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PRE-INVESTMENT STUDIES OF UNION INDUSTRIES, PHASE II*
SI/RAF/74/889

Technical report: Feasibility of establishing a cotton and polyester/cotton blend factory in the Mano River Union

Prepared by the United Nations Industrial Development Organisation,
executing agency for the United Nations Development Programme

Based on the work of John Buxton, expert in
Synthetic Textile Weaving

United Nations Industrial Development Organisation
Vienna

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COTTON AND POLYSTER/COTTON BLEND FACTORY

1. SUMMARY AND RECOMMENDATIONS

A large vertical, integrated factory to spin weave and Finish cotton and Polyester Blend fabrics would be viable if the duty rate on cotton piece goods were increased from 34.5% to 54.5% which is the new harmonized rate for Synthetic Textiles.

There is a large market in both countries for Cotton Prints which is static and highly competitive. There is a growing market for all kinds of Polyester/Cotton blend piece goods which is dynamic and profitable. The projected factory is designed to produce 35% of the total estimated domestic consumption in Mano River Union.

The scale of the projected Mill is the minimum economic size of a vertical, integrated Textile Industry. The following figures illustrate the size and complexity of the Prbject:

Total Investment Required	$40,000,000
Capital Structure Equity Capital	14,000,000
Machinery Credits	14,000,000
Long Term Loans	12,000,000
Pre-Operational Short Term Loans	3,000,000
Employment Created	1,022
Fixed Investment per employee	34,858
Annual Output Square Yards	20,000,000
Covered Space Square feet	286,250
Installed Motors KW	4,928
Generators Required 4 x 1,200 KVA (not included in Total Investment)	1,820,000
Estimated Profit and Loss	Satisfactory
Estimated Cash Flow	Satisfactory
Projected Balance Sheet	Satisfactory
Recently introduced Harmonized Tariffs	Insufficient for Cotton Goods

Payback period	7 Years
Value added to the economy	$13,953,000 from 3rd Year
Foreign Exchange Effect	Positive from 2nd Year
Foreign Exchange Effect after repaying loans	$5,508,000 per annum
Preferred location	Freetown

The study is based on best quality conventional machinery with first class buildings and installations, calculated with 1977 actual prices.

Almost all Developing Countries have established their own Textile Industries especially if they can base them on their own raw materials such as cotton, sisal, or Jute and Jute substitutes. As well as creating 1022 industrial jobs the existence of an important Textile Mill would stimulate the economy directly and indirectly. When mature, such a Mill should activate a number of satellite Textile Mills and it should provide a local source of high quality cloth for the Gara Industry and for Garment making.

The problem is the amount of capital required; if this can be solved and if suitable cotton can be grown in Sierra Leone, the Project could become a very important Union Industry.

It is recommended that International assistance should be sought for a definitive study on the possibility of viable cotton growing and development in the most promising climatic zone in the Mano River Union.

When this has been resolved it will be possible to assess the value of a Cotton and Polyester/Cotton Industry to Sierra Leone and Liberia.

II. INTRODUCTION

This feasibility study originates from a request by the Secretariat of the Mano River Union to UNIDO. A pre-investment study on a synthetic Textile Suiting Factory was made in November 1977. The request includes an examination the possibilities of creating complementary industries such as spinning of blend yarns, weaving, dyeing, printing and finishing.

The existing demand for Polyester Blend fabrics, spun on the short-staple system is too small to justify a separate mill; the market for Polyester/Cotton piece-goods has been estimated at 7,000,000 linear yards for which only 7,818 spinning spindles would be required. Therefore 9,000,000 linear yards of cotton prints were added to the production plan so as to arrive at an economic unit of a manageable size.

The combined cotton Polyester Blend factory is planned to have 19,082 spindles, 500 Automatic looms and very complete Dyeing/Printing and Finishing.

It is a full pre-investment study and something of a project manual, based on real current prices and modern methods of organisation. The objective is to illustrate the pre-planning of a complex industry and to remove misconceptions which have arisen in earlier reports.

It became apparent that the capital investment required to substitute 35% of textile imports into Liberia and Sierra Leone was $40,000,000 plus bank overdrafts of $3,000,000 during the first three years.

This sort of investment may appear to be out of proportion to the normal budgets of the two countries. It is

also probable that there are more pressing alternative agricultural and industrial needs for capital investment.

Another school of thought believes in the continuation of an import policy for cotton textiles because everyone in Mano River Union benefits from the very cheap prices at which many suppliers are prepared to sell or dump their products. In the case of cotton prints and standard piece-goods the average import price is thought to be below full cost, which allows Sierra Leone and Liberia to levy substantial import duties without elevating retail prices to unacceptable levels.

To make this project viable the duties on cotton goods would require to be increased by 20 - 30% above the recently introduced harmonised tariffs. The result would be an increase in the cost of living of the poorer members of the population, and Government would lose the duty revenue from 9,000,000 linear yards amounting to $2,000,000. To this must be added the loss in duty revenue from 7,000,000 yards of Synthetic Blend piece goods amounting to $3,500,000. Is it worthwhile?

Most other African countries have adopted a pragmatic approach to this question. They have understood that the Textile Industry represents 10-15% of the possible industrial potential in African countries; that textile Consumption is a very significant percentage of total income; that textile imports absorb large amounts of foreign exchange. Textile sales are very responsive to increases in income and they act as an economic accelerator. Many Governments have been willing to mortgage their financial futures to set up industries. The technology of the Textile industry is relatively simple and the steps which have to be taken to stimulate investment are well tried. It can provide direct employment for large numbers and its indirect effects include both job creation and skills.

To an unbiassed outside observer the almost complete lack of industrial employment opportunities, particularly in Sierra Leone, is striking. There is both unemployment and under employment.

If cotton could be grown successfully anywhere in Mano River Union this project would be completely positive. The mill is planned to consume 4,710,420 lbs of ginned cotton lint, each year. It is estimated that this quantity could provide a cash crop for 15,000 subsistence farmers based on using one acre each, producing 333 lbs of lint, ready for use by the factory. As every pound of lint cotton is worth $0.50 the family income could be improved by $167 per annum. This could improve the lot of 75,000 Mano River Union people at the normal rate of 5 per family. International help would be required to set up an intensive investigation into the possibilities of cotton growing; if initial results are positive further long-term assistance will be needed for acclimatisation, seed multiplication and large scale extension services, with financing for farmers.

This study tries to throw light on the implications of embarking on a large scale complete textile industry in Mano River Union. Although the investment appears to be astronomic at first sight it is not necessarily impossible to find the capital. There has been a deep depression in the world textile industry since 1974 after a short period of great prosperity. The machinery makers are desperate for orders and many of their Governments are anxious to stimulate exports to reduce unemployment and to re-activate their economies. Long-term financing is available especially if stable Governments in Developing countries are prepared to give official guarantees. Package deals can be negotiated with long-term financing at concessional rates.

Strong textile firms in Developed countries can be found to assume management and sometimes they can be persuaded to put up a part of the Equity Capital. Development Corporation and Financing institutions can be approached for Debenture Funds and also for part of the Equity Capital of approved projects.

Large specialised Consultancy firms have played an important role in planning financing and implementing similar projects in African countries.

The following pages of this study are analytical; as much information as possible is put forward so that decisions can be taken in the best interests of the Mano River Union concept.

COTTON AND POLY[illegible]/COTTON BLENDS IN SIERRA LEONE
AND LIBERIA: ANALYSIS OF POSSIBILITIES OF IMPORT
SUBSTITUTION

III. MARKET STUDY

The main purpose of this study is to bring up-to-date the very full market surveys recorded in 1975 by UNIDO EXPERT P.J. BLYDENSTEIN. He spent much time on Marketing and his conclusions in this respect are still valid.

Based on many visits to Importers, Wholesalers, Retailers and users of cloth in the Cara Industry, he estimated the Mano River Union consumption of Woven cotton cloth at 40 million square yards i.e. 9 square yards per capita for a joint population of 4.5 million p.

The official import statistics of Sierra Leone alone for 1974 and 1975 show Textile Woven-cloth imports of 40,396,000 and 42,911,000 square yards, of which cotton woven-cloth amounted to 30,196,000 and 31,6[illegible]3,000 square yards (including cotton "Flags" which have unexpectedly high values, and as they are woven materials in short lengths they should be included in Woven Cotton cloth). See Appendix 2.

FUTURE MARKETING PROJECTIONS

The 1980 projection has been made with an arbitrary factor of 3% increase p.a. which has been chosen to represent the estimated increase in volume of textiles consumed; this figure is in line with the estimated increase in population, without any additional increase in per capita income.

The recorded figures are sufficiently constant in the past six years to inspire confidence that there is a large market for both Cotton and Synthetic Textiles in Mano River Union. On the basis of a combined Mano River Union population of 4.5 millions by

capita Total textile consumption averages 12.7 square/yards which is similar to consumption in other African countries which are in the same stage of development.

The present study is planned to produce 20 million square yards of cotton and Polyester/cotton materials, which is 35% of the estimated total market including all cotton and synthetic materials. The projected suiting mill for synthetic blend materials has been planned to make 4 million square yards representing 40% of the recorded imports of Synthetic suitings. This figure is 7% of the estimated total market of 57 million square yards.

Since 1975, when Mr. Mydenstein submitted his reports, the popularity of Synthetic blends has swept the World. There is no mention of them in his reports but they are rapidly making themselves felt in Liberia and Sierra Leone. Even the traditional Gara Dyeing trade has found out about Polyester/cotton to replace medium quality mercerised cotton. The largest importer of Damask cloth for Gara Dyeing estimates that the industry requires 1,000,000 square yards annually. The cloth is much cheaper than Damask and the switch should stimulate sales. Between high, medium and low quality the whole Gara Dyeing trade of Sierra Leone was estimated by the UNIDO expert at 4.5 million yards annually so the potential for P/C blends should be at least 2 million yards, or more if a local Fancy weave and Jacquard weave factory can be started as one of the satellite enterprises.

The modern textile industry is dynamic and fashion oriented. The traditional lines like African Prints and cheap shirting are dominated by China, East European countries and Japan. Prices are so low that there is indirect indication of dumping.

The vertical integrated plant which has been designed in this study is ideal in scale. 19,200 spindles, 500 automatic looms and complete Processing Dyeing and Finishing is probably the best size of textile mill from both Management and economic points of view. The best conventional machinery should produce higher quality with less wastage of material than the older mills in Asia or Eastern Europe. How is it possible for them to land their Textiles in West Africa, after packing them up and sending them half-way around the world, at prices up to 33% less than the manufacturing cost of an ideal unit working in Sierra Leone or Liberia?

Part of the answer can be deduced from the Manufacturing Cost Summary in Chapter VI 3. Interest and Depreciation account for 35% of the total cost! The high incidence of International staff during the first 5 years and the high cost of Electric Power may account for a further 7% of total cost making 42%. This explains why new industries require heavy duty protection, not only during the first few years but also until they have been able to pay off the massive machinery credits and loans without which a large new industry cannot be started.

The previous UNIDO expert demonstrated in 1975 that 65% duty protection was required for cotton textiles during the first 5 years, declining to 60% for the next 5 years in order to make local manufacture viable.

Cotton Prints and Lace Goods are items of first necessity in Mano River Union which affect the household budgets of the poorest section of the population. It would create social problems if the current duty tariffs were increased from 30% +4 1/2 % to 65 %

The new harmonised duty tariffs for Synthetic Textiles have been set at 50% + 4½% (assuming that Liberia will adopt the same consular fee as Sierra Leone). It was proved in the companion

study on Synthetic suitings that this duty rate is sufficient protection to make a local factory viable.

The same situation does not necessarily apply to Cotton Prints and Piece Goods since their price of importation is so low because they originate from State Controlled Industries. Suitings are received mainly from Japan and USA; although the Japanese Government is known to stimulate exports, it is not the same as direct state-planned exportation, and private enterprise is the basis of the American Industrial philosophy.

Taking all these conflicting factors into account it must be faced that the duty tariff for Cotton Prints and Piece goods will have to be raised to all least 50% + 4½%, for a new local factory to have any chance of competing.

Another alternative would be to operate an import quota system, if it is decided that a Mano River Union large scale textile industry is desirable. The effect of quota restrictions would be to cause an increase in market prices when shortages begin to bite. Obviously this system can lead to abuses; it is difficult to administer and impossible to administer equitably.

For the purposes of this study it is therefore being assumed that the duty tariff will be raised to 50% + 4½% for Cotton Prints and Piece Goods, which has the beneficial result of equalising it with the duty tariffs on Synthetic Textiles.

The current duty rates in other African countries are generally higher than 54%, exact rates are unavailable except for Ghana where an amendment in 1977 raised the import duty on woven fabrics to 60% .

IMPLICATION AS TO CONSEQUENCE OF TARIFF INCREASE OF COTTON CLOTH

It is assumed that the total consumption of Woven Cotton fabrics is 9 sq yds. per capita for 4.5 million population in Mano River Union = 40 million square yards. Official figures for textile imports are higher, but they do not take unrecorded exports into account.

Assuming that an average CIF landed import price is $0.65, the effect of an increase of 20% in duty tariffs is $0.65 x 20% = 0.13.

a.	Increase in Government Revenue in absence of domestic production $0.13 x 40 m =	5.2	million
b.	Production of mill 11.2 million sq yds Cotton Prints cost price of mill production 11.2 x $1.01	11.3	million
c.	Loss of revenue caused by mill 11.2 x 0.35	3.9	million
d.	Net gain in Government Revenue (a-c)	1.3	million
e.	Expense to population due to increase 0,65 x 20% =	5.2	million
f.	Expense per capita on Mano River Union Population 4.5 m	1.156	
g.	Expense to each head of family (1:5 ratio)	5.78	

$$\frac{\text{11.2 Million square yards x 100}}{\text{40 million square yards}} = 28\%$$

The effect of realizing a domestic production of 28% of domestic consumption of cotton prints is to increase the cost of living of the average head of family of five by $5.78.

The Government would gain $1.3 million.

The remainder of the planned production of the mill is 7 million sq yds of Polyester/Combed Cotton Piece Goods and shirtings for which a harmonised duty rate of 50 + 4½% is applicable; it is presumed that this amount of duty protection will be sufficient. No increase is called for in the study.

a	Increase in Government Revenue in absence of domestic production	nil
b.	Production of mill 7.0 mn linear yards:	8.75 sq/yds
	cif value of mill production 8.75 x $1.23	10.76 m
c.	Loss of revenue caused by mill 8.75 x 0.43	3.76
d.	Net loss in Government Revenue (a-c)	3.76
e,f,	Net expense to population	Nil

$$\frac{\text{8.75 million square yards x 100}}{\text{17 million sq/yds, sq metic blends}} = 51.5\%$$

The effect of realizing a domestic production of 51.5% of all Synthetic blends is no increase in the cost of living of the average family.

The Government would lose $ 3.76m.

The net loss to Governments in import duties would be 3.76 - 1.3 = 2,46m

The net loss to each family attributable to the establishment of an industry employing 1,022 people directly would be $5.73 per Silver Union family of five.

This is not too high a price to pay in return for an important new textile industry. An attempt will be made in the Financial Calculations to estimate the advantages and disadvantages.

The very large trade in African Prints in both countries is highly competitive. The low cost of labour accounts for the narrow profit margins ruling, 15% is usual for retail and 10% for wholesale trade. Some importers operate in all three sectors. They import from the cheapest sources, sell wholesale to retailers, and sell retail on their premises where a spectrum of all the main lines of Cotton and synthetic fabrics can be observed. Many affix retail prices to each of the main items.

A more detailed market investigation would take several months; if there is to be any follow-up to this study it is recommended that a professional Marketing Survey should have first priority.

The production plan of this integrated factory consists of only two separate types of cloth. The cost differential between Java Prints (imitation Wax Prints) and African Prints is infinitesimal. The latter are printed with more sophisticated patterns on similar cloth except that it has eight more picks per inch! But the price that this cloth commands in the market is 10% to 30% higher, depending on the attractiveness of the pattern. Imitation wax Prints have almost eliminated real Wax Prints which command double the price of African Prints;

The policy of a local factory should be to concentrate on the top end of the trade because the excellent Rotary Screen Printing machine is capable of the best quality and should be fitted with screens for fine designs.

In addition to this the Transfer Printing machine can quickly supply the best quality of Fashion Prints. This can be done as quickly as the rolls of paper can be chosen and air freighted to the mill.

The general tendency in other Developing African countries is away from traditional African Prints especially in the cities. The urban populations are influenced by Western fashion and the short ladies' dress is more "with it" and it takes less material. The short frock needs about 3 yards whilst on African costume uses around 6 yards. Admittedly the cost per yard of the fashion material made from Polyester Blend material is nearly double the cost of the traditional cotton cloth which is universally used for African Prints. Cotton is comfortable but it does not stand up so well as Polyester blends for hard wear; it has poor resistance to creasing in a hot humid climate; Polyester is extremely strong and resilient, which results in excellent crease recovery and "drape". When blended with cotton it is cool and comfortable. The fabric dries very quickly; permanent press is so effective on Polyester Blend fabrics that trousers and skirts retain their original creases for the life of the clothing; Polyester/combed cotton fabric will outlast the stitching, and will continue to be wearable after 15 years of use including repeated washing.

The following figures are being used as the Basis for Price calculations. They are built on the average retail prices ruling in November/December 1977 in Monrovia and Freetown:-

	Retail Price Per Linear Yard
Polyester Blend Shirtings	$ 1.50 -- $ 3.00
Polyester Blend Dyed Printed Piece goods	2.00 -- $ 3.50
Imitation Wax Java Prints	1.33
Good quality African Prints	1.16

The ex-factory price has been worked back by taking 15% margin for Retail and 10% wholesale margin.

The average import price has been built up by adding 54.5% duty and 3% handling charges to the estimated average C&F import price.

UNIT $ PER LINEAR YARD

BASIS OF PRICE CALCULATIONS

African Prints	Ex-Factory Price	Wholesale Price	Retail Price
Current Market basis	0.89	0.99	1.16
Effect of 20% duty increase	1.02	1.13	1.35
Average CIF Price	0.65		
Duty & Charges 57.5%	0.37		
Landed import Cost	1,02		
Java Prints Current market	1.02	1.13	1.35
Effect of 20% duty increase	1.16		
Average CIF Price	0.68		
Duty & Charges 57.5%	0.39		
Landed import cost	1.07		
P/c Piece goods & Shirting Current Market	1.53	1.70	2.00
No Duty increase required	1.53		
Average CIF Price	0.90		
Duty & Charges 57.5%	0.52		
Landed import Cost	1.42		

ESTIMATED GROSS PROFIT MARGINS

UNIT $ per linear yard	Ex-Factory Price	Less Average Manufacturing Cost	Profit
African Prints	1.02	- 1.01	0,01
Java Prints	1.16	- 1.01	0,15
P/C Piece goods & Shirting	1.53	- 1.01	0,52

ESTIMATED GROSS PROFIT ON CALCULATED FULL PRODUCTION

African Prints	7,000,000 yards x 0.01 =		70.000
Java Prints	2,000,000 yards x 0.15		300.000
P/C Piece goods			
Shirting	7,000.000 yards x 0.52		3,640.000
			4,010.000

Analysis of profitability from Marketing Point of View

1. African Prints are very cheap in Mano River Union. They do not contribute to profits but their high volume absorbs 44% of total on cost.

2. Java Imitation Wax Prints command reasonable prices in Mano River Union but the market is limited. The production is estimated to produce a profit margin of 15% on factory cost and to absorb 12.5% of total on cost.

3. Polyester Piece-goods and Shirting command high prices in the Mano River Union markets at present. The production is estimated to contribute a profit of 51% on factory cost and to absorb 44% of total on cost.

Further Comments from Marketing Point of View

The profit margin on African Prints is unsatisfactory. As foreseen by the previous UNIDO expert duty protection of 65% would be required to make local production marginally profitable. But such a large increase in import duties on an article of first necessity to the less privileged section of the population would appear to be socially undesirable.

The profit margin on Java Imitation Wax Prints is considered to be acceptable and the market for this high quality fabric should be cultivated at the expense of African Prints.

The profit margin on Polyester/combined Cotton Blends is excellent at present, but it is expected to decline when the major sources of supply increase their production of Polyester Staple Fibre. Polyester production is still relatively small in China and European countries but it will inevitably increase owing to the world success of Polyester which is the most successful synthetic fibre of all time.

The obvious future strategy of the projected mill is to diversify and valorise the production to make best economic use of the excellent plant and machinery to be installed.

It is suggested that the volume of African Prints should be reduced as soon as more lucrative lines can be identified. One such item is cloth construction No. 3 a - high quality suiting twill made from Polyester/Combed cotton blend. Another is Denim for Blue Jeans which is increasing daily in popularity because of its use by young people all over the world. It is a simple cotton fabric as far as spinning and weaving are concerned but the warp needs expensive dyeing equipment if Indigo natural dyes are used. The mill could produce second quality denim if Beam Dyeing is included in the Processing Machinery. First quality Denim employs Indigo so that it will fade in the way required by the young.

It would be better to leave these excellent articles until the first mill is established. Any interference with the simplicity of the first stage of production will make this large project much more difficult to implement.

Another direction in which the output might be valorised would be the introduction of Polyester Blends for African and

Java Prints. The difficulty is that they are traditional trades which are used by conservative people especially in the interior. The admixture of polyester fibre would need to be produced in small quantities at first, and marketed in the cities as a fashion novelty. This also should be attempted after the first mill based on one width of cloth and only two mixings, cotton and Polyester cotton, has been well established. The space for extra combing machines can easily be earmarked in the first spinning mill so that a greater proportion of Polyester blends can be made when the market demands it.

In the meantime pure cotton piece goods and shirting should be avoided because both articles are being shipped at very cheap prices, 65% duty protection would be required in order to break even which would make local production uninteresting.

IV. RECOMMENDED LEVEL OF TECHNOLOGY

A vertical integrated textile factory is as strong as its weakest part. It consists of a long series of interdependent processes which must be balanced and highly flexible. The complete whole consists of:-

1. Location, site land and buildings
2. Spinning from staple fibre to yarn
3. Preparing the yarn for weaving
4. Weaving and Inspecting
5. Processing Dyeing and Finishing
6. Auxiliary Plant and installations
7. Power Generation if Electric Power is unavailable

Location and Buildings

ITEM 1. Location depends on the decision of the Ministerial Commission of Mano River Union.

But the job description specifically calls for an investigation of alternative proposals for location and relative benefits to the partner states. The companion textile study on Synthetic Blend Suitings suggested the industrial park near Monrovia as the preferred choice. The preferred location for cotton and short staple synthetic blends is a new Industrial site on the outskirts of Freetown mainly because Sierra Leone is the largest market for such cloth in Mano River Union.

The area of covered space required for main mill buildings and auxiliary services is 336,520 square feet i.e. 8 acres. The Standard layout is to arrange the three main pavilions like a U with the essential services inside the U for convenience, supervision and economy of power distribution. So the 8 acres of

covered space may require 16 acres of land for the factory, and ancillary services. Some provision should be allowed for lawns and flowers, making the land required for the initial factory 20 acres.

The production of 16 millions yards represents only 40% of all cloth consumed, therefore it is prudent to secure 20 more acres for future expansion, making a site of 40 acres. It must be well drained with provision for discharging industrial effluents; large quantities of pure water are required. The site ideally should be part of an industrial estate with good transport facilities and housing for workers.

In adequate land will stunt future development and it is rarely possible to buy additional land contiguous to a factory after it has started. The fact of placing any large factory in any location valorises all the land in the vicinity.

The location, site and buildings in a modern textile mill are linked to the level of technology. It does not matter how suitable the plant and machines may be for the objective, i.e. to produce 16 million yards of acceptable quality cloth efficiently and cheaply, if the location is wrong. The location should be large enough to accommodate several satellite textile mills which could be supplied with yarn if the original spinning mill is increased in size.

It is pooposed to install the most suitable modern machinery to produce cloth which has to be marginally better quality than imported cloth, otherwise it will be impossible to sell it at remunerative prices. This will only be achieved by paying careful attention to every detail of the buildings specifications. Totally enclosed completely insulated structures are required for spinning, preparing and weaving. Taller specially

ventilated buildings are required for Processing and Finishing. Lighter structures with stronger floors are needed for storage. Their layout is designed to suit the flow of material, on one floor only, and to be economical in power and steam distribution. The factory buildings should be designed to supply the precise conditions of temperature and humidity required, and full fire protection should be built into them because this industry will cost 40 million US $ today. Even if fully insured a major fire would result in disastrous loss of production entailing financial ruin.

The present study is a very detailed pre investment investigation based on current market prices of machinery and plant. The Building cost is estimated at 100% more than the cost of the customary light weight instructures which local entrepreneurs usually erect in African countries. But such buildings are not suitable for modern textile factories which must work at least on three eight hour shifts per day for 300 days every year.

Indeed the most recent mills are planned to work continuously 168 hours weekly on the four shift system in order to reduce cost by increasing output and thereby to amortise the high cost of machinery and the massive loans which are inevitable. But it is thought to be unrealistic to base this study on such an advanced system of working because there is so little industrial experience in Mano River Union. This does not mean that an experienced and capable technical partner may not wish to introduce one of the Four Group continuous production systems. As there is little existing industry, and consequently few industrial bad habits and prejudices, there is a strong case for considering continuous operation because of its obvious economic and financial adaantages.

Spinning

ITEM 2. The proposed mill incorporates the most modern and efficient conventional spinning machinery. The more advanced alternative of open end spinning is only economic for relatively coarse yarns at the present time. It is not being installed in new mills which have to spin a wide range of counts for use in conventional cloths. It is also an even more highly capital intensive investment.

Conservative speeds and conditions have been specified on the Spin Plan because the whole purpose of spinning is to serve the Weaving with a guaranteed regular supply of unvarying standardised yarns.

The spinning mill is a standard first class producing unit for Carded Cotton yarns, with the addition of a small combing section, producing high quality combed cotton for blending with 1½ Denier 1½" staple Polyester. Space should be reserved for additional combers in case a larger proportion of Polyester Combed Cotton blends is required at some future date.

The Ring Spinning Machines represent 45% of the cost of machinery at this process, and they are based on the average current price of the most robust machines available. 40 standard machines have been specified for all counts of yarn with only one size of Lift, Gauge and Ring Diameter. This gives the most economic return a capital invested and results in needing fewer spare parts. The machines are cleaned continuously by Pneumafil broken end collectors and automatic Overhead Cleaners.

PREPARING YARN FOR WEAVING

ITEM 3.1 The yarn can be conditioned to correct and unvarying humidity content, as this has a direct effect on Weaving efficiency.

Automatic yarn winding has been specified for cost and quality whereby knots are tied automatically with correct tension and size. Electronic slub catchers will control the Winding so as to remove faults that are out-with accepted standards. This type of machine makes it possible to adopt one size of ring and lift at spinning for all yarn counts and results in standardisation, as well as higher spindle speeds at the expensive Ring Spinning process.

Manual Winding has often been specified for installation in Developing Countries with disastrous results, because it takes many years for workers to attain full efficiency and the excessive number of faulty knots and slubs prejudices the efficiency and quality of later processes.

Warping has been based on the best standard machines with one extra Direct Warper because this process is a potential bottleneck. A Sectional Warper has been included for ease of producing striped warps.

The best automatic Pirn Winding has been specified, although much cheaper but less efficient Pirn Winders exist.

Sizing is a crucial process and two machines can theoretically cope with all Sizing Requirements on one 8 hour shift. In case of a machine breakdown the other Sizing Machine can provide sufficient sized beams for Weaving.

ITEM 4 WEAVING

Standard Fully Automatic Looms are specified which will be 54" useful width in the Reed; this width will produce a wide range of cloth up to 46" Finished width.

It can be foreseen that there will be demand in the future for wider cloths both for variety and to secure greater economy in cutting which is of first importance to the garment industry.

An extra cloth construction for High Quality Suiting Twill has been included under No. 3a for information only. It is the ideal Mercerised, Cassed, Combed Cotton cloth which has had so much success in Kenya for African Safari Suits. Additional machinery would be for Assembly Winding and Twisting therefore it is proposed that it should be considered after the mill is erected and working maturely. But 10% of the looms might be bought with 72" useful Reed width to accommodate cloth width up to 60" Finished width.

The market required a high proportion of plain weave cloth for all Prints, plain dyed fabrics and shirtings. But it is suggested that 20% of the looms should be specified with dobby motions to enable the weaving to cater for some Fancy Weaves which will certainly be needed for the Polyester Blend Fabrics destined for the Garm Dyed trade. Some of these high quality cloths will call for Jacquard Weaving to replace the highest quality of imported Fancy Damask fabrics. This type of weaving is highly sophisticated and it is not really suitable for inclusion in a large mass production mill. Jacquard Weaving will be suggested as one of the satellite Textile plants which could be promoted as a separate small industry depending on high quality yarn from the Spinning Department after it has been enlarged.

By resisting the temptation to produce complicated 60" wide Broad cloth at the start, the whole factory can be standarised on one single Finished width of 45", which should result in simplicity of working, lower cost and higher efficiency.

Advanced Shuttleless looms have been considered for Weaving but their chief disadvantage is excessive capital cost; they are 150% moreexpensive than the Standard Looms specified.

ITEM 5 PROCESSING, DYEING AND FINISHING

The planned production of 16 million linear yards (20 million square yards) is in line with modern practice for a complete Processing Department, because the main machines would be fully occupied on double shift with a possible third shift as a safety margin. By the nature of Processing, Dyeing and Finishing the strictest control is necessary to avoid spoilage of costly cloth and to achieve good quality all the time. It is an apt in which the human element is as important as the machines, Spinning, Preparing and Weaving can be safety planned for treble shift operation or even for continuous running from the outset because the machines do the greater part of the work and they will produce with minimum attention, provided they are maintained in perfect running order.

There has been great progress recently in Processing. Dyeing and Finishing, with emphasis on standardised machines, which have been designed to reduce dependence on the human element. It is relatively easy to commission a Finishing Department on one shift after the machines are run in by highly trained erectors under the control of practically managers. From the start, sufficient staff and workers should have been engaged to man two shifts, which are required to process 16 million yards annually. Third shifts should be avoided because they will only succeed when fully responsible and very experienced people are available.

There is great similarity between new Processing Departments for cotton and blend cloths all over the world i.e. the technology is becoming standardised and there is intense competition between the machinery makers. It pays to choose the outstanding make of machine at each process; experience has taught Finishing Specialists that certain makers have risen above their competitors in certain fields. Their products give less trouble because they are designed better. UNIDO can give advice on the choice of machinery. Second-hand machines should never be included in new Processing Dyeing and Finishing plants, because the chain is as strong as its weakest link.

1. Shearing is necessary to remove loose ends of yarn from cloth woven on Automatic looms.

2. Gassing is required to remove short fibres and to improve the appearance of Finished cloth particularly after Mercerising.

3 & 4 Scouring, Bleaching and Washing will be done by continuous open width system to avoid creases and defects introduced by the Cheaper rope system, and by semi-continuous methods. The recently perfected continuous method is simple to operate and it gives the best white at lowest cost. It is ideal for Processing Blends of Polyester and Cotton

5. Heat Setting is required early in the process for all synthetic blends to provide dimensional stability. The machine indicated is a special Pin Stenter, heated uniformly by high temperature oil. Further thermofixing can be done on the same machine after dyeing it the market requires perfect stability with minimum residual shrinkage. This process for synthetic blends makes sanforising (compressive shrinking) unnecessary.

6 & 7 Mercerising is specified for the entire output of cloth by the simpler chainless system. It results in substantial economics in dyestuffs where cotton is being processed and it improves the penetration of dyes especially when the cloth is being printed.

9. Two different mass production dyeing methods have been chosen because synthetic Blends require different treatment to pure cotton. Both the thermosol method and the Pad-Steam process can produce long runs of very equal shades with great economy of dyestuffs and chemicals. The best way to produce many print cloths is to pre-dye the fabric with a cheap but fast shade. After washing and drying the design is over printed on the plain dyed material.

10 & 11 Four totally enclosed Jig Dyeing Becks have been included for flexibility, followed by mangling and drying . They are essential for small runs of cloth and for re-dyeing where necessary.

12. Brushing, Equalising and Batching is essential to the preparation of fabric for high quality printing such as Java Prints i.e. Imitation Wax Prints.

13. The latest Rotory screen printing range has been specified, with independent complete screen making equipment. Screens can also be ordered from European sources but the delays are excessive and fashions in textile design change very rapidly. It is best to choose the simple beautifully designed make which is being installed in many African Mills as standard. It is capable of producing the highest quality prints in up to eight colours at lowest cost of link and materials.

These machines include compact drying systems which can turn out cloth ready for the market unless the inks need after treatment.

A transfer Printing set which can handle the latest design from imported paper transfers has been included for flexi bility. This system has been developed very recently and it will enable the mill to produce both short and long runs of fashion prints especially for synthetic blend cloths when the percentage of synthetic Fibre is 80% or more. The latest development is to print natural fibres by using special inks and chemicals on the transfer paper. The Transfer machines are cheap and simple to operate. There is no Processing after Printing, there are no problems of registration and there is no wastage of cloth. The number of designs immediately available from makers of Transfer Paper is now enormous When all factors are taken into account Transfer Printing competes favourably with high class Screen Printing.

14,15,16 & 17 After treatment of several kinds can be done on steaming and Resin Baking Stoves. Easy-care properties and anti-soiling finishes can be applied at these processess as well as at the:-

18. Pad Stenter which is chiefly used to achieve correct final width and smart appearance.

The Heat Setting machine which is used earlier in the process can also be used for final thermosetting and width correction.

19. Calendaring has been included for importing special finishes after padding with various types of starch or Poly Vinyl sizing material.

20. After final inspection the cloth is cut to length

21. On rolling and lapping machines

22. Stamping and Baling is mainly used for goods destined for the interior or for export.

Although all cloth will be 45" finished width, the Processing Dyeing and Finishing ranges should all be capable of handling up to 60" width, because there is a world tendency in this direction, as the wastage of cloth in cutting out is reduced.

REASONS FOR AND AGAINST STARTING WITH PRINTING/DYEING ONLY

As far as the present importers are interested in any plan for local production, they would recommend starting with Printing because the Capital investment is small and they think that they would be capable of operating it without many problems. The marketing would present minimal difficulties because they dominate the markets in both countries, and with Printing and some Processing they would strengthen their entrenched position.

There is a precedent for this way of fomenting the early stages of Textile import substitution. In the case of Nigeria several Entrepreneurs were allowed to import grey cloth duty free. The import of printed material was protected by high tariffs and regulated by quota. It amounted to a licence for a privileged small group of cloth printers to print their own money. Some made enormous profits and the system resulted in scandalous abuses.

Concurrently several large vertical integrated enterprises were started with lower profitability than the privileged few cloth printers. After several years the Government declared that all cloth printers should take steps to integrate backwards to spinning if they wished to stay in business. Suitable cotton had been established in the country and the more progressive printers agreed to install spinning and weaving at a date that Government had chosen.

In the case of Mano River Union this suggestion to start with Printing and Dyeing was sponsored by the previous UNIDO Expert in his Report dated 2nd September 1975 to the Ministry of Trade and Industry. He said he preferred the fully integrated Mill as are single operational unit at one single site, but continued that the Government might not accept the serious implications of the high tariffs required for a fully integrated Mill - also that cotton

growing might not be feasible, which will alter the necessary tariff level in the second five-year period. He then recommended that serious attention should be given to the separate Printing/Dyeing unit and recalled that the plan is based on a continual duty-free import of all inputs. It was stated that a 30% tariff level was sufficient to attain the standard profitability required. Foreign Exchange savings would remain negative.

In spite of this it was remarked that that initial establishment of only the Printing and Dyeing plant has other advantages:-

1. It will be easier to find investors for the much lower investment.
2. Considerable marketing, designing and industrial experience will be gained prior to the large investments in the spinning Weaving plant.
3. The feasibility of cotton growing will be known in the meantime.

He continued "it must be concluded that with reference to phasing the fully-integrated Mill preference should be given to the establishment of the Printing Dyeing Unit but further extention into weaving and spinning should be incorporated in all technical outlays and plans".

In an Addendum "which must be seen as an integral (part) of the Printing/Dyeing report" it was stated that "to cover the cost price of the Printing/Dyeing plant at the assured profitability level a tariff of 60% has to be imposed during the initial five years while in the second five year period a tariff of 55% suffices".

Previously the Expert had stated that 30% was sufficient, but if 60% has to be adopted the Project is neither interesting to the public nor to Government.

Government would lose the entire duty revenue on 20 million square yards of cloth, which is the economic scale of production for a modern Processing, Dyeing and Printing plant, because all inputs were stated to be duty free. Calculating the duty level at the 54.5% already applicable to Synthetic Textiles, which is also the minimum required protection for Cotton fabrics, the Government would lose $6,540,000 in revenue annually in return for starting a new industry providing less than 200 jobs. It would lose the revenue on all other inputs because the Factory would have no local inputs. The huge loss in revenue is sufficient reason for eliminating the suggestion to start with Dyeing and Printing without Spinning and Weaving. The Project would not generate adequate profits to finance future integration back to spinning and weaving. It is entirely negative.

CALCULATED LOSS OF REVENUE TO GOVERNMENT:

20 million square yards x estimated import price of dyed and printed cloth of $0.60 = $12,000,000 $12,000,000 x 54.5% duty level = $6,540,000.

IV.2 MANUFACTURING PROGRAM

	DESCRIPTION OF CLOTH	Finished WIDTH	CONSTRUCTION per inch ENDS	PICKS	COUNTS N.E. WARP	WEFT	ANNUAL PRODUCTION LINEAR YARDS
1.	Java Prints, Carded Cotton Mercerised Finely Printed	45"	68	68	30	30	2,000.000
2.	African Prints Mercerised Printed	45"	68	60	30	30	7,000.000
3.	Piece Goods, Bleached Dyed Mercerised	45"-60"	68	60	30	30	2,500.000
4.	Shirting & Blouse material Bleached/Dyed/Printed	45"	60	56	20	20	4,500.000
	Total Annual Production Linear Yards						16,000.000
	Total Annual Production Square Yards						20,000.000

IV.3

CLOTH CONSTRUCTION

NO. 1

ARTICLE: JAVA PRINTS — CARDED COTTON — 1/1 Weave

Grey Construction	Warp	68 ends per inch
	Weft	68 picks per inch
Counts	Warp	30/1 N. E
	Weft	30/1 N. E
Contraction	Warp	8%
	Weft	8%
Grey Width		49 inches
Finished Width		45 inches

Weight per Yard

Warp $\frac{68 \times 49 \times 1.08 \times 453.6}{30 \times 840}$ = 65 gms

Weft $\frac{68 \times 53 \times 453.6}{30 \times 840}$ = 65 gms

Total Weight per Yard = 130 gms $\times \frac{36}{45} \times 28.4$ = 3.7 Ounces/Yard

Width in Reed = 49 x 1.08 = 53 inches

IV.3

CLOTH CONSTRUCTION

No. 2

ARTICLE: AFRICAN PRINTS	CARDED COTTON	1/1 WEAVE
Grey Construction	Warp	68 ends per inch
	Weft	60 picks per inch
Counts	Warp	30/1 N.E.
	Weft	30/1 N.E.
Contraction	Warp	7%
	Weft	8%
Grey Width		48.5 inches
Finished Width		45 inches

Weight per Yard

Warp $\frac{68 \times 48.5 \times 1.07 \times 453.6}{30 \times 840}$ = 64 gms

Weft $\frac{60 \times 52.5 \times 453.6}{30 \times 840}$ = 57 gms

Total Weight per yard 121 gms x $\frac{36}{45}$ x 28.4 = 3.4 ounces/yd

Width Reed 48.5 x 1.08 = 52.5 inches

IV.3

CLOTH CONSTRUCTION

No. 3

Article: Piece Goods — 50% Polyester/50% Cotton — 1/1 Weave

Grey Construction	Warp Weft	68 ends per inch 60 picks per inch
Counts	Warp Weft	30/1 N.E. 30/1 N.E.
Contraction	Warp Weft	7% 8%
Grey Width		48.5 inches
Finished Width		45/46 inches

Weight per Yard

Warp $\frac{68 \times 48.5 \times 1.07 \times 453.6}{30 \times 840}$ = 64 gms

Weft $\frac{60 \times 52.5 \times 453.6}{30 \times 840}$ = 57 gms

Total Weight per yard 121 gms x $\frac{36}{45 \times 28.4}$ = 3.4 Ounces/Yd

Width in Reed 48.5 x 1.08 = 52.5 inches

IV.3

CLOTH CONSTRUCTION

No. 3a

ARTICLE	SUITING TWILL	67% Polyester	35% combed cotton	3/1 weave
Grey Construction		Warp	96 ends per inch	
		Weft	56 picks per inch	
Counts		Warp	36/2	
		Weft	24/2	
Contraction		Warp	8%	
		Weft	5%	
Grey Width			65 inches	
Finished Width			60 inches	

Weight per yard

Warp $\frac{96 \times 65 \times 1.08 \times 453.6}{18 \times 840}$ = 200 gms

Weft $\frac{56 \times 70 \times 453.6}{12 \times 840}$ = $\frac{176}{376} \times \frac{36}{60} = \frac{227 \text{ per sq yd}}{28.4} = 8$ ozs ounces/yd

Total weight per yard

Width in Reed 65 x 1.08 = 70 inches

IV.3

CLOTH CONSTRUCTION

NO 4

ARTICLE: SHIRTING — 50% Polyester/50% Cotton — 1/1 Weave

Grey Construction	Warp	60 ends per inch
	Weft	56 picks per inch
Counts	Warp	20 N.E.
	Weft	20 N.E.
Contraction	Warp	7%
	Weft	8%
Grey Width		48.5 inches
Finished Width		45/46 inches

Weight per yard

Warp $\frac{60 \times 48.5 \times 1.07 \times 453.6}{20 \times 840}$ = 84 gms

Weft $\frac{56 \times 52.5 \times 453.6}{20 \times 840}$ = 80 gms

Total weight per yard 164 gms $\times \frac{36}{45} \times 28.4 = 4.6$ Ounces/Yd

Width in Reed 48.5 x 1.08 = 52.5 inches

IV.4

YARN REQUIRED PER 8 HOUR SHIFT

NO.	ARTICLE	WIDTH	CLOTH CONSTRUCTION	COUNTS	GMS/YARD Warp	GMS/YARD Weft	GMS/YARD Cloth	PRODUCTION Per shift Yards	WASTE %	YARD Warp kgs	REQUIREMENT Weft kgs
1	Java Prints	45"	68 x 68	30 x 30	65	65	130	2222	5	152.0	152.0
2	African Prints	45"	68 x 60	30 x 30	64	57	121	7777	5	523.9	466.6
3	Piece Goods	45"	68 x 60	30 x 30	64	57	121	2777	5	187.1	166.6
4	Shirting	45"	60 x 56	20 x 20	84	80	164	5000	5	442.1	421.1

SUMMARY

Cotton 30/1 Carded 1294.5 kilos
Polyester/Cotton
30/1 353.7 "

Polyester/Cotton
20/1 863.1 "

2,511.3 Average Count 26.6 N.E

T[illegible]LES

IV.5. SPIN PLAN BASED ON 3 SHIFTS x 8 HOURS A[illegible] DAYS

SECTION	WEIGHT REQUIRED IN 8 HRS.	ENTERING COUNT	EXIT COUNT	WASTE %	DRAFT	TWIST T.P.I.	SPINDLE SPEED	EFFICIENCY	PROD. PER SPINDLE 8 HOURS	SPINDLES REQUIRED	MACHINES REQUIRED	MACHINES SPECIFIED	RATE OF USAGE
RING	909	0.8	20P/C	2	25	16	9500	88	0.176	5.15	10.7	40 x 480	
	372	1.0	30P/C	2	30	19	12000	92	0.140	2.[illegible]	5.6	Spindles	
SPINNING	1363	1.0	30Cotton	2	30	22	12000	92	0.121	11.26[illegible]	23.5		
	2644									19,[illegible]02	39.8	19,200	99.5
	928	0.12	0.8	1	6.7	1.2	1000	65	4.890	190	1.8	6 x 108	
ROVING	380	0.14	1.0	1	7.2	1.3	1100	75	4.600	[illegible]3	0.8	Spindles	
	1391	0.14	1.0	1	7.2	1.3	1100	75	4.600	30[illegible]	2.8		
	2699									577	5.4	648	89.0
	937	0.12	0.12	0.5	8 ends=8 draft		660f.p.m	75	257	[illegible].3		10 x 2	
DRAWING	384	0.14	0.14	0.5	8 ends=6draft		600 "	75	257	1.5	10	deliveries	
	1405	0.14	0.14	0.5	8 ends=6raft		800 "	70	403	3.5			
	2726									8.3			100.0
DRAWING AFTER	942	0.12	0.12	0.5	6 ends=6draft		600fpm	75	300	3.2	3	3 x 2	
COMBING	395	0.14	0.14	0.5	6 ends=6draft		600 "	75	257	1.5		deliveries	78.3
COMBING	608	40dwt	0.14	15+1	4	4	180mpm	80	200	3.3	4	4 Combers	82.5
LAP FORMING	795	0.15	40dwt	0.5	20 ends		250fpm	75	1600	0.5		1 Unit	50.0
DRAWING PRE-COMBING	799	0.15	0.15	0.5	8 ends=8draft		800fpm	75	240	3.4	2	2 x 2 deliveries	85.0
[illegible] DRAWING	363	0.15	0.15	0.5	8ends = 8draft		600 fpm	75	180	3.[illegible]	2	2x 2 deliveries	92.5

[illegible] KGS.

SPIN PLAN BASED ON 3 SHIFTS x 8 HOURS x 300 DAYS

SECTION	WEIGHT REQUIRED IN 8 HOURS	ENTERING COUNT	EXIT COUNT	WASTE %	DRAFT	TWIST T.P.I	SPINDLE SPEED	ENTRY	PROD. PER SPINDLE 8 HOURS	SPINDLES REQUIRED	MACHINES REQUIRED	MACHINES SPECIFIED	RATE OF USAGE
Carding													
Cotton	570	14 oz.	0.12	3	-	-	-	90	180	3.2	-	-	-
Cotton	233	14 oz.	0.15	3	-	-	-	90	144	1.7	-	26 cards	
Polyester	671	14 oz.	0.15	1	-	-	-	90	180	3.8	-	-	
Cotton	1412	14 oz.	0.15	3	-	-	-	90	107	15.2	-	-	
										23.9	26		91.9
Cotton	2284		14 oz.	4				85	1280	1.8	1 line with 2 Scutchers		90.0
Blowroom Polyester	678		14 oz.	1				85	1280	0.6	1 line with 1 Scutcher		60.0

45

Cotton Required 2379 Silos per 8 hour shift x 300 shifts = 2,141,100 Kg.p.a. 4,710,420 lbs cotton p.a.

Polyester Required 635 " " " " " " = 616,500 " " 1,356,300 " Polyester fibre.

iv.6

WINDING REQUIREMENTS

YARN REQUIRED INCLUDING 5% WASTE OF WEAVING

C rded	30	1.363
P C	30	372
P C	20	909
		2,644 kgs average count 26.5

Winding speed 900 met. p.m.

Efficiency 65%

Production $\frac{900 \times 65 \times 8 \times 60}{26.6 \times 1.693}$ = 6.3 kgs

2644 ÷ 6.3 = 420 spindles say 480 = 5 machines

Rate of usage 88%

IV.7

AUTOMATIC PIRNWINDING REQUIREMENTS

Weft required including 5% waste at Weaving

No 20/1 P 50/C 50	421.1
No 30/1 P 50/C 50	166.6
No 30/1 100% cotton	618.6
	1,206.3 Kgs average count 26.5 N. E

Winding speed 10,000

Efficiency 65%

Mean Pirn diameter 21.5 m.m

Weft Production $\frac{10,000 \times 21.5 \times 3.14 \times 60 \times 8 \times 65}{1,000 \times 26.5 \times 1.693} = 4.66$ Kgs

$\frac{1206.3 \text{ Kgs}}{4.66 \text{ kgs}}$ = 258 spindles or

8 x 36 spindles = 288

Rate of usage = 90%

IV.8

WARPING REQUIREMENTS

NO	ARTICLE	COUNT	ENDS	SETS	ENDS/ BEAM	WARP LENGTH 8HRS	WASTE & CONSTRUCTION	REQUIRED WARP PRODUCTION
1	Java Prints	30	3332	7	476	2222	9%	24.417
2	African Prints	30	3298	7	472	7777	8%	84.540
3	Piece Goods	30	3298	7	472	2777	8%	30,185
4	Shirting	20	6240	12	520	5000	9%	54,945
						17,776		194,087

Warping speed 450 yards P.M.

Efficiency 50%

Warping Production $\frac{450 \times 0.5 \times 60 \times 8}{} = 108.000$ yards

Machines required $\frac{194,087}{108,000} = 1.8$ say 2 machines

Rate of Usage = 90%

IV.9

SIZING REQUIREMENTS

17,776 + 10% contraction & waste = 19,744 yards

Sizing ySpeed 40 yards p.m.

Efficiency 60%

Sizing Production $\frac{40 \times 0.6 \times .60 \times 8}{}$ = 1,520 Yards

Machines Required $\frac{19,744}{11,520}$ = 1.72 = 2 Machines

Rate of Usage = 86%

IV.10 WEAVING PRODUCTION

NO.	ARTICLE	NUMBER OF LOOMS	PICKS PER MINUTE	EFFICIENCY	PICKS PER LOOM P.A. MILLIONS	PICKS REQUIRED P.A. MILLIONS	PICKS PER YARD	PRODUCTION REQUIRED: LINEAR YARDS		
								PER YEAR	PER DAY	PER 8 HOURS
1	Java Prints	70	190	85	69.768	4,896	2448	2,000,000	6,666	2,222
2	African Prints	217	190	85	69.768	15,120	2160	7,000,000	23,333	7,777
3	Piece Goods	77	190	85	69.768	5,400	2160	2,500,000	8,333	2,777
4	Shirting	130	190	85	69,768	9,072	2016	4,500,000	15,000	5,000
		494						16,000,000	53,332	17,776

500 Automatic Looms at 98.8 Rate of Usage.

IV.11 PROCESSING AND FINISHING: DAILY REQUIREMENTS

NO.	PROCESS	NO.1 JAVA PRINTS COTTON 100%	NO.2 AFRICAN PRINTS COTTON %	NO.3 PIECE GOODS P/50/cc 50	NO.4 SHIRTING P/50/cc 50	T O T A L
1	Shearing	6666	23,333	8,333	15,000	53,332
2	Singeing	6666		8,333	15,000	29,999
3	Bleaching	6666	23,333	8,333	15,000	53,332
4	Washing	6666	23,333	8,333	15,000	53,332
5	Heat Setting			8,333	15,000	23,333
6	Mercerising	6666	23,333	8,333	15,000	53,332
7	Drying	6666	23,333	8,333	15,000	53,332
8	Thermosol Dyeing			2,083	5,000	7,083
9	Pad Steam Dyeing	6666	23,333			29,999
10	Jig Dyeing				5,000	5,000
11	Mangling				5,000	5,000
12	Brushing	6666	23,333	4,166	5,000	39,165
13	Printing	6666	23,333	4,166	5,000	39,165
14	Steaming	6666	23,333	4,166	5,000	39,165
15	Heat Setting			8,333	15,000	23,333
16	Washing			8,333	15,000	23,333
17	Resin Baking			8,333	15,000	23,333
18	Stentering	6666	23,333	8,333	15,000	53,332
19	Calendering	6666	23,333			29,999

NO.	PROCESS	NO.1 JAVA PRINTS COTTON 100%	NO.2 AFRICAN PRINTS COTTON %	NO.3 PIECE GOODS P/50/cc 50	NO.4 SHIRTING P/50/cc 50	T O T A L
20	Inspecting	6666	23,333	8,333	15,000	53,332
21	Rolling, Lapping	"	"	"	"	"
22	Stamping	"	"	"	"	"
23	Baling	"	"	"	"	"

Piece Goods (No.3) 25% Bleached 25% Dyed 50% Printed

Shirting (No.4) 33% " 33% " 33% "

PROCESS IV.12

NO. 1

PROCESSING AND FINISHING REQUIREMENTS

SHEARING

Required Production	53.332 yards/day
Rated output	88 yards/minute
Efficiency	70%
Hours per day	16
Production 88 x 60 x 16 x 0.7 = 59.136 yards/day	
Machines required	1
Rate of Usage	90%

PROCESS

NO 2

SINGEING

Required Production	29,999 yards/day
Rated output	110 yards/minute
Efficiency	60%
Hours per day	8
Production 110 x 60 x 8 x 0.6	31680
Machines Required	1
Rate of Usage	95%

The ordinary quality African Points can be singed on a second shift if required i.e. 23,333 yards/day can be produced in 6.2 extra hours.

No. 3 & 4 BLEACHING, WASHING DRYING

Required Production		53,332 yards/day
Rated Output		110 yards/minute
Efficiency		70%
Hours per day		16
Production 110 x 60 x 16 x 0.7	=	73,920 yards
Machine Required		1 two-stage Range
Rate of Usage		72%

No. 5 Heat Setting

Required Production		23,333 yards/day
Rated Output		110 yards/minute
Efficiency		60%
Hours per day		8
Production 110 x 60 x 8 x 0.6	=	31,680 yards
Machines required		1
Rate of Usage		74%

No. 6 & 7 MERCERISING, WASHING, DRYING

Required Production	53,332 yards/day
Rated Output	110, yards/minute
Efficiency	60%
Hours per day	16

Production 110 x 60cc 16 x 0.6 = 63,360 yards

Machines required	1 complete Range
Rate of Usage	84%

No.8 HOT FLUE THERMOSOL DYEING

Required Production	7,083
Rated Output	60%
Hours per day	8

Production 30 x 60 x 8 x 0.6	=	23.040
Machines Required		1 Range
Rate of Usage		31%

NO. 9

P/D STEAM DYEING

Required Production	29,999 Yards/day
Rated Output	70 yards/minute
Efficiency	60%
Hours per day	26

Production 70 x 60 x 16 x 0.6 = 40,320 yards

Machines Required	1 complete Range
Rate of Usage	74%

JIG DYEING

No.10 Reauired Production	5,000 yards/day
Rated Output	625 yds in 4 hours
Efficiency	70%
Hours per day	16

Production 625 x 4 x 0.7 = 1.750 yards

Machines Required 4

Rate of Usage $\frac{5,000 \times 100}{4 \times 1750}$ = 72%

No.11 MANGLING, DRYING

Required Production		5,000 yards/day
Rated Output		45 yards/minute
Efficiency		60%
Hours per day		8
Production 45 x 60 x 8 x 0.6	=	12,960
Machines required		1 Set
Rate of Usage		39%

No.12 BRUSHING, BATCHING

Required Production		39,165 yards/day
Rated Output		65 yards/minute
Efficiency		70%
Hours per day		8
Production 65 x 60 x 16 x 0.7	=	43,680
Machines required		1
Rate of Usage		90%

No.13 PRINTING DRYING

Required Production	39165 yards/day
Rated Output	65 yards/minute
Efficiency	70%
Hours per day	16

Production 65 x 60 x 15 x 0.7 = 43,680

Machines required	1 Screen Printing Set
Auxiliary Machine	1 Transfer Printing Machine
Rate of Usage (Screen Printing)	90%

No.14 STEAMING

Required Production	39,165 yards/day
Rated Output (Two stands)	50 x 2 = 100 yards/minute
Efficiency	50%
Hours per day	16

Production 100 x 60 x 16 x 0.5 = 48,000 yards

Machines required	1
Rate of Usage	82%

No.14 HEAT SETTING

Required Production		23,333 yards/day
Rated Output		110 yards/minute
Efficiency		60%
Hours per day		8
Production 110 x 60 x 8 x 0.6	=	31,680
Machines required		None
Rate of Usage (based on item No.5)		75%

One Machine can cope with initial and final Heat-Setting.

No.16 WASHING, DRYING

Required Production		23,333 yards/day
Rated Output		65 yards/minute
Efficiency		70%
Hours per day		16
Production 65 x 60 x 16 x 0.7	=	43,680
Machines required		1
Rate of Usage		54%

There is spare capacity to wash and dry Java and African Prints as required.

No.17 RESIN BAKING

Required Production	23,333 yards/day
Rated Output (Two Strands)	50 x 2 = 100 yards/minute
Efficiency	60%
Hours per day	8
Production 100 x 60 x 8 x 0.6	= 28,800 yards
Machines required	1
Rate of Usage	81%

No.18 STENTERING

Required Production	53,332 yards/day
Rated Output	100 yards/minute
Efficiency	60%
Hours per day	16
Production 100 x 60 x 16 x 0.6	= 57,600 yards
Machines required (with Padder)	1
Rate of Usage	93%

No.19 CALENDERING FINISHING

Required Production	29,999 yards/day
Rated Output	80 yards/minute
Efficiency	60%
Hours per day	16

Production 80 x 60 x 16 x 0.6 = 46,080 yards

Machines required	1
Rate of Usage	65%

No.20 INSPECTING (AND MENDING)

Required Production	53,332
Rated Output	30 yards/minute
Efficiency	70%
Hours per day	16

Production 30 x 60 x 16 x 0.7 = 20,150 yards

Machines required	3
Rate of Usage	88%

No.21 Rolling and Lopping Machines Required	4
No.22 Stamping	1
No.23 Baling	1

V. ENGINEERING INFORMATION: COSTS

UNIT 000'S $

V.1 Spinning Machinery Cost

		FOB Price	
1	Complete Blowroom Line for cotton With Chute Feed	400	
1	Short Blowroom Line for synthetics With Chute Feed to:		
26	High Production Cards, 48" x 36" Cans	773	
1	Lap Former with Automatic Doffing	23	
4	Combers, 42" x 20" Cans, 12 Deliveries	261	
18	Drawframes of 2 Deliveries, 42" x 20" Cans	400	
6	Roving Frames 14" x 6½ dia.full bobbin SKF PK 528 Drafting with x 3 Type Arms	374	
40	Ring Spinning Frames 8" x 23/4" Ring SKF PK 225 Drafting with x 3 Type Arms	1,780	
		4,011	4,011
	Accessories	320	
	Spares	400	
	Mill Clothing (bobbins, cans etc.)	800	
	Testing Laboratory	50	
		1,570	1,570
	Spinning Machinery Cost	FOB	5,581

UNIT 000'S

V.2 Preparing and Weaving Machinery Cost

480	Spindles Fully Automatic Winding	1,483
	Electronic yarn clearing; complete	247
8	Automatic Pirn winders of 36 spindles each	228
3	High speed Warping Machines with Magazine Creels and electric Stop Motions	135
1	Sectional Warping Machine Complete	55
2	Complete Sizing Machines with automatic Moisture and Tension Controls	300
1	Size cooking and homogenising set	35
500	Fully Automatic Looms 54" width in Reed	5,500
3	Inspecting/Mending motorised tables	30
3	Cop Stripping machines	60
4	Automatic Knotters	160
	Total Preparing and Weaving Machinery	8,233
	Spares and Accessories 15%	1,235
	Preparing and Weaving Machinery Cost FOB	9,468

UNIT 000'S

V.3 PROCESSING AND FINISHING MACHINERY COST

		FOB Price	
1	Shearing and Cropping Machine	113	"
1	Singeing Machine	93	"
1	Two-Stage Bleaching & Washing Range	500	"
1	Heat-Setting Stenter	335	"
1	Chain Mercerising Machine	440	"
1	Drying Maching	60	"
1	Thermosol Hot Flue Dyeing Range	150	"
1	Pad-Steam Dyeing Range	360	"
4	Totally enclosed Jig Dyeing Machines	180	"
1	Mangling and drying set	80	"
1	Brushing and Batching Machine	20	"
1	Screen Printing set with Dryer	386	"
1	Set Screen making and accessories	336	"
1	Transfer Printing Machine	100	"
1	Steam Ager	230	"
1	Washing and Drying Range	441	"
1	Resin Baking Chamber	100	"
1	Horizontal Pin Stenter	256	"
1	3 Bowl Schreiner Calender	103	"
4	Rolling and Lapping Tables	77	"
1	Yarn Dyeing set (optional)	125	"
1	Stamping and Baling Machine	15	"
1	Colour Kitchen complete	115	"
1	Wet Process Laboratory	125	"
		4,740	
	Accessories and Spares 15%	711	
	Processing and Finishing Machinery Cost	5,451	

ENGINEERING INFORMATION, COSTS

V. 4 SERVICES

V.4.1	Complete Air Conditioning System for Spinning, and Preparing and Weaving	1,050
V.4.2	Power and Lighting Distribution	980
V.4.3	Fire Protection including sprinkler system	310
V.4.4	Maintenance Working Equipment	182
V.4.5	Steam Raising Plant Complete	410
V.4.6	Steam and Water Distribution	268
	Total Equipment for Services	3,200

NOTE:

V.4.1 is based on cost of similar Project in Africa.

V.4.2 is based on October 1977 Estimate.

V.4.3 is based on 1974 Project adjusted to 1977 Prices.

V.4.4 is based on 1974 Project adjusted to 1977 Prices with 100% additional machinery to enable the plant to be independent and efficient.

V.4.5 and V.4.6 are based on 1974 Project adjusted to 1977 Prices.

V.5 BUILDING COST INCLUDING SITEWORKS

Main Pavilions	Dimensions in FEET		Sq/Feet		$
Spinning	180 x 400	=	72,000 x 20	=	1,440,000
Preparing and Weaving	180 x 450	=	81,000 x 20	=	1,620,000
Processing & Finishing	180 x 400	=	72,000 x 20	=	1,400,000
Productive space			225,000		4,500,000
Auxiliary Buildings					
Lean to Rooms	24 x 400		9,600 x 12		115,200.
Along side all	24 x 450		10,800 x 12		129,600.
Main Buildings	24 x 400		9,600 x 12		115,200.
Cotton Store	60 x 162		9,720 x 15		145,800
Finished Goods Store	60 x 162		9,720 x 15		145,800
Boiler Room	60 x 54		3,240 x 15		48,600.
Canteen	60 x 72		4,320 x 20		86,400
Gatehouse & Medical	30 x 36		1,080 x 20		216,000
Training Centre	60 x 54		3,240 x 15		48,600.
Auxiliary Buildings			61,520		1,051,200
Estimated Cost of Siteworks depending on choice of location					448,800.

Summary

Mill Buildings	4,500,000
Siteworks	448,800
Auxiliary Buildings	1,051,200
Total Building and Sitework Cost	$6,000,000

V.6 POWER AND LIGHTING

MACHINERY	KW	POWER USE	KW MAXIMUM	HOURS	K WH	TOTAL
INSTALLED	INSTALLED	FACTOR	DEMAND	DAILY	DAILY	KWH
Spinning						
Blowroom	48	80	38	24	912	
Cards	180	90	162	24	3,888	
Waste Removal	15	50	8	24	192	
Combing Section	25	75	19	24	456	
Drawing	54	75	41	24	984	
Roving	120	70	84	24	2,016	
Spinning	880	90	792	24	19,008	
Travelling Cleaners	20	90	18	24	432	
Rotary Filters	160	50	80	24	1,920	
	1,502		1,142		29,808	29,808
Weaving						
Winding	245	65	159	24	3,816	
Pirn Winding	64	65	42	24	1,008	
Pirn Stripping	5	50	3	16	48	
Warping	35	50	17	24	408	
Sizing	40	60	24	24	576	
Looms	600	85	510	24	12,240	
Inspection	5	50	3	16	48	
	994		758		18,144	18,144
Summary from next page						
Processing	752		474		6,712	
Services	1,680		1,437		33,512	
GRAND TOTALS	4,928		3,811		88,176	88,176

Power Cost at current Electricity Board estimated rate:
88,176 KWH x $0.07 = $6,172.32 x 300 days = $1,851,696

Note Power is not available from the Freetown supply at present but several additional generators are on order.

But in view of the large requirement of Power an estimate is given on the following page for own Diesel-Generators.

MACHINERY INSTALLED	KW INSTALLED	POWER USE FACTOR	KW MAXIMUM DEMAND	HOURS DAILY	K WH DAILY	TOTAL KWH
PROCESSING						
1. Shearing	10	70	7	16	112	
2. Singeing	8	60	5	8	40	
3. Bleaching	70	70	49	16	784	
4. Washing	15	70	11	16	176	
5. Heat Setting	100	60	60	8	480	
6. Mercerising	110	60	66	16	1,056	
7. Drying	10	60	6	16	96	
8. Thermosol	40	60	24	8	192	
9. Pad Steam	40	60	24	16	384	
10. Jiggers	12	70	11	16	176	
11. Mangling	10	60	6	8	48	
12. Brushing	10	70	7	8	56	
13. Printing	90	70	63	16	1,008	
14. Steaming	12	50	6	16	96	
15. Heat Setting	-	-	-	-	-	
16. Washing	15	70	11	16	176	
17. Resin Baking	12	60	7	8	56	
18. Stentering	150	60	90	16	1,440	
19. Calendering	22	60	13	16	208	
20. Inspecting	-	-	-	-	-	
21. Rolling Lapping	6.	50	3	16	48	
22. Stamping	-	50	-	16	-	
23. Baling	10	50	5	16	80	
	752		474		6,712	6,712
SERVICES						
Air Conditioning	985	90	887	24	21,288	
Boilers	50	90	45	24	1,080	
Workshops	100	50	50	16	800	
Water System	75	90	68	24	1,632	
Miscellaneous	120	60	72	16	1,152	
Lighting	350	90	315	24	7,560	
	1,680		1,437		33,512	33,512

V.7 ESTIMATED COST OF OWN DIESEL GENERATED POWER

BASIC DATA

Diesel Fuel consumption per 1200 KVA Unit		
Based on 1460 brake House power	= 0.356	lbs/hr
1460 x 0.356	= 520	lbs/hr/unit
Lubricating oil consumption per 1200 KVA Unit	= 0.475	gallons/ engine/hour
Required KVA (KW of Maximum Demand)	= 3.811	
Rating of each Unit, KVA	1.200	
Number of sets required	3.18	
Number of sets to be installed	4	

Fuel Cost Calculations based on Current Duty free Price

Diesel Fuel

Number of Units running continously 3.18 x 520 lbs fuel	= 1654 lbs
1654 lbs x 24 hours x 300 days	= 11,908,800 lbs
÷ 10 lbs per gallon (specific gravity 1.0)	1,190,880
X Correction for specific gravity (0.869)	= 1,370,400
1,370,400 x $0.61 (fuel price)	= $835,946

Lubricating Oil

Number of Units running continuously	= 3.18 x 0.475 gallons/hr
	= 1.5105 gallons/hr
1.51 gallons x $4.6 x 24 hours x 300 days	= $50,011
Total Fuel & Lube Oil cost	= $885,957

ESTIMATED CAPITAL COST OF 4 DIESEL GENERATORS FOR COSTING PURPOSES

Based on November 1977 Budget Estimate for 4 -1200 KVA Units of Type BRK 3 C, 750 RPM for continuous running, with 10 KV alternators and exciters, waste heat recovery system, complete with lub. oil system, exhaust system, fuel system (except bulk tanks). Cooling equipment, start-up panel and a 10 KV switch board complete, with 300 KVA transformer and 3 off 10 KV/380 volt transformers each rated at 1500 KVA.

Budget Price	1,366,550	
Plus 8% for CIF charges	109,324	
Plus 10% for customs clearance & erection	136,655	
Plus spares for 3 years	85,897	
Total cost of Machinery	$1,698,426	say 1,700
Depreciation @ 10%	170,000	
Building Cost (4,000 sq/ft) x $30 =	120,000	
Depreciation @ 4%	4,800	
Total Depreciation cost	$ 174,800	
Interest @ 10% mean rate	$ 170,000	
Labour & share of overhead est.	$ 100,000	

TOTAL ESTIMATED COST OF OWN GENERATED POWER

Fuel and Lubricating Oil	885,957
Depreciation: Machinery & Buildings	174,800
Interest	170,000
Share of Labour and Overhead	100,000
	1,330,757 p.a.

Estimated Power Consumption from Schedule V.6

88,176 KWH Daily x 300 Days = 26,452,800 KWH

Cost per KWH:

$1,330,757 ÷ 26,452,800 = 5.03 US cents/KWH

For reasons of conservatism the cost of power in this study section V.6 was calculated at the Electricity Board rate of 7.00 US Cents/KWH

Estimated Capital Cost:

Machinery	1,700,000
Buildings and Tanks	120,000
	$1,820,000

If own Generators are required the Capital investment should be increased by this figure.

FUEL PRICE DATA - 29 NOVEMBER 1977

(UNIT Le. Imp. Gallon 1.08 Le=1.00 $)

	Duty Free	Duty Free	Paid
Diesel Fuel S.L. Cents/Gallon	66	32	98
Fuel Oil	57	32	89
Lubricating Oil	500		
Premium Gasoline	115	31	146
Regular Gasoline	111	31	142
Kerosene	86	9	95

Net delivered Prices in Bulk per Imperial Gallon, in 20 Mile radius of Freetown.

SPECIFICATIONS	Fuel (Oil)	Gas Oil
Specific Gravity @ 60°/60°F	0.938	0.869
Flash Point	240	196
Total Sulphur % Unit	0.70	0.20
Kinematic Viscosity	109 (122°F)	5.1 (100°F)
Pour Point °F	+70	+40
Carbon Residue (Conradson) % Unit	3.14	0.05
Water by distillation % Vol.	0.05	0.05
Sediment by Extraction % Wt.	0.02	0.001
Ash content % Unit	0.003	0.002

VI.1. RAW MATERIAL REQUIREMENTS

4,710,420 lbs of Raw Cotton x 66 cents/lb	=	3,108,877
1,356,300 lbs of Polyester fibre x 50 cents/lb	=	678,150
Total annual Fibre Requirements		3,787,027

Note: The Index price for 1 1/6" S.M. Cotton on 14.11.77 was 57.3 US Cents/lb.

The estimated cost of the special 1 1/8" - 1 3/16" staple length Strict Middling cotton for blending with 1½" cut -staple Polyester is currently 66.0 US cents/lb.

There is over-production world wide of 1½" Staple Polyester and very substantial discounts can be negotiated by buyers of large quantities. 50 US cents/lb is taken as an average quotation subject to confirmation at moment of purchase.

Cotton is more expensive than Polyester at present and yarns made from pure cotton e.g. Carded 100% cotton was quoted at £1.52 in July 1977 compared with 100% Polyester at £1.34. The difference of 18 cents/lb was due to the difference in raw material cost. Allowing for higher waste in the case of cotton this is equivalent to 16 cents differential in raw material prices.

VI. COSTING INFORMATION

VI.2 STAFF AND LABOUR — CENTRAL ADMINISTRATION

GRADE	POSITION	1ST SHIFT	2ND SHIFT	3RD SHIFT	DAY	TOTAL
1	General Manager				1	1
1	Assistant G.M.				1	1
B	Chief Accountant				1	1
C	Cost Accountant				1	1
1	Assistant Accountant				2	2
2	Cashier				1	1
1	Secretary				1	1
2	Assistant Secretaries				2	2
4	Clerks, Typists				4	4
3	Telephonist				2	2
D	Head Storekeeper				1	1
1	Stores Clerks				1	1
4	Stores Clerks				8	8
8	Stores Labourers				8	8
B	Sales Manager				1	1
1	Chief Salesman				1	1
4	Sales Clerks Typists				8	8
C	Purchasing Manager				1	1
1	Purchasing Assistant				1	1
4	Purchasing Clerks				6	6
1	Personnel Manager				1	1
2	Personnel Assistant	1	1	1		3
4	Personnel Clerks	2	2	2	6	12
3	Head Porter				1	1
5	Security Guards	10	10	10		30
7	Gardeners				10	10
2	Nurses	1	1	1		3
4	Assistant Nurses	1	1	1		3
4	Canteen Chiefs	1	1	1		3
7	Canteen Assistants	3	3	3		9
1	Quality Control				1	1
2	Laboratory Chief				1	1
5	Laboratory Assistants	3	3	3		9
8	Labourers	6	6	4		16
	CENTRAL ADMINISTRATION	23	20	26	72	154

V.C.2 STAFF AND LABOUR SUPERVISION AND INDIRECT SERVICES

GRADE	POSITION	1ST SHIFT	2ND SHIFT	3RD SHIFT	DAY	TOTAL
B	Manager				1	1
1	Assistant Manager				1	1
5	Clerks				4	4
D	Shift Manager	1	1	1		3
D	Maintenance Manager				1	1
1	Assistant Maintenance				1	1
4	Mechanics	4	4	4		12
3	Electricians	2	2	2		6
6	Assistant Electricians	2	2	2		6
7	Oilers	2	2	2		6
7	Spindle Setter				1	1
8	Cleaners				6	6
8	Sweepers	2	2	2		6
8	Yarn Carriers	2	2	2		6
7	Tape Binders	1	1	1		3
7	Pneumafil Minders	1	1	1		3
8	Traveller Cangers	1	1	1		3
8	Labourers	10	10	4		24
2	Foremen	4	4	4		12
1	Asst.Shift Manager	1	1	1		3
5	Travelling Cleaners	1	1	1		3
3	Instructors				2	2
		34	34	28	17	113

V1.2 STAFF AND LABOUR OPERATIVES AND LABOUR SPINNING

GRADE	POSITION	1ST SHIFT	2ND SHIFT	3RD SHIFT	DAY	TOTAL
6	Blowroom	2	2	2		6
6	Card	2	2	2		6
6	Drawing	6	6	6		18
6	Combing Section	2	2	2		6
6	Roving	3	3	3		9
6	Ring Spinners	10	10	10		30
8	Doffers	8	8	8		24
5	Head Doffer	1	1	1		3
6	Auto Cone Winding	10	10	10		30
8	Machine Cleaners	2	2	2		6
8	Waste Collectors				2	2
Operatives and Labour		46	46	46	2	140
Supervisional & Indirect		34	34	28	17	113
Total Spinning		80	80	74	19	253

VI.2. STAFF AND LABOUR SUPERVISION : INDIRECT PREPARING & WEAVING

GRADE	POSITION	1ST SHIFT	2ND SHIFT	3RD SHIFT	DAY	TOTAL
1	Weaving Manager				1	1
1	Asst. Weaving Manager				1	1
1	Preparation Supervision	1	1	1		3
1	Preparation Assistants	1	1	1		3
1	Weaving Supervisor	1	1	1		3
1	Weaving Assistants	1	1	1		3
5	Loom Overlookers	5	5	5		15
2	Loom Assistants	10	10	10		30
1	Training Officer				1	1
1	Training Assistant				1	1
1	Maintenance Supervisor				1	1
1	Maintenance Assistant				1	1
3	Production Clerk				1	1
5	General Clerks	2	2	2		6
3	Maintenance Mechanics	3	3	3		9
5	Maintenance Mechanic Asst	3	3	3		9
7	Oilers	1	1	1		3
3	Instructresses				4	4
7	Drawing-in	6	6	3		15
6	Knotters	3	3	3		9
6	Beam Gaiters	3	3	3		9
8	Sweeper and Cleaners	4	4	4	8	20
3	Electricians	1	1	1		3
5	Asst. Electricians	2	2	2		6
5	Trainees				10	10
		47	47	44	29	167

VI.2. STAFF AND LABOUR OPERATIVES AND LABOUR PREPARING AND WEAVING

GRADE	POSITION	1ST SHIFT	2/D SHIFT	3RD SHIFT	DAY	TOTAL
6	Winding Operatives	5	5	5		15
6	Pirn Winding	4	4	4		12
8	Pirn Stripping	2	2	2		6
6	Warping	3	3	3		9
7	Warping Creelers	3	3	3		9
6	Sizing Operatives	2	2	2		6
7	Sizing Assistants	2	2	2		6
6	Size Preparing	1	1	1		3
8	Dobbin and Beam	5	5	5		15
7	Repairers	2	2	2		6
8	Labourers	8	8	8		24
6	Weavers	25	25	25		75
8	Battery Fillers	5	5	5		15
8	Cloth Carriers	2	2	2		6
7	Cloth Examiners	3	3			6
8	Loom Cleaners				10	10
8	Waste Collectors	1	1			2
		73	73	69	10	225

VI.2. STAFF AND LABOUR

		SUPERVISION & INDIRECT			PROCESSING AND FINISHING	
GRADE	POSITION	1ST SHIFT	2ND SHIFT	3RD SHIFT	DAY	TOTAL
B	Processing Manager				1	1
1	Assistant Manager				1	1
C	Chief Chemist				1	1
1	Assistant Chemist				1	1
3	Production Clerk				1	1
5	Clerks				5	5
D	Shift Supervisors	1	1	1		3
1	Shift Assistants	1	1	1		3
D	Maintenance Supervisor				1	1
1	Maintenance Assistant				1	1
3	Cloth Storekeeper				1	1
5	Cloth Assistant	1	1	1		3
3	Maintenance Mechanics	2	2	2		6
5	Maintenance Assistants	2	2	2		6
3	Electrician	1	1	1		3
5	Electricians Assistants	2	2	2		6
		10	10	10	13	43

VI.2. STAFF AND LABOUR OPERATIVES AND LABOUR PROCESSING & FINISHING

GRADE	POSITION	1ST SHIFT	2ND SHIFT	3RD SHIFT	DAY	TOTAL
6	Shearing Operator	1	1			2
6	Singing	1	1			2
5	Bleaching	2	2			4
6	Bleaching Assistants	2	2			4
6	Heat Setting	1				1
7	Heat Setting Asst.	1				1
5	Mercerising	1	1			2
6	Mercerising Asst.	2	2			4
6	Hot Flue Dyeing	1				1
7	Hot Flue Asst.	1				1
5	Pad-Steam Dyeing	1	1			2
7	Pad Steam Asst.	2	2			4
6	Jig Dyeing	2	2			4
6	Mangling, Drying	1				1
6	Brushing, Batching	1				1
7	Brushing Assistant	1				1
C	Printing Supervisor	1				1
[illegible]	Printer	2	2			4
D	Engraving Supervisor				1	1
1	Engraving Assistant	1	1			2
2	Colour Kitchen Foreman	1	1			2
5	Colour Kitchen Asst.	2	2			4
6	Steaming	1	1			2
6	Washing Drying	1	1			2
7	Washing Assistant	1	1			2
6	Resin Baking	1				1
5	Stentering	1	1			2
6	Calendering, Finishing	2	2			4
7	Calendering Asst.	2	2			4
6	Inspecting Mending	4	4			8
7	Making Up	4	4			8
5	Screen Maker				1	1
5	Transfer Print	1	1			2
7	Transfer Asst.	1	1			2
5	Clerks				5	5
6	Transport	4	4			8
7	Baling Sewing	1	1			2
		52	43		7	102

VI.2. STAFF AND LABOUR SUPERVISION AND INDIRECT SERVICES

GRADE	POSITION	1ST SHIFT	2ND SHIFT	3RD SHIFT	DAY	TOTAL
C	Works Engineer				1	1
1	W. E. Assistant				1	1
4	Air Conditioning	2	2	2		6
4	Boilers	1	1	1		3
7	Boiler Assistant	1	1	1		3
4	Transport Mechanic	1	1			2
6	Transport Assistant	2	2			4
5	Transport Drivers	3	2	1		6
5	Fork Lift Drivers	2	2	2		6
4	Mechanics Skilled				20	20
6	Mechanics Semi-Skilled				10	10
C	Chief Electrician				1	1
1	Chief Assistant				1	1
5	Clerks Typist				2	2
8	Labourers				12	12
		12	11	7	48	78

VI.2. STAFF SALARIES AND WAGES ADOPTED FOR FEASIBILITY STUDIES

BASIS: OCTOBER 1977 US$ ANNUAL SALARIES INCLUDING HOLIDAYS

CAT.	INTERNATIONAL STAFF	NIGERIA	SIERRA LEONE
A	General Manager	50	40
B	Plant Manager	35	30
C	Technical Staff	25	20
D	Juniour Technical Staff Plus Fringe Benefits, holidays and travel 20%	15	12.5
	LOCAL STAFF		
1	Foremen-Top Secretaries - Purchasing	3.5-6.0	2.0-4.5
2	Clerks - Mill typists	3.0	1.5
3	Instructors	2.5	1.25
4	Skilled Tradesmen	2.0	1.0
5	Semi-skilled Tradesmen	1.75	0.8
6	Machine Operatives	1.5	0.75
7	Operatives in Training	1.2	0.65
8	Labourers and Starters Plus 20% for Fringe Benefits	1.0	0.6
	Intermediate Categories		
	Office Manager	12.0-16.0	12.0-14.0
	Personnel Manager	10.0-15.0	6.0
	Salesman	10.0	6.0

These salaries and wages applied to medium scale Industries in mid 1977.

UNIT 000'S

VI.2 STAFF AND LABOUR COST SUMMARY

DEPARTMENT	LOCAL GRADES 1	2	3	4	5	6	7	8	INTERNATIONAL GRADES A	B	C	D	E	TOTAL
CENTRAL ADMINISTRATION	8	10	3	44	39	-	19	24	1	3	2	1		154
Spinning														
Supervision & Indirect	5	12	3	12	7	6	13	45		1		4		113
Operatives & Labour					3	105		32						140
PREPARING & WEAVING														
Supervision &Indirect	9	30	17		31	18	18	20		1		8	15	167
Operatives & Labour						120	27	78						225
PROCESSING & FINISHING														
Supervision & Indirect	6		11		20					1	1	4		43
Operatives & Labour	2	2			22	37	25	8			1	1	4	102
SERVICES														
Supervision & Indirect	2			31	14	14	3	12			1	1		78
TOTAL PERSONNEL	32	54	39	87	136	300	105	219	1	6	5	19	19	1,022
Annual Base Salary (Sierra Leone)	3.5	1.5	1.25	1.0	0.8	0.75	0.65	0.6	40	30	20	15	12.5	
Social Charges and Travel	0.7	0.3	0.25	0.2	0.16	0.15	0.13	0.12	8	6	4	3	2.5	

UNIT 000's

VI.2 STAFF AND LABOUR COST SUMMARY

DEPARTMENT	LOCAL GRADES								INTERNATIONAL GRADES					TOTAL
	1	2	3	4	5	6	7	8	A	B	C	D	E	
Total Annual Salary	4.2	1.8	1.5	1.2	0.96	0.9	0.78	0.72		36	24	18	15	
Total Annual Cost	134	97	59	104	131	270	82	158		216	120	342	285	

STAFF & LABOUR TOTALS — 1,035 (for 972 Local Staff and workers) — 1,011 (for 50 International Staff)

STAFF AND LABOUR GRAND TOTAL — 2,046

UNIT 000's

VI.3. MANUFACTURING COST SUMMARY

			% of Total Cost
1	Raw Materials	3,787	23.4
2	Staff and Labour	2,046	12.6
3	Power and Lighting	1,852	11.4
4	Mill supplies and Maintenance Materials	713	4.4
5	Fuel	472	2.9
6	Water	94	0.6
7	Chemicals and Dyes	1,230	7.6
8	Administration	236	1.5
9	Interest on Machinery Credits	1,120	6.9
10	Interest on Loans and Debenture	1,440	8.9
11	Depreciation Machinery	2,963	18.3
12	Depreciation Buildings	240	1.5
	Total Cost including Financial Costs and Depreciation	16,193	100.0%
	Annual Estimated Production	16,000 Linear Yards = 1.012	

UNIT 0001s

VI.4. MILL SUPPLIES AND MAINTENANCE

Lubricants

Gasoline for Transport

Engineering Spares

Electrical Maintenance Spares

Stencils

Cleaning Material

Stationery for factory use

Building Maintenance Material

Based on 2% of installed fixed cost items annually

35,625 x 2% = £ 713

VI.5 FUEL COSTS

Estimated Steam Consumption — 20 Kilos per Kilo of cloth

Annual Consumption 20 x 2,145,000 = 42,900,000 Kilos

Fuel Consumption basis 10 Kilos steam per Kilo fuel

Fuel Consumption $\frac{42,900,000}{10}$ = 4,290,000 Kilos

Estimated Cost of Fuel = US 110 per 1000 Kilos delivered mill

110 x 4,290 = 471,900.

UNIT 000's

VI.6 WATER COSTS

The final cost of water depends on choice of mill site and the most economical method is to draw water from own boreholes providing that sufficient is available from the subsoil.

Drinking water and that required for social uses will be bought from the city supply.

But it has been assumed for conservative costing purposes that all water will be purchased at 1.0 US $ per 1,000 gallons. Weight of Cloth processed annually based on 4.7 ounces per linear yard.

$$\frac{16{,}000 \times 4.7}{16} = 4{,}700 \text{ lbs}$$

Water required at 20 gallons per lb. of cloth processed =

4,700 x 20 gallons 94,000

94,000 thousand gallons x 1.00 per 1000 gallons

= $94

Based on Guna Water Board rate of Le0.90 per 1000 gallons plus General Water Rate estimated at Le0.20 per 1000 gallons = Le 1.10 or approximately 1 US $.

UNIT 000's

VI.7 CHEMICALS AND DYES

	COST PER LINEAR YARD
Bleached Finished Cloth	3
Plain dyed cloth	8
Printed piece Goods	8
Printed Shirting	6
African Prints	8
Java Prints	12

REQUIRED ANNUAL PRODUCTIONS US

Bleached Piece Goods	625 x 0.03	=	18,750
Bleached Shirting	1500 x 0.03	=	45,000
Plain dyed Piece Goods	625 x 0.09	=	56,250
Plain dyed Shirting	1500 x 0.08	=	120,000
Printed Piece Goods	1250 x 0.08	=	100,000
Printed Shirting	1500 x 0.06	=	90,000
African Prints	7000 x 0.08	=	560,000
Java Prints	2000 x 0.12	=	240,000
	16,000		1,230,000

Costs based on dyeing cost in other African countries, such as Nigeria, Ghana and Zambia.

UNIT 000's

V.6. ADMINISTRATION

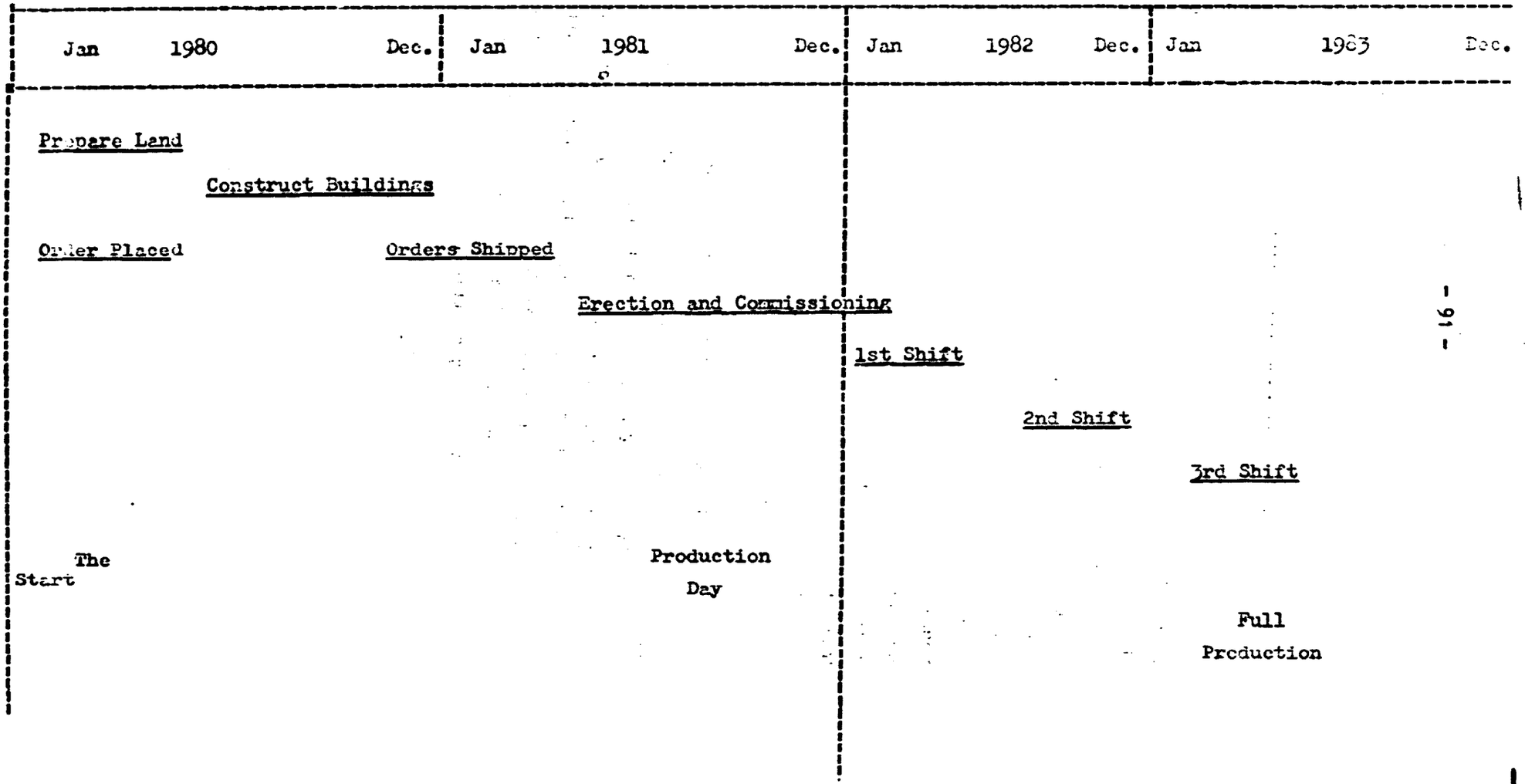
INCLUDES:

Directors Fees
Selling Expenses
Post Telephone Cables
Printing and Stationery
Insurances
Legal and Audit Fees
Banks Charges
Subscriptions
Donations
Office Maintenance
Travelling Expenses
Miscellaneous
Estimated Total 236

Based on similar factory elsewhere in Africa.

Note: For the purposes of this study Administration does not include the fees of a possible future Textile Management Company because there is no firm basis for calculation. It is essential that the Cash Flow should be sufficient to cover the fees of a technical and management partner and that Pre-Operational costs should be foreseen even if they cannot be quantified.

VII. 1 PLANNING TIME-SCALE



VII. PLANNING TIME-SCALE

OPERATION METHODOLOGY AND TRAINING

VII.2 Analysis of Planning Time-Scale

This is a large Textile Project by World standards and a very large industrial possibility by Mano River Union standards: so large that it may appear to be impossible to many people. But it should be remembered that Nigeria had no modern Textile Industry twenty years ago whereas there are now several very important modern mills which are each several times the size of this large Textile Project. Ten years ago there was no Textile Industry in Zambia which is similar in population and consumption of cloth to Mano River Union, Kafue Textiles of Zambia was started in 1968 on a similar scale to the projected Mano River Union Mill. In spite of experiencing the usual teething troubles this factory has recently been making a very important contribution to the Zambian economy; the balance of payments situation became acute owing to the reduced revenue from copper and owing to Zambia's geographical situation. Kafue Textiles is saving the country 12 millions of dollars in foreign exchange each year much information was gained from the experience of starting a large Textile Industry from scratch, and it is proposed to base the planning of Mano River Union projected Union Industry on what actually happened in Zambia.

The Government accepted the detailed feasibility study without delay and decided to implement it with the assistance of International Consultants through the Zambian Development Corporation.

Zambia is a land-locked country which had a large income from mining that was amply sufficient ten years ago to provide funds for selected industrial development.

In Sierra Leone initial studies were made from a marketing point of view by a UNIDO Expert who was attached to the Ministry of Trade and Industry in Freetown for several years. As a result of several marketing and general studies, the Sierra Leone Government included a Project for a vertical integrated Cotton Textile Plant in the latest Development Plan (see page 180). A large Textile Project is also mentioned in the Sanderson and Porter Report in a superficial and incorrect snippet (pages 45-47). The present detailed pre-investment study gives an up-to-date picture of the technical parameters of a typical vertical, integrated Textile Industry, with sufficiently detailed costings to show what is involved, starting with the total investment required, which is US $40,000,000.

The implications of this Project, which is only one of ten possible Textile Projects for Mano River Union, will need time to digest. The second most important Textile Project for Synthetic Blend Suitings has been submitted at the last Meeting of the Union Ministerial Council. It calls for an investment of US $9,000,000.

The Planning Time-Scale for the integrated Cotton and Blend Mill will depend on the reception given to this study which is difficult to foresee. The possibilities of financing even for such an excellent conception as the Mano River Union, which commands great World sympathy and which is being watched with friendly interest by many countries, are not unlimited. There are many other viable Projects which may be accorded a higher priority, rightly or wrongly, by the Mano River Union Countries.

Certain assumptions have to be made, rightly or wrongly, in order to outline any sort of Planning Time-Scale in pre-investment studies:

Presentation of pre-investment study	December 1977
Discussions in the Mano River Union Secretariat, Union Ministerial Council and by Governments of the Member States.	January 1978 - December 1978
Supposing a decision to try to implement the Project: - negotiations with possible Sources of Finance and Equity Capital	January 1979 - June 1979
Preparation of Final Project study requesting UNIDO support, and advise on sources of machinery and equipment. Preparation of Tender Documents for International Bid procedures.	January 1979 - June 1979
Decision to go ahead, followed by placing of Orders.	July 1979 - December 1979

The Planning Time-Scale Diagram is based on the foregoing assumptions. The start is taken as January 1980 but the Time-scale could equally well commence earlier or later, or not at all if the Project is not approved!

Presuming that the Ministerial Council has agreed on the general location, a suitable site should have been allocated, with the agreement of the technical management. It is imperative to make soil tests before it is finalised, the land should be levelled and cleared without delay, the perimeter fence, porter's lodge and two small buildings such as the canteen and training center should be built immediately to serve as lock-up stores during erection of machinery and installation of power distribution and services. Several thousand cases and large amounts of essential and very valuable equipment will be delivered to the mill site during a

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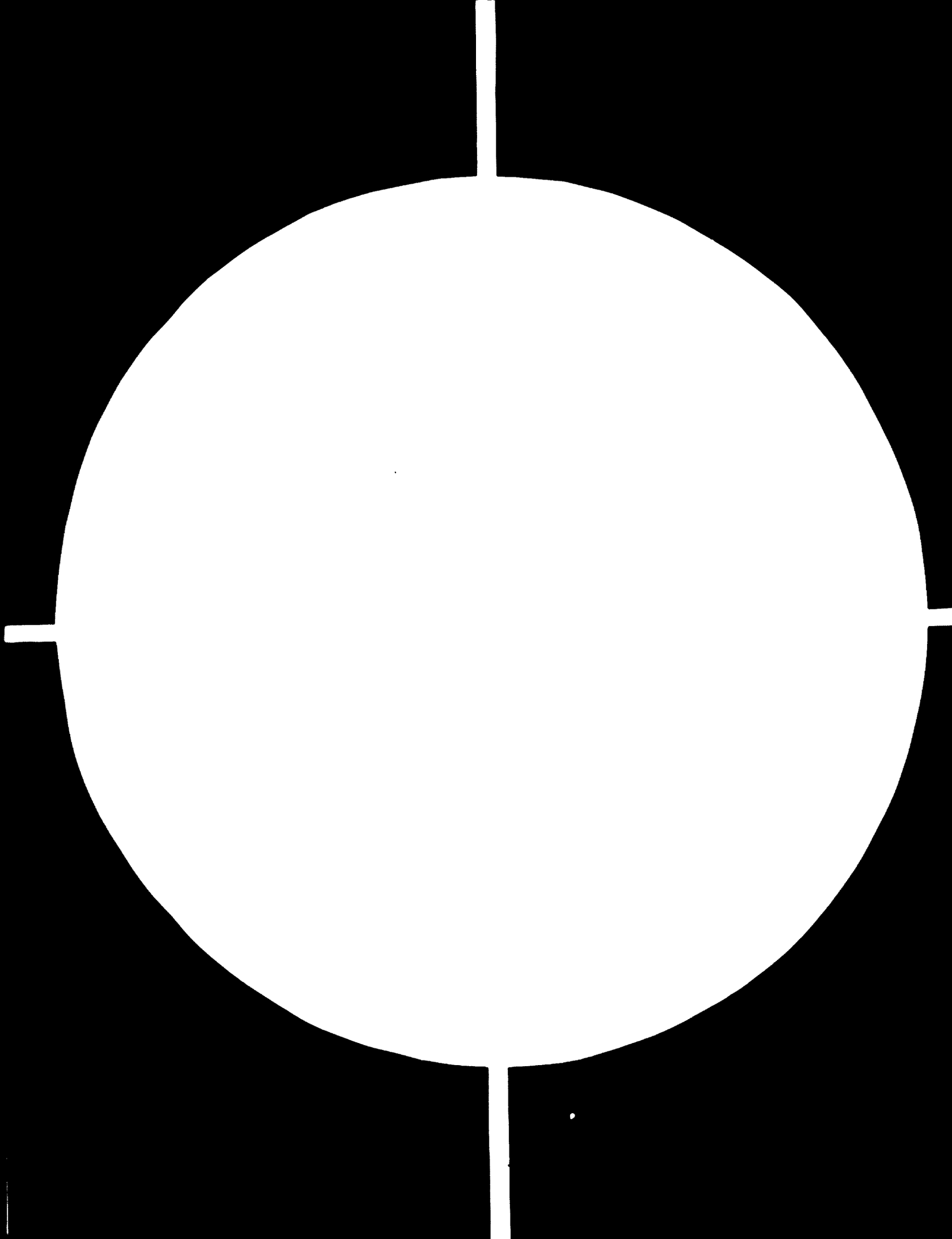
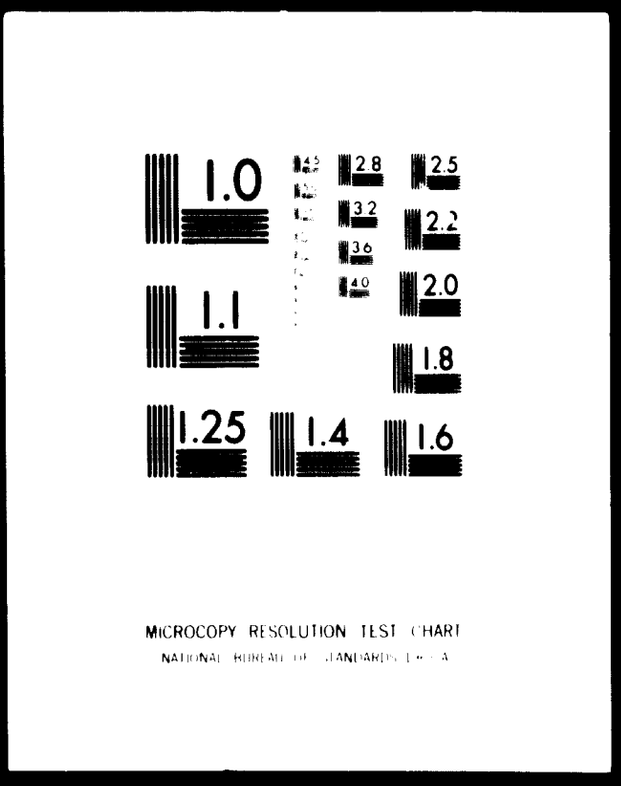




period of nine months. It is therefore best to build one of the permanent stores immediately to serve as a thief-proof storage placed under a 24 hour security.

The main factory entrance should be paved and all internal roads should be completed before arrival of machinery; they should be ready before the rains as they are essential to the progress of erection of buildings, machinery and equipment.

The concrete floors of spinning and weaving should be poured on beds of broken stone with light re-inforcing. It should be remembered that the original machines will still be producing in the year 2000 if they are correctly installed and maintained. Deep channels are required in the floors for return air from the conditioning plants and they also serve for Power Distribution at minimum cost. Heavier re-inforcing will be made to support the Processing and Finishing machinery, with large drains and culverts.

Many of these large standarised Projects use pre-fabricated steel buildings in order to simplify construction and to control at least part of the building costs. In the case of turn-Key Package deals the structural steelwork can be included in the total package with suitable financing. If the steel buildings are purchased from reliable suppliers they will be delivered punctually and they will accelerate the whole construction program. One movable crane on site will enable all steel framework to be erected in a matter of weeks, provided that column foundations are in place.

Power distribution wiring is a separate major item for a Mill of this size, but it can be done in a few months if it is planned meticulously and installed under supervision of the supplier, who will use as much local labour as possible and train them on site. The best of them should be retained for use in the electrical services. Power wiring should be complete to each pre-planned out-let in the floors before the arrival of the main machinery.

The Air Conditioning equipment should be in place by the eighteenth month, which is June 1981, so that the atmosphere will be controlled whilst the machines are being commissioned.

At present the machinery makers are suffering from slack orders and it would be easy to secure deliveries for shipment 8-18 months from time of order. No one can foresee what the position may be in 1980. Prices and deliveries may be completely different if the next textile boom takes place before that date.

Twelve months have been allowed for machinery erection and trail running. Strong teams of international machinery erectors should be backed up by chosen local personnel. A nucleus of local staff should have been trained abroad in the suppliers' workshops during the manufacture of the actual machines destined for the factory. Training schedules are suggested in Chapter VII.4. This experience is essential where the Project is being started with as much local staff as possible because there is no knowledge of the latest conventional machinery in Mano River Union. UNIDO can be consulted for advice and practical assistance in this extremely important training program.

The Final Project study for which UNIDO support is suggested, will provide full, detailed plans elevations and technical literature from the suppliers of machinery, power equipment, air conditioning. Waste removal and Fire prevention material.

The objective is not merely to have all machines and equipment in place by Production Day; the machinery and equipment should all have been tried out by then and the first sections should have started on the simplest clothes i.e. standard print cloth because 73% of the production is to be printed.

ESTIMATED PRODUCTION DURING THE PRE-OPERATIONAL PERIOD

The object of the following estimates is to provide reasonable standards for production in the vital first two years of the Project after Production Day in January 1982.

Each Shift has been allowed eight months with the intention of reaching full normal treble shift by December 1983 i.e. 24 months have been allowed instead of the usual 18 months because of the absence of industrial background in Mano River Union. Unless this Time-scale is achieved there will be painful cash flow shortage in the critical first years.

Sufficient workers for two shifts should be screened and provisionally engaged for initial work on the first shift. After 8 months, half the work force will be semi-trained and ready to start up a second shift. They will be aided by a full complement of trainees for the third shift which will commence 16 months after Production Day.

The following calculations are necessary to illustrate the way in which production ought to be built up during the two year Pre-Op. period.

1st 8 Months from Production Day (1st January 1982)

Production should rise from zero to 100% of one shift by end August 1982.

Output can be rated at 50% of 33% of full 3 shift production during the first 8 Months or 16.7% of 3 shift capacity.

2nd 8 Months from Production Day (1st September 1982 - 30th April 1983)

Production in the second eight months should rise from 100% of one shift to 100% of 2 shifts.

Output can be rated at 50% of 3 shift production during the second eight months.

3rd 8 Months from Production Day (1st May 1983 - 30th December 1983)

Production in the third eight months should rise from 100% to two shifts to 100% of 3 shifts.

Output can be rated at 83.3% of 3 shift production during the third eight months.

It follows that the average production of the 24 month Pre-Operational Period should be:-

$\frac{16.7 + 50 + 83.3}{3}$ = 50% of full 3 shift production
3 shifts.

To attain these figures the work has to be organized methodically and modern training systems should be utilised.

A small, very carefully selected nucleus of skilled workers is necessary at the start because they are indispensable to getting the first section of each shift organised. There is a strong case for bringing several female instructresses as there is a pool of able ladies in Mano River Union who would make very valuable members of technical management. The able and effective female management of the Paramount Hotel shows what can be done.

The rest of the workers can be trained quickly even if they are new to textiles. Young workers without previous mill experience are ideal providing that an example of good work discipline and behaviour is insisted upon.

It can take years to install such fundamental industrial habits as punctuality, obedience to superiors and sustained effort for periods of several hours. But as there is so little industry and such willingness on the part of Sierra Leoneans and Monrovians to better themselves, there is no reason why a splendid workforce should not be recruited. The selection process will be long and unpleasant because many will be called and few chosen. The Company must have the right of hiring and firing otherwise it will never reach the production and quality required for successful operation.

VII. 3 REVIEW OF WORKING METHODS

The normal working schedule for most new Textile Mills during the past 30 year has been a six day week of 3 shifts daily at spinning and Weaving, with only two shifts at Processing, Dyeing and Finishing.

This Project has been planned accordingly. Each eight hour shift will be continuous so that the Spinning and Weaving will work without stopping for six 24 hour days. The work force specified is sufficient for every worker to have a break of 30 minutes in the middle of each shift without stopping the production machines. Alternatively a mobile canteen can be organised to dispense coffee, soft drinks and snacks to the workers at their machines. There may be a struggle to retain a full labour force on Saturday nights but absenteeism during agreed working hours should not be tolerated.

The high cost of installation makes the most modern system of continuous running during seven 24 hour days look very attractive. In many countries one or other of the 4 Group continuous systems is operating successfully because it reduces cost by increasing output; workers in advanced countries prefer the high wages and additional holidays which can be generated by continous running.

It will be up to the technical management chosen to operate the Company to choose which system to adopt; but this study is conservatively based on the classic treble shift system at spinning and Weaving followed by double shift at Finishing.

VII. 4 TRAINING OF STAFF AND WORKERS

Most Mills started in Africa during the past 15 years have paid insufficient attention to training. Consequently although wages are low productivity is proportionately lower, and the advantages of cheap labour are not being utilised. As an example it was found that some Textile Companies in Peru actually had labour costs higher per unit of production than those in U.S.A.

Great pains have been taken in planning this Project to simplify the production technologies and to choose an assortment of fabrics that is easy to make on modern machinery. There are few Mills in the World so standardised that they have one single finished width of cloth, 45", for a production of 16 million linear yards. The Mill can start with only two basic raw materials i.e. cotton and Polyester Cotton Blends, and there will be only two counts of yarn - 20's and 30's N.E. for the entire production.

There must be a large international staff at the beginning but there is no intention to retain them longer than necessary. They must be highly paid to enable the management to select first class staff and technicians who will be "BIG" enough to find and train their successors from educated nationals of the Mano River Union.

The requirements of staff and labour are given in detail in Section VI.2. The international staff should start with 50 persons which is less than in several other new projects. A local Assistant has been specified for the international staff; no less than 86 posts are in local staff categories 1 and 2 which carry good salaries to attract educated and able people of both sexes.

On the other hand it takes many years of work and practical experience to form even a graduate into a reliable Textile Executive or Manager.

When the cases of machinery arrive the entire staff should take part in machinery erection under the skilled machinery fitters, who will have been contracted on short term basis from the machinery makers. As many as possible of the local staff should be sent on courses which are provided by the machinery makers as part of their after-sales service in addition to management training abroad. The suppliers should also be required to supply complete schedules for the Preventive Maintenance of all machinery and equipment. The emphasis should be on practical experience as there are no soft jobs in the Textile industry; graduates who have spent upto 2 years abroad must be prepared to start all over again when they return; by inplant training they should come to understand what they have seen and heard abroad, so that they will be able to contribute useful work to the team.

.Training is required for both international and local staff i.e. re-training for the former and basic training for the latter. Assuming that the foreign staff will be drawn from one of the great World Textile Mills it is desirable that they should widen their horizons by visiting suppliers and teaching institutions, which they would never normally contact.

International bodies and friendly Governments will certainly consider requests for training facilities for such a Textile Project. UNIDO could be approached in the first instance through UNDP because UNIDO will be receiving copies of this study. Such a Project requires international concessionary financing to get off the ground and the International Financing Bodies should be pleased to hear that the vital problems of Training is being taken seriously.

SUMMARY OF RECOMMENDED STAFF TRAINING

INTERNATIONAL STAFF

[illegible]	FUNCTION	NUMBER OF PERSONS	DURATION	TYPE OF TRAINING
A	General Manager	1	6 Months	Visits to all suppliers and short Management Course.
B	Chief Accountant	1	4 Months	Course in practical Mill Control systems including Standard Cost and Waste Control.
B	Spinning, Weaving and Finishing	3	3 Months	Courses at each Supplier and Visits to Technology Schools.
C	Chief Chemist	1	6 Months	Courses at Selected Dyestuff makers.
C	Printing Supervisor	1	4 Months	Course at Printing and Transfer Printing and visits to Technology School.
D	Engraving Supervisor	1	4 Months	Courses at Screen Printing Supplier and visits to Transfer Printers.
	TOTAL	9		

The General Manager would benefit from a further six months training as a Day Shift Mill Manager.

LOCAL STAFF

GRADE	FUNCTION	NUMBER OF PERSONS	DURATION	TYPE OF TRAINING
1	Company Secretary	1	6 Months	Course in Company Organization.
1	Assistant Accountant	1	6 Months	Accounting and Costing.
1	Quality Control Chief	1	1 Year	Course in School of Technology and visit to Uster in Switzerland.
1	Assistant Managers	4	2 Years	In School of Technology plus visits to makers.
1	Personnel Manager	1	1 Year	In School of Technology and major Textile Mill.
1	Weaving Training Assistant	1	2 Years	In School of Technology.
1	Spinning, Weaving & Finishing Assistant Shift Managers	9	1 Year	In School of Technology.
1	Maintenance Assistants Spinning, Weaving & Finishing	3	6 Months	Courses of specialized suppliers of machinery and services.
1	Assistant Chief Electrician	1	9 Months	Courses at Power distribution suppliers and Diesel-Electric suppliers.
	TOTAL	23		Local Staff Members

UNIT 000's

ENGINEERING INFORMATION, COSTS

V.III.1 SUMMARY

V.1.	Spinning Machinery	5,581
V.2.	Preparation and Weaving Machinery	9,469
V.3.	Processing and Finishing Machinery	5,451
V.4.	Services	3,200
		23,700
	Estimated Cost of Packing, Freight, Insurance Port Handling, Clearing Inland Transport Erection Supervision and Installation	5,925
		29,625
V.5.	Siteworks and Buildings	6,000
	Working Capital and Contingencies	4,375
	Total Investment required	$ 40,000
	Suggested Capital Structure	
	Equity Capital	14,000
	Suppliers Credits	14,000
	Loans	12,000
		$ 40,000

v

UNIT 000's

VIII.2. WORKING CAPITAL REQUIREMENTS

Raw Materials	Cotton	6 months	1,554
" "	Polyester	6 "	339
Chemicals and Dyes		6 "	615
Finished Goods		½ month	675
Sundry Debtors		½ "	675
Wages		¼ "	85
Fuel		1 month	40
Power		½ month	77
Local Stores, Mill Supplies		2 months	119
Contingencies			196
			4,375

Notes: The stock of Finished Goods is valued at cost. Raw Materils, including Chemicals and Dyes, have been taken at 6 months of stock which is very conservative. Raw Cotton and Polyester Fibre are based on November 1977 prices, Chemicals and Dyes are based on a similar African project.

'000's

VIII.3. DEPRECIATION SCHEDULE

	$	Rate
Machinery and Installation	29,625	10%
Buildings	6,000	4%

Both rates are calculated on the straight method.

Annual Depreciation for 10 years.

Machinery	Buildings	Total
2,963	240	3,203

VIII.4 LOAN INTEREST AND REPAYMENT SCHEDULE

Machinery Credits

YEAR	AMOUNT	REPAYMENT	BALANCE	INTEREST 8%
- 2				
- 1	14,000		14,000	1,120
- 1			14,000	1,120
2		2,000	12,000	1,120
3		2,000	10,000	960
4		2,000	8,000	800
5		2,000	6,000	640
6		2,000	4,000	480
7		2,000	2,000	320
8		2,000	-	160
				Interest 12%
- 2				
- 1	8.000	-	6,000	720
1	4,000	-	12,000	1,440
2		-	12,000	1,440
3		1714	10,286	1,440
4		1714	8,572	1,234
5		1714	6,858	1,029
6		1714	5,144	823
7		1714	3,430	617
8		1714	1,716	412
9		1714	-	206

000's VIII.5. TAX SCHEDULE

YEAR	NET PROFIT BEFORE TAX	INVESTMENT ALLOWANCES	TAXABLE PROFIT	TAX 45 + 15% of 45 = 51.75%
- 2	( )			
1	(4207)			
1	(2254)			
2	1507			
3	4137			
4	4503			
5	4868	13,052	(4,498)	
6	5234	3,563	(2,827)	
7	5600	3,563	(790)	
8	5965	3,563	1,612	834
9	6331	3,563	2,768	1432
10	6531	3,563	2,974	1539
11	6537	3,563	2,974	1539
12	6537	600	5,937	3072
13	6537	600	5,937	3072

Calculation of Investment Allowances

	Initial Allowance	Annual Allowance thereafter
Buildings	6,000 x 20% = 1,200	600 for 8 years
Machinery and Installations	29,630 x 40% = 11,852	2,963 for 6 years
	13,052	

UNIT 000's

VIII.6. DIVIDEND AND RESERVE SCHEDULE

PROFIT BEFORE

YEAR	TAX	TAX	DIVIDEND	ACCUMULATED RESERVE
- 1	(4207)	-	-	(4207)
1	(2754)	-	-	(6461)
2	1507	-	-	(4954)
3	4137	-	-	(817)
4	4503	-	2240	1446
5	4860	-	2240	4074
6	5234	-	2240	7068
7	5600	-	2240	10428
8	5131	834	2240	13319
9	4899	1432	2240	15978
10	4998	1539	2240	18736
11	4998	1539	2240	21494
12	3465	3072	2240	22719
13	3465	3072	2240	23944

VIII.7. PROJECTED PROFIT AND LOSS STATEMENT

Year	-1	1	2	3	4	5	6	7	8	9	10	11	12	13
Working Capacity %	-	23	72	100	100	100	100	100	100	100	100	100	100	100
Sales Revenue		5648	14522	20170	20170	20170	20170	20170	20170	20170	20170	20170	20170	20170
Less:														
Raw Materials	379	1060	2727	3787	as above							3781		
Staff and Labour	1023	1535	2046	2046	" "							2046	as above	
Power and Lighting	463	926	1333	1852	" "							1852	" "	
Mill Supplies & Maint.	178	200	515	713	" "							713	" "	
Fuel	118	236	340	472	" "							472	" "	
Others	24	26	68	94	" "							94	" "	
Chemicals & Dyes	123	344	886	1230	" "							1230	" "	
Administration	59	118	236	236	" "							236	" "	
Depreciation	-	397	2386	3203	3203	3203	3203	3203	3203	3203	3203	3203		
Cost of Production	2367	5342	10455	13633	13633	13633	13633	13633	13633	13633	13633	13633		
Gross Profit(Loss)	(2367)	306	4067	6537	6537	6537	6537	6537	6537	6537	6537	6537	6537	6537
Less: Financial Costs														
Interest on Machinery Loans	1120	1120	1120	960	800	640	480	320	160					
Interest on other Loans	720	1440	1440	1440	1234	1029	823	617	412	206				
Profit(Loss)before Tax	(4207)	(2254)	1507	4137	4503	4868	5234	5600	5965	6331	6537	6537	6537	6537
Less: Tax	-	-	-	-	-	-	-	-	834	1832	1539	1539	3072	3072
Profit after Tax	(4207)	(2254)	1507	4137	4503	4868	5234	5600	5131	4499	4998	4998	3465	3465
Dividends	-	-	-	-	2240	2240	2240	2240	2240	2240	2240	2240	2240	2240
Rate of Dividend					16%	16%	16%	16%	16%	16%	16%	16%	16%	16%

VIII.9. CASH FLOW STATEMENT

Year	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13
Profit before Tax		(4207)	(2254)	1547	4137	4503	4868	5234	5600	5965	6331	6537	6537	6537	6537
Add: Depreciation			397	2356	3203	3203	3203	3203	3203	3203	3203	3203	3203		
Operating Cash		(4207)	1357	3813	7340	7706	8071	8437	8803	9168	9534	9740	9740	6537	6537
INFLOW															
Equity Capital	14000														
Machinery Credits	14000														
Other Loans	8000	4000													
Sub Total	36000														
Total Cash Available	36000	(207)	1357	3813	7340	7706	8071	8437	8803	9168	9534	9740	9740	6537	6537
OUTFLOW															
Buildings	6000														
Machinery	29625														
Current Assets	-	1000	1000	1500	875										
Repayments				2000	2000	2000	2000	2000	2000	2000					
Machinery Credits					1714	1714	1714	1714	1714	1714	1714				
Other Loans					-	-	-	-	-	834	1432	1539	1539	3072	3072
Tax Payments					-	2240	2240	2240	2240	2240	2240	2240	2240	3465	3465
Dividends															
TOT OUTFLOW	35625	1000	1000	3500	4589	5954	5954	5954	5954	6788	5936	3779	3779	6537	6537
Surplus/Deficit	375	(1207)	357	313	2751	1752	2117	2477	2849	2380	3598	5961	5961	-	-
Cumulative Surplus/ Deficit	375	(832)	(475)	(162)	2589	4341	6458	8935	11784	14164	17762	24273	30234	30234	30234

VIII.9. PROJECTED BALANCE SHEET

Year CONSTRUCTION PERIOD	1	2	3	4	5	6	7	8	9	10	11	12	13
FIXED ASSETS													
Land and Buildings 6000	SAME	-	-	-	-	-	-	-	-	-	-	-	-
Machinery and Installations 29625													
Total Fixed Assets	35625	35625	35625	35625	35625	35625	35625	35625	35625	35625	35625	35625	35625
Less Accumulated Depreciation	-	897	3203	6406	9609	12812	16015	19218	22421	25624	28827	32030	32270	32510
NET VALUE	35625	34728	32422	29219	26016	22813	19610	16407	13204	10001	6973	3595	3355	3115
CURRENT ASSETS													
Working Capital-Stocks etc.	1000	2000	3500	4375	4375	4375	4375	4375	4375	4375	4375	4375	4375	4375
Cash in Bank	168	11	12	75	4027	6014	8467	11315	13696	17842	23623	29764	31229	32694
	36793	36739	36034	33669	34418	33172	32452	32097	31275	32218	34976	37734	38959	40184
LESS													
Current Liabilities													
Income Tax Payable													
Dividends Payable					2240	2240	2240	2240	2240	2240	2240	2240	2240	2240
Bank Overdraft	1000	3200	3000	200	-								
NET ASSETS Represented as	35793	33539	33034	33469	32018	30932	30212	29858	29035	29978	32736	35494	36719	37944
Share Capital	14000	14000	14000	14000	14000	14000	14000	14000	14000	14000	14000	14000	14000	14000
Retained Earnings	(4207)	(6461)	(4954)	(817)	1446	4074	7068	10428	13319	15978	18736	21494	22719	23944
	9793	7539	9046	13183	15446	18074	21068	24428	27319	29978	32736	35494	36719	37944
Machinery Credits	14000	14000	12000	10000	8000	6000	4000	2000	-	-	-	-	-	-
Long Term Loans	12000	12000	12000	10286	8572	6858	5144	3430	1716	-	-	-	-	-
	35793	33539	33046	33469	32018	30932	30212	29858	29035	29978	32736	35494	36719	37944

UNIT 000'S VIII.10 PAYBACK PERIOD

YEAR	NET PROFIT AFTER TAX	ADDITIONAL DEPRECIATION	YEARLY TOTAL	CUMULATIVE TOTAL
-1 and 1	(6461)	897	(5564)	(5564)
2	1507	2306	3813	1751
3	4137	3203	7340	5589
4	4503	3203	7706	13295
5	4868	3203	8071	21366
6	5234	3203	8437	29803
7	5600	3203	8803	38606
8	5965	3203	9168	47774

Total Investment including Working Capital is 40,000.

Therefore Payback Period is 7.15 Years.

The effect of a 10% rise in Sales Revenue would alter the Payback period to 6.0 Years.

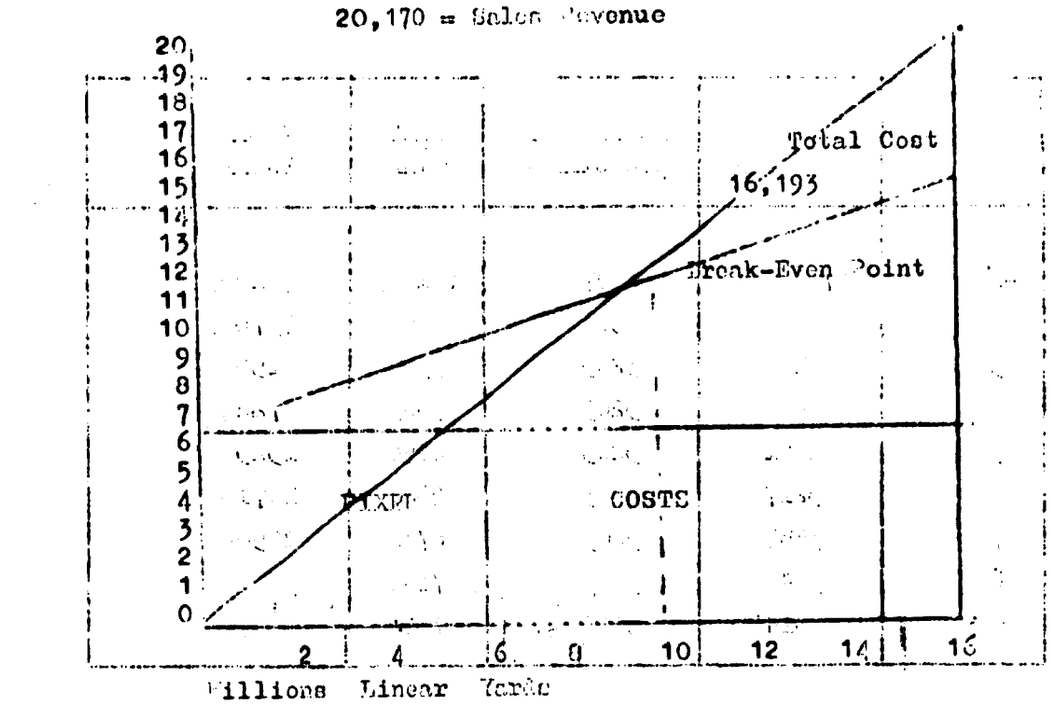
YEAR	NET PROFIT AFTER TAX	ADDITIONAL DEPRECIATION	YEARLY TOTAL	CUMULATIVE TOTAL
-1 and 1	(5896)	897	(4999)	(4999)
2	2959	2306	5265	266
3	6154	3203	9357	9623
4	6520	3203	9723	19346
5	6885	3203	10088	29434
6	7241	3203	10444	39878

VIII.10

The effect of a 10% price decrease in Sales Revenue would alter the Payback Period to 8.85 Years.

YEAR	NET PROFIT AFTER TAX	ADDITIONAL DEPRECIATION	YEARLY TOTAL	CUMULATIVE TOTAL
-1 and 1	(7026)	897	(6129)	(6129)
2	55	2306	2361	(3768)
3	2120	3203	5323	1555
4	2486	3203	5689	7244
5	2851	3203	6054	13298
6	3217	3203	6420	19718
7	3583	3203	6786	26504
8	3948	3203	7151	33655
9	4314	3203	7517	41172

VIII.11. BREAK-EVEN ANALYSIS



Break-Even Point occurs at 62.5% of full production, which means that the enterprise may never make a profit if the output cannot be increased above 10 million yards.

The cause of this high Break-Even point lies in the high incidence of Fixed Costs, which consist mainly of Interest and Depreciation.

Depreciation does not entail disbursement of cash until Fixed Assets are replaced in ten to twenty years time.

If Depreciation is deducted from Fixed Costs (i.e.6763-2963 =3800). The Break-Even point would occur at 38% of full production. For this reason the project should be considered satisfactory.

VIII.12 VALUE ADDED TO THE ECONOMY

Year	1	2	3	4	5	6	7	8	9	10
Sales Revenue	5648	14522	20170	20170	20170	20170	20170	20170	20170	20170
LESS:										
Raw Materials including Fuel, Dyes and Chemicals at 57% of Power Cost and 57% of Mill Supplies	2444	5178	6217	6217	6217	6217	6217	6217	6217	6217
Value Added	3204	9344	13953	13953	13953	13953	13953	13953	13953	13953

VIII.13. FOREIGN EXCHANGE EFFECT

YEAR CONSTRUCTION PERIOD	1	2	3	4	5	6	7	8	9	10
INFLOW										
Loan Capital 12000										
Machinery Credits 14000										
CIF Cost of the Similar Imported Product	3419	790	12210	12210	12210	12210	12210	12210	12210	12210
TOTAL INFLOW 26000										
OUTFLOW										
Machinery 25625										
Installations 4000										
Buildings 30% Imported 4200										
Repayment of Credits		2000	2000	2000	2000	2000	2000	2000	-	-
Repayment of Loans and Interest 720	1440	1440	1714 1440	1714 1234	1714 1029	1714 823	1714 617	1714 412	1714 206	-
Mill Supplies 170	200	513	713	713	713	713	713	713	713	713
Fuel 118	236	340	472	472	472	472	472	472	472	472
Chemicals and Dyes 123	344	826	1230	1230	1230	1230	1230	1230	1230	1230
Salaries Remitted 250	375	500	500	500	500	500	500	500	500	500
Raw Materials 379	1060	2727	3727	3727	3727	3727	3727	3727	3727	3727
TOTAL OUTFLOW 35593	3655	6406	9656	9650	9445	9239	9033	8828	8622	8702
Net Foreign Exchange EFFECT (9593)	(235)	384	354	560	765	971	1177	1332	3588	5508

UNIT

VIII.13. FOREIGN EXCHANGE EFFECT

The following actual average CIF prices were taken:-

Arican Prints	0.65	x 7,000,000 =	4,550,000
Java Prints	0.68	x 2,000,000 =	1,360,000
Polyester Blend cloth	0.90	x 7,000,000 =	6,300,000
		16,000,000 =	12,210,000

Total CIF of imported cloth 12,210,000

The net foreign exchange effect is positive from the second. It rises from £384,000 in the second year to £1,332,000 in the eight year.

After all loans and machinery credits have been repaid the exchange effect in the tenth and succeeding years is £5,500,000.

UNIT 000'S VIII.14 SENSITIVITY ANALYSIS

Based on thd 3rd Year of Operation which is the first year of full production.

Sales Revenue	20,170	
Profit before Tax	4,137	= 20.5% on sales
Return on Fixed Investment	35,625	= 11.6% on Fixed Investment

The profit ratio on Sales is satisfactory for the Textile Industry. The Selling Price can decrease by 20.5% before incurring a loss.

The profit will be adversely affected by shortage of stocks, failures in production control and outside interference with the Management. Speculation by cloth distributors, which is very common in the Textile Industry, will cause cyclic disturbances to sales and profit margins. It will be necessary to pay great attention to Marketing.

UNIT 000'S VIII.14 SENSITIVITY ANALYSIS: MANUFACTURING COSTS

1. Raw materials only represent 23.4% of total cost whereas they accounted for 53% of the cost of Polyester Blend Suitings. Fluctuations in costs of raw materials are not so crucial in the case of Cotton and P/C piece-goods which are based on own spinning.

2. Staff and labour at 12.6% of total cost is normal in the Textile Industry. The high cost of international management is balanced by low cost of local labour.

3. Depreciation represents 20% of cost and spotlights the high capital investment in fixed assets.

4. Interest on machinery credits and loans is 15.8% of total cost. This does not include an overdraft during the first three years of up to $3,200,000. During this early period the real cost of interest is therefore nearly 20%.

5. Power and lighting for this large industrial complex is 11.4% of total cost. Own Diesel Generators might reduce it to about 9%.

6. Chemical and Dyes are 7.6% of cost. If the management does not exercise strict control this figure could even double to 15% which would have a serious effect on profitability.

7. All other costs are 4.4% or less. The 4.4% applies to Maintenance and Mill Supplies and also requires strict control. It could easily reach 10% if wastage and theft occured and this also would affect profits seriously.

VIII.15 **INVESTIBLE SURPLUS**

YEAR CONSTRUCTION		1	2	3	4	5	6	7	8	9	10
Profit after Tax	(4207)	(2254)	1507	4137	4503	4868	5234	5600	5131	4899	4998
Add Depreciation		897	2306	3203	3203	3203	3203	3203		3203	3203
Company Tax										1432	1539
Local Interest	120	384	384	24							
	(4087)	(973)	4173	7364	8703	8071	8437	8803	9168	9534	9740
Negative Effects											
Repayment of Foreign Loans			2000	3714	3714	3714	3714	3714	3714	1714	
Interest remitted abroad	1840	2560	2560	2400	2034	1669	1303	937	572	206	
SUB-TOTAL	1840	2560	4560	6114	5748	5383	5017	4651	4286	1910	
Net Effect	(5927)	(3533)	(387)	1250	2955	2688	3420	4152	4882	7624	9740
Suggested Dividends					2240	2240	2240	2240	2240	2240	2240
Net Investible Surplus	(5927)	(3533)	(387)	1250	715	448	1180	1912	2642	5384	7500

VIII.16. NATIONAL COST BENEFIT ANALYSIS

Theoretical Estimate of Commercial and National Economic Profitability

% Factor		Commercial Profitability	National Economic Profitability
+10	Operating Revenue	20,170	28,238
+40	Raw Materials	3,797	5,302
+20	International Staff	1,000	1,200
-60	Labour	1,046	418
+35	Power and Lighting	1,952	2,593
+40	Mill Supplies	713	998
+40	Fuel	472	661
-	Water	94	94
+40	Chemicals and Dyes	1,230	1,722
	Administration	236	236
	Interest Machinery Credits	1,120	1,120
	Interest Loans	1,440	1,440
	Depreciation	3,203	3,203
	Taxes at 9th-10th years	1,500	
	Total Operating Cost	17,693	18,987
	Net Profit	2,477	9,251
	Net Profit Net Return on Fixed Capital	7%	26%

This theoretical exercise shows that the project is four times more valuable to the national economy that it would be to its private owners.

APPENDIX 3

LIST OF FIVE SATELLITE TEXTILE INDUSTRIES

Woven Cloths

1. Terry Towelling and Printing
2. Fancy Weaving
3. Jacquard Weaving
4. Denim and Drill
5. Tarpaulin and Canvas

Embroidery

6. Machine Embroidery
7. Multiple Design Machine Embroidery

Screen Printing

8. Hand Screen Printing

Knitting (Including Making-up)

9. Underwear
10. Circular and V-Bed Knitting
11. Fine Guage Knitting
12. Raschel Knitting

Socks and Hosiery, Tricot Lingerie, Waste Spinning and Carpet Weaving are not recommended at present.

1. Terry Towelling and Towel Printing

Equipment Required

1 Winding Machine
48 Automatic Terry Looms
1 Pirnwinding Machine
1 Sectional Warper
1 Sizing Machine (shared with other weavers)
1 Brushing Machine
Auxilliary equipment
Cutting and sewing Machines
Hand Screen Printing Tables
Power for 150 KV initially
Raw material: Coarse Count Cotton Yarn, bleached and fast Dyed on Cones.
Market is large and varied. A Market Survey would be required. The factory is able to produce about 2 million yards annually on normal treble shift on 300 days working.
Employment potential is 200 workers and staff.

2. Fancy Weaving

Equipment Required

1 Winding Machine
48 Automatic Looms with Dobby Motions
1 Pirnwinding Machine
1 Sectional Warper

1 sizing machine (shared with other weavers)
1 Washing Jig
2 Automatic Dye Jigs
1 Pad-stenter (shared with others)
Auxiliary Equipment
Cutting and Sewing Machines
Power for 180 KV initially
Raw Material: All types of Synthetic and Cotton yarns, bleached and Fast Dyed on Cones
Market Survey required. Estimated output up to 1 million yards annually on treble shift.
Employment potential 150 workers and staff.

3. Jacquard Weaving

1 Winding Machine
40 Semi-Automatic Jacquard Looms
1 Pirn winding Machine
Auxiliary Equipment
Cutting and Sewing Machines
Power for 70 KV initially
Raw Material: All types of synthetic and natural Fibre yarns. bleached mercerised and Fast Dyed
Market survey required especially for evaluation of demand for highest quality Gara trade.
Estimated output ½ million yards annually
Employment Potential 100 workers and staff
The initiation of this specialised industry depends on attracting on entrepreneur who has experience of Jacquards.

4 Denim and Drill

Equipment Required

1 Winding Machine
6 Automatic looms with Tappet Motions
1 Pirn winding Machine
1 Plain Warper
1 Sizing Machine (shared with other Weavers)
1 Washing Jig
2 Automatic Dye Jigs
1 Pad-stentor (shared with others)
Auxiliary Equipment with one Calendar
Raw Material: Coarse count cotton yarn
Unbleached for Weft, dyed proferably by
Indigo method for Warp
Market is large and growing; a Market Survey would be required.
The factory is able to produce up to 4 million yards annually of
Denim for Jeans and drill.

Employment potential 100

5. Tarpaulin and Canvas

1 Winding Machine
24 Automatic Looms
1 Pirwinding Machine
1 Plain Warper
1 Sizing Machine (shared with other weavers)
1 Dye Jigger
1 Calendar (shared with others)
Audiliary Equipment
Cutting and Sewing Machines
Power for 50 KV initially
Raw Material: Coarse Count Cotton Yarn, grey on cones
Market Survey required because there may be insufficient demand
Estimated output
1 million yards annually
Employment Potential 100 workers and staff
The canvas has many end use e.g. covers for trucks, tenting sunshade and tarpanting.

6 and 7 Machine Embroidery

The requirements of Machinery for this specialised factory will depend on a detailed market survey. A combined will of 30 small machines and 6 Rectilinear Machines would have a substantial output of very desirable embroidered fabric.

Power for 120 KV initially
Raw Material: High and medium grade piece Goods
Estimated output depends on design and export management
Employment Potential 120 workers and staff.

d. Hand Screen Printing

This labour intensive industry does not require machinery. The investment is in long buildings, long tables and screens which are made by hand on the premises. It is an ideal industry in collaboration with local artists because its success depends on design and marketing.

Power requirements are negligible
Potential employment is unlimited, say 100 persons for a start

9. Knitted Underwear

Equipment required

10 Inter lock Circular Knitting Machines
1 Winding Machine
50 Lockstitch, Overlock and Chain-stitch Sewing Machines

2 Industrial Presses
10 Steam Irons
1 Small Steam Boiler
Auxiliary Equipment
Power for 40 KV initially
Output 2500 dozen daily depending a detailed
Market Survey
Raw Material: Bleached Cotton Yarn
Employment Potential 100 Workers and Staff
This project would be aim at import substitution

10 Circular and V-Bed Knitting

6 double Jersey Circular Knitting Machines
10 Double V Bed rectilinear knitting machines
2 Steam Presses
10 Steam Irons
60 Industrial seqing machines
1 Small steam boiler
Power for 50 KV initially
output 8,000 yards, daily
Raw Material: Polyester Texturised and blended yarns
Market Survey would be required
Employment Potential 100 workers and staff

Auxiliary machinery as in No. 10
Power 40 KV initially
Output 5,000 yards daily
Raw Material: medium count pure Cotton and
Polyester blend yarns on cones
Market Survey would be required
Employment Potential 30 workers and staff

12. Raschel Knitting

8 Raschel knitting machines with 3 guide bars and 6 guide bars
20 Pattern Guide bars and Chopper Bar
1 Winding machine
1 Warping Machine
1 Steaming and Heat Setting stove
20 Industrial Sewing Machines
2 Tables with cutters
2 Steam Presses
5 steam Irons
1 Small steam Boiler
Power for 100 KV initially
Output 7,000 yards daily of 75" and 105" fabric
Raw Material: Texturised Polyester and Polyamide
Fibre for Ladies Outer wear, Lace Fabrics
Curtain Materials, Underwear etc.
Market Survey essential
Employment Potential 60 workers and staff

Most developing countries already have all of these small specialised factories. The small countries of Central and South America and many African countries such as Morocco, Kenya, Tanzania and Nigeria have these in addition to large vertical textile mills.

It would be essential to make full Marketing studies before embarking on any of them and it is understood that adequate Duty tariff protection would be required.

The job potential is important:-

Vertical integrated Cotton and Blend mill	1022
Synthetic Textile Suiting mill	215
Terry Towelling	200
Fancy Weaving	150
Jacquard Weaving	100
Denim and Drill	100
Tarpaulin and Canbas	100
Two Embroidery mills	120
Hand screen Printing	100
Knitted Underwear	100
Circular and V-Bed Knitting	100
Fine Guage Knitting	80
Raschel Knitting	60
Total Direct Employment Potential	2,347

ANALYSIS OF CLOTHING IMPORTS IN THE MANO RIVER UNION

The objective is to discover a possible basis for Garment Industry using locally made cloth from two projected Textile Mills

SIERRA LEONE

SITC NUMBER	ARTICLE	IMPORTS UNITS		ESTIMATED YARDAGE		SQUARE YARDS	SUGGESTED MATERIAL
841 010	Raincoats 1974-1975	19,749	x	2.5	= 49,327 x 33% =	16.292	P/c blend
841 021	Male Outergarments	192,065	x	1.5	= 288,098 x 33% =	95.072	"
841 029	Other "	57,277	x	1.5	= 85,916 x 33% =	28.352	"
841 030	Blouses	34,788	x	1.5	= 52,182 x 33% =	17.220	"
841 041	Female Outergarments	29,269	x	1.5	= 43,904 x 33% =	14.488	"
841 060	Shirts	106,472	x	1.5	= 159,709 x 33% =	52.704	"
841 210	Handkerchiefs	324,760	x	0.25	= 81,190 x 33% =	26.792	"
	Woven Cloth					250.920	P/c Blend
841 070	Undervests	1,173,064	x	0.5	= 586,532 x 33% =	193,556	Cotton
841 080	" Nes	349,948	x	0.5	= 174,974 x 33% =	57,742	"
841 431	Singlets	987,153	x	0.5	= 493,582 x 33% =	162,882	"
841 432	Shirts Knitted	54,042	x	0.7	= 37,829 x 33% =	12,484	"
841 433	Other Undergarments	158,939	x	0.5	= 79,500 x 33% =	26,249	"
841 441	Pullovers	34,173	x	0.7	= 23,921 x 33%	78,940	"
841 449	Other Garments Nes	159,900	x	1.0	= 159,900 x 33%	52,767	"
	Knitted Cloth					584,620	

LIBERIA

SITC NUMBER		ARTICLE	IMPORTS UNITS		ESTIMATED YARDAGE				SQUARE YARDS	SUGGESTED MATERIAL
841	111	Suits Jackets	228,000	x	1.5	=	342,000 x 33⅓	=	112,860	P/c Blend
841	112	Overolls	15,504	x	2.0	=	31,000 x 33⅓	=	10,233	"
841	113	Slacks	552,660	x	1.5	=	828,990 x 33⅓	=	273,567	"
841	117	Outergarments	13,236	x	1.5	=	19,854 x 33⅓	=	6,552	"
841	122	Skirts	124,980	x	1.5	=	187,470 x 33⅓	=	61,865	"
841	123	Blouses	256,260	x	1.5	=	384,390 x 33⅓	=	126,849	"
841	124	Slacks	6,756	x	1.5	=	10,134 x 33⅓	=	3,344	"
841	127	Outergarments	6,396	x	1.5	=	9,594 x 33⅓	=	3,166	"
841	128	" Infants	232,416	x	1.0	=	232,416 x 33⅓	=	76,697	"
841	131	Shirts	401,983	x	1.5	=	602,982 x 33⅓	=	198,984	"
841	132	Dress	35,148	x	1.5	=	52,722 x 33⅓	=	17,398	"
841	210	Handkerchiefs	412,416	x	0.25	=	103,104 x 33⅓	=	34,024	934,539"
841	137	Male Undergawn	1,317,960	x	0.5	=	658,980 x 33⅓	=	217,463	Cotton
841	431	Shirts	15,456	x	0.7	=	10,819 x 33⅓	=	3,570	"
841	432	Boys Undergarment	90,480	x	0.5	=	45,240 x 33⅓	=	14,929	"
841	434	Women Undergarment	61,968	x	0.5	=	30,984 x 33⅓	=	10,225	"
841	437	Infants Undergarment	13,920	x	0.25	=	3,480 x 33⅓	=	1,148	"
841	441	Pullovers etc.	12,324	x	0.5	=	6,162 x 33⅓	=	2,033	"
841	442/3	Slacks	16,104	x	0.7	=	11,272 x 33⅓	=	3,720	"
841	47	Male Outergarments	16,212	x	0.7	=	11,348 x 33⅓		3,744	"
841	48	Female Outergarments	8,652	x	0.7	=	6,056 x 33⅓		1,999	"
841	49	Infants Outergarments	37,056	x	0.4	=	12,422 x 33⅓		4,099	"
		Knitted Cloth							262,990	934,539

APPENDIX I

SUMMARY OF REQUIREMENTS OF LOCALLY MADE WOVEN AND KNITTED CLOTH

Sierra Leone	Polyester Blend Cloth	Cotton Cloth
Square Yards	250,920	584,620
Liberia	934,539	262,930
M.R.U. Total	1,185,459	847,650
Lbs Yarn Required	296,365	211,912

Suggested Assortment		lbs.		lbs.
Suiting Materials	581,956	147,000		
Piece - Goods	603,503	149,365		
Knitted Goods			1,059,562	211,912
T O T A L S	1,185,459	296,365	1,059,562	211,912

The projected Suiting Factory will be able to supply 581,956 square yards of Polyester Blend Cloth, based on semi-worsted yarn.

This short staple Polyester Blend and Cotton Cloth Factory would be capable of furnishing the 603,503 square yards of Polyester/ Combed cotton piece-goods.

The 211,912 lbs. of yarn for knitted goods could be supplied in high quality carded and combed yarn by the projected spinning Mill if 8% more machines were installed i.e. an additional 1,530 spindles.

APPENDIX I

UNIT 000'S

ADDITIONAL POSSIBILITIES FOR IMPORT SUBSTITUTION BASED ON SPINNING YARN IN MANO RIVER UNION IN THE FUTURE

SIERRA LEONE

SITC NUMBER	ARTICLE	PRESENT SUPPLIERS	1975	
			QUANTITY	VALUE
			lbs.	Le
651 010	Cotton Yarn for Weaving and Knitting	Ind. Pak. Hk.	3891	459
656 911	Cotton Towels		336	454
656 912	Bedlinen		336	384
656 913	Mosquito Net		165	184
	Total Cotton Yarn required		1,226	1,481
	Value of Imported Goods			
LIBERIA			lbs.	$
651	Textile Yarn & Thread		100	258
656 914/5	Towels		87 doz.	585
656 912/3	Bedlinen		14 doz.	620

Other Items		Liberia	$	Sierra Leone	Le
656 100	Bag and Sacks	323 lbs 177	(656,100)	2,948 units	1,1[illegible]
656 610	Blankets	155 units 267	(656,600)	336 units	2[illegible]
	Used Clothing		(267,011)		1,1[illegible]

APPENDIX II

ANALYSIS OF IMPORT STATISTICS

MAIN CATEGORIES OF TEXTILE IMPORTS: SIERRA LEONE

SITC NUMBER	DESCRIPTION	MAIN SOURCES OF SUPPLY	1974		1975		1976	
			SQ/YDS	LE	SQ/YDS	LE	SQ/YDS	LE
651 020	Pile and Chenille		18	17	89	60		
654 030	American Grey Cotton	India	212	29	178	26		
652 040	Cotton Woven Fabrics Grey Unbl.	ChiM, ChiM, Taiwan	800	231	2,706	575		
651 050	" " " White Bl.	Cz Hun E. Ger Chi/M	11,115	4,716	11,443	5,355		
651 060	" " " Printed	Jap chiM UK	13,971	5,621	11,345	4,798		
654 071	" " " Imitation Gara Dyed	Jap	-	-	92	42		
652 079	Other " " Piece Dyed	ChiM Pol Hun	2,910	1,446	3,950	1,813		
652 080	" " " Colour Woven	Jap Cz RUM UK	299	230	1,115	522		
65	Total Woven Cotton Fabrics		29,325	12,290	30,918	12,721		
652 010	Cotton Fents	Jap Hun UK	871	838	725	968		
65	Total Cotton including Fents		30,196	13,128	31,643	13,689		
651 010	Man-made Fents	Jap Hong Kong U.K.	610	637	917	1,239		
020	Pile and Chenille	-	-	-	1	2		
030	Woven discontinuous Synthetics	Jap	211	96	152	75		
040	" " Printed	Jap UK	700	247	652	280		
050	" " Colour Woven	Jap Pol	1,394	620	712	365		

APPENDIX II

SITC NUMBER	D E S C R I P T I O N	MAIN SOURCES OF SUPPLY	1974		1975		1976	
			SQ/YDS	LE	SQ/YDS	LE	SQ/YDS	LE
653 060	Other discontinuous incl. Piece Dyed	Jap UK	3,322	2,305	2,692	2,526		
653 070	Continuous Woven Synth Unbl. White	USA Jap	35	16	68	41		
653 080	" " " Printed	ChiM	96	28	347	125		
653 090	Other Woven Synth Piece Dyed	Jap	497	275	201	171		
653	Total Woven Synthetics		6,865	4,224	5,742	4,624		
841 221	Headties Synthetics		3,341	1,182	5,526	2,233		
841	Grand Total Synthetics		10,206	5,406	11,268	6,857		

LIBERIA

IMPORTS

SITC NUMBER	DESCRIPTION	MAIN SOURCES OF SUPPLY	1971 SQ/YDS	1971 $	1972 SQ/YDS	1972 $	1973 SQ/YDS	1973 $	1974 SQ/YDS	1974 $	1975 SQ/YDS	1975 $	1976 SQ/YDS	1976 $
652														
100	Cotton Gauze unbl.	China M. USA Japan Ind.	5,210	1,047	1,558	462	452	181	426	243	79	34	-	-
130	Cotton Fabric Unbl Nes	China M. Pol. USA Ind. Jap.							1,685	673	1,812	785	1,424	655
210	Cotton Gauze G/Dyed	ChiM. USSR Jap. G2	220	50	5,032	1,320	2,493	810	1,256	370	928	357	682	256
291	Cotton Printed	Jap. Neth. ChiM UK USSR	23,880	6,604	32,156	6,731	6,772	2,926	6,300	3,768	9,123	5,241	11,488	6,360
292	Cotton Fabric Dyed/Merc	Ind. Jap. ChiM USSR Pol.	858	254	3,239	1,134	6,113	2,095	2,630	1,266	2,830	1,363	4,083	1,893
653														
510	Woven Continuous Synth.	Japan, USA	1,096	465	687	569	433	363	713	569	986	877	794	518
520	Woven discontinuous Synth	USA, Japan	148	147	526	449	886	632	1,084	862	3,065	1,974	4,265	3,102
530	Pilet Chenille Synthetic	USA Japan	1	5	554	318	154	120	406	288	115	63	53	42
610	Woven Cont Regen Fibres	U.S.A.	170	94	73	133	137	155	118	114	69	63	22	18
620	Woven discon. Regen Fibres	USA, Japan	92	56	76	51	31	45	689	467	82	81	149	100
EXPORTS														
All 652 Woven Cotton Fabrics				381	1,857	994		705		330	95	144	11	12
All 653 Text fab except Cotton				68	-	241		141		30	0.3	0.7	7	13
1970											Mali IC Caub			
[illegible]	21,956 4,990 Domestic Survey 1975	@ 1971 Factor Cost Millions $	342.5		354.0		360.8		379.1		Guinea S.L. 375.0		354.3	

APPENDIX II

Unfortunately 1976 is not yet available. The following Statement gives statistics for Liberia.

The figures for Synthetic Textiles are 10,206,000 and 11,268,000 square yards including 5,341,000 and 5,526,000 square yards of Headties. These are mainly Filament Woven lightweight Fancy cloths from India which were imported at cheap prices and have become a drug on the Market.

Further analysis indicates 15,881,000 and 15,295,000 square yards, of Printed and Dyed Cotton Woven cloth i.e. about 50% of total imports of Woven Cotton Fabrics.

Some of these imports are known to have been re-exported clandestinely, but it is said that other unrecorded imports have come and are coming into Sierra Leone by contraband. The quantities will never be known, but the existence of "Free-Trade" in and out of the Mano River Union countries should not be ignored.

The next Statement Textile Imports: Liberia and Sierra Leone is an attempt to bring Table VII.1, Mano River Union Industry Studies, page 44, up-to-date.

APPENDIX II

TEXTILE IMPORTS LIBERIA AND SIERRA LEONE

1971-73 AVERAGE 1974, 1975, 1976 AND 1980-85 PROJECTIONS

Country and Textile Group	VALUE MILLIONS SQUARE YARDS					VALUE MILLIONS				1974	1975
	1971-3	1974	1975	1976	1980	71-3	74	75	76	Value/Square Yard	
							Leones				
Sierra Leone											
Printed-dyed cotton only	16.8	16.9	15.3	NA	17.7	4.2	7.0	6.6		0.42	0.43
Total Cotton Textiles	32.9	32.8	31.6	"	36.6	7.8	13.1	13.7		0.40	0.40
Total Synthetic Textiles	9.5	8.9	11.3	"	13.1	2.5	7.2	4.6		0.81	0.41
							Dollars				
Liberia											
Printed-Dyed Cotton only	8.5	8.9	11.9	15.6	13.8	2.3	4.7	6.6	8.3	0.53	0.55
Total Cotton Textiles	10.3	12.3	14.8	17.6	17.2	2.8	6.1	7.7	9.2	0.50	0.52
Synthetic Textiles	1.7	3.0	4.3	5.3	5.0	1.2	2.3	3.1	3.8	0.77	0.72
Union Total											
Printed-Dyed Cotton only	25.3	25.8	27.2	NA	31.5						
Total Cotton Textiles	43.2	45.1	46.4	"	53.8						
Total Synthetic Textiles	11.2	11.9	15.6	"	18.1						
Official Textile Exports	54.4	57.0	62.0	"	71.9	0.8	0.4	0.1	Nil		

NOTE: Figures for Liberian Imports from 1971-1973 were taken as 35% of the Official Import Statistics. It was assumed that the remaining 65% was exported clandestinely because the Official Liberian Export figures for Liberia are for negligible quantities.

APPENDIX II

The quantities and values for 1971-73 and 1974 have been taken from Table VII-I as shown on page 44 of Mano River Union Industry Studies.

A fresh analysis of Sierra Leone's 1974 Official Import Statistics revealed the following discrepancies:

Sierra Leone	Table VII-1 figures LE	Official Import Statistics Le		Table VII-1	Official Import Statistics
Printed-Dyed Cotton only	16.9	7.0	15.9	7.1	0.46	0.45
Total Cotton Textiles	32.8	13.1	30.2	13.1	0.40	0.44
Total Synthetic Textiles	8.9	7.2	6.9	4.2	0.47	0.61

The figures for Cotton Textiles are reasonably similar excepting the values shown on Table VII-1 which should be 0.41 for Printed-Dyed Cotton only instead of 0.46. For Total Synthetic Textiles on Table VII-1 the value per square yard should be 7.2 & 8.9 = 0.90 instead of 0.47.

If the Official figures for Import of Headties are added to the Official figures for Total Synthetic Textiles the following result arises:

1974	Sq/yds	Le	Value/sq/yds
Total Synthetic Textiles	6.9	4.2	0.47
Headties	3.3	1.2	0.36
	10.2	5.4	0.53

In order to complete the Tavle VII-1 figures for 1971-73, the Official Liberian Import figures were extracted from the Statistics, i.e.

APPENDIX II

Printed Dyed Cotton only	1971	24,758	Home Consumption
	1972	35,395	
	1973	12,885	
		73,018	÷ 3 = 24,339 x 35%
			= 8.5 Million sq/yds
Total Cotton Textiles	1971	30,168	
	1972	41,985	
	1973	15,830	
		87,983	÷ 3 = 29,328 x 35%
			= 10.3 million sq/yds
Total Synthetic Textiles	1971	1507	
	1972	1916	
	1973	1641	
		5.064	÷ 3 = 1.688 x 100%
			= 1.7 million sq/yds

Based on information from Importers, at least 65% Cotton Textiles was loudestinely re-exported from 1971-1973, but Synthetic Textiles were mainly imported for use in the Liberian Home Market. Some Importers assert that 75-80% of Cotton Textile imports are re-exported **clandestinely.** Neither figure can ever be proved.

Importers declared all the quantities and values in the Official Import Statistics; they paid Import Duty on whatever they declared. So there is no logical reason to suppose that the true quantities imported were Less than the Official figures. It is possible that the quantities were somewhat greater than those declared, but in the absence of proof it is safer to accept the duty paid imports at their face value.

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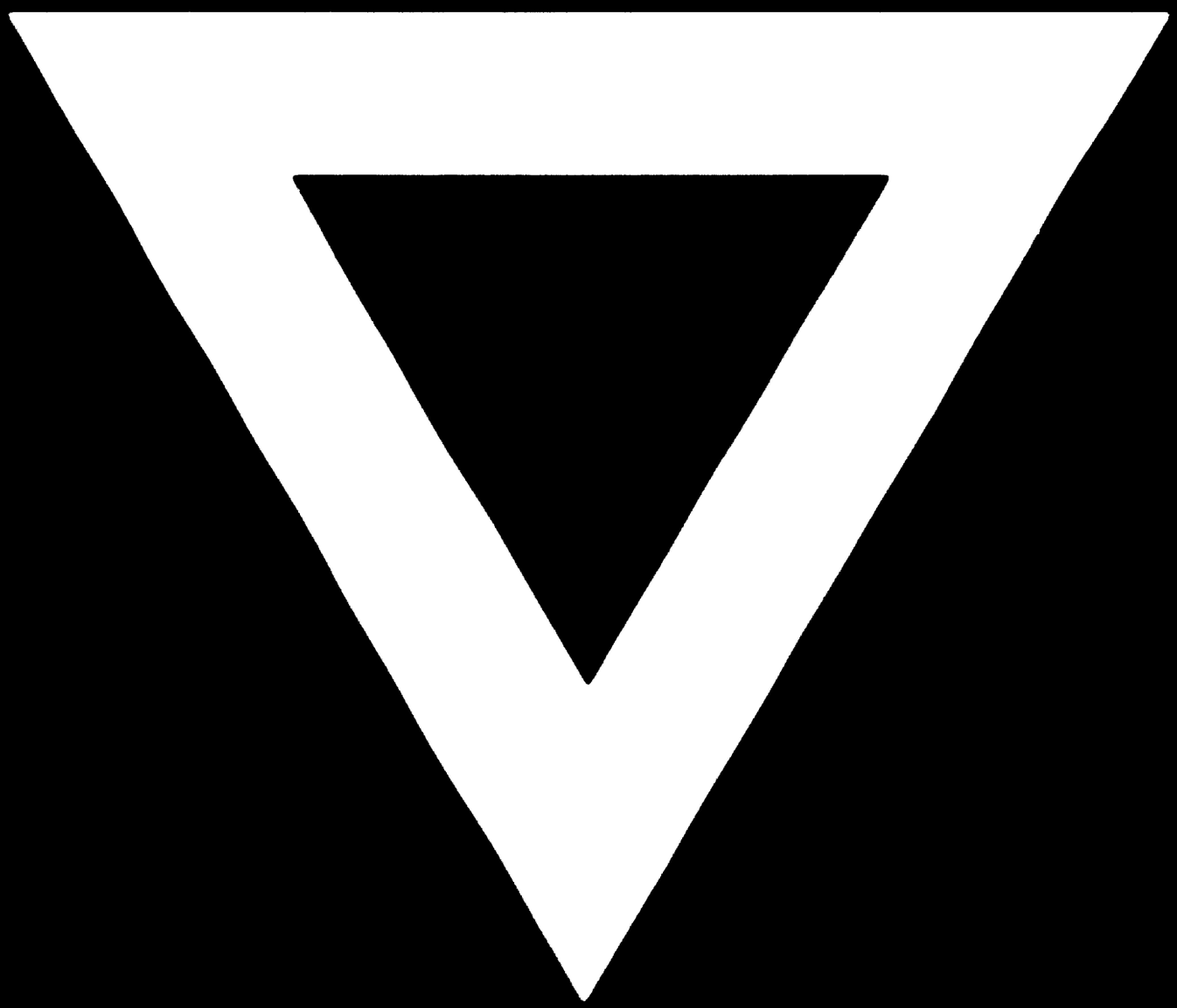

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