103. PROFILE ON THE PRODUCTION OF GRINDING WHEEL

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I. SUMMARY

This profile envisages the establishment of a plant for the production of grinding wheel with a capacity of 3,000 tons per annum. Grinding wheel are used for various grinding (abrasive cutting) and abrasive machining operations (including tool and cutter sharpening, cylindrical grinding; roll grinding, general and surface grinding and the grinding of cereals into starch and flour).

The demand for grinding wheel is entirely met through import. The present (2012) demand for grinding wheel is estimated at 4,893 tons. The demand for grinding wheel is projected to reach 7,880 tons and 12,691 tons by the year 2017 and 2022, respectively.

The principal raw materials required are graphite, silicon carbide, Ferro -silicon, and other materials like binders. All the raw materials have to be imported.

The total investment cost of the project including working capital is estimated at Birr 44.25 million. From the total investment cost, the highest share (Birr 25.51 million or 57.64%) is accounted by fixed investment cost followed by initial working capital (14.92 million or 33.71%) and pre operation cost (Birr 3.82 million or 8.64%). From the total investment cost, Birr 16.42 million or 37.11% is required in foreign currency.

The project is financially viable with an internal rate of return (IRR) of 18.43% and a net present value (NPV) of Birr 15.87 thousand, discounted at 10%.

The project can create employment for 32 persons. The project will generate Birr 14.36 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 engineering and food processing sub sectors and also generates other income for the Government.

II. PRODUCT DESCRIPTION AND APPLICATION

A grinding wheel is an expendable wheel that is composed of an abrasive compound used for various grinding (abrasive cutting) and abrasive machining operations. They are used in grinding machines.

The wheels are generally made from a matrix of coarse particles pressed and bonded together to form a solid, circular shape, various profiles and cross sections are available depending on the intended usage for the wheel.

Grinding wheel has extensive applications, which cover a wide range of activities. It is used in almost every branch of industry. The variety of work in which grinding wheel are used comprises tool and cutter sharpening, cylindrical grinding; roll grinding, general and surface grinding and the grinding of cereals into starch and flour. They are also required for grinding vitrified bricks, glass granite, lather, porcelain etc.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Present Demand and Supply

In spite of the existence of large number of grinding wheel user industries and flourishing grain mills, there is no local plant engaged in manufacturing of grinding wheel. Thus, the local requirement of grinding wheel is met through import. Table 3.1 shows the annual import of grinding wheel for the period 2002-2011.

Table 3.1

IMPORT OF GRINDING WHEEL (TONS)

Year	Import
2002	1,865
2003	2,320
2004	2,564
2005	4,258
2006	2,322
2007	3,249
2008	2,673
2009	2,163
2010	4,612
2011	4,148

Source:-*Ethiopian Revenue and Customs Authority.*

As can be seen from Table 3.1, import or apparent consumption of grinding wheels during the period 2002--2011 fluctuates from year to year ranging from the lowest 1,865 tons in 2002 to the highest 4,612 tons in 2011. However a general growth can be observed. For example; the average annual total supply during the first five years (2002-2006) which was 2,666 has increased to an average of 3,369 tons during the next five years (2007-2011). Moreover, during the period under consideration (2002--2011) total supply of grinding wheels has registered an average annual growth rate of 17.97%.

Therefore, assuming that the growth rate registered by the total supply of the product in the past will continue at least in the near future, the present (2012) demand for grinding wheels is estimated at 4,893 tons by taking the 2011 level of total supply as a base and applying a growth rate of 17.97%.

2. Demand Projection

Demand for grinding wheels is related with the agricultural outputs, particularly cereals production and consumption as well as the growth in manufacturing sector. According to the GTP, during the period 2010/11 – 2014/15 the agriculture and industrial sectors of the country (at a base case scenario) are expected to grow at an average annual growth rate of 8.6% and 20%, respectively.

However, in order to be conservative a growth rate of 10% which is slightly lower than the anticipated growth rate of GDP during the Growth and Transformation period (11.4%) is used to project the demand for grinding wheels.

Accordingly, using the estimated present demand as a base and applying a growth rate of 10% the projected demand for grinding wheels is shown in Table 3.2.

Table 3.2

PROJECTED DEMAND FOR GRINDING WHEELS (TONS)

Year	Projected Demand
2013	5,382
2014	5,921
2015	6,513
2016	7,164
2017	7,880
2018	8,668
2019	9,535
2020	10,489
2021	11,537
2022	12,691
2023	13,960
2024	15,356
2025	16,892

3. Pricing and Distribution

After assessing the current C.I.F price of grinding wheel an ex-factory price of Birr 30/kg is proposed for the envisaged project. The product will be distributed through specialized distribution agents of hardware having the relevant experience.

B. PLANT CAPACITY AND PRODUCTION PROGRAM

1. Plant Capacity

The production capacity of the plant is 3,000 tons of grinding wheel per annum, working a single shift (8 hours) a day for a total of 300 days. Production can be increased by working in two or three shifts at later stages if the product is warranted by the market.

2. Production Program

Considering the time required for skill development in operation and market penetration, the plant will operate at 65%, 75%, and 90% of the installed capacity during the first, the second and third year, respectively. Full capacity operation could be attained from fourth year onwards.

IV. MATERIAL AND INPUTS

A. RAW AND AUXILIARY MATERIALS

The main raw materials for grinding wheel manufacturing are imported items obtained preferably from India or China. The main items are: Graphite, Silicon carbide, Ferro Silicon and Other materials like binders. Table 4.1 presents the list of raw and auxiliary materials required by the envisaged plant together with their quantities and costs at full capacity operation.

Table 4.1

RAW AND AUXILIARY MATERIALS REQUIREMENT AND COST

Material	Qty	Cost in Birr		
		FC	LC	total
Silicon Carbide	1,601 ton	17,692	5,897	23,590
Graphite	1,200 ton	11,298	3,766	15,064
Ferro-Silicon	801 ton	8,855	2,952	11,806
Other misc. materials like binder etc		-	5,000	5,000
Total		**37,845**	**17,615**	**55,460**

B. UTILITIES

Utilities required by the plant include electricity and water. Annual cost of utilities is Birr 388,000. Quantities required and associated costs are given in Table 4.2.

Table 4.2

UTILITIES REQUIREMENT (AT FULL CAPACITY)

Sr. No.	Items	Qty.	Cost (Birr)
1	Electricity (kWh)	550,000	319,000
2	Water (m^3)	6,900	69,000
	Total		**388,000**

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Production Process

The production process of grinding wheel comprises the following stages:

- Required ingredients, as per the desired application and purpose of the grinding wheel/wheel are mixed with resin to prepare coated abrasive,
- Coated abrasives are mixed with resin and moulds are prepared and put under a hydraulic ram to exert pressure,
- Molded millwheels are baked in oven at a required temperature and allowed to cool after baking,

- Millwheel wheels are trued for outside diameter and finish, and
- Wheels are finally tested for Speed.

2. Environmental Impact Assessment

The production of grinding wheel involves mainly a weighing, mixing, molding and pressing. These unit operations can be performed in a controlled manner. Hence, the plant does not have any adverse impact on environment.

B. ENGINEERING

1. Machinery and Equipment

The list of machinery and equipment required for manufacturing of grinding wheel are given in Table 5.1. The total quoted cost for machinery and equipment is Birr 19.32 million out of which Birr 16.42 million is required in foreign currency. The list of the required machineries is shown in Table 5.1.

Table 5.1

MACHINERY AND EQUIPMENT REQUIREMENT

Sr. No.	Description	Qty (Pcs)
1	Crusher with fittings	1
2	Weighing scale	1
3	Ball mills	1
4	V-draught kneading mixer	2
5	Vibrating screen with dust accumulator	1
6	Hydraulic press	2
7	Misc. tools like heating kettle, mixing shovel sets	1
8	Testing equipment	1
9	Down draught kilns	1
10	Furnace/oven	2

2. Land, Building and Civil Works

The total land required for the grinding wheel manufacturing plant is 1,500 m^2. The total built-up area is 1,000 m^2. The estimated total cost of building at the rate of Birr 5,000 per m^2 amounts to Birr 5 million.

According to the Federal Legislation on the Lease Holding of Urban Land (Proclamation No. 721/2004) in principle, urban land permit by lease is on auction or negotiation basis, however, the time and condition of applying the proclamation shall be determined by the concerned regional or city government depending on the level of development.

The legislation has also set the maximum on lease period and the payment of lease prices. The lease period ranges from 99 years for education, cultural research health, sport, NGO , religious and residential area to 80 years for industry and 70 years for trade while the lease payment period ranges from 10 years to 60 years based on the towns grade and type of investment.

Moreover, advance payment of lease based on the type of investment ranges from 5% to 10%.The lease price is payable after the grace period annually. For those that pay the entire amount of the lease will receive 0.5% discount from the total lease value and those that pay in installments will be charged interest based on the prevailing interest rate of banks. Moreover, based on the type of investment, two to seven years grace period shall also be provided.

However, the Federal Legislation on the Lease Holding of Urban Land apart from setting the maximum has conferred on regional and city governments the power to issue regulations on the exact terms based on the development level of each region.

In Addis Ababa, the City's Land Administration and Development Authority is directly responsible in dealing with matters concerning land. However, regarding the manufacturing sector, industrial zone preparation is one of the strategic intervention measures adopted by the City Administration for the promotion of the sector and all manufacturing projects are assumed to be located in the developed industrial zones.

Regarding land allocation of industrial zones if the land requirement of the project is below 5,000 m^2, 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 m^2, 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 m^2. 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 m^2 .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 m^2 (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	1st	1686
	2nd	1535
	3rd	1323
	4th	1085
	5th	894
Transitional zone	1st	1035
	2nd	935
	3rd	809
	4th	685
	5th	555
Expansion zone	1st	355
	2nd	299
	3rd	217
	4th	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 m^2 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 399,000 of which 10% or Birr 39,900 will be paid in advance. The remaining Birr 359,100 will be paid in equal installments with in 28 years i.e. Birr 12,825 annually.

VI. HUMANRESOURCE AND TRAINING REQUIREMENTS

A. HUMANRESOURCE REQUIREMENT

The total human resource required by the plant is 32 persons. Annual cost of labour is Birr 579,600. The list of human resources required by type of job and corresponding cost is presented in Table 6.1.

Table 6.1

HUMAN RESOURCE REQUIREMENT AND COST

Sr. No.	Description	Reqd. No.	Month Salary	Annual Expenditure
1	Manger	1	5,000	60,000
2	Accountant	1	2,000	24,000
3	Supervisor and Quality Inspector	2	2,500	60,000
4	Skilled workers(Operators & technicians)	14	1,200	201,600
5	Unskilled workers(Laborers)	12	800	115,200
6	sales officer	1	2,000	24,000
7	General Service	2	800	19,200
	Sub- total	**32**		**504,000**
	Worker's benefit(15%)			75,600
	Total			**579,600**

B. TRAINING REQUIREMENT

The supervisor and the 14 skilled production personnel need to have a five day on-the-job training on how to operate and inspect the machines. Estimated cost of training amounts to Birr 25,000.

VII. FINANCIAL ANALYSIS

The financial analysis of the grinding wheel 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 44.25 million (see Table 7.1). From the total investment cost ,the highest share (Birr 25.51 million or 57.64%) is accounted by fixed investment cost followed by initial working capital (14.92 million or 33.71%) and pre operation cost (Birr 3.82 million or 8.64%). From the total investment cost, Birr 16.42 million or 37.11% 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	39.90		39.90	0.09
1.2	Building and civil work	5,000.00		5,000.00	11.30
1.3	Machinery and equipment	2,898.00	16,422.00	19,320.00	43.66
1.4	Vehicles	900.00		900.00	2.03
1.5	Office furniture and equipment	250.00		250.00	0.56
	Sub total	**9,087.90**	**16,422.00**	**25,509.90**	**57.64**
2	**Pre operating cost ***				
2.1	Pre operating cost	929.60		929.60	2.10
2.2	Interest during construction	2,895.12		2,895.12	6.54
	Sub total	**3,824.72**		**3,824.72**	**8.64**
3	**Working capital ****	**14,919.39**		**14,919.39**	**33.71**
	Grand Total	**27,832.01**	**16,422.00**	**44,254.01**	**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 18.70 million. However, only the initial working capital of Birr 14.91 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 65.63 million (see Table 7.2). The cost of raw material account for 84.50% of the production cost. The other major components of the production cost are depreciation, financial cost, repair and maintenance, and cost of marketing and distribution which account for 6.79%, 4.25%, 1.47% and 1.14%, respectively. The remaining 1.85% 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 (000 Birr)	%
Raw Material and Inputs	55,460	84.50
Utilities	388	0.59
Maintenance and repair	966	1.47
Labor direct	504	0.77
Labor overheads	76	0.12
Administration Costs	250	0.38
Land lease cost	0	0.00
Cost of marketing and distribution	750	1.14
Total Operating Costs	**58,394**	**88.97**
Depreciation	4,455	6.79
Cost of Finance	2,787	4.25
Total Production Cost	**65,635**	**100.00**

C. FINANCIAL EVALUATION

1. Profitability

Based on the projected profit and loss statement, the project will generate a profit throughout its operation life. Annual net profit after tax will grow from Birr 6.14 million to Birr 7.26 million

during the life of the project. Moreover, at the end of the project life the accumulated net cash flow amounts to Birr 62.89 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.

$$\text{Break- Even Sales Value} = \frac{\text{Fixed Cost + Financial Cost}}{\text{Variable Margin ratio (\%)}} = \text{Birr } 28{,}980{,}000$$

$$\text{Break -Even Capacity utilization} = \frac{\text{Break -even Sales Value}}{\text{Sales revenue}} \times 100 = 45.83\%$$

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 6 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 18.43% 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 20.31 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 32 persons. The project will generate Birr 14.36 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 engineering and food processing sub sectors and also generates other income for the Government.

Appendix 7.A

FINANCIAL ANALYSES SUPPORTING TABLES

Appendix 7.A.1
NET WORKING CAPITAL (in 000 Birr)

Items	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Total inventory	11,092.00	12,478.50	13,865.00	13,865.00	13,865.00	13,865.00	13,865.00	13,865.00	13,865.00	13,865.00
Accounts receivable	3,905.43	4,385.80	4,866.17	4,866.17	4,867.24	4,867.24	4,867.24	4,867.24	4,867.24	4,867.24
Cash-in-hand	19.96	22.45	24.94	24.94	25.12	25.12	25.12	25.12	25.12	25.12
CURRENT ASSETS	**15,017.39**	**16,886.75**	**18,756.11**	**18,756.11**	**18,757.36**	**18,757.36**	**18,757.36**	**18,757.36**	**18,757.36**	**18,757.36**
Accounts payable	98.00	110.25	122.50	122.50	122.50	122.50	122.50	122.50	122.50	122.50
CURRENT LIABILITIES	**98.00**	**110.25**	**122.50**	**122.50**	**122.50**	**122.50**	**122.50**	**122.50**	**122.50**	**122.50**
TOTAL WORKING CAPITAL	**14,919.39**	**16,776.50**	**18,633.61**	**18,633.61**	**18,634.86**	**18,634.86**	**18,634.86**	**18,634.86**	**18,634.86**	**18,634.86**

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	44,368	49,914	55,460	55,460	55,460	55,460	55,460	55,460	55,460	55,460
Utilities	310	349	388	388	388	388	388	388	388	388
Maintenance and repair	773	869	966	966	966	966	966	966	966	966
Labour direct	403	454	504	504	504	504	504	504	504	504
Labour overheads	61	68	76	76	76	76	76	76	76	76
Administration Costs	200	225	250	250	250	250	250	250	250	250
Land lease cost	0	0	0	0	13	13	13	13	13	13
Cost of marketing and distribution	750	750	750	750	750	750	750	750	750	750
Total Operating Costs	**46,865**	**52,630**	**58,394**	**58,394**	**58,407**	**58,407**	**58,407**	**58,407**	**58,407**	**58,407**
Depreciation	4,455	4,455	4,455	4,455	4,455	225	225	225	225	225
Cost of Finance	0	3,185	2,787	2,388	1,990	1,592	1,194	796	398	0
Total Production Cost	**51,320**	**60,269**	**65,635**	**65,237**	**64,852**	**60,224**	**59,826**	**59,428**	**59,030**	**58,632**

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	55,200	62,100	69,000	69,000	69,000	69,000	69,000	69,000	69,000	69,000
Less variable costs	46,115	51,880	57,644	57,644	57,644	57,644	57,644	57,644	57,644	57,644
VARIABLE MARGIN	**9,085**	**10,220**	**11,356**	**11,356**	**11,356**	**11,356**	**11,356**	**11,356**	**11,356**	**11,356**
in % of sales revenue	16.46	16.46	16.46	16.46	16.46	16.46	16.46	16.46	16.46	16.46
Less fixed costs	5,205	5,205	5,205	5,205	5,218	988	988	988	988	988
OPERATIONAL MARGIN	**3,880**	**5,015**	**6,151**	**6,151**	**6,138**	**10,368**	**10,368**	**10,368**	**10,368**	**10,368**
in % of sales revenue	7.03	8.08	8.91	8.91	8.90	15.03	15.03	15.03	15.03	15.03
Financial costs		3,185	2,787	2,388	1,990	1,592	1,194	796	398	0
GROSS PROFIT	**3,880**	**1,831**	**3,365**	**3,763**	**4,148**	**8,776**	**9,174**	**9,572**	**9,970**	**10,368**
in % of sales revenue	7.03	2.95	4.88	5.45	6.01	12.72	13.30	13.87	14.45	15.03
Income (corporate) tax	0	0	0	0	0	2,633	2,752	2,872	2,991	3,110
NET PROFIT	**3,880**	**1,831**	**3,365**	**3,763**	**4,148**	**6,143**	**6,422**	**6,700**	**6,979**	**7,258**
in % of sales revenue	7.03	2.95	4.88	5.45	6.01	8.90	9.31	9.71	10.11	10.52

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	**26,440**	**73,113**	**62,112**	**69,012**	**69,000**	**69,000**	**69,000**	**69,000**	**69,000**	**69,000**	**69,000**	**24,570**
Inflow funds	26,440	17,913	12	12	0	0	0	0	0	0	0	0
Inflow operation	0	55,200	62,100	69,000	69,000	69,000	69,000	69,000	69,000	69,000	69,000	0
Other income	0	0	0	0	0	0	0	0	0	0	0	24,570
TOTAL CASH OUTFLOW	**26,440**	**64,778**	**61,664**	**67,031**	**64,763**	**64,379**	**66,613**	**66,334**	**66,055**	**65,777**	**61,517**	**0**
Increase in fixed assets	26,440	0	0	0	0	0	0	0	0	0	0	0
Increase in current assets	0	15,017	1,869	1,869	0	1	0	0	0	0	0	0
Operating costs	0	46,115	51,880	57,644	57,644	57,657	57,657	57,657	57,657	57,657	57,657	0
Marketing and Distribution cost	0	750	750	750	750	750	750	750	750	750	750	0
Income tax	0	0	0	0	0	0	2,633	2,752	2,872	2,991	3,110	0
Financial costs	0	2,895	3,185	2,787	2,388	1,990	1,592	1,194	796	398	0	0
Loan repayment	0	0	3,981	3,981	3,981	3,981	3,981	3,981	3,981	3,981	0	0
SURPLUS (DEFICIT)	**0**	**8,335**	**448**	**1,982**	**4,237**	**4,621**	**2,387**	**2,666**	**2,945**	**3,223**	**7,483**	**24,570**
CUMULATIVE CASH BALANCE	**0**	**8,335**	**8,783**	**10,764**	**15,001**	**19,622**	**22,009**	**24,675**	**27,620**	**30,843**	**38,326**	**62,895**

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**	**55,200**	**62,100**	**69,000**	**69,000**	**69,000**	**69,000**	**69,000**	**69,000**	**69,000**	**69,000**	**24,570**
Inflow operation	0	55,200	62,100	69,000	69,000	69,000	69,000	69,000	69,000	69,000	69,000	0
Other income	0	0	0	0	0	0	0	0	0	0	0	24,570
TOTAL CASH OUTFLOW	**41,359**	**48,722**	**54,487**	**58,394**	**58,395**	**58,407**	**61,040**	**61,159**	**61,278**	**61,398**	**61,517**	**0**
Increase in fixed assets	26,440	0	0	0	0	0	0	0	0	0	0	0
Increase in net working capital	14,919	1,857	1,857	0	1	0	0	0	0	0	0	0
Operating costs	0	46,115	51,880	57,644	57,644	57,657	57,657	57,657	57,657	57,657	57,657	0
Marketing and Distribution cost	0	750	750	750	750	750	750	750	750	750	750	0
Income (corporate) tax		0	0	0	0	0	2,633	2,752	2,872	2,991	3,110	0
NET CASH FLOW	**-41,359**	**6,478**	**7,613**	**10,606**	**10,605**	**10,593**	**7,960**	**7,841**	**7,722**	**7,602**	**7,483**	**24,570**
CUMULATIVE NET CASH FLOW	**-41,359**	**-34,881**	**-27,268**	**-16,662**	**-6,057**	**4,536**	**12,496**	**20,337**	**28,059**	**35,661**	**43,144**	**67,714**
Net present value	-41,359	5,889	6,292	7,968	7,243	6,578	4,493	4,024	3,602	3,224	2,885	9,473
Cumulative net present value	-41,359	-35,470	-29,178	-21,210	-13,966	-7,389	-2,896	1,128	4,730	7,954	10,839	20,312

NET PRESENT VALUE	20,312
INTERNAL RATE OF RETURN	18.43%
NORMAL PAYBACK	6 years