PROFILE ON BRICKS

TABLE OF CONTENTS

I. SUMMARY

This profile envisages the establishment of a plant for the production of 600,000 pieces of bricks per annum.

The present demand for the proposed product is estimated to be 309,366 pieces and it is projected to reach 1,298,430 pieces by the year 2010.

The plant will create employment opportunities for 27 persons.

The total investment requirement is estimated at Birr 4.07 million, out of which Birr 2.4 million is for plant and machinery.

The project is financially viable with an internal rate of return (IRR) of 13% and a net present value (NPV) of Birr 654 thousand, discounted at 10.5%.

II. PRODUCT DESCRIPTION AND APPLICATION

Brick is physically expressed as a rectangular prism of clay or soil which has been burnet in a kiln. It is usually red in colour because of the selected clay ingredient for which the bricks are made. It has a high temperature resistance property. Depending on the type of raw materials used for the manufacture, bricks can be of different types such as fire- brick and sand - lime bricks. The standard size of bricks indicated in some literatures is about (6x10x20) centimeters. The one produced in Ethiopia is of hard and softer type having a size of (6x 12 x 25) centimeters.

The principal application of bricks is for construction in buildings, for partition and for lining various types of kilns and furnaces used in iron and steel plants, cement and fertilizer, petro-chemicals, glass and ceramics and other chemical industries extensively.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Present Supply & Demand

The demand for bricks is a derived demand of mainly building construction. Bricks are applied in construction of kilns for bakeries, in kitchen due to their high heat resistance and also in industrial and commercial construction.

Although brick has high strength and high aesthetic value in building construction, it is being gradually substituted with blockets because of high cost per unit of construction and high cement consumption in relation to blockets for the same unit area.

Most residential and high rise buildings in Addis Ababa and major urban areas are built with hollow block as a walling material, when bricks are used in building structure, it is most of the time for facing (appearance) purposes at the front side, rather than for structural purposes.

The low utilization of bricks for building residential houses could also be inferred from Table 3.1 on urban housing stock.

Table 3.1

HOUSING UNITS OF REGION, BY CONSTRUCTION MATERIALS OF WALL (URBAN)

Region	Total Urban Housing Units	Material of Wall			
		Bricks	Blockets	Wood and Mud	Others
Tigray	115421	534	543	46102	68242
Afar	20160	24	399	14842	4895
Amhara	285203	229	3409	254396	27169
Oromiya	406169	1996	4775	371986	27439
Somali	70088	30	1418	38186	39439
Bensishangul-Gumuz	8499	17	131	6489	1862
SNNR	142212	90	1029	124057	17030
Gambella	6268	10	267	4085	1906
Harari	17455	122	834	11622	4877
Addis Ababa	134742	9163	23076	307855	34648
Dire Dawa	36382	70	4514	11101	20697
Country Total	**1,482,589**	**12,291**	**40,395**	**1,190,721**	**239,182**

Source:- CSA, the 1994, Population Housing Census

If we assume Somali, Harrari and Dire Dawa as potential users of bricks, the share of housing with bricks wall in the total housing stock has been estimated to be only 0.18 per cent. It can be seen from Table 3.1 that the total housing stock in the three areas identified equals to 123,925 and those with bricks wall amounts to 222. This suggests that one out of 1000 houses are of a brick wall.

The larger proportion of application of bricks is in high rise building, commercial and industrial constructions. Its application is also more in urban areas than in rural areas.

However, the supply of bricks as reflected from the official statistics is not increasing over the past many years.

Table 3.2

PRODUCTION OF BRICKS IN ETHIOPIA

Year	Quantity Produced (thousand pcs.)
1990	21680
1991	21198
1992	19970
1993	19532
1994	19292
1995	15664
1996	19876
1997	19789

Source:- CSA, Survey of the Manufacturing and Electricity Industries.

A major share of bricks supply comes from three factories; namely Ethiopia Bricks, Ceramical Bricks and Addis Shekla. Addis Shekla has suspended production following privatization while the remaining two are still operating. In addition to the two public owned bricks factories, there are small privately owned bricks factories but their production is small in quantity and poor in quality. On the other hand, the two bricks factories are over 30 years old and are operating beyond their technical life.

Transporting and selling bricks over longer distance is not an economical operation. The Somali Region is so large in terms of land mass that supplying bricks to different urban areas of the region from a single source will not be economical. Moreover, due to shortage of cement and transport cost over a long distance construction materials are expensive in the region.

In view of the relative stagnation of supply of bricks and costs related to transporting it over long distances the demand situation has been considered within the regional context and neighboring regions.

The regional government commit a huge budget to construction and some of it may require bricks as an input. Though the sectoral plans of the region indicate that the sectoral projects involve construction, it does not show number of houses constructed with bricks or hollow blocks or other construction materials. In addition, there is no information on private commercial and industrial construction in the region.

In view of poor housing condition in the Somali region and an effort to develop the region by the private and public sector, it is assumed that the demand for construction materials including bricks will increase.

Estimation of current and future demand for bricks in this study is based on specifying consumption requirements by different types of buildings as well as anticipated construction work disaggregated into different types of buildings.

Accordingly, the following consumption coefficient were developed in consultation with professional in the field (Table 3.3).

Table 3.3

CONSUMPTION COEFFICIENT BY BUILDING TYPE

Building Type	Floor Area M^2	Wall Area m^2		Bricks requirement		
		External	Internal	Extended	Internal	Total
Ground plus zero	150	81	135	9396	7830	17226
Ground plus one	300	162	270	18792	15660	34452
Ground plus two	450	243	405	28188	23490	51678
Ground plus three	600	324	540	37564	31320	68904
Ground plus ten	900	486	872	50376	47096	10,472

Note:- Bricks requirement per m^2 of floor area is 58 piece for internal walls, and 116 pieces for external walls.

Taking the development in the region and the surrounding regions like Harari and Dire Dawa town into account, the following development trends were estimated. (Table 3.4).

Table 3.4

PROJECTED IMPLEMENTATION OF BUILDINGS IN THE REGION (NO.)

		Year				
Item	2001	2002	2003	2004	2005	Total
Ground plus zero	90	100	120	150	180	640
Ground plus one	60	70	85	100	115	430
Ground plus two	40	50	65	80	95	330
Ground plus three	30	40	55	70	85	280
Ground plus four	20	30	45	60	75	230

When the consumption coefficient established earlier are applied on Table 3.4, we can arrive at the current as well as future demand of bricks in the Somali Region (see Table 3.5). The demand estimation, however, is carried out under three scenarios.

The first scenario, which is optimistic, assumes that 10% of the buildings will use bricks as wall material. The second scenario, which is moderately optimistic assumes that 5% of buildings will be made of bricks. The third scenario assumes that only 3% of the buildings will use bricks. Accordingly, the present demand for bricks has been estimated at 309,366 pieces.

Table 3.5

CURRENT AND FUTURE DEMAND OF BRICKS

	Year				
	2001	2002	2003	2004	2005
Base year (105%)	10,312,197	13,207,388	17,640,598	22,254,687	26,867,775
Scenario 1 (10%)	1,031,220	1,320,938	1,764,060	2,225,469	2,686,777
Scenario 2 (5%)	515,610	660,369	882,030	1,127,343	1,343,389
Scenario 3 (3%)	309,366	396,221	529,218	676,641	806,033

Note: the base case refer to scenarios where all buildings are made of bricks plus 5% wastage allowance.

2. Demand projection

As the data in Table 3.1 reveals, in Ethiopia housing construction is mainly based on naturally available materials such as wood and mud. With progress in development, modern building materials, including manufactured bricks, will replace traditionally used natural building materials. This reduces the negative effect of construction on the environment. Studies made on effect of economic growth on the construction industry indicated that construction activity increases faster than growth in the economy as a whole by 20%. The demand for bricks is also influenced by growth rate of the urban population, which is estimated to be 4% per annum.

An important determinant of demand for bricks in Ethiopia, however, is the price and availability of substitute product. The most notable substitute to bricks, i.e. hallow block, is amply available and very much cheaper than bricks. The cost comparison of the two material is provided in Table 3.6.

Table 3.6

COST COMPARISON OF HALLOW BLOCK AND BRICKS

Item	Hallow Block			Bricks		
	(a) Piece /m^2	(b) Birr/piecs	c+(axb) Birr /m^2	(a) Piece/m^2	(b) Birr/price	c = axb Birr /m^2
External	12.5	2.00	25.00	116	0.75	82.00
Partition	12.5	1.75	21.90	58	0.75	43.50

Table 3.6 shows that for the same square area the cost of using bricks as a construction materials is more than three fold to that of using hollow blocks.

Apart from the price factor, hollow blocks has an added advantage because it requires less cement and sand which are complementary materials during wall construction. The workmanship required during brick laying is also of higher standard, thereby raising the cost.

Hence, despite its obvious attractive physical attribute, the demand for bricks is not growing as fast as the growth of the construction industry. In view of this, for the part of the construction period within the coming five years, an annual growth rate of 10% has been applied. Table 3.7 shows demand projection based on this rate of growth.

Table 3.7

DEMAND PROJECTION OF BRICKS

Year	Projected Demand in Pieces
2001	309,366
2002	396,221
2003	529,218
2004	676,641
2005	806,033
2006	886,636
2007	975,580
2008	1,075,083
2009	1,180,391
2010	1,298,430

3. Pricing and Distribution

The current ex-factory price of bricks in Dire-Dawa is Birr 2.00 per piece. This price is proposed for the envisaged project. All types of customers, small or big, make their purchases directly from the factories using their own means to transport the bricks to site.

B. PLANT CAPACITY AND PRODUCTION PROGRAMME

1. Plant Capacity

The envisaged plant will have a production capacity of 600,000 pieces or 1500 tonnes of bricks per annum.

2. Production Programme

The proposed plant is planned to function for about 240 days a year in a single shift of 8 hours a day production system. However, as the firing system in the drying kiln requires continuous operation, three shift production might be carried out until firing cycle is completed. The plant will start production at 80%, 90%, 100% capacity in years 1,2, and 3, respectively.

IV. MATERIALS AND INPUTS

A. MATERIALS

The raw materials used for the production of ordinary type of bricks is clay. Clay is the only raw materials for the above stated type of bricks, which are mainly used for structural purposes in building construction. Such raw material can be availed in the out skirts of Jigjiga. This raw material must possess special properties and composition or constituents such as hydrous silicates of aluminum together with some colour imparting materials like hematite and limonite. The annual requirement of clay is estimated at about 1800 tonnes, the cost of which is about Birr 50,000.

B. UTILITIES

Major utilities for bricks production are fuel oil for drying and burning of the product, electric power for machine drive and water for general purpose. The annual consumption of these utilities is shown in Table 4.1.

Table 4.1

ANNUAL CONSUMPTION OF UTILITIES

Item No.	Description	Qty	Cost '000 Birr		
			F	L	T
1	Fuel Oil (Tonnes,)	95	--	185.2	185.2
2	Electric Power, (Kwh)	28,125	--	13.8	13.8
*3	Water (m^3)	300,000	--		--
	Total			**199.0**	**199.0**

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Process Description

The most common practice of bricks production involves several unit operations such as material excavation and transportation, grinding and mixing, brick shaping, drying of semi-finished brick, burning, classifying and packing of the finished product. In the proposed plant the process starts from grinding operation in order to reduce the investment cost.

The quarried raw material is subsequently crushed and wetted several times before it is passed or feed to the press vacuum chamber where air is extracted in order to obtain a compact mix. Then, a well prepared clay mix is extruded through a mold to get the required shape and dimensions. The wet semi finished brick is conveyed to the batch drying chamber,

---

* *Well -water will be used. The cost of pumping is included in electric power charge.*

where drying is carried out by blowing in warm air and expelling of humid air with intensive fanning. Then, the dried batch is conveyed to the kiln for the final process. Burning of the batch in the kiln is accomplished by a flame traveling in circle on top of the bricks. Upon completion of the baking of bricks, the products are stored in a storage place where preliminary sorting is made. Finally, the selected bricks are made available for market. The plant is environment friendly.

2. Source of Technology

The machinery and equipment required can be obtained from the following company.

Movers (India) Private Ltd.
BASAVA BHAVAN, High Grounds
Fax 91-802263606

B. ENGINEERING

1. Machinery and Equipment

The machinery and equipments required are listed in Table 5.1. the total cost of the machinery and equipment is estimated at about Birr 2.4 million. Of the total, Birr 2.175 million is in foreign currency while the remaining 0.255 million is in local currency.

Table 5.1

REQUIRED MACHINERY AND EQUIPMENTS

Items	Qty.	Cost 'OOO Birr		
		F.C	L.C	Total
1. Front end dumper	1	340.0	-	340.0
2. Box Feeder	1	200.0	-	200.0
3. Roller crusher	1	375.0	-	375.0
4. Vacuum press with mixer	1	350.0	-	350.0
5. Conveyors	2	200.0	-	200.0
6. Cutter (Semi-automatic)	1	250.0	-	250.0
7. Drying kiln	1	460.0	-	460.0
F.O.B		**2,175.0**	**-**	**2,175.0**
C&F		**-**	**123.80**	**123.80**
Various charges			131.6	131.6
Total		**2,175.0**	**255.40**	**2,430.4**

2. Land, Building and Civil Works

The over all land required is about 3500 square meters, of which 750 square meter is alotted for building and production spaces. The total construction cost at a unit cost of Birr 1250 per m^2 is estimated to be Birr 937,500. Land lease cost at the rate of Birr 1 per m^2 and for 95 years is estimated to be Birr 332,500. Thus, total land and construction cost amounts to Birr 1,270.000.

3. Proposed Location

Jigigja town is the best location for the bricks making plant as there is a rapid urban development activity which is an advantage interms of market outlet for the product.

VI. MANPOWER AND TRAINING REQUIREMENT

A. MANPOWER REQUIREMENT

The list of manpower required and the corresponding labour costs are shown in Table 6.1 below.

Table_6.1
MANPOWER REQUIREMENT

Description	Required Number	Salary in Birr	
		Monthly	Annually
A. Administrative staff			
1 Manager	1	1500	18,000
2 Secretary	1	350	4,200
3 Accounting clerk	1	350	4,200
4 Store man	1	500	6,000
5 Guards	4	180	8,640
Sub – Total	**8**		**41,040**
B. Production Staff			
1. Production Head	1	1400	16,800
2. Supervisors	1	750	9,000
3. Machine Operators	5	600	36,000
4. Mechanic cum Electrician	2	500	12,000
5. Unskilled Workers	10	200	24,00
Sub-Total (B)	**19**		**97,800**
Total (A+B)	**27**		**138,840**
Benefits 25%			34,710
Grand Total			**173,550**

B. TRAINING REQUIREMENT

Couple of weeks orientation for production and technical personnel will be conducted during the plant erection and commissioning period by the machinery supplier. Thus, no training cost is required.

VII. FINANCIAL ANALYSIS

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

Construction period	2 years
Source of finance	70% equity
	30% loan
Tax holidays	3 years
Bank interest	10.5 %
Discounted cashflow	10.5%
Land value	based on estimated lease rate of the region
Repair and maintenance	5%plant and machinery
Accounts receivable	30 days
Raw material local	60 days
Work in progress	5 days
Finished products	30 days
Cash in hand	5 days
Accounts payable	30 days

A. TOTAL INITIAL INVESTMENT COST

The total initial investment cost of the project including working capital is estimated at about Birr 4.07 million, out of which about 53% will be required in foreign currency. For details see Table 7.1

Table 7.1

INITIAL INVESTMENT COST ('000 BIRR)

No.	Cost Items	Foreign Currency	Local Currency	Total
1	Land		332.50	332.50
2	Building and Civil Work		937.50	937.50
3	Plant Machinery and Equipment	2,173.50	256.90	2,430.40
4	Office Furniture and Equipment		50.00	50.00
5	Vehicle		-	-
6	Pre-production Expenditure*		289.80	289.80
	Total Investment Cost	**2,173.50**	**1,866.70**	**4,040.20**
7	Working Capital		33.81	33.81
	Total	**2,173.50**	**1,900.51**	**4,074.00**

B. PRODUCTION COST

The annual production cost at full operation capacity of the plant is estimated at Birr 1.4 million (see Table 7.2). The material and utility cost accounts for 16.8 per cent while repair and maintenance take 13.5 per cent of the production cost.

---

* *Pre-production expenditure include interest during construction (Birr 189,000) and cost of registration, licensing and formation of the company including legal fees, commissioning expenses, etc.*

Table 7.2

ANNUAL PRODUCTION COST ('000 BIRR)

Items	Year			
	3	4	7	15
Raw Material and Inputs	40	45	50	50
Labour direct	78.2	88.00	97.80	97.80
Utilities	159.20	179.10	199.00	199.00
Energy and power				
Spare parts				
Maintenance and repair	110.40	124.20	138.00	138.00
Factory overheads	27.80	31.20	34.71	34.71
Administration Overheads	41.04	41.04	41.04	41.04
Total operating costs	**456.60**	**508.60**	**560.55**	**560.55**
Depreciation	298.40	298.40	298.40	298.40
Cost of Finance	557.10	583.90	607.90	597.60
Total Production Cost	**1,312.10**	**1,390.9**	**1,445.10**	**1,402.90**

C. FINANCIAL EVALUATION

1. Profitability

According to the projected income statement, the project will start generating profit in the eleventh year of operation. Important ratios such as profit to total sales, net profit to equity (Return on equity) and net profit plus interest on total investment (return on total investment) will show an increasing trend during the life-time of the project.

The income statement and the other indicators of profitability show that the project is viable.

2. Break-even Analysis

The break-even point of the project is estimated by using income statement projection.

$$BE = \frac{\text{Fixed Cost}}{\text{Sales - Variable Cost}} = 60\%$$

3. Pay- Back Period

The investment cost and income statement projection are used to project the pay-back period. The project's initial investment will be fully recovered within 9 years.

4. Internal Rate of Return and Net Present Value

Based on the cashflow statement, the calculated IRR of the project is 13% and the net present value at 10.5% discount rate is Birr 653.90 thousand.

D. ECONOMIC BENEFITS

The project can create employment for 27 persons. In addition to supply of the domestic needs, the project will generate Birr 198.46 thousand interms of tax revenue. Moreover, the Regional Government can collect employment, income tax and sales tax revenue. The establishment of such factory will have a foreign exchange saving effect to the country by substituting the current imports.