

65. PROFILE ON THE PRODUCTION OF PVC RESIN

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I. SUMMARY

This profile envisages the establishment of a plant for the production of PVC with a capacity of 15,000 tons Per annum. PVC is used in the manufacture of end-use products for a wide range of applications in the consumer, construction, food and medical industries.

The demand for PVC resins is entirely met through import. The present (2012) demand for PVC resins is estimated at 10,110 tons. The demand for PVC resins is projected to reach 16,282 tons and 26,222 tons by the year 2017 and 2022, respectively.

The principal raw materials required are vinyl chloride monomer (VCM) and catalyst chemicals which have to be imported.

The total investment cost of the project including working capital is estimated at Birr 536.95 million. From the total investment cost, the highest share (Birr 461.10 million or 85.87%) is accounted by fixed investment cost followed by pre operation cost (55.59 million or 10.35%) and initial working capital (Birr 20.26 million or 3.77%). From the total investment cost Birr 321.75 million or 59.92% is required in foreign currency.

The project is financially viable with an internal rate of return (IRR) of 30.72% and a net present value (NPV) of Birr 525.05 million, discounted at 10%.

The project can create employment for 23 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 construction; food; pharmaceutical and furniture sub sectors and also generate income for the Government in terms of payroll tax.

II. PRODUCTION DESCRIPTION AND APPLICATION

Polyvinyl chloride, comely abbreviated PVC, is one of the most widely used thermoplastic after polyethylene and polypropylene. It is produced from monomer called vinyl chloride through

polymerization process. PVC has an excellent cost/benefit ratio when compared to other polymer resins.

PVC is used in the manufacture of end-use products for a wide range of applications in the consumer, construction, food and medical industries. Products made with PVC exhibit good impact strength, stiffness and strength-to-weight ratio. PVC products offer good dimensional stability at ambient temperatures, resistance to chemicals and oils, durability, and non-flammability character.

In Ethiopia PVC resin is used in the plastic factories to produce hoses, pipes and boots. These days its application has expanded to shoe sole manufacturing. In the near future ,it would have a wide application to produce high pressure pipes for water distribution and for furniture.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

At present the sources of supply to the local market for PVC resins is import. The product is imported by the local PVC products manufacturers and processed in to a variety of consumer goods such as films, bags, sacks, bottles, pipes, floor tiles, garden hoses, ball point pens, footwear etc. Table 3.1 shows import of PVC resin for the period 2002 – 2011.

Table 3.1
IMPORT OF PVC RESIN

Year	Imported Quantity (Tons)
2002	8,314
2003	11,286
2004	10,183
2005	12,739
2006	14,836
2007	9,251
2008	8,928
2009	7,096
2010	9,384
2011	12,003

Source: - *Ethiopian Revenue & Customs Authority.*

Apparent consumption of PVC resins in the country shows three distinctive trends. During the period 2002--2006 apparent consumption of the product has increased from 8,314 tons to 14,836 tons. However, during the period 2007 – 2009 apparent consumption of PVC resin has declined from 9,251 tons to 7,096 tons. On the other hand during 2010 and 2011 apparent consumption has exhibited a growth trend. During 2010 and 2011 apparent consumption of the product has increased to 9,384 tons and 12,003 tons respectively. Nevertheless, during the period under consideration import or apparent consumption of PVC resin has registered an average annual growth rate of 7.34%.

In order to estimate the present demand for PVC resin, based on the nature of the data, the Holt's two parameter double exponential smoothing method is used. Holt's two parameter double exponential smoothing model is given by:

$$F''_{t+m} = S_t + mb_t,$$

$$S_t = \alpha X_t + (1 - \alpha) (S_{t-1} + b_{t-1}), \text{ and}$$

$$b_t = \beta (S_t - S_{t-1}) + (1 - \beta) b_{t-1}.$$

Where:

F''_{t+m} stands for forecasted value,

S_t indicates the long-term level or base value for the time-series data, i.e. the level term,

b_t indicates the expected increase or decrease per year, i.e., the trend term,

X_t actual volume at time t ,

m stands for the number of time periods we want to forecast,

t -represents time, and

Alpha and beta are smoothing parameters, where $\alpha = 0.2$ and $\beta = 0.3$ in this case.

Based on the above model, the estimated present demand for PVC resin is shown in Table 3.2.

Table 3.2
HOLT'S TWO PARAMETER DOUBLE EXPONENTIALLY SMOOTHED
FORECAST (TONS)

Year	Supply in (X_t)	Smoothing of Data (Level Term)	Smoothing of Trend (Trend Term)	Forecast Value
2002	8,314	8,314	-2,972.00	
2003	11,286	8,314.00	-2,080.40	5,342
2004	10,183	8,208.30	-1,487.99	6,234
2005	12,739	9,729.66	-585.19	6,720
2006	14,836	11,990.23	268.54	9,144
2007	9,251	10,754.89	-182.62	12,259
2008	8,928	9,750.13	-429.26	10,572
2009	7,096	8,208.43	-762.99	9,321
2010	9,384	8,414.72	-472.21	7,445
2011	12,003	9,972.76	1,36.86	7,943
2012				10,110

The demand for PVC resins is projected to reach 16,282 tons and 26,222 tons by the year 2017 and 2022, respectively.

2. Demand Projection

The demand for PVC resins depend mainly on the performance of its end-user (i.e. the plastic products manufacturing sub - sector). Therefore, the demand for PVC resins is a derived demand, which depends directly on the performance of its major end - user. On the other hand the performance of the plastic products manufacturing sub - sector is dependant on the performance of the end users of PVC products. PVC products end -users include:

- **The construction sector** (pipe and tubing, windows/doors, flooring, wall cover, roofing membranes, gutters, fencing etc);
- **The Manufacturing sector** (packaging, jerry cans and containers, boxes and cases, stoppers, lids, caps and other closures) ;
- **Agriculture sector** (tubes and pipes, sheets and films);
- **Transportation** (auto undercoating, dashboards, floor mats);and
- **Consumer Goods** (furniture, blinds, toys, clothing, appliances, cards, tapes, etc).

Consequently, the demand for PVC resins depends on the growth of the above PVC products end users. The performance of the PVC products end users is dependant on a number of inter-related variables. Accordingly, the variables that are essential in determining the magnitude and trend of demand for PVC resins are:

- Performance of the national economy;
- Performance of the construction sector;
- Demand for housing and housing construction activities;
- Performance of the agricultural sector;
- Performance of the manufacturing sector; and
- Rate of population growth and urbanization.

Accordingly, the following two scenarios are considered.

Scenario 1: GDP of the country is expected to grow at an average annual growth rate of 11.2% during the GTP period (2011 – 2015).

Scenario 2: The industrial sector, which includes the construction sector, is expected to grow at an average annual growth rate of 20% during the GTP period (2011 – 2015).

Since the demand for PVC resin is highly affected by both factors, i.e. performance of GDP and the construction sector, the assumptions are valid. However, in order to be conservative a growth rate of 10% which is slightly lower than the expected growth rate of GDP during the GTP period is used to project the local demand for PVC resin. Accordingly, the projected demand for PVC resin estimated on the basis of the above assumption and using the estimated present demand as a base is presented in Table 3.3.

Table 3.3
PROJECTED DEMAND FOR PVC RESIN (TONS)

Year	Quantity
2013	11,121
2014	12,233
2015	13,456
2016	14,801
2017	16,282
2018	17,910
2019	19,701
2020	21,671
2021	23,838
2022	26,222
2023	28,844
2024	31,728
2025	34,901

3. Pricing and Distribution

The current FOB price of PVC resins is USD 960 per ton or Birr 17.40 per kg. Accordingly, allowing 30% for freight, insurance, inland transport, transit charges, bank charges and other costs the recommended factory- gate price is Birr 21,756 per ton.

The product of the envisaged factory is an intermediate product used in the manufacturing other products and the end users are limited in number and their geographical distribution is limited and are mostly located in or around major cities and towns of the country. Accordingly, by taking the nature of the product and the characteristics of the end users direct distribution to end users is selected as the most appropriate distribution channel.

B. PLANT CAPACITY AND PRODUCTION PROGRAMM

1. Plant Capacity

The envisaged plant would have a capacity to produce 15,000 tons of PVC resin single shift per day and 300 days per year.

2. Production Program

The plant would start production by utilizing 75%, 85% and 100% of its capacity during the first, second and third year of its operation, respectively. Expressed in terms of units, the corresponding figure will be 11,250.00 tons, 12,750.00 tons and 15,000 tons of PVC.

IV. RAW MATERIALS AND INPUTS

A. RAW MATERIALS

The major raw materials are vinyl chloride monomer (VCM) and catalyst chemicals. It requires 1.0250 tones of VCM to produce 1 ton of PVC resin. The total annual required raw materials is estimated to be 15,375.00 tones of VCM, and the annual total cost of VCM required will be Birr 57,548,671.25 annually. The cost of catalysts and chemicals used is estimated to be 10,739,856.50 per year which will be in foreign currency

The packaging material required is 25 kg sacks (double lined) of 600,000.00 pieces is annually. The unit cost of the sack is 6 birr/ piece, and the total annual cost for packaging material is estimated to be Birr 3.60 million. Therefore, the total cost of raw and auxiliary materials required will be Birr 71.89 million.

B. UTILITIES

The utilities required for the production process are electric power, cooling, and process water, inert gas and fuel etc. The total annual utility cost is Birr 30.87 million and the detailed cost breakdown is shown on the Table 4.1.

Table 4.1

UTILITIES REQUIREMENT AND COST(BIRR)

Utilities	UOM	Qty.	Unit Cost	Total Cost
Electricity	kWh	6,000,000.00	0.65	3,900,000
Fuel	tons	1,500.00	15,600.00	23,400,000
Inert gas	Nm ³	180,000.00	2.50	450,000
Process water	tons	405,000.00	4.00	1,620,000
Cooling water	tons	750,000.00	2.00	1,500,000
Total				30,870,000

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Production Process

The production process to be employed in the envisaged plant is a suspension polymerization of vinyl chloride monomer (VCM) which would be imported.

At the initial stage of the production, VCM, demineralized water and suspending agents are added in to the polymeriser. The contents are heated up to 56^oc before adding the initiator emulsion. The polymerization takes place in a water phase inside a reactor (polymerized).

The polymerization process takes about 6 to 8 hours to complete, and then un reacted monomers are removed and recycled to recovery system. The PVC slurry is striped and dewatered in a centrifuge and dried. After drying, oversized resin is removed by screening and the final product is packed in sacks of 25 kg.

2. Environmental Impact

The envisaged project involves production of PVC starting from VCM as a monomer. Strict emission control will be done to control the emission limit and the selected polymerization technology is integrated with emission control system to ensure the allowable emission standard.

Both the production of the monomer VCM from ethylene and chlorine or ethylene and HCl and compounding process (the process of transforming PVC resin into different materials) has emission of hazardous waste to the environment. But, both of this process production of monomer and converting the resin into final articles is not performed in the envisaged plant.

B. ENGINEERING

1. Machinery and Equipment

The cost of machinery and equipment is estimated at Birr 402,182,775, out of which Birr 321,746,220 will be required in foreign currency. The major machinery and equipment to be installed in the envisaged plant are listed in Table 5.1.

Table 5.1

LIST OF MACHINERY AND EQUIPMENT

Sr. No.	Description and Specification	Qty.
1	36 m ³ Suspension PVC reactor 30 bar, 2.5 m' dia. X 6 m'	1
2	Rotary Kiln Dryers 3000kg/hr capacity	1
3	Bird Centrifuges., 50 kW	1
4	Stripper Columns	1
5	Steam Boiler 6000 kg/hr	1
6	Spiral Heat Exchangers	1
7	Vacuum Pumps: 7.5 kW	1

Sr. No.	Description and Specification	Qty.
8	Compressors: 36 kW	1
9	Silo 9 m diameter and 18m high (160 m ³)	2
10	Weighing cell and packing plant	1
11	Water and waste treatment plant	1
	Others	

2. Building and Civil Works

A total land area of 25,000 m² is required for the envisaged plant, out of which 10,000 m² building area and open space of 5,000 m². The building includes production hall, raw material and product stores, and offices. The total construction cost is Birr 56,305,588.62 with the construction rate of Birr 5,630.56 per m².

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 6,650,000 of which 10% or Birr 665,000 will be paid in advance. The remaining Birr 5,985,000 will be paid in equal installments with in 28 years i.e. Birr 213,750 annually

VI. HUMAN RESOURCE AND TRAINING REQUIREMENT**A. HUMAN RESOURCE REQUIREMENT**

The human resource requirement for the plant is 21. Monthly and annual salaries are given in Table 6.1.

Table 6.1**HUMAN RESOURCE REQUIREMENT AND COST(BIRR)**

Sr.No.	Position	No. of Persons	Monthly Salary	Monthly Salary	Annual Salary
1	Manager	1	10,000.00	10,000.00	120,000.00
2	Secretary	1	4,000.00	4,000.00	48,000.00
3	Administration and Finance Head	1	6,000.00	6,000.00	72,000.00
4	Commercial Head	1	6,000.00	6,000.00	72,000.00
5	Technical Head	1	8,000.00	8,000.00	96,000.00
6	Production Head	1	7,000.00	7,000.00	84,000.00
7	Clerk	1	3,000.00	3,000.00	36,000.00
8	Messenger, cleaner and guard	3	1,500.00	4,500.00	54,000.00
9	Production supervisor	2	5,000.00	10,000.00	120,000.00
10	Operators	6	2,000.00	12,000.00	144,000.00
11	Mechanics	3	2,500.00	7,500.00	90,000.00
12	Electricians	2	2,500.00	5,000.00	60,000.00
	Sub-total				996,000.00
	Workers Benefit (25%)				249,000.00
	Total	23			1,245,000.00

B. TRAINING REQUIREMENT

Technical training of a month will be given for three technical personnel by the technology suppliers, and the total cost of training is estimated for Birr 90, 000.00.

VII. FINANCIAL ANALYSIS

The financial analysis of the PVC 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	-----
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 536.95 million (see Table 7.1). From the total investment cost, the highest share (Birr 461.10 million or 85.87%) is accounted by fixed investment cost followed by pre operation cost (55.59 million or 10.35%) and initial working capital (Birr 20.26 million or 3.77%). From the total investment cost Birr 321.75 million or 59.92% 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	665.00		665.00	0.12
1.2	Building and civil work	56,305.59		56,305.59	10.49
1.3	Machinery and equipment	80,436.56	321,746.22	402,182.78	74.90
1.4	Vehicles	1,500.00		1,500.00	0.28
1.5	Office furniture and equipment	450.00		450.00	0.08
	Sub total	139,357.15	321,746.22	461,103.37	85.87
2	Pre operating cost *				
2.1	Pre operating cost	20,459.14		20,459.14	3.81
2.2	Interest during construction	35,127.53		35,127.53	6.54
	Sub total	55,586.67		55,586.67	10.35
3	Working capital **	20,259.42		20,259.42	3.77
	Grand Total	215,203.24	321,746.22	536,949.46	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 28.53 million. However, only the initial working capital of Birr 20.25 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 246.55 million (see Table 7.2). Depreciation account for 35.34% of the production cost. The other major components of the production cost are cost of raw material, utility, and financial cost, which account for 29.16%, 12.52%, and 13.71%, respectively. The remaining 9.27% is the share of labor, marketing and distribution, 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	71,889.00	29.16
Utilities	30,870.00	12.52
Maintenance and repair	20,109.00	8.16
Labour direct	996.00	0.40
Labour overheads	249.00	0.10
Administration Costs	500.00	0.20
Land lease cost	-	-
Cost of marketing and distribution	1,000.00	0.41
Total Operating Costs	125,613.00	50.95
Depreciation	87,125.61	35.34
Cost of Finance	33,810.25	13.71
Total Production Cost	246,548.86	100

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 59.23 million to Birr 138.75 million during the life of the project. Moreover, at the end of the project life the accumulated net

cash flow amounts to Birr 1.12 billion. 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.

$$\text{Break -Even Sales Value} = \frac{\text{Fixed Cost} + \text{Financial Cost}}{\text{Variable Margin ratio (\%)}} = \text{Birr } 137,062,800$$

$$\text{Break -Even Capacity utilization} = \frac{\text{Break- even Sales Value}}{\text{Sales revenue}} \times 100 = 43.69\%$$

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 30.72% 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 525.05 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 23 persons. The project will generate Birr 334.99 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 construction; food, pharmaceutical and furniture sub sectors and also generate 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	53,917	61,106	71,889	71,889	71,889	71,889	71,889	71,889	71,889	71,889
Utilities	23,153	26,240	30,870	30,870	30,870	30,870	30,870	30,870	30,870	30,870
Maintenance and repair	15,082	17,093	20,109	20,109	20,109	20,109	20,109	20,109	20,109	20,109
Labour direct	747	847	996	996	996	996	996	996	996	996
Labour overheads	187	212	249	249	249	249	249	249	249	249
Administration Costs	375	425	500	500	500	500	500	500	500	500
Land lease cost	0	0	0	0	214	214	214	214	214	214
Cost of marketing and distribution	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Total Operating Costs	94,460	106,921	125,613	125,613	125,827	125,827	125,827	125,827	125,827	125,827
Depreciation	87,126	87,126	87,126	87,126	87,126	2,297	2,297	2,297	2,297	2,297
Cost of Finance	0	38,640	33,810	28,980	24,150	19,320	14,490	9,660	4,830	0
Total Production Cost	181,585	232,687	246,549	241,719	237,103	147,444	142,614	137,784	132,954	128,124

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	244,75 5	277,38 9	326,34 0	326,34 0	326,34 0	326,34 0	326,34 0	326,34 0	326,34 0	326,34 0
Less variable costs	93,460	105,92 1	124,61 3	124,61 3	124,61 3	124,61 3	124,61 3	124,61 3	124,61 3	124,61 3
VARIABLE MARGIN	151,29 5	171,46 8	201,72 7	201,72 7	201,72 7	201,72 7	201,72 7	201,72 7	201,72 7	201,72 7
in % of sales revenue	61.81	61.81	61.81	61.81	61.81	61.81	61.81	61.81	61.81	61.81
Less fixed costs	88,126	88,126	88,126	88,126	88,339	3,511	3,511	3,511	3,511	3,511
OPERATIONAL MARGIN	63,170	83,342	113,60 1	113,60 1	113,38 8	198,21 6	198,21 6	198,21 6	198,21 6	198,21 6
in % of sales revenue	25.81	30.05	34.81	34.81	34.75	60.74	60.74	60.74	60.74	60.74
Financial costs		38,640	33,810	28,980	24,150	19,320	14,490	9,660	4,830	0
GROSS PROFIT	63,170	44,702	79,791	84,621	89,237	178,89 6	183,72 6	188,55 6	193,38 6	198,21 6
in % of sales revenue	25.81	16.12	24.45	25.93	27.34	54.82	56.30	57.78	59.26	60.74
Income (corporate) tax	0	0	0	25,386	26,771	53,669	55,118	56,567	58,016	59,465
NET PROFIT	63,170	44,702	79,791	59,235	62,466	125,22 7	128,60 8	131,98 9	135,37 0	138,75 1
in % of sales revenue	25.81	16.12	24.45	18.15	19.14	38.37	39.41	40.45	41.48	42.52

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	481,563	301,461	277,565	326,604	326,340	326,340	326,340	326,340	326,340	326,340	326,340	96,581
Inflow funds	481,563	56,706	176	264	0	0	0	0	0	0	0	0
Inflow operation	0	244,755	277,389	326,340	326,340	326,340	326,340	326,340	326,340	326,340	326,340	0
Other income	0	0	0	0	0	0	0	0	0	0	0	96,581
TOTAL CASH OUTFLOW	481,563	151,166	196,728	212,023	228,280	225,069	247,116	243,735	240,354	236,973	185,292	0
Increase in fixed assets	481,563	0	0	0	0	0	0	0	0	0	0	0
Increase in current assets	0	21,578	2,866	4,299	0	21	0	0	0	0	0	0
Operating costs	0	93,460	105,921	124,613	124,613	124,827	124,827	124,827	124,827	124,827	124,827	0
Marketing and Distribution cost	0	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	0
Income tax	0	0	0	0	25,386	26,771	53,669	55,118	56,567	58,016	59,465	0
Financial costs	0	35,128	38,640	33,810	28,980	24,150	19,320	14,490	9,660	4,830	0	0
Loan repayment	0	0	48,300	48,300	48,300	48,300	48,300	48,300	48,300	48,300	0	0
SURPLUS (DEFICIT)	0	150,295	80,837	114,581	98,060	101,271	79,224	82,605	85,986	89,367	141,048	96,581
CUMULATIVE CASH BALANCE	0	150,295	231,132	345,714	443,774	545,044	624,268	706,873	792,859	882,226	1,023,275	1,119,856

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	244,755	277,389	326,340	326,340	326,340	326,340	326,340	326,340	326,340	326,340	96,581
Inflow operation	0	244,755	277,389	326,340	326,340	326,340	326,340	326,340	326,340	326,340	326,340	0
Other income	0	0	0	0	0	0	0	0	0	0	0	96,581
TOTAL CASH OUTFLOW	501,822	97,150	110,956	125,613	151,020	152,598	179,496	180,945	182,394	183,843	185,292	0
Increase in fixed assets	481,563	0	0	0	0	0	0	0	0	0	0	0
Increase in net working capital	20,259	2,690	4,035	0	21	0	0	0	0	0	0	0
Operating costs	0	93,460	105,921	124,613	124,613	124,827	124,827	124,827	124,827	124,827	124,827	0
Marketing and Distribution cost	0	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	0
Income (corporate) tax		0	0	0	25,386	26,771	53,669	55,118	56,567	58,016	59,465	0
NET CASH FLOW	-501,822	147,605	166,433	200,727	175,320	173,742	146,844	145,395	143,946	142,497	141,048	96,581
CUMULATIVE NET CASH FLOW	-501,822	354,217	187,784	12,943	188,263	362,005	508,849	654,245	798,191	940,689	1,081,737	1,178,319
Net present value	-501,822	134,186	137,548	150,809	119,746	107,880	82,890	74,611	67,152	60,433	54,380	37,236
Cumulative net present value	-501,822	367,635	230,088	-79,279	40,467	148,347	231,237	305,848	373,000	433,433	487,813	525,049

NET PRESENT VALUE 525,049
INTERNAL RATE OF RETURN 30.72%
NORMAL PAYBACK 3 years