90. PROFILE ON SMALL SCALE PAPER MAKING

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I. SUMMARY

This profile envisages the establishment of a plant for the production of 7,500 tonnes of paper per annum.

The current demand for the proposed product is estimated at 46,359 tonnes per annum and it is projected to reach 67,055 tonnes by the year 2014.

The project will create employment opportunity for 75 persons.

The total investment cost of the project is estimated at Birr 34.86 million, out of which Birr 20 million is required for plant and machinery.

The project is financially viable with an internal rate of return (IRR) of 24% and a net present value (NPV) of Birr 29.97 million, discounted at 10.5%.

II. PRODUCT DESCRIPTION AND APPLICATION

Paper is used for writing and printing, for wrapping and packaging, and a variety of other applications ranging from kitchen towels to the manufacture of building materials. In modern times, its production in large quantities has been a significant factor in the increase in literacy and the raising of educational levels of people throughout the world.

The most commonly used paper types are stationary paper (i.e. printing and writing), news print, wrapping & packaging, and paper card.

Small scale paper making is defined as one having a capacity of less than 30 tonnes of paper per day; this also includes hand-made paper.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past supply and Present Demand

Paper has become an important necessity of our day to day life. Modern life depends on paper and millions of tonnes of it are made and used each year. The range of possible uses of paper is limitless and new ways of using it are being devised daily.

We use paper for news prints, magazines, writing, printing, packaging, sanitary purpose and household uses. Books, exercise books, report cards, receipts, envelops greeting cards, calanders, diaries, wall papers, toilet tissue, towels are a few among the usages of paper.

The supply of paper in Ethiopia is dominated by imported products. The only paper producing factory in Ethiopia is Ethiopian Pulp and Paper Share Company which is located at Wonjj. This factory has a production capacity of 8,000-10,000 tonnes, annually. Due to the limited production capacity of the country's sole producer of paper, the country imports a large quantity of paper from oversees (see Table 3.1).

Table 3.1

PAPER SUPPLY IN TONNES

Year	Domestic	Import	Total
1988	7,489	20,313	27,802
1999	10,420	160,612	171,032
2000	5,143	413,432	418,565
2001	6,144	100,302	106,446
2002	7,719	32,216	39,935
2003	6,683	35,926	42,609
Average	**7,266**	**127,132**	**134,398**

As can be seen from Table 3.1, the 1998/2003 average annual domestic production of paper was 7,266 tonnes while in the same period 127,132 tonnes of paper have been imported which means the average total supply of paper during the period under consideration was 134,398 tonnes per annum, of which only about 5% was locally produced.

Supply of paper has shown a leap in the three years (1999-2001) and returns back to the under 50, 000 tonnes level in 2002. Excluding the leap years, the average annual total supply remains 36,782 tonnes with an annual growth rate of 8.8%.

Applying this annual growth rate, the current effective demand for paper is estimated at 46, 359 tonnes.

2. Projected Demand

Since modern life needs usage of paper every day, the demand for paper is increasing with population and modernization. Changes in life style, growth in standard of living, the service and industrial sector and educational coverage will contribute to the growth in demand for paper. In forecasting the demand for paper, therefore, GDP growth rate attained in 1999-2004 i.e, 3.76% is applied. The projected demand is presented in Table 3.2.

Table 3.2

PROJECTED DEMAND FOR PAPER

Year	Demand (Tonnes)
2005	48,102
2006	49,911
2007	51,787
2008	53,735
2009	55,755
2010	57,859
2011	60,027
2012	62,284
2013	65,625
2014	67,055

3. Pricing and Distribution

As a new entrant to the market, the project under study will have an advantage of using latest technology as against the existing domestic producer which will enable to produce at a lesser cost and better quality. The recommended price for the envisaged project is Birr 4 per kg. The product can be distributed by establishing own distribution outlets in strategic towns or by using hired or commissioned agents.

B. PLANT CAPACITY AND PRODUCTION PROGRAMME

1. Plant Capacity

From the technical point of view, a small-scale paper mill is one, which has a capacity of less than 30 tonnes per day. Accordingly, considering the demand projections worked out in the market study section, it is proposed that a plant with a daily capacity of 25 tonnes per day is recommended. This is equivalent to 7,500 tonnes per year.

Production capacity is based on a schedule of 300 working days per annum and 3 shifts of eight hours per day.

2. Production Programme

The envisaged production programme is given in Table 3.4. The schedule is worked out in consideration of the time required for gradual build-up in labour productivity and fine-tuning of machinery. Production will start at 75% of plant capacity in the first year of operation and reache full-gear in the 3rd year of operation and thenafter.

Table 3.4
PRODUCTION PROGRAMME

Year	**1**	**2**	**3-10**
Capacity Utilization [%]	75	85	100
Production (tonnes)	5,625	6,375	7,500

IV. MATERIALS AND INPUTS

A. MATERIALS

In tropical developing countries, where wood is often in short supply there are a number of sources of fiber. These include straw (e.g. from wheat, barley or rice), bagasse, maize stalks, bamboo, cotton cuttings, lint and fluff, rags (from cotton material), hemp and sisal from old ropes and jute. In the Benishangul-Gumuz region, maize stalks and bamboo are believed to be easily obtainable, especially through commercial farming. In addition if proper maintenance is applied, the existing bamboo forests could be utilized as a source of raw material.

Chemicals are also required in the paper making process. These include caustic soda, lime, ammonia- & calcium sulphate, chlorine, hypochlorite, alum, starch, china clay and talc.

The raw materials required for the envisaged small scale paper plant and corresponding estimated cost are indicated in Table 4.1.

Table 4.1

ANNUAL MATERIALS REQUIREMENTS AND COST (IN TONNES)

Sr. No.	Description	Qty.	Unit Price (Birr)	Cost ('000 Birr)		
				L.C	F.C	Total
1	Wood*	18,750	200	3,750.00		3,750.00
2	NaOH	2,010	4,360	3,067.26	5696.34	8,763.6
3	Cl_2	375	2,270	297.94	553.31	851.25
4	CaO	101.25	1,200	42.53	78.98	121.5
	Grand Total			**7,157.73**	**6,328.63**	**13,486.35**

* Bamboo and, agro-residues are believed to be the major fibers for paper making in the Benishangul - Gumuz region.

B. UTILITIES

Electricity, water and steam are the three major utilities required by the plant. Steam is supposed to be generated by electric boilers; hence, its cost to the project are included in electricity and water costs. Table 4.2 shows annual requirements and associated costs at full production capacity. Annual cost of utilities, at the proposed full production capacity, is estimated at Birr 4,642,500.

Table 4.2

ANNUAL UTILITIES REQUIREMENT AND COST

Sr. No.	Description	Unit of Measure	Qty.	Unit Price (Birr)	Total Cost (Birr)
1	Electricity	kWh	10,500,000	0.335	3,517.50
2	Water	m^3	750,000	1.5	1,125
3	Steam	Tonne	75,000	-	-
	Grand Total				**4,642.50**

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Production Process

The process of making paper is based on the fact that wet cellulose fibers bind together when dried under restraint. The processing of paper usually involves the initial separation of the cellulose fibers to form a wet pulp, some form of treatment, such as beating and refining, while in the pulped state, to enhance the quality of the final product, then forming of the sheet paper by hand molding or by paper making machine, and drying. Some further processing is often carried out before or during drying to acquire the desired finish.

The stages involved in transforming raw materials into paper in a small scale mill are the following operations:

- Delivery and preparation,
- Bleaching and refining,
- Sheet forming,
- Coating, drying & calendaring, and
- Cutting & packing.

Effluent treatment and disposal is another topic, which needs careful attention. The effluent from a paper mill can contain different chemical species, which, if discharged directly into the environment, would cause untold damage. In medium and large-scale plants specialized recovery equipment is used to reclaim chemicals for reuse or for incineration to provide energy. This is not cost effective in smaller plants and so some form of treatment and/or disposal is required. Biological treatment plants, such as the anaerobic digester, are sometimes used to treat the effluent. This method has the added

benefit of producing methane through digestion of the organic matter in the effluent, which can be used to provide as much as 30 % of the mill's energy requirement. The remaining sludge can, then, be disposed off on the land.

2. Source Of Technology

The manufacturing technology and machinery for small scale paper production can be obtained from renowned suppliers in Europe and Asia. The following company can be contacted for the supply of machinery and knowhow:

Small Industries Research Institute (SIRI),
PO Box 2106, 4/43 Roop Nagar,
Delhi 110 007, India.
Tel: +91 11291 81 17.

B. ENGINEERING

1. Machinery And Equipment

The list of machinery and equipment required for a small scale paper making plant is given in Table 5.1. It should be understood that a pulp & paper mill is generally capital intensive. On this basis, total cost of machinery and equipment is estimated at 20 million, out of which Birr 13 million is required in foreign currency.

Table 5.1

LIST OF MACHINERY AND EQUIPMENT

Sr. No.	Description	No. (Set)
1	Pulper	1
2	Breaker	1
3	Beater / refiner	1
4	Washer	1
5	Refining equipment	1
6	De-flaking equipment	1
7	Screen	1
8	Cleaners	1
9	Fourdrinier machine	1
10	Headbox or flow-box	1
11	Press	1
12	Dryer	1
13	Reeling, winding and sheeting equipment,	1
14	Handling equipment	1
15	Size press Machine	1
16	Cutting machine	1
17	Laboratory equipment	Set
18	Auxiliary equipment	Set
19	Boiler	1

2. Land, Building And Civil Works

Total land requirement of the project is estimated at 10,000m^2 out of which 3000m^2 is built-up area. Cost of building construction is estimated at about Birr 4.5 million. Total land lease cost, for a period of 70 years is estimated at about Birr 1,400,000. Thus, the total investment cost of land, building and civil works assuming that the total land lease cost will be paid in advance will be Birr 5.9 million.

3. Proposed Location

It is highly recommendable (and also sustainable) to base a pulp -& paper mill on commercial forests, i.e. trees that are planted on purpose with modern re-forestation schemes.

In view of this, any of the major irrigable areas of the region in the Assosa zone; namely, Afa, Dabus, Checorsa, Afafir, Yabus, Shilla or Fafa could be considered for setting the small-scale paper plant. In addition if proper maintenance plan is arranged the location could be in Kamashi and Metekel zones to utilize the existing bamboo forests/plantation.

VI. MANPOWER AND TRAINING REQUIREMENTS

A. MANPOWER REQUIREMENT

Table 6.1 shows the list of manpower required and the estimated annual labour costs. Total manpower requirement, including skilled and unskilled labour, is 75 persons. Correspondingly, the total annual labour cost including fringe benefits, is estimated at Birr 726,750.

Table 6.1

MANPOWER REQUIREMENT AND ANNUAL LABOR COSTS

Sr. No.	Description	Req. No.	Monthly Salary (Birr)	Annual Salary (Birr)
1.	General Manager	1	3000	36000
2.	Production & Technical Manager	1	2500	30000
3.	Pulp Mill Division Head	1	2000	24000
4.	Paper Mill Division Head	1	2000	24000
5.	Finance & Administration Manager	1	2200	26400
6.	Commercial Manager	1	2200	26400
7.	Accountant	1	800	9600
8.	Sales Person	1	800	9600
9.	Purchaser	1	600	7200
10.	Clerk	3	900	10800
11.	Secretary	2	1200	14400
12.	Quality Control Manager	1	2000	24000
13.	Production Foreman	4	4000	48000
14.	Chemist	1	1000	12000
15.	Operator	24	14400	172800
16.	Mechanic	2	1200	14400
17.	Electrician	2	1200	14400
18.	Unskilled Labour	20	4000	48000
19.	Guard	3	450	5400
20.	Diver	4	2000	24000
	Total	**75**	**48450**	**581400**
	Worker's Benefit = 25% of Basic Salary		12112.5	145350
	Grand Total		**60562.5**	**726750**

B. TRAINING REQUIREMENT

An on-site training programme can be arranged for key production, maintenance and quality control personnel in consultation with the machinery and technology supplier. Additionally, a training programme can be arranged at the Ethiopian Pulp & Paper Share Company. Cost of training of this nature is estimated at Birr 300,000.

VII. FINANCIAL ANALYSIS

The financial analysis of the small scale paper making project is based on the data presented in 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%
Discounted cash flow	10.5%
Repair and maintenance	5 % of the total plant and machinery
Accounts receivable	30 days
Raw material, local	60 days
Raw material, imported	90 days
Work in progress	1 day
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 34.86 million, of which about 44% will be required in foreign currency. The breakdown of the total initial investment cost is shown in Table 7.1.

Table 7.1

INITIAL INVESTMENT COST ('000 BIRR)

Sr. No.	Cost Items	Foreign Currency	Local Currency	Total
1	Land	-	1,400.00	1,400.00
2.	Building and Civil Work	-	4,500.00	4,500.00
3.	Plant Machinery and Equipment	13,0000	7,000.00	20,000.00
4.	Office Furniture and Equipment	-	150.00	150.00
5.	Vehicle	-	250.00	250.00
6.	Pre-production Expenditure*		4,877.40	4,877.40
	Total Investment cost	**13,0000**	**18,177.40**	**31,177.40**
7	Working Capital	2,413.00	1,304.60	3,717.6
	Grand Total	**15,413.00**	**19,482.00**	**34,895.00**

** Pre-production expenditure include interest during construction (Birr 4.17 million), training (Birr 300,000), and costs of registration, licensing and formation of the company including legal fees, commissioning expenses, etc.*

B. PRODUCTION COST

The annual production cost at full operation capacity of the plant is estimated at Birr 23.01 million (see Table 7.2). The material and utility cost accounts for 79 per cent while repair and maintenance take 1.12 per cent of the production cost.

Table 7.2

ANNUAL PRODUCTION COST ('000 BIRR)

Items	Year			
	3	4	7	10
Raw Material and Inputs	10,114.8	11,463.4	13,486.5	13,486.5
Labour direct	261.6	296.5	348.8	348.8
Utilities	3,481.9	3,946.1	4,642.6	4,642.6
Maintenance and repair	195.0	221.0	260.0	260.0
Labour overheads	109.0	123.5	145.4	145.4
Administration cost	174.4	197.7	232.6	232.6
Total Operating Costs	**14,336.7**	**16,248.3**	**19,115.6**	**19,115.6**
Depreciation	2,450.0	2,450.0	2,450.0	2,260.0
Cost of Finance	2,423.1	2,180.8	1,453.9	726.9
Total Production Cost	**19,209.8**	**20,879.1**	**23,019.7**	**22,102.5**

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 profit to total sales, net profit to equity (Return on equity) and net profit plus interest on total investment (return on total investment) 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.

$$Be = \frac{\text{Fixed Cost}}{\text{Sales} - \text{Variable cost}} = 23\ \%$$

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 5 years.

4. Internal Rate of Return and Net Present Value

Based on the cash flow statement, the calculated IRR of the project is 24 % and the net present value at 10.5% discount rate is Birr 29.97 million.

D. ECONOMIC BENEFITS

The project can create employment for 75 persons. In addition to supply of the domestic needs, the project will generate Birr 31.9 million in terms 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.