

**36. PROFILE ON THE PRODUCTION OF
CELLULOSE ACETATE**

TABLE OF CONTENTS

		<u>PAGE</u>
I.	SUMMARY	36-2
II.	PRODUCT DESCRIPTION & APPLICATION	36-3
III.	MARKET STUDY AND PLANT CAPACITY	36-3
	A. MARKET STUDY	36-3
	B. PLANT CAPACITY & PRODUCTION PROGRAM	36-6
IV.	MATERIALS AND INPUTS	36-6
	A. RAW & AUXILIARY MATERIALS	36-6
	B. UTILITIES	36-7
V.	TECHNOLOGY & ENGINEERING	36-8
	A. TECHNOLOGY	36-8
	B. ENGINEERING	36-9
VI.	MANPOWER & TRAINING REQUIREMENT	36-13
	A. MANPOWER REQUIREMENT	36-13
	B. TRAINING REQUIREMENT	36-15
VII.	FINANCIAL ANALYSIS	36-15
	A. TOTAL INITIAL INVESTMENT COST	36-16
	B. PRODUCTION COST	36-17
	C. FINANCIAL EVALUATION	36-17
	D. ECONOMIC & SOCIAL BENEFITS	36-19

I. SUMMARY

This profile envisages the establishment of a plant for the production of cellulose acetate with a capacity of 260 tons of per annum. Cellulose acetate is spun into textile fibers. It is used also as a component in some adhesives, as a frame material for eyeglasses, in the manufacture of playing cards, tool handles, film for photography or food wrapping, wound dressings, personal hygiene products, absorbent cloths and wipes, specialty papers, and filter media, including cigarette filters.

Since there are no local producers of cellulose acetate, the demand for the product is entirely met through import. The present (2012) demand for the products is estimated at 182 tons per annum. The demand is projected to reach 258 tons and 345 tons by the year 2018 and year 2023, respectively.

The major raw materials required by the project are cotton lint, sulfuric acid and glacial acetic acid. Cotton lint and sulfuric acid are locally available while glacial acetic acid has to be imported.

The total investment cost of the project is estimated at Birr 16.31 million. From the total investment cost the highest share (Birr 10.68 million or 65.54%) is accounted by fixed investment cost followed by initial working capital (Birr 4.05 million or 24.85%) and pre operation cost (Birr 1.56 million or 9.61%). From the total investment cost Birr 4.20 million or 25.75% is required in foreign currency.

The project is financially viable with an internal rate of return (IRR) of 19.04% and a net present value (NPV) of Birr 8.04 million, discounted at 10%.

The project can create employment for 54 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 linkage with chemicals manufacturing sub sector and the agricultural sector and forward linkage with the manufacturing sector also generates income for the Government in terms of tax revenue and payroll tax.

II PRODUCT DESCRIPTION AND APPLICATION

Cellulose acetate is a semi-synthetic polymer obtained through the esterification of acetic acid with cellulose that is a natural polymer. Cellulose acetates with different properties are obtained depending on the esterification degree (degree of substitution). Cellulose acetate widely used for industrial applications is broadly classified into two types, i.e., cellulose diacetate and cellulose triacetate with acetyl values of about 55% (degree of substitution: 2.4) and 61% (degree of substitution: 2.9), respectively.

Cellulose acetate is excellent in chemical resistance, heat resistance, and burning resistance, and in recent years, has attracted attention as a resin that is derived from the natural polymer, cellulose, as a raw material and is friendly to the human body and the environment.

Cellulose acetate is spun into textile fibers known variously as acetate rayon, acetate, or triacetate. It is used also as a component in some adhesives, as a frame material for eyeglasses, in the manufacture of playing cards, tool handles, film for photography or food wrapping, wound dressings, personal hygiene products, absorbent cloths and wipes, specialty papers, and filter media, including cigarette filters. Such materials are often referred to as “tow”.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

The consumption of cellulose acetate in the Ethiopian market has been very low till the year 2005. According to the import statistics of the Ethiopian Revenues and Customs Authority the total quantity of cellulose acetate imported during the period 2000--2005 was only 4.1 tons, which is on the average less than one tone per annum. Although it is an industrial raw material or intermediate input, the user industries in Ethiopia were at low stage of development during this

period. However, due to the conducive conditions created for investment in recent years a significant number of end- users have been established after 2005 and a number of projects in the manufacturing sector are coming up recently in various parts of the country. As a result, the demand for cellulose acetate has picked up in the past six years i.e. 2006 – 2011. On the other hand, since there are no plants that produce cellulose acetate in the country, the amount that is required by the existing users is totally met through import (see Table 3.1).

Table 3.1
IMPORT OF CELLULOSE ACETATE

Year	Volume (Tons)	Value (‘000 Birr)
2006	150.5	1,683.4
2007	74.9	915.1
2008	128.5	5,569.7
2009	316.6	19,855.1
2010	364.8	26,008.0
2011	1.44	606.1

Source: - Ethiopian Revenues and Customs Authority.

As could be seen from Table 3.1, the imported quantity during the past six years ranges from 74.9 tons to 364.8 tons, except an exceptional figure for the year 2011 which is 1.44 tons. The annual average over the last six years (including the exceptional figure of year 2011) is about 173 tons. Assuming this to be the effective demand for the year 2011 and applying a 5% growth rate the present (year 2012) demand is estimated at 182 tons.

2. Projected Demand

Due to the development of the cellulose acetate user industries in Ethiopia, the demand is expected to grow moderately. Therefore, the demand is expected to grow at a minimum of 6%

per annum, which is much below the forecasted manufacturing sector growth in the Growth and Transformation Plan (GTP). The demand projection made based on this assumption is presented in Table 3.2.

Table 3.2
DEMAND FORECAST FOR CELLULOSE ACETATE (TONS)

Year	Quantity
2013	193
2014	204
2015	217
2016	230
2017	243
2018	258
2019	273
2020	290
2021	307
2022	326
2023	345

3. Pricing and Distribution

By considering the imported price of cellulose acetate and adding costs of duty and other import related expenses, a factory -gate price of Birr 88,551 per ton is recommended.

The factory can get its market outlet through directly selling to bulk end users and through selecting experienced distributors in the product.

B. PLANT CAPACITY & PRODUCTION PROGRAM

1. Plant Capacity

Based on the demand projection indicated, time required for implementation of the project and full capacity attainment after the start of the project, the proposed plant will have a capacity to produce 260 tons of cellulose acetate per annum. The plant is envisaged to operate in one shift of 8 hours per day and for 300 days per year. However, it is also possible to work in two or three shifts based on actual market conditions.

2. Production Program

It is expected that the envisaged project will start operation at relatively lower capacity to get enough time to penetrate market and develop skill. The production build-up program is, hence, made to start at relatively lower (75%) and then gradually rise to full capacity in the 3rd year of operation. The detailed production program is given in Table 3.3 below.

Table 3.3
PRODUCTION PROGRAM

Year of Production	1st Year	2nd Year	3rd Year
Production in %	75%	85%	100%
Cellulose acetate (tons)	195	221	260

IV. MATERIALS AND INPUTS

A. MATERIALS

The raw materials required to prepare cellulose acetate is mainly cotton lint, sulfuric acid and glacial acetic acid. The total annual cost of raw materials is estimated at Birr 15.68 million of

which Birr 1.76 million or 11.2% is required in foreign currency. The detailed breakdown of material requirement at full operation capacity of the plant is given in Table 4.1.

Table 4.1
LIST OF RAW MATERIALS AND COST

Sr. No.	Description	Unit of Measure	Qty.	Costs in Birr ('000)		
				LC	FC	Total
1	Glacial Acetic Acid	tons	130.0	585	1,755	2,340
2	Sulfuric acid	tons	10.2	204	-	204
3	Cotton or cotton lint	tons	360.0	13,140	-	13,140
Total				13,929	1,755	15,684

B. UTILITIES

The plant will use electrical energy, water and fuel as main utilities. The total annual cost of utilities is estimated at Birr 1,038,800. The annual utility consumption along with corresponding cost is indicated in Table 4.2.

Table 4.2
UTILITY CONSUMPTION OF THE PLANT AT FULL CAPACITY AND COST

Utility	Unit of Measure	Consumption	Unit Cost	Total
Electricity	kWh	240,000	0.58	139,200
Water	m ³	20,000	10.00	200,000
Fuel	Lt	45,000	14.88	699,600
Grand Total				1,038,800

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Production Process

Cellulose acetate is produced through two-step reactions involving the esterification of acetic acid with cellulose and the partial hydrolysis of the resultant ester groups. Cotton linter is used as the raw material cellulose. Cellulose is activated in a pre-treatment step. In the subsequent acetylation step, to the cellulose are added acetic anhydride, acetic acid, and sulphuric acid as a catalyst to carry out the esterification reaction. In the acetylation step, cellulose triacetate in which almost all hydroxyl groups have been esterified is generated. In the subsequent ripening step, the addition of water to the cellulose triacetate partially hydrolyzes ester groups to result in cellulose acetate with a desired acetyl value.

Water is added to the solution after the completion of the ripening step to precipitate and separate the cellulose acetate. In the subsequent washing step, the remaining solvent, impurities, and the like are removed. In addition, through a drying step, a cellulose acetate product is obtained. Diluted acetic acid as a by-product generated in the precipitation and purification steps is concentrated for recycle, or for the raw material for acetic anhydride production.

2. Environmental Impact

The production of cellulose acetate is a closed system and does not have an adverse environmental impact. The diluted acetic acid to be produced as a by product during the production of cellulose acetate shall be concentrated and recycled.

B. ENGINEERING

1. Machinery and Equipment

The total cost of plant machinery and equipment is estimated at Birr 5.6 million, of which Birr 4.2 million is required in foreign currency. The list of machinery and equipment required by the envisaged plant is given in Table 5.1.

Table 5.1
LIST OF MACHINERY AND EQUIPMENT

Sr. No.	Machine / Equipment Description	Qty.
1	Dryer	1
2	Pretreater	1
3	Acetylizor	1
4	Ripener	1
5	Hydrolysor	1
6	Retention tank	1
7	Precipitor	1
8	Hardner	2
9	Shaker screen	1
10	washer	1
11	Squeeze rolls	1
12	Dryers	1

2. Land, Building and Civil Works

The required area for both building and open space for the plant is estimated to be 1,500 m², out of which 800 m² will be a built-up area. The building will be constructed with EGA sheet roof, HCB wall and cement screed floor finish. The total cost of building and civil works at the rate of Birr 5,000 per m² is estimated at Birr 4,000,000.

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 m², 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 m², 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 m². 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 m². 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 m² (see Table 5.2).

Table 5.2**NEW LAND LEASE FLOOR PRICE FOR PLOTS IN ADDIS ABABA**

Zone	Level	Floor Price/m²
Central Market District	1 st	1686
	2 nd	1535
	3 rd	1323
	4 th	1085
	5 th	894
Transitional zone	1 st	1035
	2 nd	935
	3 rd	809
	4 th	685
	5 th	555
Expansion zone	1 st	355
	2 nd	299
	3 rd	217
	4 th	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 m² 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 criteria 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 m² 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 REQUIREMENTS

A. HUMAN RESOURCE REQUIREMENT

The total human resource requirement for this plant will be 54 persons. The total annual cost of human resource is estimated at Birr 1,380,000. Details of human resource requirement and salaries are presented in Table 6.1.

Table 6.1
HUMAN RESOURCE REQUIREMENT AND COST

Sr. No.	Position	Number	Monthly Salary (Birr)	Annual Cost (Birr)
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	12	18,000	216,000
12	Assistant Operators	12	9,600	115,200
13	Chemists	3	6,000	72,000
14	Mechanic	4	6,000	72,000
15	Electrician	4	6,000	72,000
16	Messenger and Cleaner	2	800	9,600
17	Guards	4	1,600	19,200
	Sub-total	54	92,000	1,104,000
	Employees benefit(25% of basic salary)		23,000	276,000
	Total		115,000	1,380,000

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 20,000.

VII. FINANCIAL ANALYSIS

The financial analysis of the cellulose 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 local	30 days
Raw material imported	120 days
Work in progress	3 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 16.31 million (see Table 7.1). From the total investment cost the highest share (Birr 10.68 million or 65.54%) is accounted by fixed investment cost followed by initial working capital (Birr 4.05 million or 24.85%) and pre operation cost (Birr 1.56 million or 9.61%). From the total investment cost Birr 4.20 or 25.75% 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	0.24
1.2	Building and civil work	4,000.00		4,000.00	24.52
1.3	Machinery and equipment	1,400.00	4,200.00	5,600.00	34.33
1.4	Vehicles	900.00		900.00	5.52
1.5	Office furniture and equipment	150.00		150.00	0.92
	Sub -total	6,489.90	4,200.00	10,689.90	65.54
2	Pre operating cost *				
2.1	Pre operating cost	500.00		500.00	3.07
2.2	Interest during construction	1,067.03		1,067.03	6.54
	Sub -total	1,567.03		1,567.03	9.61
3	Working capital	4,053.32		4,053.32	24.85
	Grand Total	12,110.25	4,200.00	16,310.25	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 5.39 million. However, only the initial working capital of Birr 4.05 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 21.39 million (see Table 7.2). The cost of raw material account for 73.29% of the production cost. The other major components of the production cost are depreciation, direct labor and utilities which account for 7.36%, 5.16% and 4.85%, respectively. The remaining 9.34 % is the share of utility, repair and maintenance, labor overhead and administration cost. For detail production cost see Appendix 7.A.2.

Table 7.2

ANNUAL PRODUCTION COST AT FULL CAPACITY (YEAR THREE)

Items	Cost (in 000 Birr)	%
Raw Material and Inputs	15,684.00	73.29
Utilities	1,038.80	4.85
Maintenance and repair	280.00	1.31
Labor direct	1,104.00	5.16
Labor overheads	276.00	1.29
Administration Costs	164.88	0.77
Land lease cost	-	-
Cost of marketing and distribution	250.00	1.17
Total Operating Costs	18,797.68	87.84
Depreciation	1,575.00	7.36
Cost of Finance	1,027.01	4.80
Total Production Cost	21,399.69	100.00

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 1.53 million to Birr 2.82 million during the life of the project. Moreover, at the end of the project life the accumulated net cash

flow amounts to Birr 24.21 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.

$$\text{Break -Even Sales Value} = \frac{\text{Fixed Cost} + \text{Financial Cost}}{\text{Variable Margin ratio (\%)}} = \text{Birr } 9,388,090$$

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

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 6 years.

5. Internal Rate of Return

The internal rate of return (IRR) is the annualized effective compounded return rate that can be earned on the invested capital, i.e., the yield on the investment. Put another way, the internal rate of return for an investment is the discount rate that makes the net present value of the investment's income stream total to zero. It is an indicator of the efficiency or quality of an investment. A project is a good investment proposition if its IRR is greater than the rate of return that could be earned by alternate investments or putting the money in a bank account. Accordingly, the IRR of this project is computed to be 19.04 % 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 8.04 million which is acceptable.

D. ECONOMIC AND SOCIAL BENEFITS

The project can create employment for 54 persons. The project will generate Birr 6.71 million in terms of tax revenue and also generates revenue to the Government in the form of 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 linkage with chemicals manufacturing sub sector and the agricultural sector and forward linkage with the manufacturing sector.

Appendix 7.A

FINANCIAL ANALYSES SUPPORTING TABLES

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	11,763	13,331	15,684	15,684	15,684	15,684	15,684	15,684	15,684	15,684
Utilities	779	883	1,039	1,039	1,039	1,039	1,039	1,039	1,039	1,039
Maintenance and repair	210	238	280	280	280	280	280	280	280	280
Labour direct	828	938	1,104	1,104	1,104	1,104	1,104	1,104	1,104	1,104
Labour overheads	207	235	276	276	276	276	276	276	276	276
Administration Costs	124	140	165	165	165	165	165	165	165	165
Land lease cost	0	0	0	0	13	13	13	13	13	13
Cost of marketing and distribution	250	250	250	250	250	250	250	250	250	250
Total Operating Costs	14,161	16,016	18,798	18,798	18,811	18,811	18,811	18,811	18,811	18,811
Depreciation	1,575	1,575	1,575	1,575	1,575	175	175	175	175	175
Cost of Finance	0	1,174	1,027	880	734	587	440	293	147	0
Total Production Cost	15,736	18,764	21,400	21,253	21,119	19,572	19,426	19,279	19,132	18,986

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	17,267	19,570	23,023	23,023	23,023	23,023	23,023	23,023	23,023	23,023
Less variable costs	13,911	15,766	18,548	18,548	18,548	18,548	18,548	18,548	18,548	18,548
VARIABLE MARGIN	3,357	3,804	4,476	4,476	4,476	4,476	4,476	4,476	4,476	4,476
in % of sales revenue	19.44	19.44	19.44	19.44	19.44	19.44	19.44	19.44	19.44	19.44
Less fixed costs	1,825	1,825	1,825	1,825	1,838	438	438	438	438	438
OPERATIONAL MARGIN	1,532	1,979	2,651	2,651	2,638	4,038	4,038	4,038	4,038	4,038
in % of sales revenue	8.87	10.11	11.51	11.51	11.46	17.54	17.54	17.54	17.54	17.54
Financial costs		1,174	1,027	880	734	587	440	293	147	0
GROSS PROFIT	1,532	806	1,624	1,770	1,904	3,451	3,598	3,744	3,891	4,038
in % of sales revenue	8.87	4.12	7.05	7.69	8.27	14.99	15.63	16.26	16.90	17.54
Income tax	0	0	0	531	571	1,035	1,079	1,123	1,167	1,211
NET PROFIT	1,532	806	1,624	1,239	1,333	2,416	2,518	2,621	2,724	2,826
in % of sales revenue	8.87	4.12	7.05	5.38	5.79	10.49	10.94	11.38	11.83	12.28

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	11,190	22,474	19,581	23,041	23,023	23,023	23,023	23,023	23,023	23,023	23,023	8,906
Inflow funds	11,190	5,207	12	17	0	0	0	0	0	0	0	0
Inflow operation	0	17,267	19,570	23,023	23,023	23,023	23,023	23,023	23,023	23,023	23,023	0
Other income	0	0	0	0	0	0	0	0	0	0	0	8,906
TOTAL CASH OUTFLOW	11,190	19,368	19,206	22,116	21,676	21,584	21,900	21,797	21,694	21,592	20,022	0
Increase in fixed assets	11,190	0	0	0	0	0	0	0	0	0	0	0
Increase in current assets	0	4,140	549	824	0	1	0	0	0	0	0	0
Operating costs	0	13,911	15,766	18,548	18,548	18,561	18,561	18,561	18,561	18,561	18,561	0
Marketing cost	0	250	250	250	250	250	250	250	250	250	250	0
Income tax	0	0	0	0	531	571	1,035	1,079	1,123	1,167	1,211	0
Financial costs	0	1,067	1,174	1,027	880	734	587	440	293	147	0	0
Loan repayment	0	0	1,467	1,467	1,467	1,467	1,467	1,467	1,467	1,467	0	0
SURPLUS (DEFICIT)	0	3,107	376	925	1,347	1,440	1,123	1,226	1,329	1,432	3,001	8,906
CUMULATIVE CASH BALANCE	0	3,107	3,482	4,407	5,754	7,194	8,317	9,544	10,873	12,304	15,306	24,211

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	17,267	19,570	23,023	23,023	23,023	23,023	23,023	23,023	23,023	23,023	8,906
Inflow operation	0	17,267	19,570	23,023	23,023	23,023	23,023	23,023	23,023	23,023	23,023	0
Other income	0	0	0	0	0	0	0	0	0	0	0	8,906
TOTAL CASH OUTFLOW	15,243	14,698	16,822	18,798	19,330	19,382	19,846	19,890	19,934	19,978	20,022	0
Increase in fixed assets	11,190	0	0	0	0	0	0	0	0	0	0	0
Increase in net working capital	4,053	538	806	0	1	0	0	0	0	0	0	0
Operating costs	0	13,911	15,766	18,548	18,548	18,561	18,561	18,561	18,561	18,561	18,561	0
Marketing cost	0	250	250	250	250	250	250	250	250	250	250	0
Income tax		0	0	0	531	571	1,035	1,079	1,123	1,167	1,211	0
NET CASH FLOW	-15,243	2,569	2,748	4,226	3,693	3,642	3,178	3,134	3,089	3,045	3,001	8,906
CUMULATIVE NET CASH FLOW	-15,243	-12,674	-9,926	-5,701	-2,008	1,634	4,811	7,945	11,034	14,080	17,081	25,987
Net present value	-15,243	2,335	2,271	3,175	2,523	2,261	1,794	1,608	1,441	1,292	1,157	3,434
Cumulative net present value	-15,243	-12,908	-10,637	-7,462	-4,940	-2,678	-885	723	2,164	3,456	4,613	8,047

NET PRESENT VALUE 8,047
INTERNAL RATE OF
RETURN 19.04%
PAYBACK 6 years

