164. PROFILE ON ASSEMBLY OF DIESEL ENGINE

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I. SUMMARY

This profile envisages the establishment of a plant for the assembly of diesel engine with a capacity of 21,000 units per annum. Diesel engines are used as prime movers in many machines performing various jobs.

The demand for diesel engine is met entirely through import. The present (2012) demand for diesel engine is estimated at 20,501 units. The demand for diesel engine is projected to reach 26,165 units and 33,394 units by the year 2017 and 2022, respectively.

The principal raw materials required are semi assembled diesel engines which have to be imported.

The total investment cost of the project including working capital is estimated at Birr 78.58 million. From the total investment cost the highest share (Birr 67.32 million or 85.68%) is accounted by initial working capital followed by fixed investment cost (Birr 5.69 million or 7.25%) and pre operation cost (Birr 5.55 million or 7.07%). From the total investment cost Birr 1.82 million or 2.31% is required in foreign currency.

The project is financially viable with an internal rate of return (IRR) of 32.50% and a net present value (NPV) of Birr 106.02 million discounted at 10%.

The project can create employment for 50 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 construction, transport, and mining sub sectors and the agricultural sector and also generates income for the Government in terms of tax revenue and payroll tax. .

II. PRODUCT DESCRIPTIONS AND APPLICATION

Diesel engines are used as prime movers in many machines performing various jobs. These jobs include concert mixing, water well drilling, water pumping, air compressing to power hammer jacks, log saws, small fork lifts, site trucks and many other works; in the field of agriculture,

building and road construction, transport ,mining and the like. In spite of their diversity, their power has to be limited in a given range for having a limited diversity in the assembly technology. Many local factories and workshops produce the above machines and fit these imported diesel engines as their prime movers.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

Currently there is no plant that can produce or assemble diesel or benzene engines in the country. Hence, the demand for the product is met through import. Table 3.1 shows import of the product during the period 2002 – 2011.

Table 3.1

IMPORT OF DIESEL ENGINE (UNITS)

Year	Quantity
2002	16,156
2003	47,459
2004	59,133
2005	29,965
2006	16,472
2007	12,969
2008	10,454
2009	15,474
2010	16,525
2011	17,151

Source: *Ethiopian Revenue and Customs Authority.*

As could be seen from Table 3.1, import of the product shows a fluctuation trend. However, beginning from year 2008 import or total supply has exhibited a consistent year to year growth increasing from 10,454 pieces in 2008 to 17,151 pieces in 2011 registering a growth rate of 19.53%.

For estimating the present effective demand for diesel engines, it is assumed that the average growth rate exhibited by the product's import or apparent consumption in the recent four years (2008-2011) will continue at least in the near future. Accordingly, by taking the year 2011 level of supply and applying a growth rate of 19.53%, the present (2012) effective demand for diesel engines is estimated at 20,501 pieces.

2. Projected Demand

The road transport dependence for both passenger and freight traffic is increasing. The road construction being undertaken as pre-requisite for investment and development, guarantees a healthy and continuously growing auto component industry. Although the number of vehicles in the country has shown a higher growth rate in order to be conservative an annual average growth rate of 5% is used in projecting the future demand for diesel engine (see Table 3.2).

Table 3.2

PROJECTED DEMAND FOR DIESEL ENGINE (PIECES)

Year	Projected Demand
2013	21,526
2014	22,603
2015	23,733
2016	24,919
2017	26,165
2018	27,474
2019	28,847
2020	30,290
2021	31,804
2022	33,394
2023	35,064
2024	36,817
2025	38,658

3. Pricing and Distribution

Based on the average CIF value of imported diesel engines during the period 209-2011 the recommended factory gate price for the envisaged assembly plant is Birr 15,000 per a unit of diesel engine.

The product can be distributed through agents or by establishing own distribution outlet in major urban areas of the country.

B. PLANT CAPACITY AND PRODUCTION PROGRAM

1. Plant capacity

From the market study and taking into consideration the complexity of the assembly process, and employing about 30 persons on three assembly lines, the capacity of the plant is taken as 21,000 units of engines annually during the start up period of three years.

2. Production Program

Considering the assembly process involved the plant is assumed to attain its full capacity in the third year of operation. In the first and second year it will operate at 75% and 85% of its installed capacity (see Table 3.3)

Table 3.3

ANNUAL PRODUCTION PROGRAM

Type of product	Year 1	Year 2	Year 3
Diesel engines (Unit)	15,000	17,000	21,000
Capacity %	75	85	100

IV. RAW MATERIAL AND INPUTS

A. RAW AND AUXILIARY MATERIALS

The main raw material of the plant is semi assembled diesel engines from the selected manufacturer and supplier of the engine. The required raw materials and their cost for the production are listed in Table 4.1.

Table 4.1

RAW MATERIALS AND ANNUAL COST

Sr. No	Raw Materials	Annual requirement		Total Cost (000 Birr)		
		Units	Quantity	F.C	L.C	Total
1	Mono Block engine in semi knocked down (SKD) state	Set	21,000	237,300	47,460	284,760
2	Bolts, nut and other fasteners	Ton	8	288	72	360
	Lubricants /oils	lit.	37,800		3,024	3,024
	Total			**237,588**	**50,556**	**288,144**

B. UTILITIES

Electricity and water are the major utilities required by the plant. Annual cost of utilities is Birr 190,032. For details see Table 4.2.

Table 4.2

ANNUAL UTILITY REQUIREMENTS

Sr. No.	Utility	Unit	Quantity	Cost(Birr)
1	Electricity	Kwh.	280,000	162,532
2	Water	Meter cube	2,750	27,500
	Total			**190,032**

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Process Description

The Engine is mainly imported partially assembled and packed in categories for easy unpacking on the assembly table. A total of 70 diesel engines are to be assembled daily on the line. Ten assembly lines have to be arranged for unpacking, assembly, testing and checking of seven engines each in a working day of 8 hours.

Three people with two mechanics and one electrician form one group on each assembly line. The group performs the jobs of unpacking, identifying and arranging parts in categories for quick fitting, assemble and fit each part in accordance with the blue print plan from the factory. Final checking and testing on each engine is done followed by delivery to the packing line.

2. Environmental Impact

As an assembly plant there is no waste that is to be disposed from the process. Hence, the Production activity of the plant does not have any negative impact on the environment.

B. ENGINEERING

1. Machinery and Equipment

Total cost of machinery and equipment is Birr 2,276,000 of which Birr 1,820,800 is required in foreign currency. The machinery and equipment that are required for the assembly of the envisaged diesel engine are listed in Table 5.1.

Table 5.1

LIST OF MACHINERY AND EQUIPMENT AND COST

Sr. No	Machinery	Description	Unit	Quantity
1	Tool Boxes with contents complete, mounted on workshop trolleys	For -workshops, Car Electricians & Electronics technicians	set	30
2	Light steel jacks		Pcs	10
3	Steel tables with wheels.	150X200cm, height 100cm	Pcs	30
4	Sawing, drilling, threading & cutting hand tools.		set	10
5	Testing instruments to measure speed, force and other parameters.	To be supplied by Manufacturer.	set	10
6	Shelf trolleys	4-racks	pcs	10

2. Land, Building and Civil Works

The total land required by the project is about 800 m^2, of which 300 m^2 is built-up area. The cost of building and civil works is estimated at Birr 1,500,000.

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 m^2 is estimated at Birr 212,800 of which 10% or Birr 21,280 will be paid in advance. The remaining Birr 191,520 will be paid in equal installments with in 28 years i.e. Birr 6,840 annually.

VI. HUMAN RESOURCE AND TRAINING REQUIREMENT

A. HUMAN RESOURCE REQUIREMENT

A total of 50 persons are required to operate the plant, out of which 41 are technical workers. Annual cost of labor is Birr 1,293,600. The human resource requirement by type of job and salary is indicated in Table 6.1.

Table 6.1

LIST OF HUMAN RESOURCE REQUIRED AND COST

Sr. No.	Description	No.	Salary (Birr)	
			Monthly	Annual
A. ADMINISTRATION				
1	Plant Manager	1	5,000	60,000
2	Secretary	1	2,500	30,000
3	Accountant	1	2,500	30,000
4	Salesman/purchaser	1	2,500	30,000
5	Clerk	1	1,500	18,000
6	Cashier	1	2,000	24,000
7	General Service	3	800	28,800
SUB TOTAL		**9**		**220,800**
B. PRODUCTION				
8	Foreman/	1	2,500	30,000
9	Fitters	10	2,000	240,000
10	Assistant fitters	10	1,500	180,000
11	Electricians	10	2,000	240,000
12	Quality controller	3	2,000	72,000
13	Technicians	2	2,000	48,000
14	Packing workers.	3	800	28,800
15	laborer	2	800	19,200
SUB TOTAL		**41**	**-**	**858,000**
TOTAL				**1,078,800**
EMPLOYEE'S BENEFIT (25% OF BASIC SALARY)		**-**	**-**	**214,800**
TOTAL		**50**	**-**	**1,293,600**

B. TRAINING REQUIREMENT

On the job training of the operators would be enough for workers with technical back ground. The demonstration work requires a period of one month with two trainer demonstrators'. This job will cost Birr 25,000.

VII. FINANCIAL ANALYSIS

The financial analysis of the diesel engine assembly 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 78.58 million (See Table 7.1). From the total investment cost the highest share (Birr 67.32 million or 85.68%) is accounted by initial working capital followed by fixed investment cost (Birr 5.69 million or 7.25%) and pre operation cost (Birr 5.55 million or 7.07%). From the total investment cost Birr 1.82 million or 2.31% 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	21.28		21.28	0.03
1.2	Building and civil work	2,250.00		2,250.00	2.86
1.3	Machinery and equipment	455.20	1,820.80	2,276.00	2.90
1.4	Vehicles	900.00		900.00	1.15
1.5	Office furniture and equipment	250.00		250.00	0.32
	Sub total	**3,876.48**	**1,820.80**	**5,697.28**	**7.25**
2	**Pre operating cost ***				
2.1	Pre operating cost	418.28		418.28	0.53
2.2	Interest during construction	5,141.13		5,141.13	6.54
	Sub total	**5,559.41**		**5,559.41**	**7.07**
3	**Working capital ****	**67,329.15**		**67,329.15**	**85.68**
	Grand Total	**76,765.04**	**1,820.80**	**78,585.84**	**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 96.16 million. However, only the initial working capital of Birr 67.32 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 295.52 million (see Table 7.2). The cost of raw material account for 97.50% of the production cost. The other major components of the production cost are financial cost, direct labour and depreciation, which account for 1.44%, 0.37% and 0.28% respectively. The remaining 0.41% is the share of utility, repair and maintenance, labour overhead, cost of marketing and distribution 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	288,144.00	97.50
Utilities	190.00	0.06
Maintenance and repair	68.00	0.02
Labor direct	1,079.00	0.37
Labor overheads	215.00	0.07
Administration Costs	250.00	0.08
Land lease cost	-	-
Cost of marketing and distribution	500.00	0.17
Total Operating Costs	**290,446.00**	**98.28**
Depreciation	833.86	0.28
Cost of Finance	4,241.43	1.44
Total Production Cost	**295,521.29**	**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 ranges from Birr 13.63 million to Birr 47.76 million during the life of the project. Moreover, at the end of the project life the accumulated net cash flow amounts to Birr 238.87 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.

$$\text{Break Even Sales Value} = \frac{\text{Fixed Cost + Financial Cost}}{\text{Variable Margin ratio (\%)}} = \text{Birr } 55{,}550{,}000$$

$$\text{Break Even Capacity utilization} = \frac{\text{Break even Sales Value}}{\text{Sales revenue}} \times 100 = 17\%$$

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 32.50% 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 principal 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 106.02 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 50 persons. The project will generate Birr 46.42 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 agricultural sector; construction, transport, and mining sub sectors and also generate 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	50,425.20	57,628.80	64,832.40	72,036.00	72,036.00	72,036.00	72,036.00	72,036.00	72,036.00	72,036.00
Accounts receivable	16,955.18	19,371.40	21,787.62	24,203.83	24,204.40	24,204.40	24,204.40	24,204.40	24,204.40	24,204.40
Cash-in-hand	15.67	17.91	20.15	22.39	22.48	22.48	22.48	22.48	22.48	22.48
CURRENT ASSETS	**67,396.06**	**77,018.11**	**86,640.17**	**96,262.22**	**96,262.89**	**96,262.89**	**96,262.89**	**96,262.89**	**96,262.89**	**96,262.89**
Accounts payable	66.91	76.47	86.03	95.58	95.58	95.58	95.58	95.58	95.58	95.58
CURRENT LIABILITIES	**66.91**	**76.47**	**86.03**	**95.58**	**95.58**	**95.58**	**95.58**	**95.58**	**95.58**	**95.58**
TOTAL WORKING CAPITAL	**67,329.15**	**76,941.64**	**86,554.14**	**96,166.64**	**96,167.30**	**96,167.30**	**96,167.30**	**96,167.30**	**96,167.30**	**96,167.30**

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	201,701	230,515	259,330	288,144	288,144	288,144	288,144	288,144	288,144	288,144
Utilities	133	152	171	190	190	190	190	190	190	190
Maintenance and repair	48	54	61	68	68	68	68	68	68	68
Labour direct	755	863	971	1,079	1,079	1,079	1,079	1,079	1,079	1,079
Labour overheads	151	172	194	215	215	215	215	215	215	215
Administration Costs	175	200	225	250	250	250	250	250	250	250
Land lease cost	0	0	0	0	7	7	7	7	7	7
Cost of marketing and distribution	500	500	500	500	500	500	500	500	500	500
Total Operating Costs	**203,462**	**232,457**	**261,451**	**290,446**	**290,453**	**290,453**	**290,453**	**290,453**	**290,453**	**290,453**
Depreciation	834	834	834	834	834	115	115	115	115	115
Cost of Finance	0	5,655	4,948	4,241	3,535	2,828	2,121	1,414	707	0
Total Production Cost	**204,296**	**238,946**	**267,234**	**295,521**	**294,821**	**293,395**	**292,689**	**291,982**	**291,275**	**290,568**

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	220,500	283,500	315,000	315,000	315,000	315,000	315,000	315,000	315,000	315,000
Less variable costs	202,962	231,957	260,951	289,946	289,946	289,946	289,946	289,946	289,946	289,946
VARIABLE MARGIN	**17,538**	**51,543**	**54,049**	**25,054**	**25,054**	**25,054**	**25,054**	**25,054**	**25,054**	**25,054**
in % of sales revenue	7.95	18.18	17.16	7.95	7.95	7.95	7.95	7.95	7.95	7.95
Less fixed costs	1,334	1,334	1,334	1,334	1,341	622	622	622	622	622
OPERATIONAL MARGIN	**16,204**	**50,209**	**52,715**	**23,720**	**23,713**	**24,432**	**24,432**	**24,432**	**24,432**	**24,432**
in % of sales revenue	7.35	17.71	16.73	7.53	7.53	7.76	7.76	7.76	7.76	7.76
Financial costs		5,655	4,948	4,241	3,535	2,828	2,121	1,414	707	0
GROSS PROFIT	**16,204**	**44,554**	**47,766**	**19,479**	**20,179**	**21,605**	**22,311**	**23,018**	**23,725**	**24,432**
in % of sales revenue	7.35	15.72	15.16	6.18	6.41	6.86	7.08	7.31	7.53	7.76
Income (corporate) tax	0	0	0	5,844	6,054	6,481	6,693	6,906	7,118	7,330
NET PROFIT	**16,204**	**44,554**	**47,766**	**13,635**	**14,125**	**15,123**	**15,618**	**16,113**	**16,608**	**17,103**
in % of sales revenue	7.35	15.72	15.16	4.33	4.48	4.80	4.96	5.12	5.27	5.43

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	**6,116**	**293,037**	**283,510**	**315,010**	**315,000**	**315,000**	**315,000**	**315,000**	**315,000**	**315,000**	**315,000**	**102,680**
Inflow funds	6,116	72,537	10	10	0	0	0	0	0	0	0	0
Inflow operation	0	220,500	283,500	315,000	315,000	315,000	315,000	315,000	315,000	315,000	315,000	0
Other income	0	0	0	0	0	0	0	0	0	0	0	102,680
TOTAL CASH OUTFLOW	**6,116**	**275,999**	**254,803**	**283,091**	**317,222**	**307,111**	**306,831**	**306,336**	**305,841**	**305,346**	**297,782**	**0**
Increase in fixed assets	6,116	0	0	0	0	0	0	0	0	0	0	0
Increase in current assets	0	67,396	9,622	9,622	9,622	1	0	0	0	0	0	0
Operating costs	0	202,962	231,957	260,951	289,946	289,953	289,953	289,953	289,953	289,953	289,953	0
Marketing and Distribution cost	0	500	500	500	500	500	500	500	500	500	500	0
Income tax	0	0	0	0	5,844	6,054	6,481	6,693	6,906	7,118	7,330	0
Financial costs	0	5,141	5,655	4,948	4,241	3,535	2,828	2,121	1,414	707	0	0
Loan repayment	0	0	7,069	7,069	7,069	7,069	7,069	7,069	7,069	7,069	0	0
SURPLUS (DEFICIT)	**0**	**17,038**	**28,706**	**31,919**	**-2,222**	**7,889**	**8,169**	**8,664**	**9,159**	**9,654**	**17,218**	**102,680**
CUMULATIVE CASH BALANCE	**0**	**17,038**	**45,744**	**77,663**	**75,441**	**83,330**	**91,499**	**100,163**	**109,322**	**118,976**	**136,193**	**238,873**

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**	**220,500**	**283,500**	**315,000**	**315,000**	**315,000**	**315,000**	**315,000**	**315,000**	**315,000**	**315,000**	**102,680**
Inflow operation	0	220,500	283,500	315,000	315,000	315,000	315,000	315,000	315,000	315,000	315,000	0
Other income	0	0	0	0	0	0	0	0	0	0	0	102,680
TOTAL CASH OUTFLOW	**73,445**	**213,075**	**242,069**	**271,064**	**296,290**	**296,506**	**296,934**	**297,146**	**297,358**	**297,570**	**297,782**	**0**
Increase in fixed assets	6,116	0	0	0	0	0	0	0	0	0	0	0
Increase in net working capital	67,329	9,612	9,612	9,612	1	0	0	0	0	0	0	0
Operating costs	0	202,962	231,957	260,951	289,946	289,953	289,953	289,953	289,953	289,953	289,953	0
Marketing and Distribution cost	0	500	500	500	500	500	500	500	500	500	500	0
Income (corporate) tax		0	0	0	5,844	6,054	6,481	6,693	6,906	7,118	7,330	0
NET CASH FLOW	**-73,445**	**7,425**	**41,431**	**43,936**	**18,710**	**18,494**	**18,066**	**17,854**	**17,642**	**17,430**	**17,218**	**102,680**
CUMULATIVE NET CASH FLOW	**-73,445**	**-66,019**	**-24,589**	**19,347**	**38,057**	**56,551**	**74,616**	**92,470**	**110,112**	**127,541**	**144,759**	**247,439**
Net present value	-73,445	6,750	34,240	33,010	12,779	11,483	10,198	9,162	8,230	7,392	6,638	39,587
Cumulative net present value	-73,445	-66,694	-32,454	556	13,335	24,818	35,015	44,177	52,407	59,799	66,437	106,024

NET PRESENT VALUE	106,024
INTERNAL RATE OF RETURN	32.50%
NORMAL PAYBACK	2 years