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KENYA

Technical report: Development of the pulp and paper industry in Kenya
Part V: Report on the feasibility of producing hand-made paper (speciality grades) from cotton waste in Kenya*

Prepared for the Government of Kenya
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of T. Jevasingam,
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United Nations Industrial Development Organization
Vienna

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* This document has been prepared without formal editing.

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ABBREVIATIONS

ADT	AIR DRY TON
ADTPY	AIR DRY TON PER YEAR
BDT	BONE DRY TON
BL	BLEACHED
CEH	CHLORINE/CAUSTIC EXTRACTION/HYPO
CEHH	CHLORINE/CAUSTIC EXTRACTION/HYPO/HYPO
D.D.	DOUBLE DISC
FTPY	FINISHED TONS PER YEAR
GCV	GROSS CALORIC VALUE
GSM	GRAMS PER SQ.METER
KW	KILOWATT
KSHS.	KENYA SHILLINGS
M^3	CUBIC METER
MPM	METERS PER MINUTE
MM	MILLIMETER
MWH	MEGA WATT HOUR
NCV	NET CALORIC VALUE
OD	OVEN DRY
T	TON
TPD	TONS PER DAY
TPH	TONS PER HOUR
US$	US DOLLAR
WT	WEIGHT

EXPLANATORY NOTES

Value of the local currency - KENYAN SHILLING (K.Shs.) during the period of the mission in terms of United States Dollars:

1 US$ = 15.00 K.Shs.

ABSTRACT

This report presents the results of a study on the feasibility of producing hand-made paper from cotton waste. It is proposed to use process waste material from spinning and weaving mills in small-scale industrial units and to produce special grades of paper as drawing paper, certificate paper and special artist grades, which are presently imported.

The total capital investment needed would be KShs. 1,815,000 (exclusive working capital). The return on investment is estimated at 37.8%.

It is recommended that serious consideration is given to implement the project, and a further detailed study should be prepared in close co-operation with the Small-scale Industries Division and the two textile mills at Thika.

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RECOMMENDATIONS

It is recommended the project is implemented on account of the following advantages:

- The project is economically attractive with a high return on investment of 37.8%.
- The project will use a waste material for conversion to a high value product.
- The project will boost rural economy and promote small scale ventures with high employment potential.
- The project will save foreign exchange as the grades of paper such as high class drawing paper, certificate paper, ledger paper, wedding card paper are all now imported at prices exceeding $5,000 per ton.

1.0 INTRODUCTION

Kenya currently has 5 paper mills operating with a total installed capacity of 85,600 TPY of paper and paper board. The afore-mentioned 5 mills have plans to expand to 125,400 TPY within the next 2 to 3 years.

The indigenous pulping capacity is only 58,000 tons of chemical pulp and 8,000 tons of mechanical pulp per year at PANAFRICAN PAPER MILLS, WEBUYE. Therefore, the other 4 mills depend mostly on waste paper for their fibre requirements. The supply of raw material for the PANAFRICAN PAPER MILLS is based on PINE AND CYPRESS from "Man-made plantations". There will be a further demand on this source of supply when the proposed MADHU PAPER MILLS at THIKA goes into production. This mill at THIKA will require wood to produce about 20,000 TPY of chemical pulp.

It is feared Kenya is heading towards a shortage of wood and in particular for domestic fuel requirements both in the form of firewood and wood charcoal. It is, therefore felt at this stage further planning of pulp and paper mills based on wood does not look promising with only 20% of the land area available in Kenya both for agriculture as well as forestry. On the other hand Kenya needs more paper. The demand for paper during the last 5 years has been growing at the rate of 5%. It is expected the future growth will be around 6 to 7%, with a high demand for cultural grades of paper on account of the growth in school going population.

The Department of Industries in the Ministry of Commerce and Industry, sensing this problem, initiated the need for a study to look

into the aspect of using non-woody materials for pulp and paper manufacture. To conduct this study a pulp and paper expert was requested from UNIDO. He arrived on 9 November 1984 for a three-month assignment in Nairobi.

The following report is Part V of the investigations and studies related to the use of non-woody material for the production of pulp and paper, made up into five parts:

PART I - Development of the Pulp and Paper Industry in Kenya

PART II - A Report on the Feasibility of Producing Fine Paper From Bagasse

PART III - A Report on the Feasibility of Producing Hard Tissues From Sisal Waste

PART IV - A Report on the Feasibility of Producing Corrugating Medium From Straw

PART V - A Report on the Feasibility of Producing Hand Made Paper from Cotton Waste.

2.0 BASIS OF STUDY

This study in PART V relates to the use of the various wastes that results in the cotton industry for the production of paper. Normally "COTTON LINTERS" have a high demand in the paper industry and therefore the possibility of using this material was examined. Presently, there is no cotton linting plant in the country, and the possibility of settling up one in the near future does not appear to be promising.

Although there are 15 ginning mills in KENYA, they are relatively small and produce only 40,000 to 50,000 bales equivalent to about 7,400 tons of cotton per year. It is therefore considered uneconomic to set up a cotton linting mill.

Since cotton linters as a source of raw material was ruled out, other sources of Textile wastes were studied. The alternative possibility appears to be waste from spinning and weaving mills.

It is estimated about 900 to 1000 Kg./day of cotton waste could be collected from all the 6 mills in Kenya which are as follows:

RIVERTEX	-	ELDORET
KICOMI	-	KISUMU
MOUNT KENYA	-	NANYUKI
KENYA RAYON	-	MOMBASA
THIKA CLOTH MILLS	-	THIKA
UNITED MILLS	-	THIKA

The quantity, that could be collected from the above mills is again a small amount, to produce paper on machines using today's technology. But on the other hand cotton can make very high quality grades of paper based on simple hand made, paper making techniques.

The basis of this study would be therefore to achieve the following by implementing a hand paper making

project using cotton waste as the raw material.

- Use of process waste material from spinning and weaving mills
- Promote a small scale industry that could be run by a cooperative society
- Boost employment based on simple techniques to benefit the economically under privileged.

2.1 TYPES OF PAPER

The types of paper that could be produced using such an excellent raw material like cotton and using hand making techniques will be special grades of paper, that would fetch a price of $1750/Ton and above.

These will be grades such as:-

- CERTIFICATE PAPER and papers specified for durability and permanency.
- SPECIAL ARTIST GRADES - These are types of paper specified by professional artists.
- DRAWING PAPER - Specified by Architects and Engineers.
- FANCY DECORATING PAPER - These are grades used for special occasions like weddings.

It is also possible to enhance the value of the paper by incorporating special water marks.

2.2 MARKET CONSIDERATIONS

The KENYAN market presently imports these grades of paper and there are no facilities to make such grades of paper.

Besides the domestic market, it is expected there will be a market demand for such grades of paper in other neighbouring countries. Hand made paper from cotton is a class by itself and market demand could be created even in Europe and USA. The value for this grade of paper could be further enhanced by incorporating AFRICAN ART

and promoting the sale of such items through the Tourist department.

2.3 LOCATION AND CAPACITY

There are 6 Spinning and Weaving Mills presently operating and each Mill produces about 125 to 150 Kg. of Textile waste per day. It is considered with the 2 Textile Mills at THIKA the total waste of 250 to 300 Kg. per day could be used to establish a hand paper making unit. The setting up of such a unit would come under the Small Scale Industry division and preferably could be managed by a Co-operative Society or a similar set up that would maximize the benefit to the under privileged. The other alternative sites would be either ELDORET or KISUMU in close proximity to textile mills. It is recommended to initially establish one single unit. Further additions could take place elsewhere based on the experience gained through one unit. The annual production of the single unit recommended is 60 Tons per year. 60 Tons per year capacity is suggested, although there is flexibility to decrease or increase the capacity of these units. In India units as small as 10 Tons/year are operating using cotton rags and waste paper.

2.4 FIBROUS MATERIAL SUPPLY

The entire fibrous material would be from Textile mills. It is estimated the following wastes could be collected from Spinning and Weaving mills of 12,000 to 15,000 spindles capacity.

- Blow Loom waste, Filler waste Carding waste, Sweeping waste	- 100 Kg/day
- Yarn waste	- 45 Kg/day
- Finishing Room Trimmings	- 5 Kg/day
	150 Kg/day

In the case of the proposed THIKA Unit the textile waste would be collected from THIKA Cloth Mills and United Mills. In the case of KISUMU or ELDORET Unit the Textile waste would be collected from RIVERTEX and KICOMI.

2.5 MANUFACTURING PROCESS

The machinery needed would be very simple to both operate and maintain. It would consist of a Rag Chopper, digester, beater, vats of size 25" x 35" (Trimmed 22" x 30"), Hydraulic press, calendering unit, paper trimming unit and a simple wood fired or oil fired boiler.

The pulping process would involve cooking in Caustic Soda or in the alternative with Magadi Soda Ash and Slaked Lime followed by washing and bleaching in a hollander beater.

The paper making process would involve the normal hand paper making techniques of lifting paper formed on a screen by dipping in a vat. The drying of the sheet would be in open air at ambient temperature. The dried sheet would be then finished by calendering and trimming.

The steam would be generated on a simple boiler (Fire Tube) similar to the old steam locomotive type of boilers. The electricity needed will be purchased from the local authorities. The water needed for processing would be about 500 litres per kg. of Paper.

The ancilliary equipment needed will consist of platform scales, pulp storage tanks, washing cradles, press boards, stools, couching tables, felts, zinc or GI sheets, brushes, hardware and hand tools.

3.0 COST ESTIMATES

3.1 MANUFACTURING COST ESTIMATES

Items	* Kenya Shillings
- Cotton Waste (Including Transport)	127,500
- Chemicals	150,000
- Fuel Oil and Electric Power	85,000
- Other Materials	37,500
- Labour and Salaries	431,200
- Administration & Overhead	43,000
- Contingencies	15,000
	889,200
	or
	US$ 59,300

* Conversion Rate : 1 US Dollar = KShs.15.

RAW MATERIAL

The cost of textile waste indicated covers the transport and handling charges. About 85 tons of cotton waste would be needed to produce 60 tons of saleable grade of paper.

CHEMICALS

Caustic Soda produced locally from common salt will be used. In the alternative locally available Magadi Soda Ash in combination with locally produced slaked lime will be used, for cooking the textile waste. There will be a very small amount of Alum, Rosin size, dyes etc. that have to be imported.

FUEL, POWER AND WATER

The total installed capacity for the electric motors would be about 50 KW. The average load would be about 25 KWH.

A small amount of steam is needed for cooking the textile waste. This steam will be generated using a boiler of very simple design that could be fired either by oil or wood. Approximately 1 to 1 1/2 tons of steam at 7 kg/cm2 would be required for 8 hours. If possible an old locomotive boilder could be purchased and used.

The electricity would be purchased from the local distributing authorities.

Water needed per day would be 83m3. This could be obtained either from a river or stream or could be obtained from the local town supply.

OTHER MATERIALS

This refers to items such as felts, brushes, lubricating oil, additives, maintenance and finishing materials.

Labour

About 30 workers, skilled, semi-skilled and unskilled, would be needed.

The salaried personnel will consist of a manager, a foreman and an office secretary cum clerk.

The foreman, the two vatmen or paper makers will have to be provided training in a similar set-up, as available presently in India. The training needed would be for about 2 months. The training expenses are provided under capital expenditure. The annual budget for salaries and wages is indicated in the manufacturing estimates.

ADMINISTRATION AND OVERHEAD

This covers all overhead expenses of running the establishment.

CONTINGENCIES

This covers all unforeseen items of expenditure.

3.2 CAPITAL COST ESTIMATES

	K.SHs.
- Land	45,000
- Structures	300,000
- Equipment	900,000
- Engineering + Contingencies	195,000
- Total plant capital	1,440,000
- Training	105,000
- Working Capital	90,000
- Duty 30%	270,000
- Total Investment	1,905,000
	or
Conversion Rate: 1 US$ = 15 K.Shs.	US$ 127,000

Land - About 1/2 an acre of land is sufficient in close proximity to water supply. The effluent water could be used for irrigation of cash crops.

Structures - The building needed would be about 3,500 square feet with provisions for water and electricity.

Equipment - The equipment to be purchased for a project of this type will come from another developing country where the technology of this type is in active practice as for example India or China. Therefore the equipment cost would be considerably much lower in price compared, for example, to prices in Taiwan or Japan where such equipment could also be purchased but at a higher capital cost cue to higher labour cost.

Engineering and Contingencies -

An allowance has been made for engineering and for items of cost not foreseen at this time.

Training - Cost for trainir._ two technicians and one foreman in India is provided for two months.

WORKING CAPITAL

An allowance is provided for all items of cost such as raw material chemicals, fuel, start up expenses that will cover a period of 1 to 1 1/2 months.

Duty

It could be noted, although duty was allowed in the estimates, this could be government-exempted for a project of this type that is meant to help the under-priviledged who need social upliftment.

3.3 EARNINGS ESTIMATES

The details are as follows:

	K.Shs.
- Sales revenue	1,575,000
- Direct manufacturing cost	889,200
- Gross earnings	685,800
- Capital investment, excluding working capital	1,815,000
- Return on investment	37.8%

Conversion rate: 1 US$ = 15 K.Shs.