

**52. PROFILE ON THE PRODUCTION OF
HERBICIDES AND FUNGICIDES**

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I. SUMMARY

This profile envisages the establishment of a plant for the production of herbicides and fungicides with a capacity of 1,000 and 400 tons per annum, respectively. Herbicides, also commonly known as weed-killers, are pesticides designed specifically to kill weeds and applied to the foliage of unwanted plants or the soil beneath. Fungicides are pesticides used to kill or inhibit fungi or fungal spores.

The country's requirement of herbicides and fungicides is met through import. The present (2012) demand for herbicides and fungicides is estimated at 3,500 tons and 408 tons, respectively. The demand for herbicides is projected to reach 4,965 tons and 6,644 tons by the year 2018 and year 2023, respectively. Similarly, the demand for fungicides is projected to reach 578 tons and 774 tons by the year 2018 and 2023, respectively.

The principal raw materials required are 2, 4 D A, solvent, mancozeb and diatomite. Except for diatomite the other raw materials have to be imported.

The total investment cost of the project including working capital is estimated at Birr 247.51 million. From the total investment cost the highest share (Birr 207.71 million or 83.92%) is accounted by fixed investment cost followed by pre operation cost (Birr 24.79 million or 10.02%) and initial working capital (Birr 15 million or 6.06%). From the total investment cost, Birr 123.75 million or 45.35% is required in foreign currency.

The project is financially viable with an internal rate of return (IRR) of 32.76% and a net present value (NPV) of Birr 391.24 million, discounted at 10%.

The project can create employment for 60 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 and backward linkage with the agricultural and mining sectors respectively and also generates income for the Government in terms of tax revenue and payroll tax.

II. PRODUCT DESCRIPTION AND APPLICATION

Herbicides, also commonly known as weed-killers, are pesticides designed specifically to kill weeds and applied to the foliage of unwanted plants or the soil beneath. Weeds are objectionable to humans primarily because they reduce the quality and quantity of agricultural production, and produce allergens or contact dermatitis that affect public health.

Selective herbicides kill specific targets, while leaving the desired crop relatively unharmed. Some of these act by interfering with the growth of the weed and are often synthetic "imitations" of plant hormones. Herbicides used to clear waste ground, industrial sites, railways and railway embankments are not selective and kill all plant material with which they come into contact. Smaller quantities are used in forestry, pasture systems, and management of areas set aside as wildlife habitat.

Among the many available types of herbicides, 2, 4 D is recommended for this project since it is widely applicable herbicide.

Fungicides are pesticides used to kill or inhibit fungi or fungal spores. Fungi can cause serious damage in agriculture, resulting in critical losses of yield, quality and profit. Fungicides are used both in agriculture and to fight fungal infections in animals.

Fungicides are extensively used in industry, agriculture, and the home and garden for a number of purposes, including: protection of seed grain during storage, shipment, and germination, protection of mature crops, berries, seedlings, flowers, and grasses in the field, in storage and during shipment; suppression of mildews that attack painted surfaces; control of slime in paper pulps; and protection of carpet and fabrics in the home.

Among the many fungicides, mancozeb widely applicable fungicide is recommended in this profile. Mancozeb is a carbamate fungicide used to protect many fruit, vegetable, nut and field crops against a wide spectrum of fungal diseases, including potato blight, leaf spot, scab (on apples and pears), and rust (on roses).

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

Ethiopia imports a variety of herbicides and fungicides from a number of European and Asian countries. The amount of herbicides and fungicides imported during the period 2000-2011 is presented in Table 3.1.

Table 3.1
IMPORT OF HERBICIDES AND FUNGICIDES (TONS)

Year	Herbicides	Fungicides
2000	1,462	747
2001	1,312	199
2002	1,019	363
2003	1,098	559
2004	1,558	168
2005	1,801	251
2006	2,734	233
2007	2,449	306
2008	14	10
2009	3,793	397
2010	4,936	519
2011	1,774	308

Source: - Ethiopian Revenues and Customs Authority

Import of herbicides in the past 12 years has shown a general increasing trend although there were years where a drastic fall of import and huge growths are observed. During the period 2000 – 2003, the imported quantity ranges from 1,019 tons to 1,462 tons with a mean figure of 1,223 tons. In the middle of the data set i.e. 2004--2007, the yearly average quantity of import has

increased to 2,136 tons, which is an increase of 46% compared to the previous years annual average.

The imported quantity during year 2008 has fell drastically to a level of 14 tons. However, during the years 2009 and 2010 the imported quantity sharply increased to 3,793 tons and 4,936 tons. These are the periods in which the highest volume of import was registered. The extreme increases again were followed by a substantial decline in the year 2011, in which the recorded import is 1,774 tons.

With regard to fungicides the data presented in Table 3.1 does not show any trend. The data is highly erratic jumping to a very high quantity in some years and a sudden decline in other years. During the period 2000-2007 the imported quantity ranges from the lowest 168 tons to the highest 747 tons with a mean figure of 353 tons. Import during year 2008 is almost nil with only 10 tons but revived in the next three years (2009-2011) to an annual average of 408 tons.

In order to take into account the fluctuations observed in some years the recent three years average level of import is considered to reflect the present demand. Accordingly, the present demand for herbicides and fungicides is estimated at 3,500 tons and 408 tons, respectively.

2. Demand Projection

The demand for herbicides and fungicides is directly related with the modernization of the agricultural sector in general and the expansion of commercial farms in particular. Among the major users of the products are cotton farms, fruit and vegetable farms and flower producers. As these products are highly essential to the economy as a source of industrial inputs and foreign exchange earnings the government has given due attention for their expansion and development. As the area to be cultivated for the production of the above products increases the demand for herbicides and fungicides will also grow proportionally. By considering the growth of the agricultural sector a 6% annual growth of demand for herbicides and fungicides is taken to forecast the future demand. The forecasted demand based on the above plausible assumption is presented in Table 3.2

Table 3.2**PROJECTED DEMAND FOR HERBICIDES AND FUNGICIDE (TONS)**

Year	Herbicide	Fungicide
2013	3,710	432
2014	3,932	458
2015	4,168	485
2016	4,418	514
2017	4,684	545
2018	4,965	578
2019	5,262	613
2020	5,578	650
2021	5,913	689
2022	6,268	730
2023	6,644	774

The demand for herbicides will increase from 3,710 tons in the year 2013 to 4,965 tons and 6,644 tons by the year 2018 and year 2023, respectively. Similarly, the demand for fungicides will increase from 432 tons in the year 2013 to 578 tons and 774 tons by the year 2018 and 2023, respectively.

3. Pricing and distribution

By considering the CIF price of the products a factory gate price of Birr 79,814 per ton and Birr 330,328 per ton for herbicides and fungicides, respectively is recommended for sales revenue projection and financial evaluation. The project is recommended to distribute its products directly to bulk purchasers while appointing distributors for these whose requirements are small.

B. PLANT CAPACITY AND PRODUCTION PROGRAM

1. Plant Capacity

The demand for herbicides will increase from 3,710 tons in the year 2013 to 6,644 tons by the year 2023 while the demand for fungicides will increase from 432 tons in the year 2013 to 774 tons by the year 2023, as indicated in the market study. By considering two years of implementation period and three years to achieve full capacity, it is prudent to take year 2018 as a base year for the determination of capacity to avoid expansion at the early stage of the project life. Therefore, the plant is proposed to produce 1,000 and 400 tons per annum of herbicides (2,4 D) and fungicides (Mancozeb), respectively. The plant will operate single shift of 8 hours per day for 300 days in a year.

2. Production Program

The production programme is worked out by deducting Sundays and public holidays and assuming that maintenance works will be carried out during off-production hours. The plant is assumed to start its operation at 65% of its rated full capacity and progressively increase to 75%, 85% and 100% in the second, third and fourth year respectively. The production programme is provided in Table 3.3.

Table 3.3

PRODUCTION PROGRAM

Year	1	2	3	4
Capacity Utilization (%)	65	75	85	100
Production of herbicide(tons)	650	750	850	1,000
Production of fungicide(tons)	260	300	340	400

IV. MATERIALS AND INPUTS

A. RAW AND AUXILIARY MATERIALS

The raw materials required for the production of herbicide are 2, 4 D AI and solvent while for fungicides are mancozeb and an inert carrier such as diatomite and kaolin. The auxiliary raw material required by the envisaged project is packing material for finished product. The total annual cost of raw material is estimated at Birr 68,140,000. The annual requirement and cost of this raw material is given in Table 4.1.

Table 4.1

ANNUAL REQUIREMENT OF RAW MATERIALS AND COST

Sr. No	Raw Material	Quantity	Cost ('000 Birr)		
			LC	FC	TC
1	2,4 D active ingredient (tons)	460	-	25,300	25,300
2	Mancozeb active ingredient (tons)	320	-	27,200	27,200
3	Diatomite (tons)	80	120	-	120
4	Solvent (tons)	540	-	9,720	9,720
5	Packing material	LS	800	5,000	5,800
	Grand Total		920	67,220	68,140

B. UTILITIES

The utilities required for the production of herbicides and fungicides are electricity and water. The total annual cost of utilities is estimated at Birr 703,000. The annual requirement of these utilities and their respective cost is given in Table 4.3.

Table 4.3**ANNUAL UTILITIES REQUIREMENT AND THEIR RESPECTIVE COST**

Sr.No.	Description	Unit of Meas.	Quantity	Cost (Birr)
1	Electricity	kWh	350,000	203,000
2	Water	m ³	50,000	500,000
	Total			703,000

V. TECHNOLOGY AND ENGINEERING**A. TECHNOLOGY****1. Production Process**

The envisaged herbicide and fungicide plant shall have two types of formulation plants, one for dust formulation to produce mancozeb, which is fungicide and the other for liquid formulation to produce 2, 4 D, which is herbicide.

A liquid formulation plant accepts the active ingredient, measures out the proper amount and feed to the mixing tank using a feeding screw conveyor if it is in solid state or siphoned pump if it is in liquid state. Solvents, emulsifiers and stabilizers are similarly pumped to the jacketed kettle and these ingredients are heated to a certain temperature in a controlled manner depending on the type of the active ingredient and mixed until a homogeneous mixture is obtained.

A homogeneous and stable mixture of active and inert ingredients makes the final product simpler, safer, and more efficacious to apply to a target insect.

Once formulated, the products pass to the holding tank by passing through a filter to trap insoluble matters. The formulated and filtered insecticide passes through a packing machine, consisting of several automatic packing-machines functioning in parallel and automated capping and labeling machines.

The dust formulation plant shall receive the active ingredient and the carrier, measure proper amount and mix it in a ribbon mixer to get a homogeneous product. Once formulated, the product passes to a holding tank after passing with a screen to separate the coarser particles. Finally the product will be packed into different packing sizes by using automatic packing machine.

2. Environmental Impact Assessment

The plant has little effect on the environment. Waste air and aqueous streams are treated before discharge to the environment. Other wastes are incinerated in an approved high temperature incinerator. All rain water that falls on site is retained in ponds on site until analysis confirms that it is safe to release it. The plant is equipped with all the necessary environmental impact mitigating facilities.

B. ENGINEERING

1. Machinery & Equipment

The total cost of machinery is estimated at Birr 165,500,000, of which Birr 123,750,000 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	Pumping station	1
2	Screw feeder for solid active ingredients	1
3	Mixing kettle with a weigh cell	1
4	Holding tank	1
5	Pump	2
6	Filling and capping machine	1unit

Sr.No.	Machinery	No.
7	Labeling machine	1 unit
8	Air handling system	1unit
9	PLC control unit	1 unit
10	Ribbon mixer with weigh cell and sprayer	1
11	Screw conveyor	1
12	Carrier silo	1
13	Holding silo	1
14	Packing machine	1
15	Waste treatment unit	Set

2. Land, Building and Civil Works

The total area of the project is 15,000 m² out of which 10,000 m² is a built-up area. Therefore, the cost of building and civil work is estimated at Birr 40 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 5000 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 2,660,000 of which 10% or Birr 266,000 will be paid in advance. The remaining Birr 2,394,000 will be paid in equal installments with in 28 years i.e. Birr 85,500 annually.

VI. HUMAN RESOURCE & TRAINING REQUIREMENT

A. HUMAN RESOURCE REQUIREMENT

The total human resource required for the envisaged plant is 60. The total annual cost of labor is estimated at Birr 1,698,000. The list of human resource and labor cost are indicated in Table 6.1.

Table 6.1**HUMAN RESOURCE REQUIREMENT & COST**

Sr. No.	Manpower	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	Personnel	1	3,000	36,000
11	Time keeper	1	900	10,800
12	Production and technical head	1	6,000	72,000
14	Mechanic	3	6,000	72,000
15	Electrician	3	6,000	72,000
16	Chemist	3	7,500	90,000
17	Junior chemists	3	3,600	43,200
18	Production supervisor	1	4,000	48,000
19	Operators	12	18,000	216,000
20	Safety officer	1	5,000	60,000
21	Laborers	4	2,400	28,800
22	General service	12	4,800	57,600
	Sub- total	60	113,200	1,358,400
	Benefit (25% Basic Salary)		28,300	339,600
	Total		141,500	1,698,000

B. TRAINING REQUIREMENT

The formulation process involves a simple mixing unit operation and does not require a special training except orientation of technical personnel during erection and commissioning. This training cost is included in the cost of machinery and equipment.

VII. FINANCIAL ANALYSIS

The financial analysis of the herbicides and fungicides project is based on the data presented in the previous chapters and the following assumptions:-

Construction period	1 year
Source of finance	30 % equity & 70 % loan
Tax holidays	3 years
Bank interest	10%
Discount cash flow	10%
Accounts receivable	30 days
Raw material local	30 days
Raw material imported	120 days
Work in progress	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 247.51 million (see Table 7.1). From the total investment cost the highest share (Birr 207.71 million or 83.92%) is accounted by fixed investment cost followed by pre operation cost (Birr 24.79 million or 10.02%) and initial working capital (Birr 15 million or 6.06%). From the total investment cost, Birr 123.75 million or 45.35% 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	266.00		266.00	0.11
1.2	Building and civil work	40,000.00		40,000.00	16.16
1.3	Machinery and equipment	41,750.00	123,750.00	165,500.00	66.86
1.4	Vehicles	1,500.00		1,500.00	0.61
1.5	Office furniture and equipment	450.00		450.00	0.18
	Sub -total	83,966.00	123,750.00	207,716.00	83.92
2	Pre operating cost *				
2.1	Pre operating cost	8,605.00		8,605.00	3.48
2.2	Interest during construction	16,192.77		16,192.77	6.54
	Sub -total	24,797.77		24,797.77	10.02
3	Working capital **	15,004.27		15,004.27	6.06
	Grand Total	123,768.04	123,750.00	247,518.04	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 23.05 million. However, only the initial working capital of Birr 15 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 130.19 million (see Table 7.2). The cost of raw material account for 52.34% of the production cost. The other major components of the production cost are depreciation, financial cost and repair and maintenance which account for 28.24%, 10.26% and 6.36%, respectively. The remaining 2.80 % is the share of utility, labor, labor overhead and administration cost. For detail production cost see Appendix 7.A.2.

Table 7.2

ANNUAL PRODUCTION COST AT FULL CAPACITY (YEAR FOUR)

Items	Cost (in 000 Birr)	%
Raw Material and Inputs	68,140.00	52.34
Utilities	703.00	0.54
Maintenance and repair	8,275.00	6.36
Labor direct	1,358.40	1.04
Labor overheads	339.60	0.26
Administration Costs	500.00	0.38
Land lease cost	-	-
Cost of marketing and distribution	750.00	0.58
Total Operating Costs	80,066.00	61.50
Depreciation	36,766.00	28.24
Cost of Finance	13,359.03	10.26
Total Production Cost	130,191.03	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 48.68 million to Birr 91.09 million

during the life of the project. Moreover, at the end of the project life the accumulated net cash flow amounts to Birr 777.58 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.

$$\text{Break -Even Sales Value} = \frac{\text{Fixed Cost} + \text{Financial Cost}}{\text{Variable Margin ratio (\%)}} = \text{Birr } 70,532,940$$

$$\text{Break- Even Capacity utilization} = \frac{\text{Break- even Sales Value}}{\text{Sales revenue}} \times 100 = 33\%$$

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 32.76 % 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 391.24 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 60 persons. The project will generate Birr 238.22 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 and backward linkage with the agricultural and mining sectors, respectively 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	44,291	51,105	57,919	68,140	68,140	68,140	68,140	68,140	68,140	68,140
Utilities	457	527	598	703	703	703	703	703	703	703
Maintenance and repair	5,379	6,206	7,034	8,275	8,275	8,275	8,275	8,275	8,275	8,275
Labour direct	883	1,019	1,155	1,358	1,358	1,358	1,358	1,358	1,358	1,358
Labour overheads	221	255	289	340	340	340	340	340	340	340
Administration Costs	325	375	425	500	500	500	500	500	500	500
Land lease cost	0	0	0	0	86	86	86	86	86	86
Cost of marketing and distribution	750	750	750	750	750	750	750	750	750	750
Total Operating Costs	52,305	60,237	68,169	80,066	80,152	80,152	80,152	80,152	80,152	80,152
Depreciation	36,766	36,766	36,766	36,766	36,766	1,645	1,645	1,645	1,645	1,645
Cost of Finance	0	17,812	15,586	13,359	11,133	8,906	6,680	4,453	2,227	0
Total Production Cost	89,071	114,815	120,520	130,191	128,050	90,703	88,476	86,250	84,023	81,797

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	137,760	158,954	180,147	211,938	211,938	211,938	211,938	211,938	211,938	211,938
Less variable costs	51,555	59,487	67,419	79,316	79,316	79,316	79,316	79,316	79,316	79,316
VARIABLE MARGIN	86,205	99,467	112,728	132,622	132,622	132,622	132,622	132,622	132,622	132,622
in % of sales revenue	62.58	62.58	62.58	62.58	62.58	62.58	62.58	62.58	62.58	62.58
Less fixed costs	37,516	37,516	37,516	37,516	37,602	2,481	2,481	2,481	2,481	2,481
OPERATIONAL MARGIN	48,689	61,951	75,212	95,106	95,021	130,142	130,142	130,142	130,142	130,142
in % of sales revenue	35.34	38.97	41.75	44.87	44.83	61.41	61.41	61.41	61.41	61.41
Financial costs		17,812	15,586	13,359	11,133	8,906	6,680	4,453	2,227	0
GROSS PROFIT	48,689	44,139	59,627	81,747	83,888	121,235	123,462	125,688	127,915	130,142
in % of sales revenue	35.34	27.77	33.10	38.57	39.58	57.20	58.25	59.30	60.35	61.41
Income tax	0	0	0	24,524	25,166	36,371	37,039	37,707	38,374	39,042
NET PROFIT	48,689	44,139	59,627	57,223	58,722	84,865	86,423	87,982	89,540	91,099
in % of sales revenue	35.34	27.77	33.10	27.00	27.71	40.04	40.78	41.51	42.25	42.98

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	216,321	169,479	159,034	180,227	211,938	211,938	211,938	211,938	211,938	211,938	211,938	63,517
Inflow funds	216,321	31,719	80	80	0	0	0	0	0	0	0	0
Inflow operation	0	137,760	158,954	180,147	211,938	211,938	211,938	211,938	211,938	211,938	211,938	0
Other income	0	0	0	0	0	0	0	0	0	0	0	63,517
TOTAL CASH OUTFLOW	216,321	84,024	102,693	108,398	143,783	138,724	147,693	146,135	144,576	143,018	119,194	0
Increase in fixed assets	216,321	0	0	0	0	0	0	0	0	0	0	0
Increase in current assets	0	15,526	2,379	2,379	3,569	8	0	0	0	0	0	0
Operating costs	0	51,555	59,487	67,419	79,316	79,402	79,402	79,402	79,402	79,402	79,402	0
Marketing cost	0	750	750	750	750	750	750	750	750	750	750	0
Income tax	0	0	0	0	24,524	25,166	36,371	37,039	37,707	38,374	39,042	0
Financial costs	0	16,193	17,812	15,586	13,359	11,133	8,906	6,680	4,453	2,227	0	0
Loan repayment	0	0	22,265	22,265	22,265	22,265	22,265	22,265	22,265	22,265	0	0
SURPLUS (DEFICIT)	0	85,455	56,341	71,829	68,155	73,214	64,245	65,803	67,362	68,920	92,744	63,517
CUMULATIVE CASH BALANCE	0	85,455	141,796	213,625	281,780	354,994	419,239	485,042	552,404	621,325	714,069	777,586

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	137,760	158,954	180,147	211,938	211,938	211,938	211,938	211,938	211,938	211,938	63,517
Inflow operation	0	137,760	158,954	180,147	211,938	211,938	211,938	211,938	211,938	211,938	211,938	0
Other income	0	0	0	0	0	0	0	0	0	0	0	63,517
TOTAL CASH OUTFLOW	231,325	54,604	62,536	71,617	104,598	105,318	116,522	117,190	117,858	118,526	119,194	0
Increase in fixed assets	216,321	0	0	0	0	0	0	0	0	0	0	0
Increase in net working capital	15,004	2,299	2,299	3,448	8	0	0	0	0	0	0	0
Operating costs	0	51,555	59,487	67,419	79,316	79,402	79,402	79,402	79,402	79,402	79,402	0
Marketing cost	0	750	750	750	750	750	750	750	750	750	750	0
Income tax		0	0	0	24,524	25,166	36,371	37,039	37,707	38,374	39,042	0
NET CASH FLOW	-231,325	83,156	96,418	108,530	107,340	106,620	95,416	94,748	94,080	93,412	92,744	63,517
CUMULATIVE NET CASH FLOW	-231,325	-148,169	-51,751	56,779	164,119	270,739	366,155	460,903	554,983	648,395	741,139	804,656
Net present value	-231,325	75,596	79,684	81,540	73,314	66,203	53,860	48,621	43,889	39,616	35,757	24,489
Cumulative net present value	-231,325	-155,729	-76,045	5,496	78,810	145,013	198,873	247,493	291,382	330,998	366,755	391,243

NET PRESENT VALUE 391,243

INTERNAL RATE OF

RETURN 32.76%

PAYBACK 2 years