116. PROFILE ON THE PRODUCTION OF CHIP BOARD

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I. SUMMARY

This profile envisages the establishment of a plant for the production of chipboard with a capacity of 187,200.00 m^3 per annum. Chipboard is used in the construction industry as prefabricated houses or as ceiling materials in monolithic structure and in the furniture and wood industries as a substitute for wooden boards.

The demand for chipboard is met both from import and domestic production. The present (2012) demand for chipboard is estimated at 2.33 million cubic meters. The demand for chipboard is projected to reach 3,752 million cubic meters and 6,043 million cubic meters by the year 2017 and 2022, respectively.

The principal raw materials required by the envisaged plant are eucalyptus tree logs and glue which are locally available.

The total investment cost of the project including working capital is estimated at Birr 72.23 million. From the total investment cost the highest share (Birr 47.94 million or 66.37%) is accounted by initial working capital followed by fixed investment cost (Birr 18.46 million or 25.56%) and pre operation cost (Birr 5.82 million or 8.06%). From the total investment cost Birr 12 million or 16.61% is required in foreign currency.

The project is financially viable with an internal rate of return (IRR) of 34.64% and a net present value (NPV) of Birr 116.69 million discounted at 10%.

The project can create employment for 41 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 furniture and construction sub sectors and also generates income for the Government in terms of tax revenue and payroll tax.

II. PRODUCT DESCRIPTION AND APPLICATION

Chip board/ wood are produced by gluing wood particles. It is used in the construction industry as prefabricated houses or as ceiling materials in monolithic structure. Chip wood is also used in the furniture and wood industries where it is used as a substitute for wooden boards.

The major end user of chip wood is the building construction sector. Thus the demand for chip wood is related to the expansion and growth of the building construction sector. The current demand for chipboard is met through local production and import.

Chip wood is produced in standard sizes of 1.2 meters by 2 meters. The thickness range is 8mm, 12mm, 13mm, 15mm, 17mm, and 20mm.

The project is resource based. Moreover, at present the country import a significant quantity of the products. Therefore, the project is both resource based and aimed at import substitution.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STDY

1. Past Supply and Present Demand

Chip board/wood is mainly used in the housing construction industry as a prefabricated house or as a ceiling material and in the furniture industrial group as a substitute for wooden boards.

The country`s requirement of chip wood is met both from import and domestic production. The External Trade Statistics of the Ethiopian Revenues & Customs Authority reveals that Ethiopia imports chip wood categorized in to three types. These are coniferous wood sawn or chipped > 6mm thick, beech wood and oak wood (quercus spp) sawn /chipped length wise > 6 mm thick and wood n.e.s sawn or chipped > 6 mm thick. The total quantity of the three types of chipped woods (excluding particle board) imported to the country in the past 10 years is given in Table 3.1.

Table 3.1

IMPORT OF CHIP WOOD

Year	Quantity (Mt Cu)	Value (`000 Birr)
2002	67,794	14,484
2003	5,526	11,148
2004	4,651,578	55,825
2005	3,042,389	48,788
2006	2,147,414	65,661
2007	2,387,880	93,336
2008	1,229,133	106,268
2009	1,987,240	119,277
2010	1,317,031	165,463
2011	2,322,327	150,685

Source: *- Ethiopian Revenues & Customs Authority.*

A glance at Table 3.1 reveals that import of chip board/ wood in the past ten years was very erratic, showing a big jump in some years and sudden decline in other years. For instance, imported quantity during 2002 and 2003 was 67,794 cubic meters and 5,526 cubic meters, respectively. The imported quantity sharply increased to about 4.65 million cubic meters and 3.04 million cubic meters by the years 2004 and 2005, respectively. During the period 2008 to 2010 the imported quantity ranged from the lowest 1.23 million cubic meters to the highest 1.99 million cubic meters. A huge increase of import is again registered during 2011, which stands at 2.32 million cubic meters, which is higher by more than 76% compared to year 2010.

With regard to domestic production a specific data for chipboard/wood is not available since it is aggregated with particle board, although it is a close substitute product. The data obtained from Statistical Abstract of Ethiopia, CSA, for the past eight years is presented in Table 3.2.

Table 3.2

DOMESTIC PRODUCTION OF CHIP WOOD & PARTICLE BOARD (CU.MT)

Year	Quantity
2003	2,231
2004	7,950
2005	1,300
2006	2,079
2007	6,925
2008	7,266
2009	129,630
2010	556,704

Source:-*Various issues of the Statistical Abstract of Ethiopia, CSA.*

Domestic production of chip board/wood and particle board in the past eight years was fluctuating highly in the past eight years as shown in Table 3.2. During the initial six years of the data set, i.e. 2003--2008, the production level ranged from the lowest 1,300 cubic meters (year 2005) to the highest 7,950 cubic meters in year 2004, with a mean figure of 4,625 cubic meters. The production level has tremendously increased to 129,630 cubic meters and 556,704 cubic meters by the year 2009 and 2010, respectively. According to information obtained from knowledgeable people in the sub-sector the exceptional increase observed in the last two years of the data set is due to the establishment and start of operation of a new particle board plant at Maichew, Tigray regional state. Hence, it can be concluded that the volume of chip board/wood that is supplied from the domestic source is estimated to be near to the amount that was produced in 2008, which is 8 thousand cubic meters.

Therefore, the present demand is estimated by adding only the domestic production of chipboard (excluding particle board) and the imported quantity in year 2011. Accordingly, present demand for the product is set at 2.33 million cubic meters, which is reasonable compared to the past eight year's average.

2. Projected Demand

Demand for chipboard/ wood is influenced by the growth of the building construction industry and manufacturing sector mainly the furniture industrial group. The industrial sector (which includes manufacturing and construction) has been growing by about 10% in the recent past years. During the GTP period the industrial sector is forecasted to grow at annual average growth rate of 20%. To be conservative, at a minimum, the demand for chipboard/ wood is assumed to grow by 10%. The total projected demand and the unsatisfied demand that has to be fulfilled through the establishment of new plants is shown in Table 3.3.

Table 3.3

PROJECTED DEMAND FOR CHIPBOARD/ WOOD (`000 CU.MT)

Year	Total Demand	Domestic Production	Unsatisfied Demand
2013	2,563	8	2,555
2014	2,819	8	2,811
2015	3,101	8	3,093
2016	3,411	8	3,403
2017	3,752	8	3,744
2018	4,127	8	4,119
2019	4,540	8	4,532
2020	4,994	8	4,986
2021	5,494	8	5,486
2022	6,043	8	6,035

The unsatisfied demand for chip wood will increase from 2,555 thousand cubic meters by the year 2013 to 3,744 thousand and 16,250 thousand cubic meters by the year 2,018 and 2,022, respectively.

3. Pricing and Distribution

The current factory gate price of chip wood in Addis Ababa which is 1,275 per mt.cu is adopted for sales revenue projection.

The product can be sold directly to the end users i.e. building construction enterprise and furniture industrial group.

B. PLANT CAPACITY AND PRODUCTION PROGRAM

1. Plant Capacity

According to the market study, unsatisfied demand of chip board/wood in the year 2018 will be 3,744,000 m^3, whereas this demand will grow to 16,250,000 m^3 by the year 2022. Taking only about 5% of the demand of the year 2018, the proposed plant will have a capacity of 187,200.00 m^3 per annum. The size of chip wood to be manufactured is 1.2 mt x2mtx12 mm. Its demand is ever on the increase. However, additional market requirement can be met by running the production unit on a second or third shift or through the establishment of other similar plants.

2. Production Program

The unit is planned to operate one shift of 8 hours a day for a total working of 300 days a year by taking Sundays and national holidays into considerations.

It is also anticipated to operate at 75% and 85% of installed capacity in the first and second year, respectively. Full capacity production is expected to be achieved in the successive years. The low production level at the initial stage is planned to develop substantial market outlets for the product and to build up production capacity of new equipment (see Table 3.4).

Table 3.4

ANNUAL PRODUCTION PROGRAM

Description	Production Year		
	1	2	3
Capacity utilization rate (%)	75	85	100
Chip board (m^3)	140,400	159,120	187,200

IV. MATERIAL AND INPUTS

A. RAW AND AUXILIARY MATERIALS

Eucalyptus tree Logs, which are suitable for chip wood, and glue are the main materials used to produce chip wood. The annual raw material requirement is calculated on the bases of the final output. Thus, the total cost of material at full operation capacity of the plant is estimated to be Birr 204,300,000. The detail breakdown is shown in Table 4.1.

Table 4.1

ANNUAL RAW AND AUXILIARY MATERIALS REQUIREMENT AND COST

No.	Description	Qty	Unit	Unit Cost (Birr)	Cost (`000 Birr)		
					LC	FC	Total
1	Red Eucalyptus tree Logs	60,000	m^3	3,200.00	192,000	-	192,000
2	Glue	180	ton	66,666.67	12,000	-	12,000
3	Miscellaneous	set	-	300,000.00	300	-	300
Total Raw Material Annual Cost							**204,300**

B. UTILITIES

The major utilities of the project are electricity, furnace oil and water. The total annual expenditure on utilities is, thus, about Birr 3,349,350.00. Annual requirement and cost of utilities is indicated in Table 4.2.

Table 4.2

UTILITIES REQUIREMENT AND COST

Sr. No.	Description	Annual Consumption	Unit	Unit Cost (Birr)	Total Cost ("000) Birr
1	Electricity	310,000	kWh	0.58	179.80
2	Furnace oil	160,000	lt	14.50	2320.00
3	Water	85,000	m3	10.00	850.00
Total Annual Cost					**3,349.80**

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Process Description

The manufacturing of chipboard/ wood requires intermediate technology. It involves chopping eucalyptus logs to standard sizes. Then, they are grounded by the wood-grinding machine and reduced to woodchips. Then, the chip is mixed with glue and water. Next, it is fed to the forming machine where the thickness, length and width of the board are set and is then formed. It is fed to the hydraulic press. The product is dried in the press using steam. Finally, it is polished, inspected and then made ready for delivery.

2. Environmental impact

The process has some dusty effect on the workers, and needs proper exhaust system for it. Therefore, for this environmental protection equipment an estimated amount of Birr 100,000 is allocated.

B. ENGINEERING

1. Machinery and Equipment

The total cost of machinery and equipment is estimated at Birr 15 million, of which Birr 12 million is required in foreign currency. Table 5.1 shows the list of machinery and equipment required by the envisaged plant.

Table 5.1

LIST OF MACHINERY AND EQUIPMENT

Sr. No.	Description	Qty.
1	Chopping machine	1
2	Grinding machine	1
3	Gluing machine	1
4	Forming machine	1
5	Pressing machine	1
6	Conveyor system	1
7	Polishing machine	1
8	Drying press	1
9	Boiler with its accessories	1

2. Land, Building and Civil Works

The plant requires a total of 2,500 m^2 area of land out of which 1,600 m^2 is built-up area which includes Processing area, raw material stock area, offices etc. Assuming construction rate of Birr 5,000 per m^2 the total investment cost for building and civil works is estimated at Birr 8 million.

According to the Federal Legislation on the Lease Holding of Urban Land (Proclamation No 272/2002) 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 m^2 is estimated at Birr 665,000 of which 10% or Birr 66,500 will be paid in advance. The remaining Birr 598,500 will be paid in equal installments with in 28 years i.e. Birr 21,375 annually.

VI. HUMAN RESOURCE AND TRAINING REQUIREMENT

A. HUMAN RESOURCE REQUIREMENT

The Chip-board manufacturing plant will create job opportunities for about 41 workers, of these 36 of the employees are production workers while the remaining are administrative staff. Annual cost of labor is estimated at Birr 887.040. The detail is indicated in Table 6.1.

Table 6.1

HUMAN RESOURCE REQUIREMENT AND LABOR COST (BIRR)

No.	Description	No.	Monthly Salary (Birr)	Annual salary ("000) Birr
1	Plant manager	1	6,000.00	72.0
2	Secretary	1	1,500.00	18.0
3	Administration and finance	1	3,500.00	42.0
4	Accountant	1	2,000.00	24.0
5	Mechanic	1	2,200.00	26.4
6	Electrician	1	2,200.00	26.4
7	Operators and skilled workers	20	1,400.00	336.0
8	production foreman	1	3,000.00	36.0
11	Clerk	1	800.00	9.6
12	Cashier	1	1,000.00	12.0
13	Assistant operator	5	700.00	42.0
14	Quality supervisor	2	1,600.00	38.4
15	store keeper	1	1,400.00	16.8
16	time keeper	1	1,200.00	14.4
17	Guards	3	700.00	25.2
Total		**41**	**29,200.00**	**739.2**
18	Employment benefits and allowances 20%		5,840.00	147.8
Total Annual Labor Cost (Direct +Indirect)				**887.0**

B. TRAINING REQUIREMENT

Imparting skill both on the supervisor and the operators who will be directly involved in the plywood production is an essential task. Thus, on-job-training by the machinery supplier for about two weeks should be given locally. The training cost is estimated to be Birr 100,000.

VII. FINANCIAL ANALYSIS

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

Construction period 1 year
Source of finance 30 % equity & 70 loan

Tax holidays	3 years
Bank interest	10%
Discount cash flow	10%
Accounts receivable	30 days
Raw material local	30 days
Work in progress	5 days
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 72.23 million (See Table 7.1). From the total investment cost the highest share (Birr 47.94 million or 66.37%) is accounted by initial working capital followed by fixed investment cost (Birr 18.46 million or 25.56%) and pre operation cost (Birr 5.82 million or 8.06%). From the total investment cost Birr 12 million or 16.61% 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	66.50		66.50	0.09
1.2	Building and civil work	2,250.00		2,250.00	3.11
1.3	Machinery and equipment	3,000.00	12,000.00	15,000.00	20.76
1.4	Vehicles	900.00		900.00	1.25
1.5	Office furniture and equipment	250.00		250.00	0.35
	Sub total	**6,466.50**	**12,000.00**	**18,466.50**	**25.56**
2	**Pre operating cost ***				
2.1	Pre operating cost	1,100.00		1,100.00	1.52
2.2	Interest during construction	4,725.85		4,725.85	6.54
	Sub total	**5,825.85**		**5,825.85**	**8.06**
3	**Working capital ****	**47,945.67**		**47,945.67**	**66.37**
	Grand Total	**60,238.02**	**12,000.00**	**72,238.02**	**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 68.47 million. However, only the initial working capital of Birr 47.94 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 217.14 million (see Table 7.2). The cost of raw material account for 94.08 % of the production cost. The other major components of the production cost are financial cost, depreciation and utility, which account for 1.80%, 1.62% and 1.54% respectively. The remaining 0.96% is the share of labor, marketing and distribution, repair and maintenance, labour overhead and administration cost. For detail production cost see Appendix 7.A.2.

Table 7.2

ANNUAL PRODUCTION COST AT FULL CAPACITY (year three)

Items	**Cost (000 Birr)**	**%**
Raw Material and Inputs	204,300.00	94.08
Utilities	3,349.00	1.54
Maintenance and repair	450.00	0.21
Labor direct	739.00	0.34
Labor overheads	148.00	0.07
Administration Costs	250.00	0.12
Land lease cost	-	-
Cost of marketing and distribution	500.00	0.23
Total Operating Costs	**209,736.00**	**96.59**
Depreciation	3,515.00	1.62
Cost of Finance	3,898.83	1.80
Total Production Cost	**217,149.83**	**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 16.59 million to Birr 20.16 million during the life of the project. Moreover, at the end of the project life the accumulated net cash flow amounts to Birr 243.71 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.

$$\text{Break Even Sales Value} = \frac{\text{Fixed Cost + Financial Cost}}{\text{Variable Margin ratio (\%)}} = \text{Birr } 32{,}546{,}536$$

$$\text{Break Even Capacity utilization} = \frac{\text{Break even Sales Value}}{\text{Sales revenue}} \times 100 = 14\%$$

4. Pay-back Period

The pay- back period, also called pay-off period is defined as the period required for recovering the original investment outlay through the accumulated net cash flows earned by the project.

Accordingly, based on the projected cash flow it is estimated that the project's initial investment will be fully recovered within 2 years

5. Internal Rate of Return

The internal rate of return (IRR) is the annualized effective compounded return rate that can be earned on the invested capital, i.e., the yield on the investment. Put another way, the internal rate of return for an investment is the discount rate that makes the net present value of the investment's income stream total to zero. It is an indicator of the efficiency or quality of an investment. A project is a good investment proposition if its IRR is greater than the rate of return that could be earned by alternate investments or putting the money in a bank account. Accordingly, the IRR of this project is computed to be 34.64% % % 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 116.69 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 41 persons. The project will generate Birr 54.36 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 furniture and construction sub sectors and also generate income for the Government in terms of payroll tax.

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	35,752.50	40,860.00	45,967.50	51,075.00	51,075.00	51,075.00	51,075.00	51,075.00	51,075.00	51,075.00
Accounts receivable	12,247.10	13,990.73	15,734.37	17,478.00	17,479.78	17,479.78	17,479.78	17,479.78	17,479.78	17,479.78
Cash-in-hand	15.43	17.63	19.84	22.04	22.34	22.34	22.34	22.34	22.34	22.34
CURRENT ASSETS	**48,015.03**	**54,868.37**	**61,721.70**	**68,575.04**	**68,577.12**	**68,577.12**	**68,577.12**	**68,577.12**	**68,577.12**	**68,577.12**
Accounts payable	69.36	79.27	89.18	99.08	99.08	99.08	99.08	99.08	99.08	99.08
CURRENT LIABILITIES	**69.36**	**79.27**	**89.18**	**99.08**	**99.08**	**99.08**	**99.08**	**99.08**	**99.08**	**99.08**
TOTAL WORKING CAPITAL	**47,945.67**	**54,789.10**	**61,632.53**	**68,475.96**	**68,478.04**	**68,478.04**	**68,478.04**	**68,478.04**	**68,478.04**	**68,478.04**

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	143,010	163,440	183,870	204,300	204,300	204,300	204,300	204,300	204,300	204,300
Utilities	2,344	2,679	3,014	3,349	3,349	3,349	3,349	3,349	3,349	3,349
Maintenance and repair	315	360	405	450	450	450	450	450	450	450
Labour direct	517	591	665	739	739	739	739	739	739	739
Labour overheads	104	118	133	148	148	148	148	148	148	148
Administration Costs	175	200	225	250	250	250	250	250	250	250
Land lease cost	0	0	0	0	21	21	21	21	21	21
Cost of marketing and distribution	500	500	500	500	500	500	500	500	500	500
Total Operating Costs	**146,965**	**167,889**	**188,812**	**209,736**	**209,757**	**209,757**	**209,757**	**209,757**	**209,757**	**209,757**
Depreciation	3,515	3,515	3,515	3,515	3,515	115	115	115	115	115
Cost of Finance	0	5,198	4,549	3,899	3,249	2,599	1,949	1,300	650	0
Total Production Cost	**150,480**	**176,602**	**196,876**	**217,150**	**216,521**	**212,472**	**211,822**	**211,172**	**210,522**	**209,872**

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	167,076	214,812	238,680	238,680	238,680	238,680	238,680	238,680	238,680	238,680
Less variable costs	146,465	167,389	188,312	209,236	209,236	209,236	209,236	209,236	209,236	209,236
VARIABLE MARGIN	**20,611**	**47,423**	**50,368**	**29,444**	**29,444**	**29,444**	**29,444**	**29,444**	**29,444**	**29,444**
in % of sales revenue	12.34	22.08	21.10	12.34	12.34	12.34	12.34	12.34	12.34	12.34
Less fixed costs	4,015	4,015	4,015	4,015	4,036	636	636	636	636	636
OPERATIONAL MARGIN	**16,596**	**43,408**	**46,353**	**25,429**	**25,408**	**28,808**	**28,808**	**28,808**	**28,808**	**28,808**
in % of sales revenue	9.93	20.21	19.42	10.65	10.65	12.07	12.07	12.07	12.07	12.07
Financial costs		5,198	4,549	3,899	3,249	2,599	1,949	1,300	650	0
GROSS PROFIT	**16,596**	**38,210**	**41,804**	**21,530**	**22,159**	**26,208**	**26,858**	**27,508**	**28,158**	**28,808**
in % of sales revenue	9.93	17.79	17.51	9.02	9.28	10.98	11.25	11.53	11.80	12.07
Income (corporate) tax	0	0	0	6,459	6,648	7,863	8,057	8,252	8,447	8,642
NET PROFIT	**16,596**	**38,210**	**41,804**	**15,071**	**15,511**	**18,346**	**18,801**	**19,256**	**19,710**	**20,165**
in % of sales revenue	9.93	17.79	17.51	6.31	6.50	7.69	7.88	8.07	8.26	8.45

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	19,567	219,817	214,822	238,690	238,680	238,680	238,680	238,680	238,680	238,680	238,680	74,620
Inflow funds	19,567	52,741	10	10	0	0	0	0	0	0	0	0
Inflow operation	0	167,076	214,812	238,680	238,680	238,680	238,680	238,680	238,680	238,680	238,680	0
Other income	0	0	0	0	0	0	0	0	0	0	0	74,620
TOTAL CASH OUTFLOW	19,567	199,706	186,439	206,712	233,445	226,154	226,717	226,262	225,807	225,353	218,400	0
Increase in fixed assets	19,567	0	0	0	0	0	0	0	0	0	0	0
Increase in current assets	0	48,015	6,853	6,853	6,853	2	0	0	0	0	0	0
Operating costs	0	146,465	167,389	188,312	209,236	209,257	209,257	209,257	209,257	209,257	209,257	0
Marketing and Distribution cost	0	500	500	500	500	500	500	500	500	500	500	0
Income tax	0	0	0	0	6,459	6,648	7,863	8,057	8,252	8,447	8,642	0
Financial costs	0	4,726	5,198	4,549	3,899	3,249	2,599	1,949	1,300	650	0	0
Loan repayment	0	0	6,498	6,498	6,498	6,498	6,498	6,498	6,498	6,498	0	0
SURPLUS (DEFICIT)	0	20,111	28,383	31,977	5,235	12,526	11,963	12,418	12,873	13,327	20,280	74,620
CUMULATIVE CASH BALANCE	0	20,111	48,494	80,472	85,706	98,232	110,195	122,613	135,485	148,813	169,093	243,713

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**	**167,076**	**214,812**	**238,680**	**238,680**	**238,680**	**238,680**	**238,680**	**238,680**	**238,680**	**238,680**	**74,620**
Inflow operation	0	167,076	214,812	238,680	238,680	238,680	238,680	238,680	238,680	238,680	238,680	0
Other income	0	0	0	0	0	0	0	0	0	0	0	74,620
TOTAL CASH OUTFLOW	**67,512**	**153,809**	**174,732**	**195,656**	**216,197**	**216,405**	**217,620**	**217,815**	**218,010**	**218,205**	**218,400**	**0**
Increase in fixed assets	19,567	0	0	0	0	0	0	0	0	0	0	0
Increase in net working capital	47,946	6,843	6,843	6,843	2	0	0	0	0	0	0	0
Operating costs	0	146,465	167,389	188,312	209,236	209,257	209,257	209,257	209,257	209,257	209,257	0
Marketing and Distribution cost	0	500	500	500	500	500	500	500	500	500	500	0
Income (corporate) tax		0	0	0	6,459	6,648	7,863	8,057	8,252	8,447	8,642	0
NET CASH FLOW	**-67,512**	**13,267**	**40,080**	**43,024**	**22,483**	**22,275**	**21,060**	**20,865**	**20,670**	**20,475**	**20,280**	**74,620**
CUMULATIVE NET CASH FLOW	**-67,512**	**-54,245**	**-14,165**	**28,859**	**51,342**	**73,617**	**94,677**	**115,542**	**136,213**	**156,688**	**176,968**	**251,589**
Net present value	-67,512	12,061	33,124	32,325	15,356	13,831	11,888	10,707	9,643	8,684	7,819	28,769
Cumulative net present value	-67,512	-55,451	-22,327	9,998	25,354	39,185	51,073	61,780	71,422	80,106	87,925	116,694

NET PRESENT VALUE	116,694
INTERNAL RATE OF RETURN	34.64%
NORMAL PAYBACK	2 years