopian Revenues and Customs Authority.*

As could be observed from Table 3.1, the imported quantity of formaldehyde during the period 2002--2005 was relatively much lower compared to the period of 2006-2011 and is also characterized by high fluctuations. During the period 2002-2005, the yearly average level of import was about 4,200 kg. The imported quantity during year 2006 and 2007 has tremendously increased to a level of 19,661 kg and 269,073 kg, respectively. Again, the quantity imported during year 2008 and 2009 plummeted to 1,693 kg and 3,358 kg. By the years 2010 and 2011 the

imported quantity has climbed to 219,515 kg and 66,399 kg, respectively. In general, the yearly average level of import in the recent five years of the data set was 112,076 kg.

Although the above analysis on certain years of interval shows that there is a general increase of demand for the product it does not indicate a clear trend. Hence, in the absence of a clear trend the average of the recent two years is assumed to be the present effective demand. Accordingly, the present demand is set at 143,000 kg.

2. Demand Projection

Demand for formaldehyde will grow with the development of the manufacturing sector mainly the chemical industries such as disinfectants, cosmetics, pharmaceuticals, insecticide & fungicides and the like. The demand for the output of such establishments is in turn influenced by population growth, urbanization, income rise and expansion of health services and the like. Considering the combined effect of the above factors a growth rate of 10% is taken to forecast the future demand. The projection worked out based on this methodology is shown in Table 3.2.

Tale 3.2

PROJECTED DEMAND FOR FORMALDEHYDE (KG)

Year	Projected Demand
2013	157,300
2014	173,030
2015	190,333
2016	209,366
2017	230,303
2018	253,333
2019	278,666
2020	306,533
2021	337,187
2022	370,905
2023	407,996

3. Pricing and Distribution

Based on the year 2011 average CIF price and considering duty and other import related expenses, Birr 35 per kg is recommend as a factory gate price. The project can utilize both direct and indirect methods of distribution to reach the end consumers of the product. For a relatively bulk consumers it can be sold directly while for small quantity purchasers it can be reached through employing distributors and retailers.

B. PLANT CAPACITY & PRODUCTION PROGRAM

1. Plant Capacity

The projected demand for the year 2016 and the available technology has been considered in setting the plant capacity. The annual production capacity of the project is thus set at 230 tons of formaldehyde per annum, based on 300 working days per annum and 3 shifts per day.

2. Production Program

At the initial stage of the production period, the plant requires some years to penetrate the market. Therefore, in the first and second year of production, the capacity utilization rate will be 70% and 90%, respectively. In the third year and thereafter, full production shall be attained. The production program is indicated in Table 3.3.

Table 3.3

PRODUCTION PROGRAM

Sr. No.	Product	Production Year		
		1	2	3 -10
1	Formaldehyde production (tons)	161	207	230
2	Capacity utilization rate (%)	70	90	100

IV. RAW MATERIAL AND INPUTS

A. RAW AND AUXILIRY MATERIALS

The major raw materials required for the production of formaldehyde are methanol and metallic oxide catalyst. In addition to these raw materials, packing material for finished product is required as auxiliary raw material for the production of formaldehyde. The annual requirement and cost of raw material is indicated in Table 4.1. The total annual cost of raw material is estimated at Birr 2,570,500.

Table 4.1

ANNUAL RAW AND AUXILIARY MATERIALS REQUIREMENT AND COST (AT FULL CAPACITY)

Sr. No.	Raw Material	UOM	Qty	Cost ('000 Birr)		
				FC	LC	Total
1	Methanol	Tons	265	2305.5	-	2,305.5
2	Catalyst	kg	1,000	35.0	-	35.0
3	Packing material (200kg, plastic barrel)	Pcs	1,150	-	230	230.0
	Total			**2,340.5**	**230**	**2,570.5**

B. UTILITIES

Electricity, furnace oil and water are utilities of the proposed project. The total annual cost of utilities is estimated at Birr 129,000. The annual consumption and cost of these inputs is indicated in Table 4.2.

Table 4.2

ANNUAL UTILITIES REQUIREMENT & COST (AT FULL CAPACITY)

Sr. No.	Utility	UOM	Qty	Cost (Birr)
1	Electricity	kWh	50,000	29,000
2	Water	m^3	10,000	100,000
	Total	**-**	**-**	**129,000**

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Production Process

Fresh methanol, at 30°C and 14.7 psia mixes with recycled methanol, at 68.3°C and 16 psia. The pump, raises the pressure up to 35 psia and enters a heat exchanger where the methanol is vaporized to a temperature of 150°C and 29 psia.

Fresh air is available at 25°C and 14.7 psia and Compressed to a pressure of 35 psia. This stream is then heated by medium-pressure steam to a temperature of 150°C. The vaporized methanol and hot air are mixed and fed to the reactor.

The reactor converts 87.4% of the methanol. The exit reactor temperature is 343°C. Heat is removed by making high-pressure steam from boiler feed water. The outlet of the reactor is at 343°C and 25 psia. A valve drops the pressure of this stream to 5 psia before it enters the absorber. Fresh water is sent through the absorber at 30°C and 20 psia. The absorber is set to absorb 99% of the formaldehyde that enters. The outlet is then heated to 102°C before entering to the formaldehyde distillation column.

The absorber recovers a 37 wt% solution of formaldehyde in water. Most of the methanol is recovered in the distillate. The distillate is recycled back to the inlet of fresh methanol at 68.3°C and 16 psia. The bottom of the distillate is pumped to storage. Deionized water at 30°C is added to achieve the 37 wt% solution of formaldehyde in water.

2. Environmental Impact Assessment

The adverse impact in relation to the formaldehyde production process is caused by the exhaust gas to be generated from the oxidation reaction and hence the exhaust gas is catalytically treated before discharged to the atmosphere. The cost of emission treatment system is included in the list of machinery and equipment.

B. ENGINEERING

1. Machinery and Equipment

The cost of machinery and equipment is estimated to be Birr 9,850,000 of which Birr 7,387,500 is required in foreign currency. The list of machinery and equipment for the envisaged project is indicated in Table 5.1.

Table 5.1

LIST OF MACHINERY & EQUIPMENT

Sr. No.	Description	No.
1	Methanol pump	1
2	Methanol vaporizer	1
3	Air Compressor	1
4	Air heater	1
5	Fluid bed reactor	1
6	Formalin absorber	1
7	Heater	1
8	Formalin distillation column	1
9	Methanol condenser	1
10	Formalin re-boiler	1
11	Reflux pump	1
12	Reflux drum	1
13	Formalin pump	1
14	Formalin cooler	1
15	Emission treatment system	Set

2. Land, Building and Civil Work

The total land required for the plant is 1,500 m^2, out of which the built-up area is 500 m^2. The cost of building at the rate of Birr 5,000 m^2 is estimated at Birr 2.5 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 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 399,000 of which 10% or Birr 39,900 will be paid in advance. The remaining Birr 359,100 will be paid in equal installments with in 28 years i.e. Birr 12,825 annually.

VI. HUMANM RESURCE AND TRAINING REQUIREMENT

A. HUMANM RESURCE REQUIREMENT

The total labor requirement of the envisaged plant is 22. The total annual labor cost is estimated at Birr 570,000. The list of human resource and monthly and annual cost are indicated in Table 6.1.

Table 6.1

HUMAN RESOURCE REQUIREMENT & COST

Sr. No.	Manpower	Req. No.	Monthly Salary (Birr)	Annual Salary (Birr)
1	General manager	1	7,000	84,000
2	Secretary	1	1,500	18,000
3	Accountant	2	5,000	60,000
4	Purchase and Sales Officer	2	5,000	60,000
5	Production and Technical Head	1	5,000	60,000
6	Chemist	1	3,000	36,000
7	Operator technician	3	4,500	54,000
8	Ass. Operator technician	3	3,000	36,000
9	General Service	8	4,000	48,000
	Sub-total	**22**	**38,000**	**456,000**
	Benefits (25% BS)		9,500	114,000
	Grand Total		**47,500**	**570,000**

B. TRAINING REQUIREMENT

Training of key labor force shall be carried out during plant erection and commissioning by the experts of machinery supplier. The cost of training is estimated at Birr 40,000.

VII. FINANCIAL ANALYSIS

The financial analysis of the formaldehyde 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	3% of machinery cost

A. TOTAL INITIAL INVESTMENT COST

The total investment cost of the project including working capital is estimated at Birr 15.61 million (see Table 7.1). From the total investment cost the highest share (Birr 13.23 million or 84.81%) is accounted by fixed investment cost followed by pre operating cost (Birr 1.51 million or 9.72%) and initial working capital (Birr 853.70 thousand or 5.47%). From the total investment cost Birr 7.38 million or 47.32% is required in foreign currency.

Table 7.1

INITIAL INVESTMENT COST ('000 Birr)

Sr. No.	Cost Items	Local Cost	Foreign Cost	Total Cost	% Share
1	**Fixed investment**				
1.1	Land Lease	39.90		39.90	0.26
1.2	Building and civil work	2,500.00		2,500.00	16.02
1.3	Machinery and equipment	2,462.50	7,387.50	9,850.00	63.10
1.4	Vehicles	600.00		600.00	3.84
1.5	Office furniture and equipment	250.00		250	1.60
	Sub -total	**5,852.40**	**7,387.50**	**13,239.90**	**84.81**
2	**Pre operating cost ***				
2.1	Pre operating cost	495.50		495.50	3.17
2.2	Interest during construction	1,021.24		1,021.24	6.54
	Sub -total	**1,516.74**		**1,516.74**	**9.72**
3	**Working capital ****	**853.70**		**853.70**	**5.47**
	Grand Total	**8,222.83**	**7,387.50**	**15,610.33**	**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 946.56 thousand. However, only the initial working capital of Birr 853.70 thousand during the first year of production is assumed be funded through external sources. During the remaining years the working capital requirement will be financed by funds 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 7.79 million (see Table 7.2). The cost of raw material account for 32.96% of the production cost. The other major components of the production cost are depreciation and financial cost, which account for 29.67% and 14.40%, respectively. The remaining 22.97% is the share of and direct labor, 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 FOUR)

Items	Cost (in 000 Birr)	%
Raw Material and Inputs	2,570.50	32.96
Utilities	129.00	1.65
Maintenance and repair	492.50	6.31
Labor direct	456.00	5.85
Labor overheads	114.00	1.46
Administration Costs	250.00	3.21
Land lease cost	-	-
Cost of marketing and distribution	350.00	4.49
Total Operating Costs	**4,362.00**	**55.93**
Depreciation	2,314.10	29.67
Cost of Finance	1,123.36	14.40
Total Production Cost	**7,799.46**	**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 grow from Birr 251 thousand to Birr 2.48 million during the life of the project. Moreover, at the end of the project life the accumulated net cash flow amounts to Birr 14.81 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.

$$\text{Break- Even Sales Value} = \frac{\text{Fixed Cost + Financial Cost}}{\text{Variable Margin ratio (\%)}} = \text{Birr } 5{,}311{,}046$$

$$\text{Break -Even Capacity utilization} = \frac{\text{Break- even Sales Value}}{\text{Sales revenue}} \times 100 = 66\%$$

4. Pay-back Period

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

5. Internal Rate of Return

The internal rate of return (IRR) is the annualized effective compounded return rate that can be earned on the invested capital, i.e., the yield on the investment. Put another way, the internal rate of return for an investment is the discount rate that makes the net present value of the investment's income stream total to zero. It is an indicator of the efficiency or quality of an investment. A project is a good investment proposition if its IRR is greater than the rate of return that could be earned by alternate investments or putting the money in a bank account. Accordingly, the IRR of this project is computed to be 19.18 % 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 6.41 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 22 persons. The project will generate Birr 5.26 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	578.36	642.63	642.63	642.63	642.63	642.63	642.63	642.63	642.63	642.63
Accounts receivable	330.07	363.50	363.50	363.50	364.57	364.57	364.57	364.57	364.57	364.57
Cash-in-hand	16.41	18.23	18.23	18.23	18.41	18.41	18.41	18.41	18.41	18.41
CURRENT ASSETS	**924.84**	**1,024.35**	**1,024.35**	**1,024.35**	**1,025.60**	**1,025.60**	**1,025.60**	**1,025.60**	**1,025.60**	**1,025.60**
Accounts payable	71.14	79.04	79.04	79.04	79.04	79.04	79.04	79.04	79.04	79.04
CURRENT LIABILITIES	**71.14**	**79.04**	**79.04**	**79.04**	**79.04**	**79.04**	**79.04**	**79.04**	**79.04**	**79.04**
TOTAL WORKING CAPITAL	**853.70**	**945.31**	**945.31**	**945.31**	**946.56**	**946.56**	**946.56**	**946.56**	**946.56**	**946.56**

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	2,313	2,571	2,571	2,571	2,571	2,571	2,571	2,571	2,571	2,571
Utilities	116	129	129	129	129	129	129	129	129	129
Maintenance and repair	443	493	493	493	493	493	493	493	493	493
Labour direct	410	456	456	456	456	456	456	456	456	456
Labour overheads	103	114	114	114	114	114	114	114	114	114
Administration Costs	225	250	250	250	250	250	250	250	250	250
Land lease cost	0	0	0	0	13	13	13	13	13	13
Cost of marketing and distribution	350	350	350	350	350	350	350	350	350	350
Total Operating Costs	**3,961**	**4,362**	**4,362**	**4,362**	**4,375**	**4,375**	**4,375**	**4,375**	**4,375**	**4,375**
Depreciation	2,314	2,314	2,314	2,314	2,314	125	125	125	125	125
Cost of Finance	0	1,123	983	843	702	562	421	281	140	0
Total Production Cost	**6,275**	**7,799**	**7,659**	**7,519**	**7,391**	**5,062**	**4,921**	**4,781**	**4,640**	**4,500**

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	7,245	8,050	8,050	8,050	8,050	8,050	8,050	8,050	8,050	8,050
Less variable costs	3,611	4,012	4,012	4,012	4,012	4,012	4,012	4,012	4,012	4,012
VARIABLE MARGIN	**3,634**	**4,038**	**4,038**	**4,038**	**4,038**	**4,038**	**4,038**	**4,038**	**4,038**	**4,038**
in % of sales revenue	50.16	50.16	50.16	50.16	50.16	50.16	50.16	50.16	50.16	50.16
Less fixed costs	2,664	2,664	2,664	2,664	2,677	488	488	488	488	488
OPERATIONAL MARGIN	**970**	**1,374**	**1,374**	**1,374**	**1,361**	**3,550**	**3,550**	**3,550**	**3,550**	**3,550**
in % of sales revenue	13.39	17.07	17.07	17.07	16.91	44.10	44.10	44.10	44.10	44.10
Financial costs		1,123	983	843	702	562	421	281	140	0
GROSS PROFIT	**970**	**251**	**391**	**531**	**659**	**2,988**	**3,129**	**3,269**	**3,410**	**3,550**
in % of sales revenue	13.39	3.11	4.86	6.60	8.19	37.12	38.87	40.61	42.36	44.10
Income tax	0	0	0	159	198	897	939	981	1,023	1,065
NET PROFIT	**970**	**251**	**391**	**372**	**461**	**2,092**	**2,190**	**2,289**	**2,387**	**2,485**
in % of sales revenue	13.39	3.11	4.86	4.62	5.73	25.99	27.21	28.43	29.65	30.87

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	**13,735**	**9,191**	**8,058**	**8,050**	**8,050**	**8,050**	**8,050**	**8,050**	**8,050**	**8,050**	**8,050**	**3,508**
Inflow funds	13,735	1,946	8	0	0	0	0	0	0	0	0	0
Inflow operation	0	7,245	8,050	8,050	8,050	8,050	8,050	8,050	8,050	8,050	8,050	0
Other income	0	0	0	0	0	0	0	0	0	0	0	3,508
TOTAL CASH OUTFLOW	**13,735**	**5,907**	**6,989**	**6,749**	**6,768**	**6,680**	**7,237**	**7,139**	**7,041**	**6,942**	**5,440**	**0**
Increase in fixed assets	13,735	0	0	0	0	0	0	0	0	0	0	0
Increase in current assets	0	925	100	0	0	1	0	0	0	0	0	0
Operating costs	0	3,611	4,012	4,012	4,012	4,025	4,025	4,025	4,025	4,025	4,025	0
Marketing cost	0	350	350	350	350	350	350	350	350	350	350	0
Income tax	0	0	0	0	159	198	897	939	981	1,023	1,065	0
Financial costs	0	1,021	1,123	983	843	702	562	421	281	140	0	0
Loan repayment	0	0	1,404	1,404	1,404	1,404	1,404	1,404	1,404	1,404	0	0
SURPLUS (DEFICIT)	**0**	**3,284**	**1,069**	**1,301**	**1,282**	**1,370**	**813**	**911**	**1,009**	**1,108**	**2,610**	**3,508**
CUMULATIVE CASH BALANCE	**0**	**3,284**	**4,353**	**5,654**	**6,936**	**8,306**	**9,118**	**10,029**	**11,039**	**12,146**	**14,757**	**18,264**

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**	**7,245**	**8,050**	**8,050**	**8,050**	**8,050**	**8,050**	**8,050**	**8,050**	**8,050**	**8,050**	**3,508**
Inflow operation	0	7,245	8,050	8,050	8,050	8,050	8,050	8,050	8,050	8,050	8,050	0
Other income	0	0	0	0	0	0	0	0	0	0	0	3,508
TOTAL CASH OUTFLOW	**14,589**	**4,052**	**4,362**	**4,362**	**4,523**	**4,573**	**5,271**	**5,313**	**5,356**	**5,398**	**5,440**	**0**
Increase in fixed assets	13,735	0	0	0	0	0	0	0	0	0	0	0
Increase in net working capital	854	92	0	0	1	0	0	0	0	0	0	0
Operating costs	0	3,611	4,012	4,012	4,012	4,025	4,025	4,025	4,025	4,025	4,025	0
Marketing cost	0	350	350	350	350	350	350	350	350	350	350	0
Income tax		0	0	0	159	198	897	939	981	1,023	1,065	0
NET CASH FLOW	**-14,589**	**3,193**	**3,688**	**3,688**	**3,527**	**3,477**	**2,779**	**2,737**	**2,694**	**2,652**	**2,610**	**3,508**
CUMULATIVE NET CASH FLOW	**-14,589**	**-11,397**	**-7,709**	**-4,021**	**-493**	**2,984**	**5,763**	**8,499**	**11,194**	**13,846**	**16,456**	**19,964**
Net present value	-14,589	2,902	3,048	2,771	2,409	2,159	1,568	1,404	1,257	1,125	1,006	1,352
Cumulative net present value	-14,589	-11,687	-8,639	-5,868	-3,459	-1,300	269	1,673	2,930	4,055	5,061	6,414

NET PRESENT VALUE	6,414
INTERNAL RATE OF RETURN	19.18%
PAYBACK	5 years