Bagasse based Unit

1 Introduction

Today in the world of Industrialization, with increased production, discarding or reusing the used product or remains of raw materials, become a major challenge. Now-a-days people are focusing on technology that will reduce the generation of waste material/ unused materials or can recycle and reuse those waste materials to produce some new products. Bagasse is such a material which contains large amount of fibers. After obtaining juice from the sugarcane for producing sugar, Bagasse is left as waste material. The Bagasse can be used to produce environment-friendly handmade papers. With the concept of recycling and reusing, handmade paper based unit is very good alternative for the sugarcane industries.

With the technology revolution, the production of paper has reduced everywhere. But the amount of paper consumed around the world each day, is still very large. Wood fiber is the main material used in paper production and thousands of trees are cut down every year to satisfy the large demand of paper. Deforestation has become a huge environmental issue worldwide, and wood based papers are adding to these problems greatly. It is critical to find the alternatives for wood fiber, in-order to control the deforestation it causes.

Demand of eco-friendly handmade paper is increasing with the rising awareness of sustainability among the people. The two main alternatives are wheat straw and bagasse.As the domestic demand is on the rise, the paper industry in India has become more promising. Increasing population and literacy rate, growth in GDP, improvement in manufacturing sector and lifestyle of individuals are expected to account for the growth in the paper industry of India.

1.1 Scenario of Paper Industry in India

Indian paper industry accounts for about 1.6% of the world's production of paper and paperboard. The estimated turnover of the industry is Rs 25000 crore. According to "India Paper Industry Forecast & Opportunities, 2017" the paper industry in India is expected to grow at the CAGR of around 9.6% during 2012-2017, which will make the revenues of paper industry of India to reach up to USD 11.83 Billion by 2017. About 70% of the total installed capacity of paper production in India is accounted by Gujarat, West Bengal, Orissa, Andhra Pradesh, Karnataka and Maharashtra. Uttar Pradesh, Tamil Nadu, Haryana, Kerala, Bihar and Assam together account for about 25% of the total paper production in India.

The demand for paper and board in India will certainly continue to grow with the development of country's economy over the coming decades. The per capita consumption of paper is expected to grow

with the coming years. The demand of paper in developing countries is still low as compared with the many industrialized countries.

Like other industries, paper production also requires regular supply of raw materials. Given the current pressure on forests, traditionally used wood-based resources will become scarce and uneconomical. Scarcity of resources has already leaded to a decline in capacity utilization in the Indian Paper industry. Many Indian paper and board mills are currently running at 60 per cent capacity.

On an average, Large-scale units consume 2.5 tons of forest-based raw materials per tons of paper; small-scale units consume of 3.5 tons of raw materials, mostly agro-based, per tons of paper. On the other hand, a handmade paper unit uses only 1.1 tons of paper produced.

On the other hand handmade paper units are mainly constrained only by limited demand. But now people in the world is emphasizing on the use of environment- friendly products and production system. So, there is large untapped potential of the handmade paper industries. For a developing country like India, this industry offers a huge potential to meet development objectives and respond to increasing demand for both domestic and export products.

1.2 Handmade Paper Industry

Handmade paper unit is a labor and water intensive project. It is defined essentially by the fact that,rather than chemical pulping methods, their operations are carried out manually with pure cellulosic (or raw materials), mechanically. The existing handmade paper industry completely depends on secondary resources.

Non- forest materials are exclusively used by handmade paper industries. At present, cellulose-rich materials like Cotton Rags, Bagasse, Waste Paper and WasteKraft are only used. This could easily be extended towards the use of biomass materials and agricultural residues, some of which can be grown specifically for handmade paper production. Non-wood biomass resources have the additional advantage of being amendable to conversion by environment friendly processes. Some steps have already been initiated in this direction for the utilization of straws, Bagasse, rice husk and grasses.

Handmade paper production also offers the possibilities for recycling waste products. The paper waste coming out from industries having intensive use of paper can very easily be recycled for reuse in the parent industry, which often saves cost. Moreover, opportunities exist for interfacing paper recycling systems with a host of industries involved in, for example, packaging, printing, and industrial filter manufacture.

1.3 Odisha Scenario

Sugarcane is mostly cultivated in undivided districts of Puri, Cuttack, Ganjam, Koraput, Dhenkanal, Bolangir, Kalahandi & Sambalpur districts. The year wise Area, Production & Productivity is indicated below in the table. Yield has increased from 70.36 t/ha to 72 t/ha with the years.

Table 1: Area, Production and Yield of Sugarcane in Odisha

Year	Area (100'ha)	Production (100'T)	Yield (T/ha)
2007-08	380.8	26793.1	70.36
2008-09	379.4	26653.0	70.25
2009-10	368.6	26116.2	70.85
2010-11	408.4	29074.8	71.19
2011-12	387.3	27885.6	72.00

In Odisha state, there are many cooperatives and private sectors which are engaged in Sugar industries. Millions of tons of Sugarcane are crushed per year which makes the easy availability of Bagasse.

Table 2: Year wise cane crushed (in '000 MTs)

Year	Total Cooperative	Total Private	Grand Total
2008-09	118.090	208.680	326.770
2009-10	52.460	195.270	247.730
2010-11	167.577	351.025	518.602
2011-12	316.706	485.569	802.275
2012-13	287.792	478.742	766.534
2013-14	213.000	466.500	679.510

Bagasse, the by-product of every Sugarcane industries; is mainly used as fuel for generating power in industries. Otherwise it is mostly used for producing compost, to be used as manure for the agriculture sector. It is also used in paper manufacturing industries for generating environment and eco- friendly paper. As Bagasse contains high silica content, it is also used in fly ash bricks.

2. Rationale

Odisha state is also contributing in India's total Sugarcane production. Sugarcane is produced by both Cooperative and private sectors. For setting handmade paper unit, the raw material is Bagasse which can be easily obtained from the nearby sugar industries at a very cheaper rate. The State has many sugar factories with high capacity utilization.

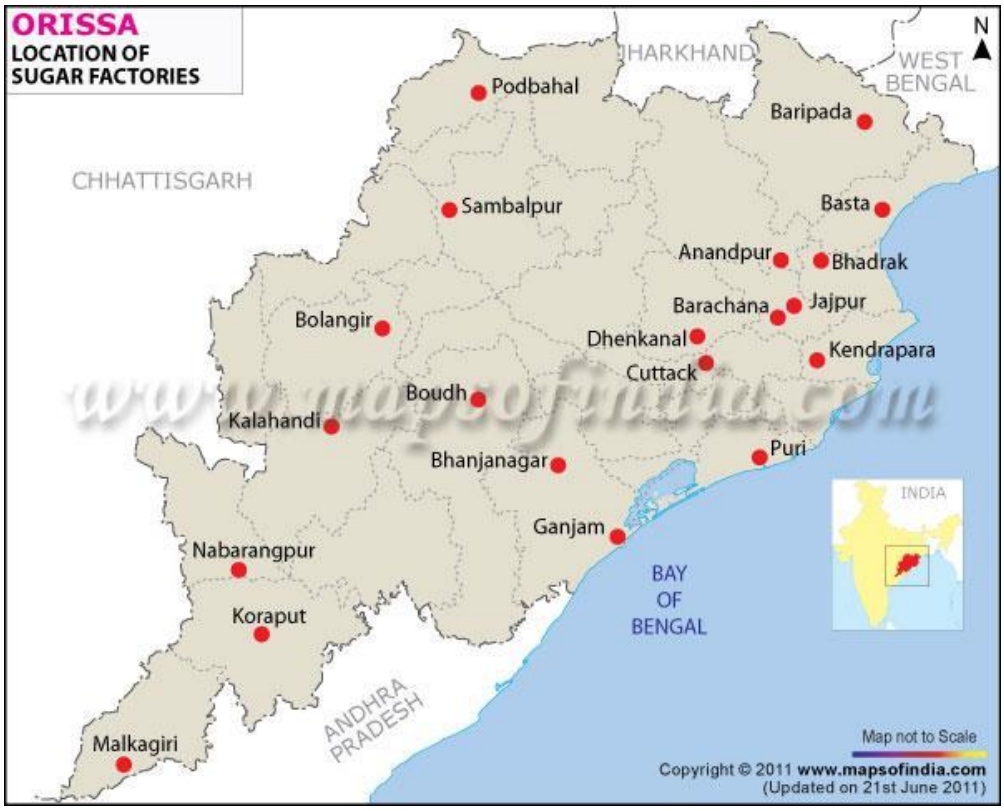

Figure 1: Location of Sugar Factories in Odisha

The handmade paper unit can be installed in any of the places in and around the operating sugar factories in Odisha, as availability of raw material is in plenty. Since this unit will require more raw material as the production capacity is more, the unit can be set up at any place having sugar industries nearby.

3 Procedures Involved In Hand Made Paper Making

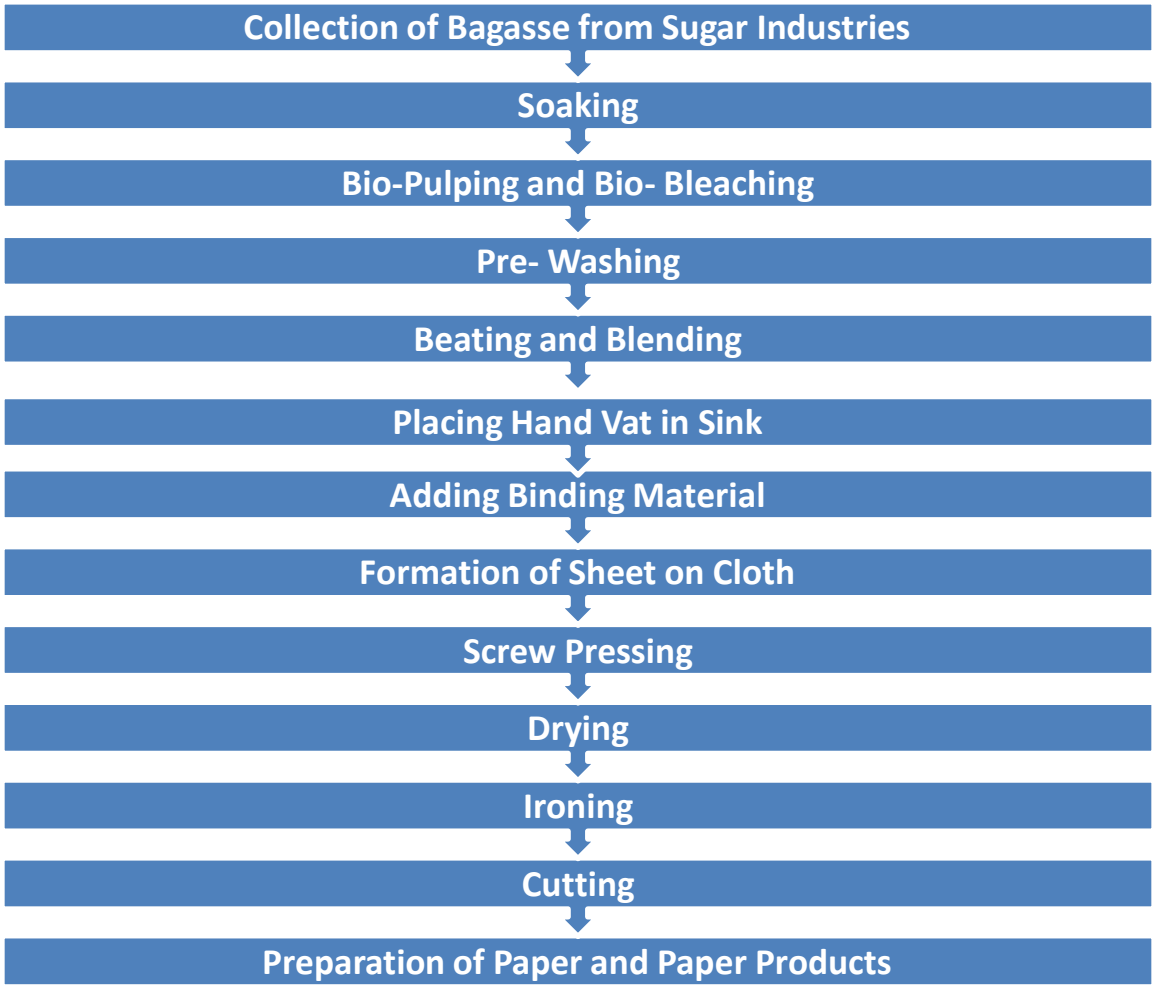

Figure 2: Process Flow Chart

3.1 Steps involved in Production of Handmade Paper

Step 1: Collection of Raw materials i.e. Bagasse

Papers are made from tree free materials like Bagasse, the fibrous matter that remains after sugarcane stalks are crushed to extract their juice. The dry pulpy residue left after the extraction of juice from sugar cane. Bagasse can be obtained from nearby sugar factories.

20 Kg of paper consists of 500 sheets. This means, 1 Kg of paper has 25 sheets. This unit will be producing 10 tons of paper per month i.e. 120 tons per annum. Fiber pulp contains 80% of water. The

moisture content in paper is 10%. From 1 Kg of fiber pulp, 300 g of paper will be obtained. 3 Kg of Bagasse is needed to produce 1 Kg of pulp.

Step 2: Soaking

The collected Bagasse is soaked in water prior to pulping.

Step 3: Bio Pulping & Bio-bleaching

In a separate tank, the obtained fiber is bleached by subjecting to microbial treatment. The duration of treatment is 3-5 days. Fungi like *Trichoderma*sp and *Pythium* sp are used in microbial treatment. These fungi are used to enhance the brightness of the paper as it leached put lignin and hemicelluloses which is responsible for the dull colour of fibre.

Step: 4(Pre) Washing

After the fungal treatment which has been done for 3-5 days, fiber has to be washed to remove unwanted materials and microbialstrains. Safety gloves can be used to avoid infection by other microbes from environment and grown during the enhanced fermentation.

Step: 5Beating and Blending

In this process, the pulp is obtained from the fiber. The Beater plays an important rolein taking out the pulp. Additives are also added during this process.

Step 6: Placing Hand VAT in the sink

The thoroughly mixed pulp is poured on the hand vat. Hand vat in kept inside a sink and dipped in water for upward and downward motion. Water should be filled in the half portion of hand vat for pouring pulp for paper formation.

Step 7: Adding Binding materials

Some binding materials are added to paper stock to increase the dry strength of paper. Commonly used binding materials are starch, polysaccharide, resins, and natural gums such as locus bean gum and guar gum.

Step 8: Formation of sheet on cloth

A piece of Gada cloth is taken which can cover the outer surface of vat. The cloth should be neat and wrinkle free. There should not be any folding, gaps or bubbles in the pulp formed on the cloth. For each

sheet of pulp use different layers of cloths and place it one over the other. After that, it is placed in Screw pressing to remove the water.

Step 9: Screw pressing

In this process, the water is removed by applying even pressure to obtain smooth surfaced paper.

Step 10: Drying

From the screw press stocked pulp is removed from each cloth and is kept for drying process. Pulp cloth is hanged on the ropes running parallel for drying. . It may take six hours to dry under room temperature. The sheets are removed from the cloth only when it completely dried.

Step 11: Ironing

This process helps in achieving smoothness and removing wrinkles from the paper. Each dried papers are pressed separately using iron box.

Step 12: Cutting

After ironing, the sheets are cut to required size and shape. Then the paper can be further used in preparing various paper products.

3.2 List of Equipments Required

1. **Rag Chopper:** It is used in cutting the raw materials into small pieces for its further processing.
2. **Beater:** It helps in producing paper pulp from cellulose containing Bagasse.
3. **Auto Vat:** It is made up of wood. It is used to deposit the wet pulp onto the mesh before it is pressed and dried into sheets of paper.
4. **Hydraulic Press:** This machine in used to squeeze out as much water as possible from the pulp.
5. **Calendaring Machine:** It is used to smoothen the dried paper under high loading and pressure.
6. **Paper Dryer:** This machine removes the water content down to a level of about 10%, where it will remain at typical indoor atmospheric conditions.

4 Financials

4.1 Project Cost

The total project cost will be Rs 141.58 Lakhs which consists of Land and site development of Rs 24.26 Lakhs, Building of Rs 63.00Lakhs, Plant and Machinery of Rs 20.83 Lakhs, Miscellaneous Fixed Assets of Rs 18.38 Lakhs, Pre-Operative Expense of Rs 10 Lakhs and Security deposits of Rs 5 Lakhs.

Table 3: Total Project Cost

Particulars	Cost (Rs in Lakhs)
Land and Site Development	24.26
Building	63.00
Plant and Machinery	20.94
Miscellaneous Fixed Assets	18.38
Pre-operative Expenses	10.00
Security Deposits	5.00
Total	**141.58**

4.2 Land and Site Development

For setting up Bagasse based handmade paper unit, half acre of land will be required @ Rs 500000 which will cost Rs 250000 and the cost of land development will be Rs 79000 which sums to Rs 3.29 Lakhs. General Civil Works include cost of Fencing of Rs 0.77 Lakhs, Gate of Rs 0.53 Lakhs, Drainage of Rs 1.82 Lakhs, Parking of Rs 0.77 Lakhs, Internal Roads of Rs 1.33 Lakhs and Effluent Treatment Plant (E.T.P) of Rs 15.75 Lakhs which will sum to Cost Rs 24.26 Lakhs.

Table 4: Cost of Land and Site Development

Particulars	Unit Basis	Qty	Unit Rate	Cost	Contingencies Invt	Total Ph Cost
Land & Site Development						
Land	Acres	0.50	500,000	2.50		2.50
Cost Of Development						
Land Development	LS	1.00	75000	0.75	0.04	0.79
General Civil Works						
Fencing	RMT	184.00	400	0.74	0.04	0.77
Gate	LS	1.00	50000	0.50	0.03	0.53
Drainage	RMT	158.00	1100	1.74	0.09	1.82

Parking	SQM	92	800	0.74	0.04	0.77
Internal Roads	RMT	158.00	800	1.26	0.06	1.33
E.T.P	LS	1.00	1,500,000	15.00	0.75	15.75
Sub-Total				**23.22**	**1.04**	**24.26**

4.3 Technical Building

The total cost for Technical Building will be estimated as Rs 63.00 Lakhs which includes cost of Building area of Rs 54.60 Lakhs and Miscellaneous Cost including Toilets and Store room of Rs 8.40 Lakhs.

Table 5: Total Cost of Technical Building

Particulars	Unit Basis	Qty	Unit Rate	Cost	Contingencies Invt.	Total PH Cost
Building Area	SQM	1300	4,000	52.00	2.60	54.60
Misc Cost(Toilets, Store Room)	SQM	200	4,000	8.00	0.40	8.40
Sub-Total				**60.00**	**3.00**	**63.00**

4.4 Plant and Machinery

Plant and Machinery Cost will include cost of Dusting Box, Rag Chopper, Beater, Auto Vat, Hydraulic Press, Paper Dry Machine, Calendaring Machine, Equipment and accessories, Miscellaneous cost which includes Freight and Insurance, Internal Electrification and DG Sets of 100 kva which sums to Rs 20.94 Lakhs.

Table 6: Total Cost of Plant and Machinery

Particulars	Unit Basis	Qty	Unit Rate	Cost	Contingencies Invt.	Total PH Cost
Dusting Box	LS	1	10,000	0.10	0.01	0.11
Rag Chopper 10" Blade	LS	2	8,000	0.16	0.01	0.17
Beater 24"*56"	LS	1	50,000	0.50	0.03	0.53
Auto Vat 44"*56"	LS	12	1,500	0.18	0.01	0.19
Hydraulic Press 35"*45"	LS	1	100,000	1.00	0.05	1.05
Paper Dry Machine	LS	1	450,000	4.50	0.23	4.73
Calendaring Machine	LS	1	200,000	2.00	0.10	2.10
Equipment And Accessories	LS	1	50,000	0.50	0.03	0.53
Misc. Cost(Freight & Insurance)	LS	1	-	3.00	0.15	3.15
Internal Electrification	LS	1	-	3.00	0.15	3.15
Dg Sets(100kva)	LS	1	500,000	5.00	0.25	5.25
Sub-Total				**19.94**	**1.00**	**20.94**

4.5 Miscellaneous Fixed Assets

The total cost of Miscellaneous Fixed Assets will be Rs 18.38 Lakhs which comprises of Furniture and Fixture, Computers and communication, Miscellaneous Expenses and Fire Fighting and Water Treatment Plant.

Table 7: Cost of Miscellaneous Fixed Assets

Particulars	Unit Basis	Qty	Unit Rate	Cost	Contingencies Invt.	Total PH Cost
Furniture & Fixture	LS	1	100,000	1.00	0.05	1.05
Computers & Communication	LS	1	100,000	1.00	0.05	1.05
Miscellaneous Expenses & Fire Fighting	LS	1	50,000	0.50	0.03	0.53
Water treatment Plant	LS	1	1,500,000	15.00	0.75	15.75
Sub-Total				**17.50**	**0.88**	**18.38**

4.6 Pre-Operative Expenses

Pre-operative expenses have been calculated based on various costs incurred before operationalisation of the facility and during the implementation of the project. A total cost of Rs10.00 Lakhs has been estimated as pre-operative expenses for the project which includes DPR of Rs 1.00 Lakhs and Interest during Construction (IDC) of Rs 9.00 Lakhs.

4.7 Means of Finance

For funding of the project, promoter will contribute in the form of equity. Total contribution of promoter will be 30% of the project, therefore Rs39.62 Lakhs. Term loan will make 14% of total project cost, i.e. Rs 92.46 Lakhs. Total estimated cost will be Rs 132.08 Lakhs.

Table 8: Means of Finance

Particulars			Total (Rs in Lakhs)	Total (Rs in Lakhs)
Equity		30%	39.62	39.62
Term Loan	14.00%		92.46	92.46
Financial Institutions	12.00			
Total			**132.08**	**132.08**

4.8 Operations and Revenue

Major revenue source will be sale of handmade papers in domestic markets. It is expected that over period of time, capacity utilization of the facility will increase; therefore there will be increase in total revenue. Sale revenue is expected to grow from Rs 91.46 Lakhs in year one will increase up to Rs 130.65 Lakhs by sixth year. Project will start earning gross margin from first year itself. Thereafter, profit is expected from the first year onwards.

4.9 Sensitivity Analysis

Sensitivity analysis includes Internal Rate of Return (IRR), Break Even Point, Pay Back Period, Return on Investment (ROI) and Return on Capital Employed. Details of calculations are given in the financial indices as mentioned below. IRR, Break Even Point and Pay Back Period depict that the project is self- sustainable and is capable of absorbing future exigencies without any major impact on the financial viability. For this project, the estimated IRR will be 22.74%, Break Even Point will be 49.04%, Pay Back Period will be 1.31 and ROI of 19.46% with 64.87% of Return on Capital Employed.

Table 9: Sensitivity Analysis

Parameters	
Internal Rate of Return (%)	22.74
Break Even Point (%)	46.04
Pay Back Period (Years)	1.31
Return on Investment (ROI)(%)	19.46
Return on Capital Employed (%)	64.87