

**182. PROFILE ON THE PRODUCTION OF PRINTED
CIRCUIT BOARD**

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I. SUMMARY

This profile envisages the establishment of a plant for the production of printed circuit board with a capacity of 300,000 pieces per annum. Printed circuit board is an electronic device in which the circuit is plated onto a laminated board and is used in military, civilian and domestic products.

The demand for printed circuit board is met entirely through import. The present (2012) demand for printed circuit board is estimated at 1,510 kgs. The demand for printed circuit board is projected to reach 2,432 kgs and 3,916 kgs by the year 2017 and 2022, respectively.

The principal raw materials required are bare printed circuit boards, electronic components-axial (e.g. Resistor), radial (e.g. Diodes), integrated circuits and surface mount components, and solder paste flux epoxy adhesives which have to be imported.

The total investment cost of the project including working capital is estimated at Birr 33.98 million. From the total investment cost the highest share (Birr 22.33 million or 65.72%) is accounted by fixed investment cost followed by initial working capital (Birr 8.58 million or 25.24%) and pre operation cost (Birr 3.07 million or 9.04%). From the total investment cost Birr 14.38 million or 42.32% is required in foreign currency.

The project is financially viable with an internal rate of return (IRR) of 29.63% and a net present value (NPV) of Birr 36.25 million discounted at 10%.

The project can create employment for 51 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 electrical and electronic equipments manufacturing sub sector and also generates income for the Government in terms of tax revenue and payroll tax.

II. PRODUCT DESCRIPTION AND APPLICATION

An assembled printed circuit board (PCB) is an electronic device in which the circuit is plated onto a laminated board. The board then has holes drilled into it, into which conventional electronic components are placed and soldered to complete the circuit. Small 'surface mount' components can also be mounted directly onto the circuit. Advances in printed circuit board technology have enabled many military, civilian and domestic products to be greatly reduced in size over the last decade.

The assembled and testing of printed circuit board used to be highly labor intensive and therefore electronic goods were manufactured in countries where labor is cheap and efficient. There are now highly automated machines for component insertion, soldering and testing of PCBs, so it is economic to have centralized PCB assembly and testing, servicing the assembly of various products. Freed from the labor intensive operation of component insertion and soldering, the final assembly of products can also be carried out close to the market.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

Printed circuit board (PCB) is base of any electronics/electrical equipment. A PCB provides the connectivity to the electronic component such as resistor, capacitor, coils, pots, diodes, FET, transistor, ICs, transformer etc. to form a complete electronic circuit. In the present scenario, the existence of electronics equipments cannot be imagined without a PCB. The PCBs are not only providing the connectivity among the electronic components but also reduces the size and increases the efficiency of the electronic equipment.

PCBs are used in each and every electronic and most of the electrical equipments. The working of any electronic equipments such as home appliances, entertainment equipment, testing, medical equipments or even defense electronic equipment etc. cannot be imagined without a PCB. The small, medium and large scale units have Nos. of vendors to carry out the specific job. The

mounting of electronic components on PCB is also a one of the ancillary job. With proper marketing, high quality and competitive price this type of units have sufficient scope in the present scenario.

The demand for PCBs is fully met through import. Table 3.1 shows the country's import of PCBs during the period 2002 – 2011.

Table 3.1

IMPORT OF PCBs (K.GS)

Years	Quantity
2002	1,210
2003	1,014
2004	739
2005	1,889
2006	213
2007	177
2008	1,303
2009	4,486
2010	1,163
2011	421

Source: Ethiopian Revenue and Customs Authority

As can be seen from Table 3.1 import of PCBs fluctuates from year to year. However, a general growth trend can be observed. The yearly average quantity imported during the first five years in the data set (2002-2006) was around 1,013 kgs and grew to 1,510 kgs during the second five years of 2007--2011.

In estimating the present demand for the product it is assumed that the recent five years average (2007-2011) is a reasonable approximate of current level of demand. Accordingly, current (2012) demand for PCBs is estimated at 1,510 kgs.

2. Demand Projection

The demand for PCBs is directly related with the development of the various sub sectors of the manufacturing sector. According to the Growth and Transformation Plan (GTP), the industrial sector is expected to grow at an average annual growth rate of 20% during the period 2011 – 2015. Taking this in to account and to be conservative an annual average growth rate of 10% is assumed for projecting the demand for PCBs (see Table 3.2.).

Table 3.2
PROJECTED DEMAND FOR PCBs (KGs)

Year	Projected Demand
2013	1,661
2014	1,827
2015	2,010
2016	2,211
2017	2,432
2018	2,675
2019	2,942
2020	3,237
2021	3,560
2022	3,916
2023	4,308
2024	4,739
2025	5,213

3. Pricing and Distribution

The price of PCBs varies greatly according to use, design and other factors. For the purpose of this project the average import value of the recent two years plus 30% for various costs is taken. Accordingly, Birr 175 per pieces is recommended. The product will be sold directly to the end user.

B. PLANT CAPACITY AND PRODUCTION PROGRAMME

1. Plant Capacity

Based on the market study, and capital requirement, the envisaged PCBs manufacturing plant will have a capacity of producing 300,000 per annum operating in one shift/day (8 hours/shift) and 300 days/annum. The capacity can be doubled or further increased, without increasing any significant fixed investment cost, by increasing the number of shifts.

2. Production Programme

The production program is based on the time required for the adjustment of feedstock, labour and equipment to the technology selected. Accordingly capacity utilization is set as follows:

- 75% of plant capacity during the 1st year
- 85% of plant capacity during the 2nd year
- 100% of plant capacity during the 3rd year

IV. MATERIALS AND INPUTS

A. RAW MATERIALS

The principal raw materials required for printed circuit board assembly are bare printed circuit boards- bought in specialist suppliers (could be established locally), electronic components-axial (e.g. resistor), radial (e.g. diodes), integrated circuits and surface mount components, solder ,paste flux and epoxy adhesives. The annual requirement of these raw materials and their costs are shown in Table 4.1.

Table 4.1**ANNUAL CONSUMPTION FOR RAW AND AUXILIARY MATERIALS AND COST**

Sr. No.	Description	Unit of Measure	Annual Consumption	Cost in '000 Birr		
				FC	LC	TC
1.	bare printed circuit boards	pcs	315,000	5,500	-	5,500
2.	Electrical components	Impsum	-	4,650	-	4,650
3.	solder	Tones	45	5,450	-	5,450
4.	Solder paste	Tones	22	2,680	-	2,680
5.	flux	Lt.	550	4,340	-	4,340
6.	Epoxy adhesives	Tones	25	2,200	-	2,200
7.	Packing material	Tones	24	2,430	-	2,430
	Total			27,250	9,083	36,333

B. UTILITIES

Industrial water of 200 m³ and electric power of 15,000 kWh are consumed in this plant per annum. The total cost of utilities is estimated to be Birr 10,667. Details of utility consumption and cost are shown in Table 4.2.

Table 4.2**ANNUAL REQUIREMENT OF UTILITIES AND COST**

Sr. No.	Description	Qty.	Unit Price (Birr)	Cost ('000 Birr)
1	Electricity (kWh)	15,000	0.58	8.667
2	Water (m ³)	200	10.00	2.000
	Total			10.667

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Production Process

There are three levels of technology available for the assembly of printed circuit boards:

- Hand assembly
- Conventional component insertion machine
- Surface mount component (SMC) placement machine.

The conventional components are assembled onto the board by automatic component insertion machine (ACI). Each shape of components requires a different machine.

- Dual-inline-package (D.I.P) Insertion Machine
- Radial Insertion Machine
- Axial Insertion machine
- Sequencer
- Screen printer
- Chip placement machine
- Reflow machine
- Flow track machine
- Flow solder machine
- Heat cycle oven
- Automatic electrical inspection

2. Environmental Impact

The envisaged PCBs manufacturing plant use assembly process which does not create any negative impact on the environment.

B. ENGINEERING

1. Machinery and Equipment

The list of machinery and equipment required for the manufacture of printed circuit board is given in Table 5.1. Total cost of machinery and equipment is estimated at Birr 16.632 million, out of which Birr 14.382 million is required in foreign currency.

Table 5.1
MACHINERY AND EQUIPMENT REQUIREMENTS AND COST

Sr. No.	Description	Qty.	Cost in '000 Birr		
			FC	LC	TC
1.	Dual-inline-package (D.I.P) Insertion Machine	1	2,400	-	2,400
2.	Radial Insertion Machine	1	1,350	-	1,350
3.	Axial Insertion machine	1	950	-	950
4.	Sequencer	1	1,250	-	1,250
5.	Screen printer	1	1,100	-	1,100
6.	Chip placement machine	1	1,300	-	1,300
7.	Reflow machine	1	1,350	-	1,350
8.	Flow track machine	1	550	-	550
9.	Flow solder machine	1	1,400	-	1,400
10.	Heat cycle oven	1	1,530	-	1,530
11	Automatic electrical inspection, Hard pallet truck		1,200	-	1,200
	Total		14,382	2,250	16,632

2. Land, Building and Civil Works

A total site area of about 2,000 square meters will be required for the plant. The total built-up area is estimated to be about 1,000 square meters. Of this area, about 120 square meters is for

office complex. The average unit cost for factory shed, office complex and store is Birr 4,500 per m². Accordingly, the total cost of building and civil work is estimated at Birr 4.5 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 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 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 AND TRAINING REQUIREMENTS

A. HUMAN RESOURCE REQUIREMENT

The plant will require a total of 51 workers. The plant manager will have to be a mechanical engineer having sufficient experience in the field. The detail of human resource requirement is given in Table 6.1.

B. TRAINING REQUIREMENT

All operators need basic training so that they can be acquainted to the operation. This can be done during the commissioning period of the plant. The cost of such training is estimated at Birr 150,000.

Table 6.1
HUMAN RESOURCE REQUIREMENT AND COST

Sr. No	Description	Req. No.	Salary Monthly (Birr)	Salary Annual (Birr)
1	Plant Manager	1	8,000	96,000
2	Secretary	1	1,000	12,000
3	Store Man	1	2000	24,000
4	Sales Man	1	3,000	36,000
5	Accountant	1	3,000	36,000
6	Clerk	1	1000	12,000
7	General Services	4	1750	84,000
1	Supervisor	1	5,000	60,000
2	Skilled workers	25	2,500	750,000
3	Semi-skilled workers	10	1,500	180,000
4	Helpers	5	1,000	60,000
Sub-total		51	29,750	1,350,000
8	Workers Benefit 25% of basic Salary		7,438	337,500
Grand Total		51	37,188	1,687,500

VII. FINANCIAL ANALYSIS

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

Construction period	1 year
Source of finance	30 % equity and 70% loan
Tax holidays	3 years
Bank interest	10%
Discount cash flow	10%
Accounts receivable	30 days
Raw material imported	120 days
Work in progress	1 day
Finished products	30 days
Cash in hand	5 days
Accounts payable	30 days
Repair and maintenance	5% of machinery cost

A. TOTAL INITIAL INVESTMENT COST

The total investment cost of the project including working capital is estimated at Birr 33.98 million (See Table 7.1). From the total investment cost the highest share (Birr 22.33 million or 65.72%) is accounted by fixed investment cost followed by initial working capital (Birr 8.58 million or 25.24%) and pre operation cost (Birr 3.07 million or 9.04%). From the total investment cost Birr 14.38 million or 42.32% 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	53.20		53.20	0.16
1.2	Building and civil work	4,500.00		4,500.00	13.24
1.3	Machinery and equipment	2,250.00	14,382.00	16,632.00	48.94
1.4	Vehicles	900.00		900.00	2.65
1.5	Office furniture and equipment	250.00		250.00	0.74
	Sub total	7,953.20	14,382.00	22,335.20	65.72
2	Pre operating cost *				
2.1	Pre operating cost	848.96		848.96	2.50
2.2	Interest during construction	2,223.35		2,223.35	6.54
	Sub total	3,072.31		3,072.31	9.04
3	Working capital **	8,578.00		8,578.00	25.24
	Grand Total	19,603.51	14,382.00	33,985.51	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 12.33 million. However, only the initial working capital of Birr 8.57 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 45.30 million (see Table 7.2). The cost of raw material account for 80.20% of the production cost. The other major components of the production cost are depreciation, financial cost, direct labour, cost of marketing and distribution, and repair and maintenance which account for 8.57%, 4.72%, 2.98%, 1.10 and 1.10% respectively. The remaining 1.33% is the share of utility, labour 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 (000 Birr)	%
Raw Material and Inputs	36,333	80.20
Utilities	11	0.02
Maintenance and repair	499	1.10
Labour direct	1,350	2.98
Labour overheads	338	0.75
Administration Costs	250	0.55
Land lease cost	0	0.00
Cost of marketing and distribution	500	1.10
Total Operating Costs	39,281	86.71
Depreciation	3,881	8.57
Cost of Finance	2,140	4.72
Total Production Cost	45,302	100.00

C. FINANCIAL EVALUATION

1. Profitability

Based on the projected profit and loss statement, the project will generate a profit throughout its operation life. Annual net profit after tax will grow from Birr 5.25 million to Birr 9.10 million during the life of the project. Moreover, at the end of the project life the accumulated net cash

flow amounts to Birr 81.52 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.

$$\text{Break Even Sales Value} = \frac{\text{Fixed Cost} + \text{Financial Cost}}{\text{Variable Margin ratio (\%)}} = \text{Birr } 22,050,000$$

$$\text{Break Even Capacity utilization} = \frac{\text{Break even Sales Value}}{\text{Sales revenue}} \times 100 = 31.94\%$$

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 3 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 29.63% 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 principal 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 36.25 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 51 persons. The project will generate Birr 23.17 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 electrical and electronic equipments manufacturing sub sector and also generates other income for the Government.

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	25,433	32,700	36,333	36,333	36,333	36,333	36,333	36,333	36,333	36,333
Utilities	8	10	11	11	11	11	11	11	11	11
Maintenance and repair	349	449	499	499	499	499	499	499	499	499
Labour direct	945	1,215	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350
Labour overheads	237	304	338	338	338	338	338	338	338	338
Administration Costs	175	225	250	250	250	250	250	250	250	250
Land lease cost	0	0	0	0	17	17	17	17	17	17
Cost of marketing and distribution	500	500	500	500	500	500	500	500	500	500
Total Operating Costs	27,647	35,403	39,281	39,281	39,298	39,298	39,298	39,298	39,298	39,298
Depreciation	3,881	3,881	3,881	3,881	3,881	205	205	205	205	205
Cost of Finance	0	2,446	2,140	1,834	1,529	1,223	917	611	306	0
Total Production Cost	31,528	41,730	45,302	44,996	44,708	40,726	40,420	40,115	39,809	39,503

Appendix 7.A.3
INCOME STATEMENT (in 000 Birr)

Item	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Sales revenue	36,750	47,250	52,500	52,500	52,500	52,500	52,500	52,500	52,500	52,500
Less variable costs	27,147	34,903	38,781	38,781	38,781	38,781	38,781	38,781	38,781	38,781
VARIABLE MARGIN	9,603	12,347	13,719	13,719	13,719	13,719	13,719	13,719	13,719	13,719
in % of sales revenue	26.13	26.13	26.13	26.13	26.13	26.13	26.13	26.13	26.13	26.13
Less fixed costs	4,381	4,381	4,381	4,381	4,398	722	722	722	722	722
OPERATIONAL MARGIN	5,222	7,966	9,338	9,338	9,321	12,997	12,997	12,997	12,997	12,997
in % of sales revenue	14.21	16.86	17.79	17.79	17.75	24.76	24.76	24.76	24.76	24.76
Financial costs		2,446	2,140	1,834	1,529	1,223	917	611	306	0
GROSS PROFIT	5,222	5,520	7,198	7,504	7,792	11,774	12,080	12,385	12,691	12,997
in % of sales revenue	14.21	11.68	13.71	14.29	14.84	22.43	23.01	23.59	24.17	24.76
Income (corporate) tax	0	0	0	2,251	2,338	3,532	3,624	3,716	3,807	3,899
NET PROFIT	5,222	5,520	7,198	5,252	5,455	8,242	8,456	8,670	8,884	9,098
in % of sales revenue	14.21	11.68	13.71	10.00	10.39	15.70	16.11	16.51	16.92	17.33

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	23,184	47,659	47,281	52,515	52,500	52,500	52,500	52,500	52,500	52,500	52,500	17,215
Inflow funds	23,184	10,909	31	15	0	0	0	0	0	0	0	0
Inflow operation	0	36,750	47,250	52,500	52,500	52,500	52,500	52,500	52,500	52,500	52,500	0
Other income	0	0	0	0	0	0	0	0	0	0	0	17,215
TOTAL CASH OUTFLOW	23,184	38,556	43,375	45,713	46,423	46,223	47,110	46,896	46,682	46,468	43,197	0
Increase in fixed assets	23,184	0	0	0	0	0	0	0	0	0	0	0
Increase in current assets	0	8,686	2,470	1,235	0	2	0	0	0	0	0	0
Operating costs	0	27,147	34,903	38,781	38,781	38,798	38,798	38,798	38,798	38,798	38,798	0
Marketing and Distribution cost	0	500	500	500	500	500	500	500	500	500	500	0
Income tax	0	0	0	0	2,251	2,338	3,532	3,624	3,716	3,807	3,899	0
Financial costs	0	2,223	2,446	2,140	1,834	1,529	1,223	917	611	306	0	0
Loan repayment	0	0	3,057	3,057	3,057	3,057	3,057	3,057	3,057	3,057	0	0
SURPLUS (DEFICIT)	0	9,103	3,905	6,802	6,077	6,277	5,390	5,604	5,818	6,032	9,303	17,215
CUMULATIVE CASH BALANCE	0	9,103	13,009	19,811	25,888	32,165	37,554	43,158	48,976	55,007	64,310	81,525

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	36,750	47,250	52,500	52,500	52,500	52,500	52,500	52,500	52,500	52,500	17,215
Inflow operation	0	36,750	47,250	52,500	52,500	52,500	52,500	52,500	52,500	52,500	52,500	0
Other income	0	0	0	0	0	0	0	0	0	0	0	17,215
TOTAL CASH OUTFLOW	31,762	30,086	36,622	39,281	41,534	41,636	42,830	42,922	43,014	43,105	43,197	0
Increase in fixed assets	23,184	0	0	0	0	0	0	0	0	0	0	0
Increase in net working capital	8,578	2,439	1,219	0	2	0	0	0	0	0	0	0
Operating costs	0	27,147	34,903	38,781	38,781	38,798	38,798	38,798	38,798	38,798	38,798	0
Marketing and Distribution cost	0	500	500	500	500	500	500	500	500	500	500	0
Income (corporate) tax		0	0	0	2,251	2,338	3,532	3,624	3,716	3,807	3,899	0
NET CASH FLOW	-31,762	6,664	10,628	13,219	10,966	10,864	9,670	9,578	9,486	9,395	9,303	17,215
CUMULATIVE NET CASH FLOW	-31,762	25,098	-14,470	-1,251	9,715	20,579	30,249	39,827	49,313	58,708	68,011	85,225
Net present value	-31,762	6,058	8,783	9,932	7,490	6,746	5,458	4,915	4,425	3,984	3,587	6,637
Cumulative net present value	-31,762	25,704	-16,921	-6,989	501	7,247	12,705	17,620	22,046	26,030	29,617	36,254

NET PRESENT VALUE 36,254
INTERNAL RATE OF RETURN 29.63%
NORMAL PAYBACK 3 years