

156. PROFILE ON THE PRODUCTION OF BOILER

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I. SUMMARY

This profile envisages the establishment of a plant for the production of boiler with a capacity of 150 units per annum. Boiler is used for industrial and for other uses such as big hotels.

The demand for boiler is met entirely through import. The present (2012) demand for boiler is estimated at 697 units. The demand for boiler is projected to reach 889 units and 1,134 units by the year 2017 and 2022, respectively.

The principal raw materials required are hot rolled steel sheet for pressure vessel and chamber manufacturing, low carbon steel pipe for fire tube passage, and welding electrodes of which have to be partly imported.

The total investment cost of the project including working capital is estimated at Birr 31.45 million. From the total investment cost the highest share (Birr 24.97 million or 79.38%) is accounted by fixed investment cost followed by pre operation cost (Birr 3.58 million or 11.39%) and initial working capital (Birr 2.90 million or 9.23%). From the total investment cost Birr 17.32 million or 55.08% is required in foreign currency.

The project is financially viable with an internal rate of return (IRR) of 21.31% and a net present value (NPV) of Birr 17.14 million discounted at 10%.

The project can create employment for 55 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 and hotel and tourism sub sectors and also generates income for the Government in terms of tax revenue and payroll tax.

II. PRODUCT DESCRIPTION AND APPLICATION

Boilers are used for industrial and for other uses such as big hotels. Boiler and pressure vessel manufacture needs strict licensing procedure that is specially formulated in accordance with relevant requirements in the Supervision Administration Regulation for Manufacture of Boiler and Pressure Vessel. This profile considers fire tube boilers.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

Boilers are used for industrial and for other uses such as big hotels. There is no plant in Ethiopia that produces boiler products. Hence, the products are imported from various countries. Table 3.1 below shows the import of boilers that were registered during 2001 - 2011.

Table 3.1

IMPORT OF BOILERS (UNITS)

Year	Import
2001	313
2002	343
2003	576
2004	528
2005	243
2006	594
2007	497
2008	680
2009	344
2010	690
2011	664
Total	5472
Average	497

Source: - Ethiopian Revenue and Customs Authority.

As could be seen from Table 3.1, the imported quantity of boilers ranges from the lowest figure 243 in 2005 to the highest 690 in 2010 during the period. The import data shows an increasing trend in some years and fluctuations in other years during the period. During 2001- 2004 it ranges from the lowest import figure 313 boilers to the highest 576 with an average of 365 boilers. During 2004 - 2007 there are ups and downs in the import data.

In order to estimate the current effective demand, the following assumptions are made.

Although there are some fluctuations in the import data in some years under consideration, in recent years it has shown an increasing trend. Hence, the average of the last two years of the

period under consideration is assumed to indicate the present demand. The average is 677 boilers. The annual average growth rate of eleven years (3%) has been also considered.

Based on the above assumptions, the current effective demand for boilers for year 2012 has been estimated at 697 boilers.

2. Demand Projection

The demand for boilers is mainly dependent on the growth of manufacturing and hotel industries, which are the largest users of the product. On the basis of an anticipated growth and expansion of the mentioned sectors, the demand for boilers is expected to grow at an average rate of 5% per annum. Based on this assumption, the demand projection for the period 2013-2025 is shown in Table 3.2.

Table 3.2

PROJEDTED DEMANDFOR BOILERS (UNITS)

Year	Projected Demand
2013	732
2014	769
2015	807
2016	847
2017	889
2018	933
2019	980
2020	1,029
2021	1,080
2022	1,134
2023	1,191

3. Pricing and Distribution

There are variations in the price of boilers depending on the size, use and specification. For the purpose of this study, however, a representative type of low pressure steam-producing boiler is considered. Hence, for the purpose of financial analysis and sales revenue Birr 175,000 is recommended.

Regarding distribution, boilers are normally made on order basis. Hence, distribution does not conform to the conventional whole sale and retails structures.

B. PLANT CAPACITY AND PRODUCTION PROGRAM

1. Plant Capacity

According to the market study, the demand for boilers grows from 600 in the year 2012 to 1,187 in the 2025 and considering the economic scale of Boiler manufacturing, the plant is proposed to manufacture 150 in number per annum that is about 25% of the demand for 2014.

The selected production capacity is based on 300 working days per annum, single shift of eight hours each per day. The rest of calendar days are left for cleaning and maintenance.

2. Production Program

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:

- 70% of plant capacity during the 1st year,
- 85% of plant capacity during the 2nd year, and
- 100% of plant capacity during the 3rd year.

IV. MATERIALS AND INPUTS

A. RAW MATERIALS

Main raw materials required for production of boilers are: hot rolled steel sheet for pressure vessel and chamber manufacturing, low carbon steel pipe for fire tube passage, and welding electrodes.

Assuming that some standard products such as bolts, nuts, etc to be used for fabrication are made available through purchase as they completed for use, the annual requirement of these raw

materials is shown in Table 4.1. Manufacturer of boiler shall establish, and continuously and effectively implement a sound quality management system suitable for its boiler and pressure vessel products. In order to verify the control capability of its quality management system for boiler and pressure vessel products, the manufacturer shall have enough practice in continuous producing boiler and pressure vessel products

Table 4.1

ANNUAL REQUIRED FOR RAW AND AUXILIARY MATERIALS AND COST

Sr. No.	Description	Unit of Measure	Annual Con's	Cost in '000 Birr		
				FC	LC	TC
1.	Hot rolled steel sheet	Tons	1,500	4,500	900	5,4000
2	Low carbon steel pipe	Tons	900	4,000	800	5,400
3	Welding electrode	Tons	50	750	150	900
3.	Laboratory materials (2% product sales value)	Lum psum	-	450	90	540
4	Standard materials (1% product sales value)	lumpsum	-		225	225
	Total			9,700	2,165	11,865

B. UTILITIES

Industrial water of 200 m³ and electric power of 150,000 kWh are consumed in this plant per annum. The total cost of utilities is estimated to be Birr 88,670. Details of which 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)	150,000	0.5778	86.67
2	Water (m ³)	200	10.00	2.00
	Total			88.67

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Production Process

Manufacturing of boilers passes through the following steps.

- Cutting of holes on sheet plate with pantographic cutting machine;
- Forming the vessel portion of boiler and beveling to prepare for welding ;
- Bending of pipes;
- Continues welding of the vessel;
- Welding of the plates and the vessel;
- Inserting the chamber into the vessel;
- Fitting and welding of pipes;
- Pressure testing of the weld for leaks;
- NDT testing;and
- Getting the license.

2. Environmental Impact

The production process does not have any negative impact on the environment.

B. ENGINEERING

1. Machinery and Equipment

Total cost of machinery and equipment is estimated at Birr 20.79 million, out of which Birr 17.325 million is required in foreign currency. The list of machinery and equipment required for the manufacture of boilers is given in Table 5.1.

Table 5.1
MACHINERY AND EQUIPMENT REQUIREMENTS AND COST

Sr. No.	Description	Qty.	Cost in '000 Birr		
			FC	LC	TC
1.	Semi automatic cutting machine	1	2,500	500	3,000
2.	Bevel machines in plates and pipes	1	1,500	300	1,800
3.	Automatic arc welding	1	5,000	1,000	6,000
4.	Gas shield arc welding	1	1,250	250	1,500
5.	Bending machine	1	1,500	300	1,800
6	Heat treatment furnaces	1set	1,250	250	1,500
7	Spiral pipe production equipment	1set	500	100	600
8	Overhead crane	20 ton	750	150	900
9	Compressor	1	150	30	180
10	Surface grinder	1	125	25	150
11	Examination and testing equipment	1set	2,000	400	2,400
12	Hard pallet truck	1	800	160	960
	Total		17,325	3,465	20,790

2. Land, Building and Civil Works

The plant requires a total of 1000 m² area of land out of which 600 m² is built-up area which includes manufacturing area, raw material stock area, offices etc. Assuming construction rate of Birr 5,000 per m², the total cost of construction is estimated to be Birr 3 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 266,000 of which 10% or Birr 26,600 will be paid in advance. The remaining Birr 239,400 will be paid in equal installments with in 28 years i.e. Birr 8,550 annually.

VI. HUMAN RESOURCE AND TRAINING REQUIREMENTS

A. HUMAN RESOURCE REQUIREMENT

Total human resource requirement, including skilled and unskilled labor is 55 persons. Correspondingly, total annual labor cost is estimated at Birr 2,542,400. Table 6.1 below shows the list of human resource required and the estimated labor costs.

B. TRAINING REQUIREMENT

All welders need basic and special training so that they can be skilled to the operation. This can be done during the commissioning period of the plant. The cost of such training is estimated at Birr 750,000.

Table 6.1**HUMAN RESOURCE REQUIREMENT & COST**

Sr.No.	Job Position	Qty	Salary /Month	Salary /Year
1	Manger	1	8,000	96,000
2	Production and maintenance supervisor	3	15,000	180,000
3	Production clerk	1	1250	15,000
4	Welder	36	252,000	3,024,000
5	Labour	6	3,900	46,800
6	Stores, Finance ,administration and sales head	1	4,500	54,000
7	Secretary	1	3500	42,000
8	Cashier/ clerk	1	2500	30,000
9	Store clerk	1	1200	14,400
10	Security guard	1	850	10,200
11	Messenger/ cleaner	2	1000	12,000
12	Driver	1	1500	18,000
	Total	55	295,200	3,542,400

VII. FINANCIAL ANALYSIS

The financial analysis of the boiler 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
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 31.45 million (see Table 7.1). From the total investment cost the highest share (Birr 24.97 million or 79.38%) is accounted by fixed investment cost followed by pre operation cost (Birr 3.58 million or 11.39%) and initial working capital (Birr 2.90 million or 9.23%). From the total investment cost Birr 17.32 million or 55.08% 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	26.60		26.60	0.08
1.2	Building and civil work	3,000.00		3,000.00	9.54
1.3	Machinery and equipment	3,465.00	17,325.00	20,790.00	66.10
1.4	Vehicles	900.00		900.00	2.86
1.5	Office furniture and equipment	250.00		250.00	0.79
	Sub total	7,641.60	17,325.00	24,966.60	79.38
2	Pre operating cost *				
2.1	Pre operating cost	1,523.70		1,523.70	4.84
2.2	Interest during construction	2,057.63		2,057.63	6.54
	Sub total	3,581.33		3,581.33	11.39
3	Working capital **	2,904.39		2,904.39	9.23
	Grand Total	14,127.32	17,325.00	31,452.32	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 4.18 million. However, only the initial working capital of Birr 2.90 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 24.15 million (see Table 7.2). The cost of raw material account for 49.14% of the production cost. The other major components of the production cost are financial cost, depreciation, labor overheads, and labor which account for 8.20%, 19.83%, 2.93% and 14.67%, respectively. The remaining 5.23% is the share maintenance and repair, of utility, cost of marketing and distribution, 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 (000 Birr)	%
Raw Material and Inputs	11,865	49.14
Utilities	89	0.37
Maintenance and repair	624	2.58
Labor direct	3,542	14.67
Labor overheads	708	2.93
Administration Costs	250	1.04
Land lease cost	0	0.00
Cost of marketing and distribution	300	1.24
Total Operating Costs	17,378	71.97
Depreciation	4,788	19.83
Cost of Finance	1,980	8.20
Total Production Cost	24,146	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 1.67 million to Birr 6.10 million during the life of the project. Moreover, at the end of the project life the accumulated net cash flow amounts to Birr 45.23 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.

$$\text{Break Even Sales Value} = \frac{\text{Fixed Cost} + \text{Financial Cost}}{\text{Variable Margin ratio (\%)}} = \text{Birr } 11,025,000$$

$$\text{Break Even Capacity utilization} = \frac{\text{Break even Sales Value}}{\text{Sales revenue}} \times 100 = 55.47\%$$

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 21.31% 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 17.14 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 55 persons. The project will generate Birr 13.74 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 and hotel and tourism sub sectors 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	8,306	10,679	11,865	11,865	11,865	11,865	11,865	11,865	11,865	11,865
Utilities	62	80	89	89	89	89	89	89	89	89
Maintenance and repair	437	562	624	624	624	624	624	624	624	624
Labour direct	2,479	3,188	3,542	3,542	3,542	3,542	3,542	3,542	3,542	3,542
Labour overheads	496	637	708	708	708	708	708	708	708	708
Administration Costs	175	225	250	250	250	250	250	250	250	250
Land lease cost	0	0	0	0	9	9	9	9	9	9
Cost of marketing and distribution	300	300	300	300	300	300	300	300	300	300
Total Operating Costs	12,255	15,670	17,378	17,378	17,387	17,387	17,387	17,387	17,387	17,387
Depreciation	4,788	4,788	4,788	4,788	4,788	145	145	145	145	145
Cost of Finance	0	2,263	1,980	1,698	1,415	1,132	849	566	283	0
Total Production Cost	17,042	22,721	24,146	23,863	23,589	18,663	18,380	18,097	17,814	17,532

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	18,375	23,625	26,250	26,250	26,250	26,250	26,250	26,250	26,250	26,250
Less variable costs	11,955	15,370	17,078	17,078	17,078	17,078	17,078	17,078	17,078	17,078
VARIABLE MARGIN	6,420	8,255	9,172	9,172	9,172	9,172	9,172	9,172	9,172	9,172
in % of sales revenue	34.94	34.94	34.94	34.94	34.94	34.94	34.94	34.94	34.94	34.94
Less fixed costs	5,088	5,088	5,088	5,088	5,096	454	454	454	454	454
OPERATIONAL MARGIN	1,333	3,167	4,084	4,084	4,076	8,718	8,718	8,718	8,718	8,718
in % of sales revenue	7.25	13.41	15.56	15.56	15.53	33.21	33.21	33.21	33.21	33.21
Financial costs		2,263	1,980	1,698	1,415	1,132	849	566	283	0
GROSS PROFIT	1,333	904	2,104	2,387	2,661	7,587	7,870	8,153	8,436	8,718
in % of sales revenue	7.25	3.83	8.01	9.09	10.14	28.90	29.98	31.06	32.14	33.21
Income (corporate) tax	0	0	0	716	798	2,276	2,361	2,446	2,531	2,616
NET PROFIT	1,333	904	2,104	1,671	1,863	5,311	5,509	5,707	5,905	6,103
in % of sales revenue	7.25	3.83	8.01	6.36	7.10	20.23	20.99	21.74	22.49	23.25

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	26,490	23,580	23,694	26,285	26,250	26,250	26,250	26,250	26,250	26,250	26,250	8,023
Inflow funds	26,490	5,205	69	35	0	0	0	0	0	0	0	0
Inflow operation	0	18,375	23,625	26,250	26,250	26,250	26,250	26,250	26,250	26,250	26,250	0
Other income	0	0	0	0	0	0	0	0	0	0	0	8,023
TOTAL CASH OUTFLOW	26,490	17,460	21,655	22,634	22,621	22,430	23,624	23,425	23,227	23,029	20,002	0
Increase in fixed assets	26,490	0	0	0	0	0	0	0	0	0	0	0
Increase in current assets	0	3,147	892	446	0	1	0	0	0	0	0	0
Operating costs	0	11,955	15,370	17,078	17,078	17,087	17,087	17,087	17,087	17,087	17,087	0
Marketing and Distribution cost	0	300	300	300	300	300	300	300	300	300	300	0
Income tax	0	0	0	0	716	798	2,276	2,361	2,446	2,531	2,616	0
Financial costs	0	2,058	2,263	1,980	1,698	1,415	1,132	849	566	283	0	0
Loan repayment	0	0	2,829	2,829	2,829	2,829	2,829	2,829	2,829	2,829	0	0
SURPLUS (DEFICIT)	0	6,120	2,039	3,651	3,629	3,820	2,626	2,825	3,023	3,221	6,248	8,023
CUMULATIVE CASH BALANCE	0	6,120	8,160	11,811	15,440	19,260	21,887	24,711	27,734	30,955	37,203	45,226

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	18,375	23,625	26,250	26,250	26,250	26,250	26,250	26,250	26,250	26,250	8,023
Inflow operation	0	18,375	23,625	26,250	26,250	26,250	26,250	26,250	26,250	26,250	26,250	0
Other income	0	0	0	0	0	0	0	0	0	0	0	8,023
TOTAL CASH OUTFLOW	29,395	13,077	16,082	17,378	18,095	18,185	19,663	19,747	19,832	19,917	20,002	0
Increase in fixed assets	26,490	0	0	0	0	0	0	0	0	0	0	0
Increase in net working capital	2,904	823	411	0	1	0	0	0	0	0	0	0
Operating costs	0	11,955	15,370	17,078	17,078	17,087	17,087	17,087	17,087	17,087	17,087	0
Marketing and Distribution cost	0	300	300	300	300	300	300	300	300	300	300	0
Income (corporate) tax		0	0	0	716	798	2,276	2,361	2,446	2,531	2,616	0
NET CASH FLOW	-29,395	5,298	7,543	8,872	8,155	8,065	6,587	6,503	6,418	6,333	6,248	8,023
CUMULATIVE NET CASH FLOW	-29,395	24,097	-16,554	-7,682	474	8,539	15,126	21,629	28,046	34,379	40,627	48,651
Net present value	-29,395	4,816	6,234	6,666	5,570	5,008	3,718	3,337	2,994	2,686	2,409	3,093
Cumulative net present value	-29,395	24,579	-18,344	11,679	-6,109	-1,101	2,618	5,954	8,948	11,634	14,043	17,136

NET PRESENT VALUE 17,136
INTERNAL RATE OF RETURN 21.31%
NORMAL PAYBACK 5 years