71. PROFILE ON THE PRODUCTION OF SODIUM SULPHIDE

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I. SUMMARY

This profile envisages the establishment of a plant for the production of sodium sulphide with a capacity of 1,000 tons per annum. Sodium sulphide is an industrial raw material used in pulp and paper, leather, textile industries and as a reducing agent in the manufacture of amino acids and preparation of many dyes and rubber chemicals.

Since there are no local producers of sodium sulphide the demand for the product is entirely met through import. The present (2012) demand for the product is estimated at 700 tons per annum. The demand is projected to reach 1,240 tons and 1,997 tons by the year 2018 and year 2023, respectively.

Major raw materials required are sodium sulphate and coal which have to be imported.

The total investment cost of the project including working capital is estimated at Birr 16.11 million. From the total investment cost the highest share (Birr 12.70 million or 78.82%) is accounted by fixed investment followed by initial working capital (Birr 1.83 million or 11.41%) and pre operation cost (Birr 1.57 million or 9.77%). From the total investment cost Birr 4.20 or 26.06% is required in foreign currency.

The project is financially viable with an internal rate of return (IRR) of 23.98% and a net present value (NPV) of Birr 11.75 million, discounted at 10%.

The plant will create employment opportunities for 29 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 generates income for the city administration in terms of tax revenue and payroll tax.

II. PRODUCT DESCRIPTION AND APPLICATION

Sodium sulphide is the chemical compound with the formula Na_2S, or more commonly its hydrate $Na_2S·9H_2O$. Both are colorless water-soluble salts that give strongly alkaline solutions.

Sodium sulphide is primarily used in pulp and paper industry in the kraft process . It is widely used in the leather industry for removing hairs from hides and skins as a depilatory. The product also finds extensive use or application in the textile industry as well as in the synthesis of sulphur dies as a bleaching, as a desulfurising and as a dechlorinating agent and reduction of amino compounds. Sodium sulphide is also used in the lithography and engraving manufacture of sulphur black dies. It is consumed as a reducing agent in the manufacture of amino compounds, and it enters into the preparation of many dyes.

It is also used in the production of rubber chemicals, sulfur dyes and other chemical compounds. It is used in other applications including ore flotation, oil recovery, food preservative, making dyes, and detergent.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

As indicated in the product description and application section the use of sodium sulphide in the manufacturing sector is very wide. However, since there are no industrial establishments that produce and supply locally the entire requirement of the country is met by importing from various countries. Import of sodium sulphide in volume and value for the last twelve years is presented in Table 3.1.

Table 3.1

IMPORT OF SODIUM SULPHIDE

Year	Qty (Tons)	Value ('000 Birr)
2000	492.7	2,791.9
2001	1,244.8	6,736.7
2002	931.1	4,757.5
2003	490.2	2,691.5
2004	429.0	2,249.7
2005	734.7	4,159.7
2006	507.2	2,649.3
2007	415.2	2,245.5
2008	24.7	169.1
2009	243.2	2,079.7
2010	317.8	3,276.5
2011	1,045.0	12,217.8

Source: - *Ethiopian Revenues and Customs Authority.*

Although the country imports a substantial amount of sodium sulphide from various countries the time series data obtained from the Ethiopian Revenues and Customs Authority is highly erratic. As could be seen from Table 3.1 the quantity imported is characterized by a very huge increase of import in some years and a sudden decline in other years.

During the starting point of the data set, i.e. year 2000, the imported quantity was 492.7 tons. In the following year (2001) the imported quantity drastically increased to a level of 1,244.8 tons, which is higher than by 2.5 folds compared to year 2000. After the huge increase of year 2001 the imported quantity for the next three consecutive years has declined to 931 tons and to about 460 tons by the years 2002 and 2003/04, respectively. The trend continued similarly for the

remaining years. After a moderate increase to 735 tons in year 2005 a decline of import was again observed for the consecutive years of 2006--2008. The yearly average imported quantity in the years 2006/07 was around 460 tons, while in the year 2008 it reached at the extremely low figure of 24.7 tons. An upward tend of import has again started during the last three recent years i.e. 2009--2011. During year 2009, year 2010 and year 2011 the quantity imported was 243 tons, 318 tons and 1,045 tons, respectively.

In the absence of a trend in the data set the average of the last two recent years is taken to reflect the present demand. Accordingly, present demand for sodium sulphide is set at 700 tons.

2. Demand Projection

Demand for sodium sulphide will proportionally increase with the development of the end user industries mainly pulp and paper and textile industries. As per the GTP the country has planned to establish a number of pulp and paper producing plants in various parts of the country. The studies of these projects are already underway and are expected to be implemented with in a short period of time. When these big projects with a very big capacity start operation, the demand for sodium sulphide will also increase tremendously. However, to be conservative demand is assumed to grow by 10% per annum (see Table 3.2).

Table 3.2

PROJECTED DEMAND FOR SODIUM SULPHIDE (TONS)

Year	Projected Demand
2013	770
2014	847
2015	932
2016	1,025
2017	1,127
2018	1,240
2019	1,364
2020	1,500
2021	1,650
2022	1,815
2023	1,997

Demand for sodium sulphide is forecasted to grow from 770 tons in the year 2013 to 1,240 tons and 1,997 tons by the year 2018 and 2023, respectively.

3. Pricing and Distribution

Based on the CIF price of imported sodium sulphide in the year 2011 and adding duty and other costs associated with import Birr 16,030 is recommended as a factory gate price for this project.

Since the major end users are to be pulp and paper factories direct distribution is recommended due to their limited number and bulk purchase requirement. The product can be supplied in a variety of package sizes and in bulk via tank truck. Hence, for bulk purchasers direct distribution by the factory is recommended for convenience of handling. For these who require in relatively small quantity agents who have the requisite experience can be utilized.

B. PLANT CAPACITY AND PRODUCTION PROGRAM

1. Plant Capacity

The proposed annual production capacity of the envisaged project is 1,000 tons considering the market study and period required for implementation and full capacity attainment. This capacity is determined assuming 300 working days per annum, three shifts per day of 8hrs each.

2. Production Program

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

Table 3.3

PRODUCTION PROGRAM

Sr. No.	Product	Production Year		
		1	2	3-10
1	Sodium Sulphide (ton)	700	900	1,000
2	Capacity utilization rate (%)	70	90	100

IV. RAW MATERIAL AND INPUTS

A. RAW AND AUXILIARY MATERIAL

The principal raw materials of the plant are sodium sulphate and coal. Both are imported. The two chemicals react and yield sodium sulphide and carbon dioxide. Table 4.1 shows the annual raw material requirement and cost at full capacity production. The total annual cost of raw materials is estimated at Birr 7,011,600.

Table 4.1

ANNUAL RAW MATERIAL REQUIREMENT & COST

Sr. No.	Raw Material	UOM	Qty.	Cost ('000 Birr)
1	Sodium sulphate	Tons	2,022	6,066.0
2	Coal	Tons	341	545.6
3	Polypropylene bag(25kg)	pcs	40,000	400.0
	Total			**7,011.6**

B. UTILITIES

The major utilities of the proposed plant are electricity furnace oil and water. The annual utility requirement and cost are indicated in Table 4.2. The total annual cost of utilities is estimated at Birr 2,640,560.

Table 4.2

ANNUAL UTILITIES REQUIREMENT & COST

Sr. No.	Utility	UOM	Qty.	Cost ('000 Birr)
1	Electricity	kWh	612,000	354.96
2	Furnaces oil	lt	120,000	1,785.60
3	Water	m^3	50,000	500.00
	Total			**2,640.56**

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Production Processes

The sodium sulphate and coal in the ratio of 2:1 are mixed together thoroughly and pulverized properly. The mixture is transferred to a reverberate furnace. At about 1000^{o}c, sodium sulphate is reduced to sodium sulphide and carbon monoxide, which again reacts with the remaining molecule of sodium sulphate to give sodium sulphide and carbon dioxide. The reaction product is then transferred into cooling bogies. After cooling it is crushed in a jaw crusher and then transferred to leaching tanks containing hot water. After leaching the clear liquid is run into evaporators. The concentrate is crystallized to get yellowish brown crystals of sodium sulphide.

2. Environmental Impact

The plant has to be equipped with a waste water treatment plant to contain the waste water to be generated during production of sodium sulphide and treat before disposal to the environment. The cost of waste water treatment system is included in the cost of machinery and equipment.

B. ENGINEERING

1. Machinery & Equipment

The total cost of machinery is estimated at Birr 5,600,000, of which Birr 4,200,000 is in foreign currency. The list of machinery and equipment is indicated in Table 5.1.

Table 5.1

LIST OF MACHINERY & EQUIPMENT

Sr. No.	Machinery	No.
1	Disintegrator with all accessories	1
2	Jaw crusher with	1
3	Ball mill	
3	Evaporators (steam heated)	1
4	Reverbratory furnace with chimney and other accessories	1
5	Trolley	1
6	Settling tank	2
7	Leaching tanks	2
8	Steam boiler with accessories	1

2. Land, Building and Civil Work

The total area of the project is 2,000 m^2, out of which 1,200 m^2 is a built-up area. The total cost of building and civil work at the rate of Birr 5,000 per m^2 is estimated at Birr 6,000,000.

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 532,000 of which 10% or Birr 53,200 will be paid in advance. The remaining Birr 478,800 will be paid in equal installments with in 28 years i.e. Birr 17,100 annually.

VI. HUMAN RESOURCE & TRAINING REQUIREMENT

A. HUMAN RESOURCE REQUIREMENT

The project requires a total of 29 persons. The total annual cost of labor is estimated at Birr 687,000. The list of human resource and cost are indicated in Table 6.1.

Table 6.1
HUMAN RESOURCE REQUIREMENT & COST

Sr. No.	Human Resource	No. of Persons	Monthly Salary (Birr)	Annual Salary (Birr)
1	General manager	1	7,000	84,000
2	Sales officers	1	3,000	36,000
3	Accountant	1	3,000	36,000
4	Production and technical head	1	5,000	60,000
5	Mechanic	2	3,000	36,000
6	Electrician and instrument technician	2	3,000	36,000
7	Chemist	3	6,000	72,000
8	Operators	6	9,000	108,000
9	Laborers	8	4,800	57,600
10	General service	4	2,000	24,000
	Sub -total	**29**	**45,800**	**549,600**
	Benefit (25% BS)		11,450	137,400
	Total	**29**	**57,250**	**687,000**

B. TRAINING REQUIREMENT

Training of labor force shall be carried out during plant erection by the experts of plant machinery supplier for about one month on the operation and maintenance of machinery, production process and quality control. The cost of training is estimated at Birr 40,000

VII. FINANCIAL ANALYSIS

The financial analysis of the sodium sulphide 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 16.11 million (see Table 7.1). From the total investment cost the highest share (Birr 12.70 million or 78.82%) is accounted by fixed investment followed by initial working capital (Birr 1.83 million or 11.41%) and pre operation cost (Birr 1.57 million or 9.77%). From the total investment cost Birr 4.20 or 26.06% 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	53.20		53.20	0.33
1.2	Building and civil work	6,000.00		6,000.00	37.23
1.3	Machinery and equipment	1,400.00	4,200.00	5,600.00	34.75
1.4	Vehicles	900.00		900.00	5.58
1.5	Office furniture and equipment	150.00		150.00	0.93
	Sub -total	**8,503.20**	**4,200.00**	**12,703.20**	**78.82**
2	**Pre operating cost ***				
2.1	Pre operating cost	520.00		520.00	3.23
2.2	Interest during construction	1,054.39		1,054.39	6.54
	Sub -total	**1,574.39**		**1,574.39**	**9.77**
3	**Working capital**	**1,839.54**		**1,839.54**	**11.41**
	Grand Total	**11,917.14**	**4,200.00**	**16,117.14**	**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 2.62 million. However, only the initial working capital of Birr 1.87 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 13.70 million (see Table 7.2). The cost of raw material account for 51.15% of the production cost. The other major components of the production cost are utility, depreciation and financial cost which account for 19.26 %, 12.10% and 7.40%, respectively. The remaining 10.08% is the share of repair and maintenance, labor overhead and administration cost.

Table 7.2

ANNUAL PRODUCTION COST AT FULL CAPACITY (YEAR FOUR)

Items	Cost (in 000 Birr)	%
Raw Material and Inputs	7,011.60	51.15
Utilities	2,640.56	19.26
Maintenance and repair	280.00	2.04
Labor direct	549.60	4.01
Labor overheads	137.40	1.00
Administration Costs	164.88	1.20
Land lease cost	-	-
Cost of marketing and distribution	250.00	1.82
Total Operating Costs	**11,034.04**	**80.49**
Depreciation	1,659.00	12.10
Cost of Finance	1,014.85	7.40
Total Production Cost	**13,707.89**	**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 1.65 million to Birr 3.30 million during the life of the project. Moreover, at the end of the project life the accumulated net cash flow amounts to Birr 24.45 million.

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.

$$\text{Break-Even Sales Value} = \frac{\text{Fixed Cost + Financial Cost}}{\text{Variable Margin ratio (\%)}} = \text{Birr } 5{,}833{,}300$$

$$\text{Break -Even Capacity utilization} = \frac{\text{Break - even Sales Value}}{\text{Sales revenue}} \times 100 = 40\%$$

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 23.98% 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 11.75 million which is acceptable.

D. ECONOMIC AND SOCIAL BENEFITS

The project can create employment opportunities for 29 persons. The project will generate Birr 8.16 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 by supplying the raw material required.

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	1,227.03	1,577.61	1,752.90	1,752.90	1,752.90	1,752.90	1,752.90	1,752.90	1,752.90	1,752.90
Accounts receivable	649.90	829.64	919.50	919.50	920.93	920.93	920.93	920.93	920.93	920.93
Cash-in-hand	11.00	14.15	15.72	15.72	15.96	15.96	15.96	15.96	15.96	15.96
CURRENT ASSETS	**1,887.94**	**2,421.39**	**2,688.12**	**2,688.12**	**2,689.79**	**2,689.79**	**2,689.79**	**2,689.79**	**2,689.79**	**2,689.79**
Accounts payable	48.39	62.22	69.13	69.13	69.13	69.13	69.13	69.13	69.13	69.13
CURRENT LIABILITIES	**48.39**	**62.22**	**69.13**	**69.13**	**69.13**	**69.13**	**69.13**	**69.13**	**69.13**	**69.13**
TOTAL WORKING CAPITAL	**1,839.54**	**2,359.17**	**2,618.99**	**2,618.99**	**2,620.65**	**2,620.65**	**2,620.65**	**2,620.65**	**2,620.65**	**2,620.65**

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

Item	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Raw Material and Inputs	4,908	6,310	7,012	7,012	7,012	7,012	7,012	7,012	7,012	7,012
Utilities	1,848	2,377	2,641	2,641	2,641	2,641	2,641	2,641	2,641	2,641
Maintenance and repair	196	252	280	280	280	280	280	280	280	280
Labour direct	385	495	550	550	550	550	550	550	550	550
Labour overheads	96	124	137	137	137	137	137	137	137	137
Administration Costs	115	148	165	165	165	165	165	165	165	165
Land lease cost	0	0	0	0	17	17	17	17	17	17
Cost of marketing and distribution	250	250	250	250	250	250	250	250	250	250
Total Operating Costs	**7,799**	**9,956**	**11,034**	**11,034**	**11,051**	**11,051**	**11,051**	**11,051**	**11,051**	**11,051**
Depreciation	1,659	1,659	1,659	1,659	1,659	255	255	255	255	255
Cost of Finance	0	1,160	1,015	870	725	580	435	290	145	0
Total Production Cost	**9,458**	**12,774**	**13,708**	**13,563**	**13,435**	**11,886**	**11,741**	**11,596**	**11,451**	**11,306**

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	11,221	14,427	16,030	16,030	16,030	16,030	16,030	16,030	16,030	16,030
Less variable costs	7,549	9,706	10,784	10,784	10,784	10,784	10,784	10,784	10,784	10,784
VARIABLE MARGIN	**3,672**	**4,721**	**5,246**	**5,246**	**5,246**	**5,246**	**5,246**	**5,246**	**5,246**	**5,246**
in % of sales revenue	32.73	32.73	32.73	32.73	32.73	32.73	32.73	32.73	32.73	32.73
Less fixed costs	1,909	1,909	1,909	1,909	1,926	522	522	522	522	522
OPERATIONAL MARGIN	**1,763**	**2,812**	**3,337**	**3,337**	**3,320**	**4,724**	**4,724**	**4,724**	**4,724**	**4,724**
in % of sales revenue	15.71	19.49	20.82	20.82	20.71	29.47	29.47	29.47	29.47	29.47
Financial costs		1,160	1,015	870	725	580	435	290	145	0
GROSS PROFIT	**1,763**	**1,653**	**2,322**	**2,467**	**2,595**	**4,144**	**4,289**	**4,434**	**4,579**	**4,724**
in % of sales revenue	15.71	11.45	14.49	15.39	16.19	25.85	26.76	27.66	28.56	29.47
Income tax	0	0	0	740	778	1,243	1,287	1,330	1,374	1,417
NET PROFIT	**1,763**	**1,653**	**2,322**	**1,727**	**1,816**	**2,901**	**3,002**	**3,104**	**3,205**	**3,307**
in % of sales revenue	15.71	11.45	14.49	10.77	11.33	18.10	18.73	19.36	20.00	20.63

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	**13,223**	**14,163**	**14,441**	**16,037**	**16,030**	**16,030**	**16,030**	**16,030**	**16,030**	**16,030**	**16,030**	**7,328**
Inflow funds	13,223	2,942	14	7	0	0	0	0	0	0	0	0
Inflow operation	0	11,221	14,427	16,030	16,030	16,030	16,030	16,030	16,030	16,030	16,030	0
Other income	0	0	0	0	0	0	0	0	0	0	0	7,328
TOTAL CASH OUTFLOW	**13,223**	**10,741**	**13,099**	**13,765**	**14,094**	**14,006**	**14,324**	**14,223**	**14,121**	**14,020**	**12,468**	**0**
Increase in fixed assets	13,223	0	0	0	0	0	0	0	0	0	0	0
Increase in current assets	0	1,888	533	267	0	2	0	0	0	0	0	0
Operating costs	0	7,549	9,706	10,784	10,784	10,801	10,801	10,801	10,801	10,801	10,801	0
Marketing cost	0	250	250	250	250	250	250	250	250	250	250	0
Income tax	0	0	0	0	740	778	1,243	1,287	1,330	1,374	1,417	0
Financial costs	0	1,054	1,160	1,015	870	725	580	435	290	145	0	0
Loan repayment	0	0	1,450	1,450	1,450	1,450	1,450	1,450	1,450	1,450	0	0
SURPLUS (DEFICIT)	**0**	**3,422**	**1,342**	**2,272**	**1,936**	**2,024**	**1,706**	**1,807**	**1,909**	**2,010**	**3,562**	**7,328**
CUMULATIVE CASH BALANCE	**0**	**3,422**	**4,764**	**7,036**	**8,972**	**10,996**	**12,702**	**14,509**	**16,418**	**18,429**	**21,990**	**29,319**

Appendix 7.A.5

DISCOUNTED CASH FLOW (in 000 Birr)

Item	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Scrap
TOTAL CASH INFLOW	**0**	**11,221**	**14,427**	**16,030**	**16,030**	**16,030**	**16,030**	**16,030**	**16,030**	**16,030**	**16,030**	**7,328**
Inflow operation	0	11,221	14,427	16,030	16,030	16,030	16,030	16,030	16,030	16,030	16,030	0
Other income	0	0	0	0	0	0	0	0	0	0	0	7,328
TOTAL CASH OUTFLOW	**15,063**	**8,318**	**10,215**	**11,034**	**11,776**	**11,830**	**12,294**	**12,338**	**12,381**	**12,425**	**12,468**	**0**
Increase in fixed assets	13,223	0	0	0	0	0	0	0	0	0	0	0
Increase in net working capital	1,840	520	260	0	2	0	0	0	0	0	0	0
Operating costs	0	7,549	9,706	10,784	10,784	10,801	10,801	10,801	10,801	10,801	10,801	0
Marketing cost	0	250	250	250	250	250	250	250	250	250	250	0
Income tax		0	0	0	740	778	1,243	1,287	1,330	1,374	1,417	0
NET CASH FLOW	**-15,063**	**2,903**	**4,212**	**4,996**	**4,254**	**4,200**	**3,736**	**3,692**	**3,649**	**3,605**	**3,562**	**7,328**
CUMULATIVE NET CASH FLOW	**-15,063**	**-12,160**	**-7,949**	**-2,953**	**1,301**	**5,502**	**9,238**	**12,930**	**16,578**	**20,184**	**23,745**	**31,074**
Net present value	-15,063	2,639	3,481	3,754	2,906	2,608	2,109	1,895	1,702	1,529	1,373	2,825
Cumulative net present value	-15,063	-12,424	-8,943	-5,190	-2,284	324	2,433	4,327	6,029	7,558	8,931	11,757

NET PRESENT VALUE	11,757
INTERNAL RATE OF RETURN	23.98%
PAYBACK	4 years