44. PROFILE ON THE PRODUCTION OF ETHYL ACETATE

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I. SUMMARY

This profile envisages the establishment of a plant for the production of ethyl acetate with a capacity of 80 tons of per annum. Ethyl acetate is used as a solvent in the production of a wide range of products including surface coating and thinners, pharmaceuticals, flavors and essences and flexible packaging

The demand for the product is met through import. The present (2012) demand for the products is estimated at 60 tons per annum. The demand is projected to reach 95 tons and 140 tons by the years 2018 and year 2023, respectively.

The principal raw materials are acetic acid, sulphuric acid and ethyl alcohol. Sulphuric acid and ethyl alcohol are locally available while acetic acid has to be imported.

The total investment cost of the project including working capital is estimated at Birr 9.11 million. From the total investment cost the highest share (Birr 7.43 million or 81.53%) is accounted by fixed investment followed by pre operating cost (Birr 900.30 thousand or 9.87%) and initial working capital (Birr 783.42 thousand or 8.59%). From the total investment cost Birr 3.16 million or 34.68% is required in foreign currency.

The project is financially viable with an internal rate of return (IRR) of 19.80% and a net present value (NPV) of Birr 4.67 million, discounted at 10%.

The project can create employment opportunities for 18 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 backward and forward linkage with the chemical production sub sector and the manufacturing sector, respectively and also generates income for the Government in terms of tax revenue and payroll tax.

II. PRODUCT DESCRIPTION AND APPLICATION

Ethyl acetate is a colorless liquid with a fruity odor, having a formula $CH_3COOCH_2CH_3$ and molecular weight of 88.10. It is slightly soluble in water and soluble in most organic solvents, such as alcohol, acetone, ether and chloroform. It finds use as a solvent in a wide range of applications, across many industries, including:

- **Surface coating and thinners:** Ethyl acetate is one of the most popular solvents and finds wide use in the manufacture of nitrocellulose lacquers, varnishes and thinners. It exhibits high dilution ratios with both aromatic and aliphatic diluents and is the least toxic of industrial organic solvents.
- **Pharmaceuticals:** Ethyl acetate is an important component in extractants for the concentration and purification of antibiotics. It is also used as an intermediate in the manufacture of various drugs.
- **Flavors and essences:** Ethyl acetate finds extensive use in the preparation of synthetic fruit essences, flavors and perfumes.
- **Flexible packaging:** Substantial quantities of ethyl acetate are used in the manufacture of flexible packaging and in the manufacture of polyester films and BOPP films. It is also used in the treatment of aluminum foils.
- **Miscellaneous:** Ethyl acetate is used in the manufacture of adhesives, cleaning fluids, inks, nail-polish removers and silk, coated papers, explosives, artificial leather, photographic films & plates.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

The major consumers of ethyl acetate in Ethiopia are lacquer and adhesive industries. Other users are pharmaceuticals and plastic industries. Currently, their requirement is entirely met through import. Imported quantity of ethyl acetate in the past twelve years is given in Table 3.1.

Table 3.1

IMPORT OF ETHYL ACETATE

Year	Import (Tons)	Value (Birr)
2000	0.11	5,581
2001	4.0	37,956
2002	2.8	20,878
2003	4.3	1,128
2004	19.8	563,539
2005	8.1	175,607
2006	56.4	713,411
2007	34.3	531,080
2008	24.5	376,747
2009	84.7	1,643,886
2010	63.9	1,665,705
2011	31.6	1,797,018

Source: - *Ethiopian Revenues and Customs Authority.*

As could be noted from Table 3.1, the imported quantity of ethyl acetate during the period 200 – 2005 was relatively much lower compared to the period of 2006--2001. During the period 2000 – 2005, the highest volume of import was 19.4 tons in the year 2004 and the lowest 0.11 tons in the year 2000. The yearly average level of import in the early six years of the data set was only 6.5 tons.

The situation was completely changed after year 2005. The imported quantity which was only 8.1 tons in the year 2005 has increased to 56.4 tons by the year 2006. The increase of import is also observed in the remaining years of 2007-2011. Generally, the annual average level of import during the period 2006-2011 has reached to a level of 44 tons. Compared to the yearly averages

of the period 2000--2005, it is 6.7 times higher. The high increase of demand in the past six years is believed to be due to the establishment of new chemical, plastic and pharmaceutical industries in various parts of the country.

From the above analysis carried out it can be safely concluded that the imported quantity of the recent three years average is assumed to reflect the current effective demand. Accordingly, current effective demand is estimated at 60 tons.

2. Demand Projection

Demand for ethyl acetate will grow with the development of the manufacturing sector mainly the chemical and pharmaceutical industries. Considering this, an annual average growth rate of 8%, which is much lower than the forecasted growth rate of the manufacturing sector, is applied to project the future demand (see Table 3.2).

Tale 3.2

PROJECTED DEMAND FOR ETHYL ACETATE (TONS)

Year	Projected Demand
2013	65
2014	70
2015	76
2016	82
2017	88
2018	95
2019	103
2020	111
2021	120
2022	130
2023	140

3. Pricing and Distribution

Based on the year 2011 average CIF price and considering duty and other import related expenses, Birr 65,000 per ton is recommended as a factory- gate price.

As the product is an intermediate input to the manufacturing sector it can be directly sold to the end users without involving intermediaries.

B. PLANT CAPACITY AND PRODUCTION PROGRAM

1. Plant Capacity

The proposed annual production capacity of the project is 80 tons of ethyl acetate, based on single shift per day and 300 working days per annum.

2. Production Program

Considering the gradual development of processing skill and marketing of the product, the rate of capacity utilization during the 1st and 2nd year of production will be 70 and 90%, respectively. Full capacity will be attained in the third year and then after. Table 3.3 shows the production program of the proposed project.

Table 3.3

PRODUCTION PROGRAM

Sr.No.	Product	Production Program		
		1	2	3-10
1	Ethyl acetate (tons)	56	72	80
2	Capacity utilization rate (%)	70	90	100

IV. MATERIAL AND INPUTS

A. RAW AND AUXILIARY MATERIALS

The principal raw materials are acetic acid, sulphuric acid and ethyl alcohol. The last two chemicals are locally available. The total annual cost of raw and auxiliary material is estimated at

Birr 2,434,000. Table 4.1 shows the annual raw and auxiliary materials requirement and cost of the project.

Table 4.1

ANNUAL RAW AND AUXILIARY MATERIALS REQUIREMENT (TONS) AND COST

Sr.No.	Raw Material	Qty.	Cost ('000 Birr)		
			FC	LC	Total
1	Acetic acid	86.0	1,204	-	1,204
2	Ethanol	62.0	-	1,116	1,116
3	Sulfuric acid (98%)	4.5	-	90	90
4	Packing material (200kg steel drum)		24	-	24
	Grand Total		**1,228**	**1,206**	**2,434**

B. UTILITIES

Electricity, furnace oil and water are utilities of the proposed project. The total annual cost of utilities is estimated at Birr 310,520. Table 4.2 indicates the annual utility requirement and cost at full capacity.

Table 4.2

ANNUAL UTILITIES REQUIREMENT & COST

Sr. No.	Utility	Unit	Qty	Cost ('000 Birr)
1	Electricity	kWh	90,000	52.20
2	Furnace oil	Lt.	14,000	208.32
3	Water	m^3	5,000	50.00
	Total			**310.52**

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Process Description

The main technology to produce ethyl acetate is the esterification of ethanol and acetic acid with the aid of acid catalysts such as sulfuric acid.

$CH_3COOH + C_2H_5OH \longrightarrow CH_3\ COOC_2H_5 + H_2O$

The qualitative amount of alcohol and acetic acid are taken in a conical bottom reactor filled with stirrer and jacketed with steam coil. Temperature is maintained at 50-60^oC. The reaction is completed in about 10 min. The products of the reaction are transferred to crude ethyl acetate storage tank. The crude product is then distilled and packed.

2. Environmental Impact Assessment

Ethyl acetate emitted to the air and discharged into wastewater during its production will be lost primarily by evaporation (half-life 10 hr in a typical river) and biodegradation. Therefore, the plant has no any adverse impact on environment.

B. ENGINEERING

1. Machinery & Equipment

The total cost of machinery is estimated at Birr 3,794,000, of which Birr 3,161,660 is required 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	Reaction vessel	1
2	Distillation column (with reboiler)	1
3	Condenser	1
4	Storage tanks	4
5	Boiler	1

2. Land, Building & Civil Works

The total area of the project is 1,500 m^2, of which 600 m^2 is a built-up area. The cost of building is estimated at Birr 3,000,000 at a rate of Birr 5,000 per m^2.

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. HUMAN RESOURCE AND TRAINING REQUIREMENT

A. HUMAN RESOURCE REQUIREMENT

The envisaged project requires 18 work forces. The total annual cost of labor is estimated at Birr 229,500. The list of the required human resource and annual labor cost are indicated in Table 6.1.

Table 6.1

HUMAN RESOURCE REQUIREMENT & LABOR COST (BIRR)

Sr .No.	Manpower	Req. No.	Monthly Salary (Birr)	Annual Salary (Birr)
1	General manager	1	6,000	36,000
2	Accountant	1	2,500	24,000
3	Production head	1	4,000	24,000
4	Chemist	1	2,000	18,000
5	Operators	4	4,800	33,600
6	Laborers	6	3,600	28,800
7	General service	4	1,600	19,200
	Sub -total	**18**	**1,5300**	**183,600**
	Benefits (25% BS)		3,825	45,900
	Total	**18**	**19,125**	**229,500**

B. TRAINING REQUIREMENT

Training of workforce will take place during plant erection and commissioning for about one month by the experts of machinery supplier. The cost of training is estimated at Birr 40,000.

VII. FINANCIAL ANALYSIS

The financial analysis of the ethyl acetate 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 imported	120 days
Raw material local	60 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 9.11 million (see Table 7.1). From the total investment cost the highest share (Birr 7.43 million or 81.53%) is accounted by fixed investment followed by pre operating cost (Birr 900.30 thousand or 9.87%) and initial working capital (Birr 783.42 thousand or 8.59%). From the total investment cost Birr 3.16 million or 34.68% 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	0.44
1.2	Building and civil work	3,000.00		3,000.00	32.90
1.3	Machinery and equipment	632.34	3,161.66	3,794.00	41.61
1.4	Vehicles	450.00		450.00	4.94
1.5	Office furniture and equipment	150.00		150	1.65
	Sub- total	**4,272.24**	**3,161.66**	**7,433.90**	**81.53**
2	**Pre operating cost ***				
2.1	Pre operating cost	303.82		303.82	3.33
2.2	Interest during construction	596.48		596.48	6.54
	Sub -total	**900.30**		**900.30**	**9.87**
3	**Working capital ****	**783.42**		**783.42**	**8.59**
	Grand Total	**5,955.96**	**3,161.66**	**9,117.62**	**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 870.33 thousand. However, only the initial working capital of Birr 783.42 thousand 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 5.03 million (see Table 7.2). The cost of raw material account for 48.37% of the production cost. The other major components of the production cost are depreciation, financial cost and utility which account for 20.76%, 11.42% and 6.17%, respectively. The remaining 13.30 % is the share of direct labor, 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	2,434.00	48.37
Utilities	310.52	6.17
Maintenance and repair	189.70	3.77
Labor direct	183.60	3.65
Labor overheads	45.90	0.91
Administration Costs	100.00	1.99
Land lease cost	-	-
Cost of marketing and distribution	150.00	2.98
Total Operating Costs	**3,413.72**	**67.83**
Depreciation	1,044.56	20.76
Cost of Finance	574.11	11.41
Total Production Cost	**5,032.40**	**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 68 thousand to Birr 1.70 million during the life of the project. Moreover, at the end of the project life the accumulated net cash flow amounts to Birr 13.35 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.

$$\text{Break- Even Sales Value} = \frac{\text{Fixed Cost + Financial Cost}}{\text{Variable Margin ratio (\%)}} = \text{Birr } 2{,}619{,}320$$

$$\text{Break -Even Capacity utilization} = \frac{\text{Break-even Sales Value}}{\text{Sales revenue}} \times 100 = 44\%$$

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 19.80 % 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 4.67 million which is acceptable. For detail discounted cash flow see Appendix 7.A.5.

D. ECONOMIC AND SOCIAL BENEFITS

The project can create employment opportunities for 18 persons. The project will generate Birr 4.06 million in terms of tax revenue and also generates income for the Government in terms payroll tax. 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 backward and forward linkage with the chemical production sub sector and the manufacturing sector, respectively.

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	547.65	608.50	608.50	608.50	608.50	608.50	608.50	608.50	608.50	608.50
Accounts receivable	257.28	284.48	284.48	284.48	285.55	285.55	285.55	285.55	285.55	285.55
Cash-in-hand	6.49	7.21	7.21	7.21	7.39	7.39	7.39	7.39	7.39	7.39
CURRENT ASSETS	**811.42**	**900.19**	**900.19**	**900.19**	**901.43**	**901.43**	**901.43**	**901.43**	**901.43**	**901.43**
Accounts payable	28.00	31.11	31.11	31.11	31.11	31.11	31.11	31.11	31.11	31.11
CURRENT LIABILITIES	**28.00**	**31.11**	**31.11**	**31.11**	**31.11**	**31.11**	**31.11**	**31.11**	**31.11**	**31.11**
TOTAL WORKING CAPITAL	**783.42**	**869.08**	**869.08**	**869.08**	**870.33**	**870.33**	**870.33**	**870.33**	**870.33**	**870.33**

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	2,191	2,434	2,434	2,434	2,434	2,434	2,434	2,434	2,434	2,434
Utilities	279	311	311	311	311	311	311	311	311	311
Maintenance and repair	171	190	190	190	190	190	190	190	190	190
Labour direct	165	184	184	184	184	184	184	184	184	184
Labour overheads	41	46	46	46	46	46	46	46	46	46
Administration Costs	90	100	100	100	100	100	100	100	100	100
Land lease cost	0	0	0	0	13	13	13	13	13	13
Cost of marketing and distribution	150	150	150	150	150	150	150	150	150	150
Total Operating Costs	**3,087**	**3,414**	**3,414**	**3,414**	**3,427**	**3,427**	**3,427**	**3,427**	**3,427**	**3,427**
Depreciation	1,045	1,045	1,045	1,045	1,045	135	135	135	135	135
Cost of Finance	0	656	574	492	410	328	246	164	82	0
Total Production Cost	**4,132**	**5,114**	**5,032**	**4,950**	**4,881**	**3,890**	**3,808**	**3,726**	**3,644**	**3,562**

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	4,200	5,400	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
Less variable costs	2,937	3,264	3,264	3,264	3,264	3,264	3,264	3,264	3,264	3,264
VARIABLE MARGIN	**1,263**	**2,136**	**2,736**	**2,736**	**2,736**	**2,736**	**2,736**	**2,736**	**2,736**	**2,736**
in % of sales revenue	30.06	39.56	45.60	45.60	45.60	45.60	45.60	45.60	45.60	45.60
Less fixed costs	1,195	1,195	1,195	1,195	1,207	298	298	298	298	298
OPERATIONAL MARGIN	**68**	**942**	**1,542**	**1,542**	**1,529**	**2,438**	**2,438**	**2,438**	**2,438**	**2,438**
in % of sales revenue	1.62	17.44	25.70	25.70	25.48	40.64	40.64	40.64	40.64	40.64
Financial costs		656	574	492	410	328	246	164	82	0
GROSS PROFIT	**68**	**286**	**968**	**1,050**	**1,119**	**2,110**	**2,192**	**2,274**	**2,356**	**2,438**
in % of sales revenue	1.62	5.29	16.13	17.49	18.65	35.17	36.54	37.91	39.27	40.64
Income tax	0	0	0	315	336	633	658	682	707	732
NET PROFIT	**68**	**286**	**968**	**735**	**783**	**1,477**	**1,535**	**1,592**	**1,650**	**1,707**
in % of sales revenue	1.62	5.29	16.13	12.25	13.05	24.62	25.58	26.53	27.49	28.45

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	**7,738**	**5,608**	**5,403**	**6,000**	**6,000**	**6,000**	**6,000**	**6,000**	**6,000**	**6,000**	**6,000**	**3,307**
Inflow funds	7,738	1,408	3	0	0	0	0	0	0	0	0	0
Inflow operation	0	4,200	5,400	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	0
Other income	0	0	0	0	0	0	0	0	0	0	0	3,307
TOTAL CASH OUTFLOW	**7,738**	**4,495**	**4,979**	**4,808**	**5,041**	**4,994**	**5,208**	**5,150**	**5,093**	**5,036**	**4,158**	**0**
Increase in fixed assets	7,738	0	0	0	0	0	0	0	0	0	0	0
Increase in current assets	0	811	89	0	0	1	0	0	0	0	0	0
Operating costs	0	2,937	3,264	3,264	3,264	3,277	3,277	3,277	3,277	3,277	3,277	0
Marketing cost	0	150	150	150	150	150	150	150	150	150	150	0
Income tax	0	0	0	0	315	336	633	658	682	707	732	0
Financial costs	0	596	656	574	492	410	328	246	164	82	0	0
Loan repayment	0	0	820	820	820	820	820	820	820	820	0	0
SURPLUS (DEFICIT)	**0**	**1,113**	**424**	**1,192**	**959**	**1,006**	**792**	**850**	**907**	**964**	**1,842**	**3,307**
CUMULATIVE CASH BALANCE	**0**	**1,113**	**1,537**	**2,729**	**3,688**	**4,694**	**5,487**	**6,336**	**7,243**	**8,207**	**10,049**	**13,356**

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**	**4,200**	**5,400**	**6,000**	**6,000**	**6,000**	**6,000**	**6,000**	**6,000**	**6,000**	**6,000**	**3,307**
Inflow operation	0	4,200	5,400	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	0
Other income	0	0	0	0	0	0	0	0	0	0	0	3,307
TOTAL CASH OUTFLOW	**8,521**	**3,173**	**3,414**	**3,414**	**3,730**	**3,762**	**4,060**	**4,084**	**4,109**	**4,133**	**4,158**	**0**
Increase in fixed assets	7,738	0	0	0	0	0	0	0	0	0	0	0
Increase in net working capital	783	86	0	0	1	0	0	0	0	0	0	0
Operating costs	0	2,937	3,264	3,264	3,264	3,277	3,277	3,277	3,277	3,277	3,277	0
Marketing cost	0	150	150	150	150	150	150	150	150	150	150	0
Income tax		0	0	0	315	336	633	658	682	707	732	0
NET CASH FLOW	**-8,521**	**1,027**	**1,986**	**2,586**	**2,270**	**2,238**	**1,940**	**1,916**	**1,891**	**1,867**	**1,842**	**3,307**
CUMULATIVE NET CASH FLOW	**-8,521**	**-7,494**	**-5,508**	**-2,922**	**-651**	**1,586**	**3,527**	**5,442**	**7,334**	**9,200**	**11,042**	**14,349**
Net present value	-8,521	934	1,642	1,943	1,551	1,390	1,095	983	882	792	710	1,275
Cumulative net present value	-8,521	-7,588	-5,946	-4,003	-2,452	-1,063	32	1,016	1,898	2,689	3,399	4,674

NET PRESENT VALUE	4,674
INTERNAL RATE OF RETURN	19.80%
PAYBACK	5 years