73. PROFILE ON BRICKS

TABLE OF CONTENTS

I. SUMMARY

This profile envisages the establishment of a plant for the production of 300,000 pcs of bricks per annum.

The present demand for proposed product is estimated at 115,759 pcs and it is projected to reach at 750,745 pcs by the year 2020.

The plant will create employment opportunities for 16 persons.

The total investment requirement is estimated at Birr 4 million, out of which Birr 2.74 million is required 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 571,010, discounted at 10.5%.

II. PRODUCT DESCRIPTION AND APPLICATION

Brick is physically expressed as a rectangular prism of clay or soil which has been burnt 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 litratures is about (6 x 10 x 25 cm.).

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. Past Supply and Present Demand

The demand for bricks is mainly derived from building construction, especially wall construction. Globally, according to some studies, about 65% of all bricks are used for residential buildings; while the remaining are used for industrial, commercial and institutional buildings. Because of the low income of the population and the relative expensiveness of bricks, the above pattern of brick consumption does not, however, apply in Ethiopia. On the contrary, major users of bricks in this country (in relative terms) are commercial and institutional buildings. Most low-cost residential buildings in Addis Ababa are, for instance, built with hollow blocks as walling material. When bricks are ever used in a building structure, it is most of the time for facing (appearance) purposes at the front side rather than for structural utilities.

The low utilization of bricks in Ethiopia for building residential houses could also be easily inferred from Table 3.1 on the urban housing stocks.

Table 3.1
HOUSING UNITS OF REGIONS BY CONSTRUCTION MATERIAL 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	39454
Benishangul-Gumuz	8499	17	131	6489	1862
SNNPR	142212	96	1029	124057	17030
Gambella	6268	10	267	4085	1906
Harari	17455	122	834	11622	4877
Addis Ababa	374742	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 and Housing Census of Ethiopia.*

The above table reveals that from the total urban housing stock of about 1.5 million, only 12,291 units, i.e., 0.8% are built with bricks; and of these, 9,163 or about 75% are found in Addis Ababa.

Although more bricks are used as walling and structural materials in commercial and institutional buildings, the rate of utilization does not appear to be increasing despite the observable heightened construction activity all over the country.

The fact that the supply situation with regard to bricks has stagnated for a long time also amply testifies to the foregoing observation. As the data in Table 3.2 shows, the supply of bricks during the fifteen years period from 1988 to 2002 has exhibited no increasing trend. On the contrary, from a peak amount of 30.4 million pieces in 1989, the figure has declined to an average of about 19 million pieces since 1993.

A substantial share of the brick supply comes from three factories, namely; Ethio-Bricks, Ceramical Bricks and Addis Shekla. Addis Shekla has suspended production following its privatization, whereas the former two are still operating under state ownership. Although all the three factories were established 30 years ago, they are considered as the sole suppliers of bricks by contractors since bricks produced by private producers are of sub-standard quality, which do not meet the minimum acceptable specifications.

Table 3.2

PRODUCTION OF BRICKS IN ETHIOPIA (1998-2002)

Year	Quantity of Bricks Produced (Thousand Pieces)
1988	21150
1989	27381
1990	30458
1991	21680
1992	21198
1993	19970
1994	19532
1995	19292
1996	15664
1997	19876
1998	19789
1999	19410
2000	20152
2001	20040
2002	22111

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

An investigation of the demand for bricks in backward regions like Benishngul Gumuz is, hence, an exercise to be carried out against the background of a stagnant market scenario prevailing in the country as a whole, and particularly those relatively developed urban areas like Addis Ababa.

Nonetheless, since transporting and selling bricks over a long distance is not a feasible option, the relevant market is the local or regional market. In this regard, as a large proportion of investment in construction is anticipated to emanate from the public sector, the Three Year Development Plan of the region (1995-1997 E.C.) was reviewed. Although the plan catalogues individual sectoral projects (Health, Education, etc.), these will not create market for bricks because sectoral standards demand that they will be constructed with stone masonry and hollow blocks except those structures such as incinerators. The plan also envisages construction of a number of houses for public servants; but, these too are unlikely to use bricks as they are meant to be of low-cost ones.

Hence, in view of the above, the market for bricks would derive mainly from construction of commercial buildings for hotels, restaurants, gas-stations and the like by the private sector; and a few office buildings by the regional government. The determination of current and future demand in this study is, thus, based on specifying consumption requirements of bricks by different types of buildings as well as anticipated construction work disaggregated into different types of buildings.

Accordingly, the following consumption coefficients were developed in consultation with knowledgeable professionals and by reviewing Building Construction Manuals (see Table 3.3).

Table 3.3

CONSUMPTION COEFFICIENT BY BUILDING TYPE

Building Type	Floor Area (m^2)	Wall Area (m^2)		Brick Requirement (Pcs)		
		External	Internal	External	Internal	Total
Ground plus zero	300	162	270	18792	15660	**34452**
Ground plus one	600	324	540	37584	31320	**68904**
Ground plus two	900	486	812	56376	47096	**103472**

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

Based on the impression gained during the Resource Potential Study, IPS (2003) as well as knowledgeable opinion on current developmental trends of the region, the following construction of commercial and office building is forecasted in Table 3.4 to be realized in the coming five years.

Table 3.4

PROJECTED IMPLEMENTATION OF BUILDING CONSTRUCTION (NO.)

Item	Year					Total
	2005	2006	2007	2008	2009	
Ground plus zero	30	35	40	45	50	**200**
Ground plus one	1	3	5	7	9	**25**
Ground plus two	-	1	2	3	4	**10**

When the consumption coefficient established earlier is applied on Table 3.4, we arrive at the current as well as the coming five years demand for bricks in Benishangul-Gumuz (see Table 3.5). The demand estimation, however, is carried out under two scenarios. The first scenario, which is highly optimistic, assumes that all buildings will use bricks as wall material. The second and most realistic scenario assumes that only about 10% of buildings will use bricks. Accordingly, the present demand for bricks is estimated to be about 115,759 pieces.

Table 3.5

CURRENT AND FUTURE DEMAND FOR BRICKS

Demand for Bricks By Different Scenarios	Year				
	2005	**2006**	**2007**	**2008**	**2009**
Scenario 1 (105%)*	1,157,587	1,591,804	2,025,998	2,460238	2,894,455
Scenario 2 (10%)	115,759	159,180	202,600	246,024	289,445

2. Projected Demand

As the data in Table 3.1 easily reveals, in Ethiopia housing construction is mainly based on naturally available building materials such as wood and mud. With progress in development, modern building materials, including manufactured bricks, increasingly replace traditionally used natural building materials. Studies made on effect of economic growth on the construction industry indicate 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 extremely important determinant of demand for bricks in Ethiopia, however, is the price and availability of substitute products. The most notable substitute to bricks, i.e., hollow block, is amply available and very much cheaper than brick. The cost per m^2 of wall area using the two materials is provided in Table 3.6 for the sake of comparison.

---

* *The base case refers to a scenario where all buildings are made of bricks plus 5% wastage allowance.*

Table 3.6

COST COMPARISION OF HOLLOW BLOCK AND BRICK

Use	Hollow Block			Brick		
	(a) Piece/m^2	(b) Birr/Piece	(c=axb) Birr/m^2	(a) Piece/m^2	(b) Birr/Piece	(c=axb) Birr/m^2
External Wall	12.5	2.60	32.50	116	1.25	145
Partition Wall	12.5	2.40	30.00	58	1,25	72.50

A glance at the above table easily reveals that for the same area of wall, the cost of brick is more than four times higher, in the case of external wall, and more than twice higher, in the case of partition wall than that of hollow blocks.

Apart from the price factor, hollow block 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 a higher standard, thereby raising the cost.

Hence, despite its obvious attractive physical attributes, due to the foregoing reasons, 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 extending beyond the coming five years, an annual average growth rate of 10% is deemed to be reasonable to execute demand projection. Table 3.7 shows the demand projection made on this basis.

Table 3.8

PROJECTED DEMAND FOR BRICKS

Year	Projected Demand (Pieces)
2006	115,759
2007	159,180
2008	202,600
2009	246,024
2010	289,445
2011	318,389
2012	350,228
2013	385,251
2014	423,776
2015	466,154
2016	512,769
2017	564,046
2018	620,450
2019	682,495
2020	750,745

3. Pricing and Distribution

The current ex-factory price of bricks at Addis Ababa is Birr 2.50 per piece. This price is proposed for sales revenue and financial analysis of the project. All types of customers, small or big, make their purchase 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 300,000 pieces 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 complete. The plant will start production at 80%, 90% and 100% capacity in the first, second and third year and then after, respectively.

IV. MATERIALS AND INPUTS

A. RAW MATERIALS

The raw materials used for the production of ordinary type of bricks is clay. Clay is available in most part of the region. This raw material must possess special properties and composition or constituents such as hydrous silicates of aluminum together with some colour in imparting materials like hematite and limonite. The annual requirement of clay is estimated at1,100 tonnes, which cost Birr 22,500 for royalty since it will have its own quarry.

B. UTILITIES

Major utilities for bricks production are fuel oil for drying and burning 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 AND COST

Sr. No.	Description	Qty.	Cost '000 Birr
1	Fuel oil (tonnes)	28	72.00
2	Electric power (kWh)	6,000	12.00
3	Water (m^3)	1,600	5.00
	Grand Total	-	**89.00**

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Process Description

The most common practice of bricks production involves several unit of 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 investment cost.

The quarried raw material is subsequently crushed and wetted several time before it is passed or fed to the press vacuum chamber where air is extracted in order to obtain 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 transported to the batch drying chamber, where drying is carried out by blowing in warm air and expelling of humid air with intensive fanning. Then, the dried batch is transported to the kiln for the final process. Burning of batch in the kiln is accomplished by a flame traveling in circle on top of the bricks. Upon completion of the burning of bricks, the products are sorted in a storage place where preliminary sorting is made. Finally, the selected bricks are made available for market.

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 equipment required along with estimated cost are listed in Table 5.1. The total cost of the machinery and equipment is estimated at Birr 1.43 million.

Table 5.1
MACHINERY AND EQUIPMENT REQUIREMENT AND COST

Sr. No.	Items	Qty. No.	Cost '000 Birr		
			FC	LC	Total
1	Excavator	1	800.00	-	800.00
2	Loader	1	600.00	-	600.00
3.	Box feeder	1	210.00	-	210.00
4.	Roller crusher	1	280.00	-	280.00
5.	Vacuum press with mixer	1	250.00	-	250.00
6.	Cutter (Semi-automatic	1	150.00	-	150.00
7.	Drying kiln	1	350.00	-	350.00
	F.O.B		**2,640.00**	**-**	**2,640.00**
	C & F		-	100.00	100.00
	Grand Total		**2,640.00**	**100.00**	**2,640.00**

2. Land, Building and Civil Works

The overall land required by the envisaged project is about 2,500 m^2, of which 625 m^2 is allotted for building and production spaces. The total construction cost at a unit cost of Birr 650 per m^2 is estimated to be Birr 406,250. Land lease cost, at the rate of Birr 1.2 per m^2 and for 70 years, is estimated to be Birr 210,000. Thus, the total land and construction cost assuming that the total land lease cost will be paid in advance amounts to Birr 616,250.

3. Proposed Location

Based on the availability of infrastructure, utility and market Assosa town is recommended as the best location of the envisaged plant. Moreover, considering the availability of the basic raw material (clay) an alternative location could be Mao-Kamo and Bambasi woredas.

VI. MANPOWER AND TRAINING REQUIREMENT

A. MANPOWER REQUIREMENT

The envisaged bricks project requires a total of 16 workforce. The list of manpower required and corresponding labour cost is shown in Table 6.1.

Table 6.1

MANPOWER REQUIREMENT AND ANNUAL LABOUR COST

Description	Required Number	Salary in Birr	
		Monthly	Annually
A. Administrative staff			
1. Manager	1	1600.00	19200.00
2. Secretary	1	450.00	5400.00
3. Accounting clerk	1	750.00	9000.00
4. Store man	1	350.00	4200.00
5. Guards	2	250.00	6000.00
Sub-Total			**43800.00**
B. **Production staff**			
1. Production head	1	12,000.00	14,400.00
2. Supervisor	1	1,050.00	12,600.00
3. Machine operators	2	400.00	9,600.00
4. Mechanic /Electrician	1	500.00	6,000.00
5. Unskilled /workers	5	250.00	15,000.00
Sub-Total	**16**		**44,600.00**
Total (A+B)			**88,400.00**
Benefits (25%)			22,100.00
Grand Total	**16**		**101,500.00**

B. TRAINING REQUIREMENT

Due to focus of the government on technical training, skilled workers on construction materials production are available. So no special training is required.

VII. FINANCIAL ANALYSIS

The financial analysis of the bricks project is based on the data presented on the previous chapters and the following assumptions.

Construction period	2 years
Source of finance	30% equity
	70% loan
Tax holidays	3 years
Bank interest	10.5%
Discount cash flow	10.5%
Repair and maintenance	5% of plant and machinery and equipment cost
Accounts receivable	30 days
Raw material (local)	50 days
Work in progress	2 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 Birr 4 million, out of which about 66% will be required in foreign currency. Details are indicated in Table 7.1.

Table 7.1

INITIAL INVESTMENT COST ('000 BIRR)

Sr. No.	Cost Items	Foreign Currency	Local Currency	Total
1.	Land	-	210.00	210.00
2.	Building and Civil Work	-	406.25	406.25
3.	Plant Machinery and Equipment	2,640.00	100.00	2,740.00
4.	Office Furniture and Equipment	-	25.00	25.00
5.	Pre-production Expenditure*	-	609.74	609.74
	Total Investment Cost	**2,640.00**	**1,350.99**	**3,990.99**
6.	Working Capital	-	16.84	16.84
	Grand Total	**2,640.00**	**1,367.83**	**4,007.83**

B. PRODUCTION COST

The annual production cost at full operation capacity of the plant is estimated at Birr 722,990 (see Table 7.2). The material and utility cost accounts for 15 per cent while repair and maintenance take 4.42 per cent of the production cost.

---

* *Pre-production expenditure include interest during construction (Birr 534,740) 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**	**10**
Royality	10.00	22.50	22.50	22.50
Labour Direct	42.43	47.47	53.04	53.04
Utilities	71.20	80.10	89.00	89.00
Maintenance and repair	25.60	28.80	32.00	32.00
Labour overheads	17.68	19.89	22.10	22.10
Administration Cost	28.29	31.28	35.36	35.36
Total operating costs	**203.20**	**254.00**	**254.00**	**254.00**
Depreciation	171.81	171.81	177.81	162.81
Cost of Finance	310.18	291.18	221.35	127.13
Total Production Cost	**691.20**	**722.99**	**653.16**	**543.94**

C. FINANCIAL EVALUATION

1. Profitability

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

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

2. Break-even Analysis

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

$$BE = \frac{\text{Fixed Cost}}{\text{Sales-Variable Cost}} = 28\ \%$$

3. Pay-Back Period

The investment cost and income statement projection are used to project the pay-back period. The project will fully recover the initial investment and working capital within 7 years time.

4. Internal Rate of Return and Net Present Value

Based on the cash flow statement, the calculated IRR of the project is 13% and the net present value at 10.5%, discount rate is Birr 571,010.

D. ECONOMIC BENEFITS

The project can create employment opportunities for 16 persons. In addition to supply of the domestic needs, the project will generate Birr 1.41 million in terms of tax revenue. Moreover, the Regional Government can collect employment, income tax and sales tax revenue.