

**53. PROFILE ON THE PRODUCTION OF
HYDROCHLORIC ACID**

TABLE OF CONTENTS

	<u>PAGE</u>
I. SUMMARY	53-2
II. PRODUCT DESCRIPTION & APPLICATION	53-3
III. MARKET STUDY AND PLANT CAPACITY	53-3
A. MARKET STUDY	53-3
B. PLANT CAPACITY & PRODUCTION PROGRAM	53-6
IV. MATERIALS AND INPUTS	53-7
A. RAW & AUXILIARY MATERIALS	53-7
B. UTILITIES	53-7
V. TECHNOLOGY & ENGINEERING	53-8
A. TECHNOLOGY	53-8
B. ENGINEERING	53-9
VI. MANPOWER & TRAINING REQUIREMENT	53-13
A. MANPOWER REQUIREMENT	53-13
B. TRAINING REQUIREMENT	53-15
VII. FINANCIAL ANALYSIS	53-15
A. TOTAL INITIAL INVESTMENT COST	53-15
B. PRODUCTION COST	53-17
C. FINANCIAL EVALUATION	53-18
D. ECONOMIC & SOCIAL BENEFITS	53-19

I. SUMMARY

This profile envisages the establishment of a plant for the production of hydrochloric acid with a capacity of 2,800 tons per annum. Hydrochloric acid is used in the production of pharmaceuticals, dyes, pigments and leather.

The country's requirement of hydrochloric acid is met through import. The present (2012) demand for hydrochloric acid is estimated at 1,637 tons. The demand for hydrochloric acid is projected to reach 2,900 tons and 4,670 tons by the years 2018 and 2023, respectively.

The principal raw materials required are sulphuric acid and common salt. Both raw materials are locally available.

The total investment cost of the project including working capital is estimated at Birr 70.54 million. From the total investment cost the highest share (Birr 54.58 million or 77.38%) is accounted fixed investment cost by followed by initial working capital (Birr 8.98 million or 12.74%) and pre operation cost (Birr 6.96 million or 9.88%). From the total investment cost Birr 30.37 million or 43.06% is required in foreign currency.

The project is financially viable with an internal rate of return (IRR) of 34.81% and a net present value (NPV) of Birr 133.18 million, discounted at 10%.

The project can create employment for 78 persons. The establishment of such factory will have a foreign exchange saving effect to the country by substituting the current imports. The project will also create forward linkage with the manufacturing sector and backward linkage with the mining sector and chemical manufacturing sub sector and also generates income for the Government in terms of tax revenue and payroll tax.

II. PRODUCT DESCRIPTION AND APPLICATION

Hydrochloric acid, also known as muriatic acid, is an aqueous solution of hydrogen chloride gas. At room temperature, it is a colorless gas, which forms white fumes of hydrochloric acid upon contact with atmospheric humidity. Hydrochloric acid is a strong inorganic acid widely used chemical. The largest end uses for hydrochloric acid are steel pickling, oil well acidizing, food manufacturing, producing calcium chloride, and ore processing.

Aqueous hydrochloric acid is used in recovery of semiprecious metals from used catalysts, as a catalyst in synthesis, use in catalyst regeneration, pH control, regeneration of ion exchange resins used in wastewater treatment and electric utilities, neutralization of alkaline products or waste materials, and in brine acidification for use in the production of chlorine and caustic soda.

The pharmaceutical industry consumes hydrochloric acid as a catalyst in synthesis, for pH control, for deionization of water and as a reduction agent (e.g., in the production of ascorbic acid and Para- aminobenzoic acid).

Numerous other uses of hydrochloric acid include the manufacture of dyes and pigments; the removal of sludge and scale from industrial equipment; the de-liming, tanning and dyeing of hides by the leather industry; manufacture of permanent wave lotion; the carbonizing of wool; use as a bleaching and dyeing assistant in the textile industry; and the purification of sand and clay.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

The demand for hydrochloric acid is entirely met through import. Ethiopia has been importing the product from various countries of the world. The major exporters of hydrochloric acid to Ethiopia include India, Pakistan, and South Africa. Other suppliers are Belgium, United Kingdom and Germany. The volume and value of hydrochloric acid imported to the country covering the period 2000-2011 is presented in Table 3.1.

Table 3.1
IMPORT OF HYDROCHLORIC ACID

Year	Qty. (Tons)	Value (‘000 Birr)
2000	402	998
2001	873	2,073
2002	238	747
2003	1,188	3,005
2004	889	3,265
2005	717	1,856
2006	1,843	5,158
2007	1,678	5,030
2008	1,568	5,225
2009	1,388	6,483
2010	1,243	6,632
2011	2,105	12,297

Source: - Ethiopian Revenue and Customs Authority.

As could be seen from Table 3.1, import of hydrochloric acid in the past twelve years exhibits an increasing trend although it is characterized by fluctuations. The yearly average level of import which was 504 tons during the period 2000-2002 has increased to a yearly average level of 931 tones and 1,696 tons during the period 2003-2005 and 2006-2008, respectively. During the two periods ,there was a total increase of about 84%. During the last recent three years of 2008 – 2011 the yearly average quantity imported has slightly decreased to 1,578 tons or a decline of by 7%. This could be due to stock carry over from the previous three years where imported quantity was very high compared to other years.

In order to estimate the present demand the average of the recent two years is considered, which takes in to account the fluctuations occurred in the data set. Accordingly, the present demand is estimated at 1,637 tons.

2. Demand Projection

The demand for hydrochloric acid is highly influenced by the development of the manufacturing sector particularly the chemical sub sector. Since the Ethiopian economy is on the way to transform its economic structure to the industrial sector an annual average growth rate of 10% is applied in forecasting the future demand. See Table 3.2.

Table 3.2

PROJECTED DEMAND FOR HYDROCHLORIC ACID (TONS)

Year	Projected Demand
2013	1,800
2014	1,980
2015	2,179
2016	2,397
2017	2,636
2018	2,900
2019	3,190
2020	3,509
2021	3,,860
2022	4,246
2023	4,670

The demand for hydrochloric acid will grow from 1,800 tons in the year 2013 to 2,900 tones and 4,670 tones by the years 2018 and 2023, respectively.

3. Pricing and distribution

Based on the CIF value of year 2011 import and considering other import related costs a factory gate price of Birr 7,010 per ton is recommended as a factory gate price.

The product has to be sold directly to the end user industries since their number and geographical distribution is limited.

B. PLANT CAPACITY AND PRODUCTION PROGRAM

1. Plant Capacity

The market study indicates that, the demand for hydrochloric acid increases from 1,800 tons in the year 2013 to 4,670 tons in the year 2023. The annual production capacity of the envisaged project is proposed to be 2,800 tons of hydrochloric acid based on the market study, minimum economies of scale and period required for the implementation of the project and technical skill development and market penetration. The capacity is determined assuming that there will be 300 working days per annum and three shifts of 8 hours each per day.

2. Production Program

The production program is indicated in Table 3.3. At the initial stage of the production period, the plant requires some years to penetrate the market and develop technical skill. Therefore, in the first, second and third year of production, the capacity utilization rate will be 65%, 75 and 90%, respectively. In the fourth year and then-after, full capacity production shall be attained.

Table 3.3
PRODUCTION PROGRAM

Sr. No.	Product	Production Year			
		1	2	3	4-10
1	Hydrochloric acid (ton) (31%)	1,820	2,100	2,520	2,800
2	Sodium sulphate (ton)	3,900	4,500	5,400	6,000
	Capacity utilization rate (%)	65	75	90	100

IV. RAW MATERIAL AND INPUTS

A. RAW AND AUXILIARY MATERIAL

The principal raw materials required by the envisaged plant are sulphuric acid and common salt. Both raw materials are locally available. The total annual cost of raw and auxiliary materials is estimated at Birr 39,596,000. Table 4.1 shows the annual raw material requirement and cost of the project at full capacity production.

Table 4.1
ANNUAL RAW MATERIAL REQUIREMENT & COST

Sr.No.	Raw material	UOM	Qty.	Total
1	Sulphuric Acid (98%)	Ton	4,000	32,000
2	Salt (NaCl-96%)	Ton	5,000	7,500
3	Packing materials for HCl(50kg plastic drum)	pcs	560	84
4	Packing materials sodium sulphate(50kg PP bag)	Pcs	1,200	12
	Total			39,596

B. UTILITIES

The major utilities of the proposed plant are electricity furnace oil and water. The total annual cost of utility is estimated at Birr 4,850,160. The annual utility requirement and cost are indicated in Table 4.2.

Table 4.2
ANNUAL UTILITIES REQUIREMENT & COST

Sr.No.	Description	UOM	Qty	Cost (Birr)
1	Electricity	kWh	912,000	528,960
2	Furnaces oil	Lt.	240,000	3,521,200
3	Water	m ³	80,000	800,000
	Total			4,850,160

V. TECHNOLOGY AND ENGINEERING

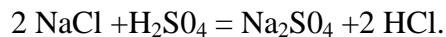
A. TECHNOLOGY

1. Production Processes

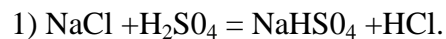
Hydrochloric acid can be produced mainly by four basic methods: the chlorination of organic chemicals; the combination of hydrogen and chlorine; the salt-sulfuric acid production process; and, as a co-product in the manufacture of silica. Among these processes, the salt-sulfuric acid is selected for the envisaged profile since the raw materials are totally available locally; can operate at a lower capacity and the investment cost is relatively low as compared to the other processes. The process description of the salt-sulfuric acid method of hydrochloric acid production is given hereunder.

Hydrochloric or muriatic acid is generally made by the action of sulphuric acid on common salt.

The process may be represented by the equation: -

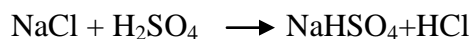


But as actually carried out it takes place in two stages, according to the following reactions: -

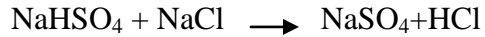


These reactions may be carried out by heating the mixture of salt and sulphuric acid either in an "open roaster," or in a muffle or "close roaster." These are both called "**salt-cake furnaces.**"

The muffle or "close roaster" is used very generally since it yields a stronger and purer acid. In the closed furnace process, common salt is first mixed with calculated amount of concentrated sulfuric acid and then heated in a cast iron furnace. Two products will be formed i.e., Sodium hydrogen sulphate and hydrogen chloride gas.



The resulting paste of sodium hydrogen sulphate (NaHSO_4) is then taken out and heated to a high temperature (550°C to 600°C) on the hearth of a furnace along with some more common salt. The sodium hydrogen sulphate is thus converted into sodium sulphate, known as salt cake.



The hydrogen chloride gas (HCl) is given off from the furnace and allowed to pass into a packed tower (absorption tower). A spray of water also come down the tower and dissolves the vapour of hydrogen chloride to form hydrochloric acid. In this process adiabatic absorption is used to produce high strength acid (about 31% concentrate). On the other side, the salt cake is then broken and pulverized.

2. Environmental Impact Assessment

The nuisance caused by the acid fumes in the neighborhood of the factory is high so that the acid fumes has to be absorbed in a pure water to avoid the chimney gas to be discharged into the atmosphere. The selected technology is seamless and does not have any gas emission, liquid as well as solid wastes. Hence there is no adverse impact on environment.

B. ENGINEERING

1. Machinery & Equipment

The total cost of machinery is estimated at Birr 40,500,000, of which Birr 30,375,000 is in foreign currency. The list of machinery and equipment for the production of hydrochloric acid is indicated in Table 5.1.

Table 5.1
LIST OF MACHINERY & EQUIPMENT

Sr.No.	Machinery	No.
1	Storage tank (sulfuric acid)	1
2	Furnace (double compartment)	1
3	Cooler (sodium sulphate)	1
4	Crusher with screen and recycle	1
5	Pulverizer	1
6	Cooler (HCl)	1
7	Absorption unit	1 unit
8	Storage tank (HCl)	1

2. Land, Building and Civil Works

The total area of the project is 5,000 m², out of which 3,000 m² is a built-up area. Therefore, the cost of building and civil work is estimated at Birr 12 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/m ²
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 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 m² is estimated at Birr 1,330,000 of which 10% or Birr 133,000 will be paid in advance. The remaining Birr 1,197,000 will be paid in equal installments with in 28 years i.e. Birr 42,750 annually.

VI. HUMAN RESOURCE & TRAINING REQUIREMENT

A. HUMAN RESOURCE REQUIREMENT

The total human resource required for the envisaged plant is 78. The total annual cost of labor is estimated at Birr 1,788,000. The list of human resource and labor cost are indicated in Table 6.1.

Table 6.1**HUMAN RESOURCE REQUIREMENT & LABOR COST**

Sr. No.	Human Resource	No. of Persons	Monthly Salary (Birr)	Annual Salary (Birr)
1	General manager	1	8,000	96,000
2	Secretary	1	2,000	24,000
3	Commercial manager	1	6,000	72,000
4	Sales man	2	6,000	72,000
5	Purchaser	2	6,000	72,000
6	Finance manager	1	6,000	72,000
7	Accountant	3	9,000	108,000
8	Cashier	2	1,800	21,600
9	Clerk	2	1,200	14,400
10	Production and technical head	1	6,000	72,000
11	Mechanic	6	9,000	108,000
12	Electrician	6	9,000	108,000
14	Chemist	3	6,000	72,000
15	Junior chemists	3	3,600	43,200
16	Operators	12	18,000	216,000
17	Assistant Operator	12	12,000	144,000
18	Laborers	8	4,800	57,600
19	General service	12	4,800	57,600
	Sub- total	78	119,200	1,430,400
	Benefit (25% Basic Salary)		29,800	357,600
	Total		149,000	1,788,000

B. TRAINING REQUIREMENT

Training of labor force shall be carried out during plant erection by the experts of plant machinery supplier. The cost of training is estimated at Birr 90,000.

VII. FINANCIAL ANALYSIS

The financial analysis of the hydrochloric acid 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 70.54 million (see Table 7.1). From the total investment cost the highest share (Birr 54.58 million or 77.38%) is accounted fixed investment cost by followed by initial working capital (Birr 8.98 million or 12.74%) and pre operation cost (Birr 6.96 million or 9.88%). From the total investment cost Birr 30.37 million or 43.06% is required in foreign currency.

Table 7.1**INITIAL INVESTMENT COST ('000 Birr)**

Sr. No.	Cost Items	Local Cost	Foreign Cost	Total Cost	% Share
1	Fixed investment				
1.1	Land Lease	133.00		133.00	0.19
1.2	Building and civil work	12,000.00		12,000.00	17.01
1.3	Machinery and equipment	10,125.00	30,375.00	40,500.00	57.41
1.4	Vehicles	1,500.00		1,500.00	2.13
1.5	Office furniture and equipment	450.00		450.00	0.64
	Sub -total	24,208.00	30,375.00	54,583.00	77.38
2	Pre operating cost *				
2.1	Pre operating cost	2,355.00		2,355.00	3.34
2.2	Interest during construction	4,614.94		4,614.94	6.54
	Sub -total	6,969.94		6,969.94	9.88
3	Working capital**	8,989.74		8,989.74	12.74
	Grand Total	40,167.68	30,375.00	70,542.68	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 13.80 million. However, only the initial working capital of Birr 8.98 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 62.71 million (see Table 7.2). The cost of raw material account for 63.14% of the production cost. The other major components of the production cost are depreciation, utility and financial cost, which account for 14.98%, 7.73% and 6.07%, respectively. The remaining 8.07% is the share of 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 THREE)

Items	Cost (in 000 Birr)	%
Raw Material and Inputs	39,596.00	63.14
Utilities	4,850.16	7.73
Maintenance and repair	2,025.00	3.23
Labor direct	1,430.40	2.28
Labor overheads	357.60	0.57
Administration Costs	500.00	0.80
Land lease cost	-	-
Cost of marketing and distribution	750.00	1.20
Total Operating Costs	49,509.16	78.95
Depreciation	9,396.00	14.98
Cost of Finance	3,807.33	6.07
Total Production Cost	62,712.49	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 17.71 million to Birr 29.08 million

during the life of the project. Moreover, at the end of the project life the accumulated net cash flow amounts to Birr 260.27 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.

$$\text{Break- Even Sales Value} = \frac{\text{Fixed Cost} + \text{Financial Cost}}{\text{Variable Margin ratio (\%)}} = \text{Birr } 24,095,780$$

$$\text{Break - Even Capacity utilization} = \frac{\text{Break -even Sales Value}}{\text{Sales revenue}} \times 100 = 26\%$$

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 2 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 34.81 % 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 133.18 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 78 persons. The project will generate Birr 77.95 million in terms of tax revenue. The establishment of such factory will have a foreign exchange saving effect to the country by substituting the current imports. The project will also create forward linkage with the manufacturing sector and backward linkage with the mining sector and also generates income for the Government in terms of payroll tax.

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	25,737	29,697	35,636	39,596	39,596	39,596	39,596	39,596	39,596	39,596
Utilities	3,153	3,638	4,365	4,850	4,850	4,850	4,850	4,850	4,850	4,850
Maintenance and repair	1,316	1,519	1,823	2,025	2,025	2,025	2,025	2,025	2,025	2,025
Labour direct	930	1,073	1,287	1,430	1,430	1,430	1,430	1,430	1,430	1,430
Labour overheads	232	268	322	358	358	358	358	358	358	358
Administration Costs	325	375	450	500	500	500	500	500	500	500
Land lease cost	0	0	0	0	43	43	43	43	43	43
Cost of marketing and distribution	750	750	750	750	750	750	750	750	750	750
Total Operating Costs	32,443	37,319	44,633	49,509	49,552	49,552	49,552	49,552	49,552	49,552
Depreciation	9,396	9,396	9,396	9,396	9,396	525	525	525	525	525
Cost of Finance	0	5,076	4,442	3,807	3,173	2,538	1,904	1,269	635	0
Total Production Cost	41,839	51,792	58,471	62,712	62,121	52,615	51,981	51,346	50,711	50,077

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	59,558	68,721	82,465	91,628	91,628	91,628	91,628	91,628	91,628	91,628
Less variable costs	31,693	36,569	43,883	48,759	48,759	48,759	48,759	48,759	48,759	48,759
VARIABLE MARGIN	27,865	32,152	38,582	42,869	42,869	42,869	42,869	42,869	42,869	42,869
in % of sales revenue	46.79	46.79	46.79	46.79	46.79	46.79	46.79	46.79	46.79	46.79
Less fixed costs	10,146	10,146	10,146	10,146	10,189	1,318	1,318	1,318	1,318	1,318
OPERATIONAL MARGIN	17,719	22,006	28,436	32,723	32,680	41,551	41,551	41,551	41,551	41,551
in % of sales revenue	29.75	32.02	34.48	35.71	35.67	45.35	45.35	45.35	45.35	45.35
Financial costs		5,076	4,442	3,807	3,173	2,538	1,904	1,269	635	0
GROSS PROFIT	17,719	16,929	23,994	28,916	29,507	39,013	39,647	40,282	40,917	41,551
in % of sales revenue	29.75	24.63	29.10	31.56	32.20	42.58	43.27	43.96	44.66	45.35
Income tax	0	0	0	8,675	8,852	11,704	11,894	12,085	12,275	12,465
NET PROFIT	17,719	16,929	23,994	20,241	20,655	27,309	27,753	28,197	28,642	29,086
in % of sales revenue	29.75	24.63	29.10	22.09	22.54	29.80	30.29	30.77	31.26	31.74

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	56,938	73,350	68,750	82,508	91,628	91,628	91,628	91,628	91,628	91,628	91,628	25,749
Inflow funds	56,938	13,792	29	43	0	0	0	0	0	0	0	0
Inflow operation	0	59,558	68,721	82,465	91,628	91,628	91,628	91,628	91,628	91,628	91,628	0
Other income	0	0	0	0	0	0	0	0	0	0	0	25,749
TOTAL CASH OUTFLOW	56,938	46,235	50,144	57,524	69,739	67,927	70,140	69,695	69,251	68,807	62,017	0
Increase in fixed assets	56,938	0	0	0	0	0	0	0	0	0	0	0
Increase in current assets	0	9,177	1,402	2,103	1,402	4	0	0	0	0	0	0
Operating costs	0	31,693	36,569	43,883	48,759	48,802	48,802	48,802	48,802	48,802	48,802	0
Marketing cost	0	750	750	750	750	750	750	750	750	750	750	0
Income tax	0	0	0	0	8,675	8,852	11,704	11,894	12,085	12,275	12,465	0
Financial costs	0	4,615	5,076	4,442	3,807	3,173	2,538	1,904	1,269	635	0	0
Loan repayment	0	0	6,346	6,346	6,346	6,346	6,346	6,346	6,346	6,346	0	0
SURPLUS (DEFICIT)	0	27,115	18,606	24,984	21,889	23,701	21,488	21,933	22,377	22,821	29,611	25,749
CUMULATIVE CASH BALANCE	0	27,115	45,721	70,705	92,594	116,295	137,784	159,717	182,093	204,914	234,525	260,274

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	59,558	68,721	82,465	91,628	91,628	91,628	91,628	91,628	91,628	91,628	25,749
Inflow operation	0	59,558	68,721	82,465	91,628	91,628	91,628	91,628	91,628	91,628	91,628	0
Other income	0	0	0	0	0	0	0	0	0	0	0	25,749
TOTAL CASH OUTFLOW	65,928	33,817	39,380	46,007	58,188	58,404	61,256	61,446	61,637	61,827	62,017	0
Increase in fixed assets	56,938	0	0	0	0	0	0	0	0	0	0	0
Increase in net working capital	8,990	1,373	2,060	1,373	4	0	0	0	0	0	0	0
Operating costs	0	31,693	36,569	43,883	48,759	48,802	48,802	48,802	48,802	48,802	48,802	0
Marketing cost	0	750	750	750	750	750	750	750	750	750	750	0
Income tax		0	0	0	8,675	8,852	11,704	11,894	12,085	12,275	12,465	0
NET CASH FLOW	-65,928	25,741	29,341	36,458	33,440	33,224	30,372	30,182	29,991	29,801	29,611	25,749
CUMULATIVE NET CASH FLOW	-65,928	-40,187	-10,845	25,613	59,053	92,277	122,649	152,831	182,823	212,624	242,235	267,983
Net present value	-65,928	23,401	24,249	27,392	22,840	20,629	17,144	15,488	13,991	12,639	11,416	9,927
Cumulative net present value	-65,928	-42,527	-18,278	9,114	31,954	52,584	69,728	85,216	99,207	111,846	123,262	133,189

NET PRESENT VALUE 133,189

INTERNAL RATE OF RETURN 34.81%

2 years

PAYBACK