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**WORKING GROUP No.3**

**APPROPRIATE TECHNOLOGY  
FOR THE  
PRODUCTION OF TEXTILES**

.....  
APPROPRIATE TECHNOLOGY FOR TEXTILE INDUSTRIES  
Background Paper ,

APPROPRIATE TECHNOLOGY FOR  
TEXTILE INDUSTRIES

by

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## I.0 PREFACE:

Traditionally, the levels of labour and machine productivity, in the Developing countries in the Textile Industry have been significantly lower than those obtained in the other major advanced textile producing countries of the world.

The present level of productivity achieved by an average textile industry in the developing countries is substantially below the levels achieved in the developed countries. Developing countries productivity levels can be considered to be between one-half and one-third of those achieved in advanced countries.

In the developing countries the average production per spindle/year for 20s count is 82.5 kg as against 200 kg in the developed countries. A substantial part of the difference is because of lower spindle utilisation. Furthermore, the spindles in the developing countries are worked mostly on the basis of 22.5 hours a day for 300 days a year. In contrast textile mills in the developed countries work 24 hours a day for 350 days a year. Of the total installed spindles in the developing countries only about 80% are utilized as against an achievable level of 96%. If the spindle utilization is increased to the maximum permissible levels the production per spindle/year can be increased from 82.5 Kg to 125 Kg. This still leaves a productivity gap of nearly 75 Kg. per spindle/year.

In weaving also in the developing countries the productivity levels are much lower than those in the developed countries. The productivity per operative shift for a standard sheeting is 2.87 times higher than the comparable figure for weaving on automatic looms. Relative to the productivity per operative/shift on non-automatic power looms, in the developed countries, operative productivity is 6.5 times higher, mainly due to the exclusive use of the automatic loom. This large difference must obviously be due to the lower levels of labour productivity and machine productivity. The contribution of labour productivity to this productivity gap is likely to be more than that of machine productivity.

It is obvious that low productivity levels result in several disadvantages. When the productivity level is increased, it means higher production



from the same fixed cost of men and machinery. Thus, not only is there a reduction in the cost of manufacture but also an increase in total sales realization resulting in a larger contribution.

A high cost of manufacture due to low productivity levels can result in less demand for the fabrics which in turn can result in stock accumulation and price cutting. Low productivity reduces the competitiveness in both the domestic and export markets. Low productivity is almost invariably associated with low product quality. This means a greater value loss in sales.

## 2.0 - INTRODUCTION

### What is Appropriate Technology?

Appropriate technology for manufacturing industry in developing countries is, "The choice of technology which produces in an optimum manner, the kind, quality and uniformity of products, suitable for the requirements of local and export markets, with the lowest possible utilisation of capital and skill and the highest possible use of labour and materials available locally."

This description of appropriate technology is given in the report "Appropriate Technology and Research for Industrial Development", by the United Nations Advisory Committee on the Application of Science and Technology to Development.

### Why Appropriate Technology?

The less developing countries are short of capital and skills while having plenty of labour. The technologies of the highly developed countries are designed to suit the extreme opposite situation, shortage of labour, highly developed skills and well organised capital market. When these technologies are transferred to the developing countries, the result is often a burdensome accumulation of foreign debts, under-utilisation<sup>of</sup> capacities because of lack of skills and no solution to the unemployment problem.

### The choice of Technology:

A manufacturing enterprises is a business. The talent for selecting at any time the most appropriate technology will decide the ability of any manufacturing enterprises to operate a successful business. It has to provide a reasonable return on its investment. Economics and Technology are inseparable.

The selection of the most appropriate technology for manufacturing enterprises in developing countries represents a particular challenge to the entrepreneur and the special professional groups involved in the selection process. If a new enterprise is to be established, or a sizeable expansion of an existing one is to be planned, the choice of

technology is wide open.

Any technology should be a function of the condition under which it is operating. The selection of the most appropriate technology for any given situation requires an integrated and multi-disciplinary approach. Many professional specialities are required in an open and constructive inter-action.

Research and analysis must ascertain the real needs of the potential market. The availability and quality of land, labour and materials etc. must be assessed. Product development together with plant and production development must design and plan the manufacture of a product which really meets the needs and the means of the market. Marketing and distribution must be developed in order for the product to reach the buyer.

The economic implications of each factor must be calculated in order to evaluate every possibility and measure the effects of one alternative against another.

Designers and Engineers must co-operate with marketing and management specialists as well as with economists, sociologists and skill development experts. etc. etc. Their common focus should be the real needs of the market and the conditions under which the products are to be manufactured and used.

The best possibilities for influencing the selection of the most appropriate technology is at the stages when a project is being planned or when it is appraised, while establishing a training programme on appropriate technology in a developing country, the objective must be to reach the professional groups which have the chances for influencing the choice of technology and to control that it corresponds to the established aims of appropriate technology and the National policies.

### 3.0 - WORLD TEXTILE CAPACITY

#### 3.1 - SPINNING:

The total number of spindles in place in the cotton and allied textile industries throughout the world again increased during 1976, to 149,51 million, and the number of active spindles increased marginally to 136.67 million, representing 91.4% of those installed. The overall increase of 0.5% in installed capacity masks the small reduction in the installed capacity in Europe, and the large reduction (of almost half a million spindles) in North America. Variances in levels of active machinery tended parallel to the changes in installed capacities. These developments are shown in APPENDIX NO. III

Details of open-end-spinning have again been included in the spinning section. It is stated that available data are incomplete despite the inclusion of trade estimates in addition to the usual official national figures. The estimated number of rotors installed at the end of 1976 in the western <sup>countries</sup> around 9,70,000 with possible 60% as many in the U.S.S.R., and an estimated further 320,000 in total in the countries of Eastern Europe. This puts the total installed open-end-spinning rotor capacity at the end of 1976 at around 1.9 million.

#### 3.2 WEAVING:

The world total of looms in place decreased slightly during 1976, to 2.96 million. Of these, 65.5% were automatic. The total number active (representing 92.91% of the installed capacity) also decreased, to 2.76 million, of which automatic looms represented 66.5%. However, this was chiefly due to the reduction in the numbers of both installed and active looms in North America and Europe, for elsewhere some increase were shown. A point to be noted is that, whilst the installed weaving capacity in South America expanded, less of this machinery was utilised during the year than in 1975. These changes are shown in APPENDIX NO. IV.

#### 3.3 MACHINERY UTILISATION

Utilisation of active spindles increased encouragingly during 1976 in all areas except for Africa. Particularly, the marked reduction in

utilisation in North America during 1975 was reversed in 1976.

Although the average number of hours worked per active loom increased during 1976 (by 2.3%), this is almost entirely due to increases in North America; except for a small increase in Asia and Oceania, machinery utilisation declined elsewhere. APPENDIX NO. V & VI.

The main reason for low machinery utilization may be perhaps attributed to recessionary trends in demand, power shortages, fuel crisis, paucity of raw material and labour problems.

### 3.4 TRENDS IN WORLD TEXTILE MACHINERY

The following paragraph gives the over-all picture of the textile machinery supplied in the world market and the principal buyers. Developing countries are going for sophisticated technology to substitute imports and to enter export market.

Forty per cent fewer spindles, open-end rotors and shuttle-looms were supplied world-wide in 1977 by the world's leading textile machinery producers, where as shuttle-less loom supplied were higher than 1976.

Of the 1.8 million ring spindles installed, 48% were for Asia and Oceania, 21% for Europe, 16% for Africa, 11% for South America, and 4% for North America. The six largest markets were South Korea, India, Brazil, Sudan, Egypt and Tanzania.

Just under 232,000 rotors were supplied during 1977, 50% to Europe, 27% to Asia and Oceania, 12% to Africa, 6% to North America, and 5% to South America. The Principal markets were the U.S.S.R., Tanzania, Syria, Hong Kong, Hungary and the U.S.A.

Less than 20,000 shuttle looms were supplied during the year. 46% were for Asia and Oceania, 23% for Africa, 16% for Europe, 13% for North America, and 3% for South America. The largest markets were South Korea, Indonesia, Tanzania, the U.S.A., Cuba and Algeria.

Supply of shuttle-less looms reached just over 19,000 during 1977, that is 49.5% of all looms supplied. Europe received 57%, North

America 5%, and Africa 3%. Principal markets were the U.S.A., the U.S.S.R., Italy, and the U.K. as shown in the APPENDIX NO. III & IV.

#### 4.0 THE INDIAN TEXTILE INDUSTRY

Next to agriculture, textile industry is the largest industry in the country employing 11 million persons; one million in the mill sector and 10 million in the handloom sector. Cotton textile is a labour-intensive industry and it can be an excellent media for generating larger employment. Apart from being a source of providing one of the basic needs, Cotton Textile Industry plays a crucial role in an interdependent socio-economic structure of the country. The industry represents the single largest enterprise in the organised sector in India accounting for about 20% of the value of India's total industrial production and giving direct employment to about 1/5 of the total factory labour force. In addition, this industry is responsible for providing employment to several millions in handloom and powerloom sector and means of livelihood to much larger number of cultivators and agricultural labourers in rural areas. It is also one of the leading foreign exchange earner. During 1975-76 exports of the mill sector was US dollar 475 million, far exceeded the target of US dollars 425 million. Exports of handloom and made-ups achieved the total exports worth US dollars 530 million representing 11% of India's total exports.

The industry is a big consumer of fuel, power and lubricants. Various related commodities such as dyes, chemicals, stores, sizing, packing material and etc., worth US dollars 45 million is being consumed by the industry. Along with textile machinery such as manufacturers and suppliers, of mill stores and other auxiliary manufacturerers depend on this industry for their existence.

This industry touches national life at several crucial points and is a vital force in stimulating the national economy and hence it has a significant bearing on over all national growth. However between April 76 to February 77 cotton and jute were the only sectors of industry to record negative growth. Other industries had shown growth rates between 10 to 20 per cent, but a stagnant textile industry had pulled down the national economic growth by 8%.

The Textile Industry consists of two sectors - organised mill sector and decentralised sector. The organised sector consists of two types of mills - spinning mills, producing yarn only and the composite mills producing yarn as well as cloth. The decentralised sector consists of powerlooms and handlooms which depends on organised sector for the supply of yarn. There are also few processing units processing the cloth manufactured by the decentralised sector.

The organised mill sector being a prominent sector, its accumulated problems have more significance in the context of the general study of the industry,. There were 704 mills in 1977 of which 289 were composite and 415 were spinning mills.

#### 4.1 PROBLEMS COMMON TO DEVELOPING COUNTRIES:

Most of the developing countries faced similiar basic problems in the textile industry, some of them are as under:

- Cost of Raw-material up by 50%, besides irregular supply and shortages.
- Periodic power shortage
- Labour problems
- Export difficulties
- Demand recession
- Short fall in working capital, higher over-head expenses
- Diminishing productivity
- Modernisation and renovation of plant and machinery
- Stockpiling by some units
- Inefficient management
- Heavy borrowings and dividend policy unrelated to profits.

Other industrialised countries tackled these problems shortly after the Second World War and thereafter the industry has been reconstructed with effective modernisation, but in India and other developing countries similar efforts were not made and hence it became internationally uncompetitive and has lost the ground in textile market.

Problems of textile industry as pointed out earlier belong to two major groups:-

- Social or socio-economic in which lie problems like that of labour, management, working capital; and



- Technological in which fall the problems of productivity, higher production and modernisation.

Socio-economic problems are of more inter-disciplinary nature, whereas technological ones are lesser and also concrete in effects. Moreover, generally problems of technological nature are prior to the emergences of other socio-economic problems. They are, therefore, more crucial in nature. We are, here, concentrating on the problems connected with the technology and the machinery corresponding to the appropriate technology required in the developing country.

## 5.0 COMPARISON OF PROCESSES

### 5.I SPINNING

#### 5.II BLOW ROOM

There are three types of processes:

- Double process: The laps will be produced on one scutcher and the doubling of 3 to 4 laps will be done on the finisher scutcher. This is known as the conventional lap preparation which is at present outdated
- Single process: Instead of having breaker and finisher scutchers more uniform laps will be produced in a single process by having photo electric and other feed regulatory devices. But the doffing may be manual or automatic. Single process system would lead to improvement of quality and also improve working conditions for the employees, apart from reduction in cost of production.
- Chute feed to cards: In the latest development the material is directly fed to cards by chute feed system without making laps.

#### 5.I2 CARDING

The semi-high production cards would give nearly twice the output of the conventional cards. The high production cards would give about  $3\frac{1}{2}$  times the output of a conventional card.

#### 5.I3 COMBERS

The production of high speed combers is about three times that of conventional combers.

#### 5.I4 DRAW-FRAMES

The production of high speed type is at least four times that of ordinary type.

#### 5.I5 SPEED FRAMES

The conventional sequence was to have slubber/inter/Roving Frames. But, during the last several years, it has been an accepted practice in the cotton textile industry to eliminate one or two processes. Many mills have gone ahead in this respect. Majority of the counts of yarn can be spun from one passage of the speed frames i.e. either can-fed high draft inter frame or can-fed high drafting roving frames.

### 5.16 RING FRAMES

Highspeed ring frames give 20-25% more production and better quality yarn than the convention ring frames with casa drafting.

### 5.17 DOUBLER WINDERS AND TWISTERS

Doubling is an essential process for the production of strong and even thread. Further, it is also an expensive process. Two for one twister are sophisticated and modern replacement for the conventional doublers and winders.

### 5.2 WEAVING

#### 5.21 WARP WINDING

The production on automatic type is at least twice that of conventional winder. The modern trend is to go in for fully automatic warp winding machines having either single knotter or multiple knotters.

#### 5.22 WARPING

The types of machines are given below:

- Machines capable of running up to 100 metres per minute
- Machines capable of running from 101 to 450 metres per minute
- Over 450 metres per minute
- Sectional Warping

The high speed machines are capable of running over 450 metres per minute.

#### 5.23 SIZING

The production of one high speed sizing machine is about 1½ times that of a slasher.

#### 5.24 PIRN WINDING

The practice of feeding Pirms directly from the Ring Frames to Looms also exists, but the present trend is to rewind the weft and thus use it on looms to get better efficiency in loom shed. Pirm Winding machine is necessary whenever automatic looms are installed.

#### 5.25 LOOMS

Hand-loom give production of approx. 14 to 15 yards per day. Production of non-automatic power-loom is approx. 6 times more than hand-loom.

The production of an automatic loom is approximately 1.5 times more than that of non-automatic loom. The production of a shuttle-less loom is approximately two times that of high speed automatic loom.

### 5.3 GENERAL

Re-orientation of textile machinery industry is a continuous process as the machines manufactured will have to be changed to modern types having regard to the developments that take place from time to time. While on this subject, it should be mentioned that opportunities should be given to the indigenous manufacturers, their design and textile technologists to keep themselves abreast with quick technological development, and innovations taking place in textile machinery. It is a common knowledge that good performances of the machines cannot be ensured without the supply of good quality accessories and spares. It is, therefore, essential that the manufacturers of stores and accessories and ancillaries are given the required and right quality of raw material.

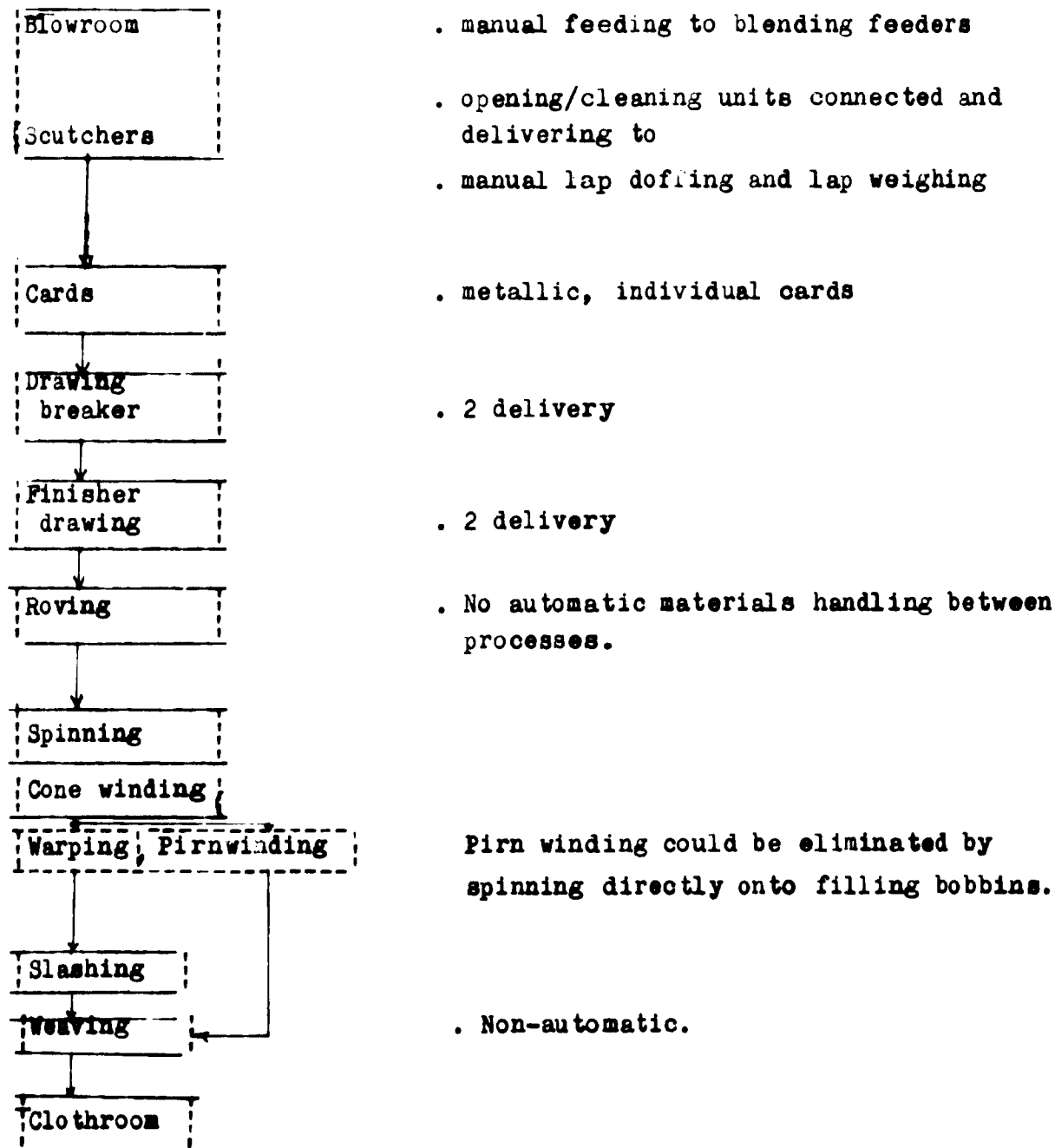
On the following pages are given three textile mill processes as under:

- Conventional System
- Intermediate Level,
- Continuous Automated Process.

## 5.4 TEXTILE MILL PROCESSES

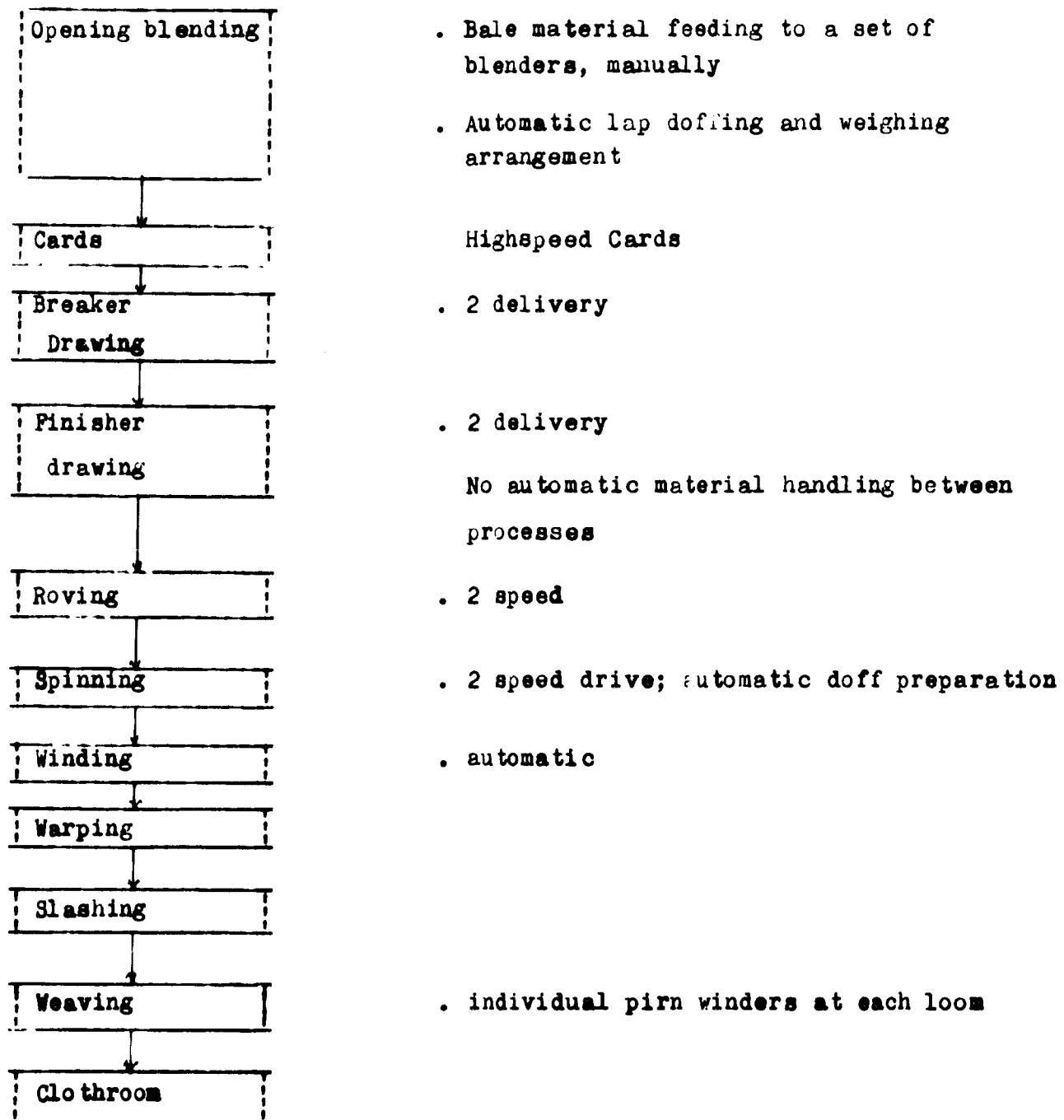
### 5.41 CONVENTIONAL SYSTEM

#### Major processes



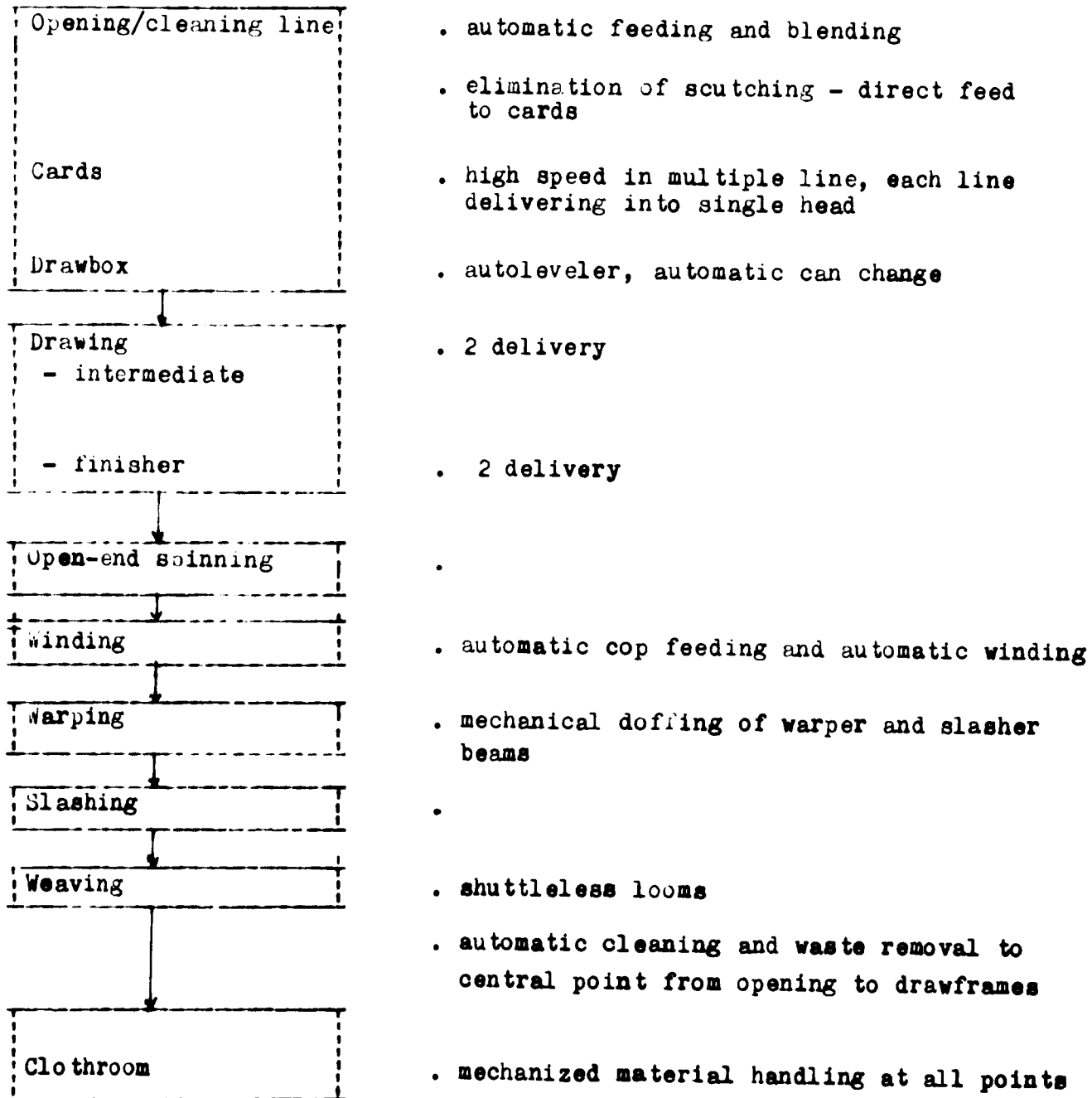
## 5.42 INTERMEDIATE LEVEL

### Major processes



6.43 CONTINUOUS AUTOMATED PROCESS

Major processes



## 6.0 CASE STUDY FOR TRANSFER OF APPROPRIATE TECHNOLOGY

### 6.1 SPINNING

For Open-End Spinning 10-25s Count is viable and economical under developing countries, mostly conditions as yarn manufactured is of coarse type. Otherwise open-end spinning is neither viable nor economical for such conditions, taking into consideration the type and staple length of the cotton fibre cultivated in the developing countries. On the broader basis, it would be advantageous to convert the conventional ring frames to the top-arm drafting system which is more appropriate. In the case of conversion there is no direct retrenchment of labour but results in higher production and improved quality. But in comparison with ring spinning to open-end spinning, the relatively extra cost involved in capital, and saving in labour, makes it un-attractive for all counts finer than 25s and hence this technology can only be suitable for coarse counts. Moreover it has been proved that open-end spun yarn is more suitable for knit-wear and Hosiery requirements. The constraint is that the relatively clean cotton is required. The second constraint is that the open-end-spinning is more energy (power) consuming technology while there is lot of fluctuations in the supply of energy (power) in the developing countries.

If the more expensive machine which is imported and becomes idle for want of power such proposition would become un-economical and not viable in the developing countries.

In most of the developing countries the technology is different or more advanced than the technology used in the developing countries. In developing countries the automation has taken place with respect to labour saving attachments, for example automatic doffing on the ring frames and chute feeding on cards. In return of the total savings in wages compared to the extra capital cost involved, it is neither attractive proposition nor economical for developing countries.

### 6.2 WEAVING

Lot of developments have taken place especially on the automation of the weaving preparatory and loomshed, but we will deal only with the types of



looms on specific lines.

The following types of looms are available:

	Approx. Cost US \$
Hand Loom	100 - 120
Power Loom	800 - 1200
Automatic Loom	3000 - 4000
High speed automatic Loom	5000 - 6000
Shutteless Loom 3 Bands	10000 - 12000

Today some of the mills in the West have discarded auto-looms and replaced them by shutteless looms. High speed automatic looms run at 270 to 280 RPM for a 44 inch width. The imported cost price of such a loom in the developing countries is approx. US \$ 6000.

Broadly speaking the shutteless loom is economical only for high priced export quality where 200 meters of flawless cloth is required. High speed automatic loom is economical for expensive fabrics, both for export and domestic market where only 40 to 80 meters length is required. Where as for the rest of all domestic market and medium priced export market, the conventional automatic loom will be more suitable. While for the domestic market where the 95% of the cloth is sold by meters and not in the form of garments, plain loom continues to be the most attractive proposition both from labour and capital point of view in the developing countries.

### 6.3 PROCESSING

The trend in <sup>the developed</sup> and the developing countries is on the continuous processing. In the developing countries, majority of the mills have more than one process where they process 5000 Kg. to 6000 Kg. per day. Contract processors are very few, but more individual processing houses are being set-up. For a mill which processes only 5000 Kg. to 6000 Kg. having about 25 to 40 different varieties of cloth, which differ both in width and weight, continuous processes are un-economical, as they require long lengths of cloth. Developing countries have wide range of

different climatic conditions and requirements of dresses which vary from region to region and state to state. It is not possible to have standard fabrics, therefore several varieties have to be manufactured to meet the demand of the market. Developing countries have to cater to the needs of such vast variety of cloth which make it un-economical and not viable to have highly modern machines.

At a rough estimate one can say that economic size for a modern process house would be to have processing capacity of standard fabric to the tune of 15,000 Kg. per day. Such a process house can adopt continuous bleaching and continuous dyeing, high speed rotary-screen printing with adequate capacity utilization. The processing need of wide width fabrics such as sheatings requires special attention .

## 7.0 DECENTRALISED SECTOR OF THE TEXTILE INDUSTRY

### CASE-STUDY INDIA:

The decentralised sector can be divided into five major sections:

- Hand-Looms
- Power Looms
- Knitting
- Co-operative Spinning Unit
- Process Houses.

The Decentralized Sector is mostly concerned with weaving. Of all cloth woven almost one half is produced in the decentralized sector. Roughly two-thirds of this is woven on handlooms. The number of handlooms in use has been estimated at 3,000,000 and the number of people dependent on handlooms and power looms for their living is from 7.5 to 10 million. The estimated production of cloth from the hand and power loom sectors is around 4000 million metres annually. While most of that output is commandeered by the local market, the export potential, particularly when such fabrics are converted into ready-made garments, is by no means small. It is a remarkable fact that handmade materials have a handle and charm of their own which cannot be captured by a mechanisation. That is not all. People like to be different. Fashions change all the time. Today, in the western world, hand woven fabrics and man-made fabrics are the trend.

One-third of the decentralised sector cloth production is woven on non-automatic power looms operated in small work-rooms or in larger installations financed by co-operatives. The proprietors of these hand and small shed power looms are encouraged by concessional excise duty rates and other fiscal concessions and in addition are given monopoly rights in the production of some cloths.

Most of the yarn used in the decentralized sector is spun by the Mill Sector & small part by Amber charka. To ensure a satisfactory supply of yarn Government puts pressure on the Mill Sector in various ways. Some yarn is supplied by co-operative spinning units set up specifically to provide yarn to the decentralized sector. There are also cooperative finishing units which process fabrics produced by the decentralized sector. Much of the cloth produced is sold locally but there are

cooperatives marketing undertaking relating on a regional scale.

The power loom is at least six times more productive than its counterpart operated by manpower. Perhaps one of the ways of providing hand loom weaver with a better income is to earmark for manufacturing fabrics which bring in better returns such as carpets, Brocades, tapestries etc.

It is estimated that there are about 35,000 knitting machines working in about 5000 knitting factories in India, of which 26,450 are Circular Knitting Machines, 1,850 are socks knitting machines, 8,500 flat bed knitting machines and 844 warp knitting machines.

In fact, several spinning cooperative mills have already been set and are doing well in supplying the yarn to the hand-loom and power-loom weavers. This is one of the many complex problems associated with the task of social upliftment and community development of the country.

At present, post loom processing facilities available in the handloom sector is inadequate and whatever post-loom processing is done is mostly carried out by independent processing units. Since the width of the handloom fabric is not uniform, the handloom industry is finding it difficult to get the cloth processed. To obviate this difficulty, it is advisable to manufacture fabrics with uniform width which are required to be processed.

The decentralized sector is an important feature of the domestic economy and is a significant part of the textile industry. In order to afford job opportunities, the Government's attitude is to encourage the handloom and powerloom sectors.

Problems of the decentralised sector:

- capital
- Living conditions
- Supply of Raw Material
- Processing
- Inadequate Marketing Facilities.
- Inadequate Technical Services.

## 8.0 TRENDS IN THE INTERNATIONAL TEXTILE INDUSTRY

### 8.1 RAW MATERIALS

Consumption of raw materials by spindles operating on the cotton-system increased overall by around 6% during 1976, to 17.7 million tons. Raw cotton consumption increased overall by 5.1% to 13.4 million tons; consumption of artificial (cellulosic) fibres increased by 0.8% to 1.8 million tons; and consumption of synthetic (non-cellulosic) fibres increased by 17.0%, to 2.3 million tons. These changes - and the geographical variations - are summarised in APPENDIX NO. I & II.

The figures for relative shares of fibre consumption in 1976, however, indicate that overall, utilisation of synthetic fibres increased to the detriment of all others; raw cotton's utilisation increased in Africa and South America, however. This may be seen from APPENDIX NO. I & II.

### 8.2 MACHINERY PRICES

Prices of textile machinery have sharply increased over the last two to three years all over the world. The determination of prices and cost competitiveness of capital goods is normally a difficult exercise since international prices are usually influenced by the size of the manufacturer's domestic market, marginal cost.

In India over the last two years price increases have ranged from 35% for automatic looms to 233% for plain looms, refer APPENDIX NO. XIV... on the average prices have increased by 65% (roughly 2% per month). It is difficult to identify the reason for the wide variation in price increases for different types of machinery. Difference in raw material requirements, explain part of the variations but discriminatory pricing policies in some areas also contribute. Given the rapid price increases machinery manufacturers did not conclude any fixed price contracts with textile mills. The latter, on the other hand, were particularly reluctant to purchase machinery without firm prices, since in some cases prices were arbitrarily determined and bore little relation to cost increases. To reconcile these two positions the Government should have evolved prices of raw material, power, interest rates and wages.

### 8.3 AUTOMATION

The developed countries have manufactured machinery as automatic as

possible to save labour cost, while in the developing countries where abundance of labour-force is available machinery with intermediate technology is being manufactured.

#### 8.4 TRENDS IN FABRIC PRODUCTION

The competing technologies for fabric production are weaving, knitting, and non-woven. After the industrial revolution weaving had maintained its supreme position until 1960, thereafter knitting has become a serious contender in the field of fabric production and very recently non-wovens have been showing some signs of impact. The share of these technologies in world textile fabric production is shown in APPENDIX No. VII-~~XIII~~. The share of the knitted goods for USA, UK and Europe is far higher than other countries.

Though it would appear that weaving is fast losing its ground, it is really not so if the actual quantum of woven production is considered. The woven fabric production has been generally steady and very recently there is some sign of increase.

#### 8.5 PATTERNS OF FABRIC PRODUCTION

Fabric production in developed countries declined markedly in both 1974 and 1975. In the United States production of woven cotton fabrics decreased by 8 per cent in 1974 and 13 per cent in 1975, and in Japan by 9 and 2 per cent for the same years. In EEC production declined by 3 per cent in 1974 and 12 per cent in 1975. Production of woven wool fabrics in the United States declined by 4 per cent in 1973, by 21 per cent in 1974 and by 15 per cent in 1975, while in Japan it decreased by 24 per cent in 1974 and just under 4 per cent in 1975. In EEC, production declined by 16 per cent in 1974 and 6 per cent in 1975.

Production of woven man-made fibre fabrics in the United States declined by 2 per cent in 1974 and 11 per cent in 1975, and in Japan in the same years by 14 and 10 per cent, though in both countries production has been recovering since the second quarter of 1975. EEC production of woven man-made fibre fabrics increased by 1 per cent in 1974 but fell by 12 per cent in 1975. Refer APPENDIX NO. IX.

In developing countries as a group, production of fabrics levelled off in 1974 and increased slightly in 1975. In 1974, woven cotton production increased in India, Mexico and Thailand, but fell in most developing countries. In 1975 it declined in India, the Republic of Korea, Pakistan

and the Philippines but recovered in Egypt and Hong Kong. Production of woven wool fabrics increased in India in 1974 but declined in Egypt and the Republic of Korea. In 1975 it recovered in Egypt and the Republic of Korea. Production of woven man-made fibre fabrics declined in India and the Republic of Korea in 1974 but rose by 39% in the latter in 1975.

Over the years, a shift in the pattern of cloth production in favour of fine and superfine varieties is perceptible as shown in the APPENDIX NO. X a.b.c.d.e., and XI.

While the share of coarse and lower medium varieties in the total output of cloth declined from 49.4 per cent in 1961 to 41.7 per cent in 1975, that of fine and superfine varieties went up from 8.4 per cent to 12.9 percent. During the same period, the share of higher medium variety in the total cloth production increased from 42.2 per cent to 45.4 per cent.

#### 8.6 EXPORTS, IMPORTS AND TRADE

In 1974 exports increased by 21 per cent to dollars 20,390 million but declined by 7 per cent to dollars 18,900 million in 1975. APPENDIX NO. XVI shows textile exports by value and main areas.  
& XVII

Developed countries remained the main market for textiles, but their imports in 1974 expanded less rapidly (16 per cent) than the world total, and in 1975 declined more steeply (13 per cent) than the world total.

In 1974 exports from developed countries increased by 26 per cent, i.e. more rapidly than world exports. In 1975 exports from developed countries declined by 8 per cent, roughly the same rate as world exports.

After an 18 per cent increase in 1973, exports from developing countries declined by 9 per cent in 1975.

The developed countries increased their textile export surplus from dollar 790 million in 1973 to dollars 2,200 million in 1975. Developed countries' export surplus in their trade with developing countries rose

from dollars 690 million in 1973 to dollars 1,750 million in 1975. On the other hand the developing countries' import surplus vis-a-vis the rest of the world rose from dollars 930 million in 1973 to dollars 1,850 million in 1975. In 1973, the state trading countries' export surplus of dollars 140 million vis-a-vis the rest of the world was transformed into import surpluses of dollars 430 million in 1974 and dollars 350 million in 1975 as shown in APPENDICES XV, XVII, XIX.

#### 8.7 FABRIC PRODUCTION RATES:

The production rates possible with the different techniques of fabric formation are given in APPENDIX NO. VIII.

The newer technologies undoubtedly offer phenomenal rates of production, but their full exploitation would considerably depend on developing new markets that could benefit from the specific characteristics and properties of the new fabric structures.

#### 8.8 PROFITABILITY TRENDS - FINANCIAL RATIOS.

It will be observed that the record of profitability of the cotton textile industry was quite un-impressive upto 1973-74. During 1973-74, the percentage of gross profits to net sales and that to total net assets improved to 11.2 and 15.1 from 7.0 and 9.8 respectively during 1972-73. The percentage of profits after tax to net worth also rose sharply to 21.8 from 10.8 in 1972-73. In 1974-75, however, the profitability of the industry again worsened. Profits after tax as percentage of net worth declined sharply to 11.9 percent and was below that of "all industries", which stood at 13.7 per cent as shown in APPENDIX NO. XII.

#### 8.9 FUTURE TRENDS IN FABRIC PRODUCTION

Taking into consideration the international trends of the fabrics manufactured, the woven fabrics will retain its dominating position over knitted and non-woven fabrics for years to come. The woven fabrics are more flexible and versatile to suit the changing fashions. Availability of man-made fabrics in the country is the main factor which would decide the growth of knitted and non-wovens. As the developed countries switch more and more to newer methods of fabric production, the conventional and intermediate technologies of fabric production



will pick up in developing countries because of availability of cheap labour and less skill required to operate and maintain them. Some of the developing countries may also adopt newer techniques to meet the demands of changing fashion in both domestic and export market. It should be realised that the advancement and the application of newer technologies is greatly influenced by the self-interest of fibre and machinery manufacturers to open new markets as profits from conventional methods start diminishing. It can be pointed out that the opportunity for growth of textile fabrics of all kinds is unlimited.

## 9.0 OUTLINE OF INDUSTRIAL POLICY FOR DEVELOPING COUNTRIES

The Industrial policy must be directed towards removing distortions of the past so that the genuine aspirations of the people can be met within a time-bound programme of economic development.

The close interaction between the agricultural and industrial sectors of the economy cannot be overemphasised. Much of the Industrial production is based on agricultural raw material. Similarly in order to increase the agricultural productivity by adaption of modern technology and agronomic practices to the prevailing conditions, important inputs have to come from the industrial sector. Highest priority must be accorded to generation and transmission of power.

The prosperity and the distribution of income arising from a broad-based growth of agriculture and related activities in the countryside has to provide the basic demand for a wide range of articles of consumption produced by industries. It is only by such a process of reinforcing interaction of the agricultural and industrial sectors that employment can be found for the large numbers of the rural population who cannot be absorbed in the agricultural sector.

### 9.1 SMALL SCALE INDUSTRIES

The emphasis of industrial policy so far has been mainly on large industries neglecting cottage industries, completely relegating small industries to a minor role.

The main thrust of the Industrial Policy should be on effective promotion of cottage and small industries widely dispersed in rural areas and small towns. It should be the policy of the Government that whatever can be produced by small and cottage industries must be restricted to the same.

It must also be ensured that production in this sector is economic and of acceptable quality.

Governments should also consider introducing special legislation for protecting the interest of cottage and household industries with a view to ensuring that these activities which provide self-employment in large numbers get due recognition in industrial development.

### 9.2 PROMOTIONAL MEASURES

The growth of the small scale and cottage industries sectors has been tardy mainly for want of satisfactory marketing arrangements for their products and supply of raw materials. Measures such as purchase preference, reservation for exclusive purchase by Government Departments and Public Sector Undertakings will also be used to support the marketing of these products.

### 9.3 APPLICATION OF APPROPRIATE TECHNOLOGY:

The development and application of technology appropriate to the socio-economic conditions has so far not received adequate attention. Efforts should be made to ensure an effective and coordinated approach for the development and widespread application of suitable small and simple machines and devices for improving the productivity and earning capacity of workers in small and village industries.

In addition to small and village industries, there is also a clear role for large scale industry. The role of large scale industry will be related to the programme for meeting the basic minimum needs of the population through wider dispersal of small scale and village industries and strengthening of the agricultural sector. In general, areas for large scale industry will be the basic industries which are essential for providing infrastructure as well as for development of small and village industries.

In order to ensure social accountability, the financial institutions whose support is vital for setting up and running of large scale enterprises will be expected to assume a more active role and profess-

ional managements.

Apart from socialising the means of production in strategic areas, public sector provides a countervailing power to the growth of large houses and large enterprises in the private sector. There should be an expanding role for the public sector in several fields. Not only will it be the producer of important and strategic goods of basic nature, but it will also be used effectively as a stabilising force for maintaining essential supplies for the consumer. The public sector should be made responsible for encouraging the development of wide range of ancillary industries, and contribute to the growth of decentralised production by making available its expertise in technology and management to small scale and cottage industry sectors. It should also be the endeavour of the Governments to operate public sector enterprises on profitable and efficient lines in order to ensure that investment in these industries pay an adequate return to society.

The country should have a well-developed infrastructure of scientific establishments. Future development of industries must be based on indigenous technology. Science and technology must contribute to the improvement in the living standards and the quality of life of the masses.

In order to promote technological self-reliance, the Government should recognise the necessity for continued inflow of technology. In sophisticated and high priority areas where ideal skills and technology are not adequately developed. In such areas, the Government's preference should be for outright purchase of the best available technology and then adapting to their condition. so that imported technology is properly utilised and assimilated. Self-reliance must continue to be a paramount objective<sup>of a.</sup> country's industrial and economic policy. The industrial strategy, therefore, must respond to the objective of creating an

industrial base which is sufficiently diversified and strong to withstand the vagaries of international trade and aid relationships.

Exports of manufactures are an important and growing segment of the export trade. Governments should consider favourably proposals for export-oriented manufacturing capacity in fields where such investment is likely to be internationally competitive after making allowance for the structure of indirect taxation in the form of customs and excise duties and other similar levies. Moreover the export should be both competitive and remunerative and generate additional direct and indirect employment.

#### 9.4 COMPULSORY EXPORTS:

In many cases, compulsory exports obligations should be imposed while approving new industrial capacity because of the need to ensure that import of raw materials and capital goods required by the project are paid for through future exports. Creation of export free-trade zones are some of the solutions and examples.

#### 9.5 LOCATION OF INDUSTRIES:

The Government should attach a great importance to balanced regional development of the entire country so that disparities in levels of development between different regions are progressively reduced. Governments should note with concern that most of the industrial development that has taken place in the developing country, has been concentrated around the major and large cities. The result has been a large scale influx to cities and thereby rapid deterioration in the living conditions especially for the working classes and attendant problems of slums and environmental pollution.

#### 9.6 PRICING POLICY:

A sound pricing policy has to aim at a reasonable degree of price stability and a fair parity between prices of agricultural and industrial products.

There should be price control distribution through co-operatives so that the controlled price should assure an adequate return to the investor.

#### 9.7 WORKERS PARTICIPATION:

The most important single resource of any country is the skill and hard work of its people. Developing countries have an abundant supply of labour which is capable of acquiring new skill in quickly and also an existing reservoir of technical and managerial personnel. These resources can be used effectively only in an environment in which the workers and managers develop a sense of personal involvement in the working of the enterprise.

#### 9.8 STREAMLINING OF PROCEDURES:

Government should continue its efforts to remove irritants in the industrial approval procedures which come in the way of accelerating industrial development. Every effort should be made to improve administrative arrangements so as to result not only in further speedy and orderly approval procedures but also in enforcing on expeditious translation of letters of intent and industrial licences into productive capacity on ground.

Industrial development is a complex process requiring the effective interaction and cooperation of all sections of society which will result in accelerated industrial growth. The willing cooperation of industrial workers, trade unions, managers, entrepreneurs, financial institutions and various governmental authorities are essential to achieve the laid-down goals.

## 10.0 SUGGESTIONS AND RECOMMENDATIONS:

The following important aspects have to be taken into consideration for the upgrading of any industry specially the textile industry, on a broad basis:

### 10.1 RAW MATERIAL

It would be desirable to lower cotton prices without hurting the farmer's income. This is possible only by increasing yields per acre, which is necessarily a long term action. Likewise, improvements in quality with reference to maturity and length uniformity are long term actions. It should be possible, however, to stabilize cotton prices to a greater extent by instituting the mechanism of a buffer market. Better selection of mix and blends would also help to some extent in improvement in quality.

The same reasoning applies to polyester. The ex-factory price of polyester staple in India is about five times than the international price. The exporting mill should either be allowed to import polyester against its export commitment or be compensated for the difference in domestic and international price of polyester staple.

### 10.2 PRODUCTIVITY

The machine productivity is governed by technological conditions. The productivity is of two kinds:

- Machine Productivity
- Operative Productivity

The machine productivity consists of efficiency and production rates, while operative productivity is the operative's efficiency and human input.

The increase in productivity through better use of machine and man-power lowers the cost of manufacture, lowers the waste %, increase in efficiency and production.

The productivity levels in the developing countries are generally low.

### 10.3 QUALITY

Quality of fabric is the reputation of the textile mill which manufac-

tures it. To compete in the domestic market, the brand name rules because of the quality. To compete on international basis, which is the main source of foreign exchange earning depends on what quality we manufacture. The developing countries have to take this into account, if they want to be export-oriented.

#### 10.4 SKILLS:

Skill is an important aspect not only for efficiency but as well for quality. The modern machinery can only be operated if the local people have acquired the skills. What is the use of installing the modern machines if one cannot operate them efficiently and maintain them to the required standards. Here the trainees play a vital role not only in the development of operative skills but overall managerial development.

#### 10.5 MODERNISATION AND RENOVATION:

To get the maximum output from the existing machinery and still have higher productivity and good quality, modernisation and renovation of the textile industry should be continuous and regular feature.

#### 10.6 MAINTENANCE:

Preventive maintenance of machine is always preferable than break down maintenance. The appropriate maintenance of machines will give many fold benefits such as 1. Higher Productivity, 2. Fewer break downs, 3. Quality Products and reduce the overall cost. With the trend of going for high speed modern machines, the maintenance should be given highest priority.

#### 10.7 POWER:

Regular and sufficient supply of power is essential, as in most of the developing countries, the machinery and material is imported, skills undeveloped and any machine idle-time not only loss to the industry but a national loss.

#### 10.8 COST CONSCIOUSNESS:

The textile mills should objectively analyse and evaluate their day-to-day



operations and function as critics of their own actions and inactions, so that they could be alert and vigilant to face any contingency with confidence and determination.

#### 10.9 PROFITABILITY:

In the present materialistic world, it is being stressed that maximization of returns on owner's funds should not be the sole objective of an industry. The main aim of an industry should be to serve the interest of the society. The returns of the capitalist who provide the funds, should be in harmony with this objective. Though this is debatable question, but there should be a complete agreement that is for the harmonious blending of profitability, sufficient returns on investment and service to the society. It is necessary that the textile industry should generate sufficient surpluses and to marshal financial resources.

#### 10.10 RESEARCH AND DEVELOPMENT

The Textile Industry would also need laboratory equipments for the purpose of inspection, measuring and testing so that the standards of quality and performance can be evaluated in advance as is the normal practice in all textile mills of high repute. The capacity to manufacture such laboratory equipments required by the Textile Industry will have to be developed in the country if economics of production so justifies.

It would not always be possible and feasible to expect 100% self-sufficiency in regard to a capital item like textile machinery and in the case of items where there is sporadic demand, production of indigenous machines may be uneconomical and from that angle, it is necessary to have import of such items on a regulated basis. It may be mentioned here that even the most developed countries have to import certain items of machinery which cannot be produced economically in those countries. The textile machinery industry and the textile mills should also work in close co-operation so that the fruits of innovation and development would be available for immediate practical application. The development of new equipment in textile industry requires study of many engineering problems which may include hydraulics, electronics and many other engineering systems including metallurgy. Therefore, co-operation of

various specialised institutions is also essential.

The Research and Development is an expensive and continuous process and to finance such a process, the Textile Machinery Making Industry should be left with adequate resources. The fortunes of the machinery manufacturing industry are closely linked with the fortunes of the textile industry and in recent years the textile mill industry has been passing through a difficult period.

**10.II MAIN OBJECTIVES:**

- Assured availability of clothing to the population at reasonable prices.
- Realising the full potential of the textile industry for exports.
- Enlarged employment opportunity particularly in the rural areas.
- Development of all the three sectors of the industry in a manner so as to make them complementary to each other.
- Imparting vigour and vitality to all sectors of the industry.

## II.0 CONCLUSION:

Viewed from the international technology standards the textile machinery manufactured in the developing countries could be said to be a decade behind. However, this limitation does not prove to be a constraint from productivity as well as quality aspects in a developing country, where abundance of relatively cheap labour force is available. As a matter of fact what developing countries need is the technology that would make "the fullest use of material and man-power resources available in the country." However care should be taken that the technology adopted should prove to be adequately productive while it is economically viable and at the same time should not prevent the natural growth of employment opportunities. Developing countries need technology which is relatively cheap technology permitting a very wide application so that workers without special training could be provided with gainful employment. Such a technology would be an intermediate position between highly productive technology used in industrially advanced countries and very simple equipments and tools used in primitive economics.

The aspiration of the Government in the developing countries is to modernise the textile industry and increase the productivity. But at the same time, they want to protect the indigenous textile machinery industry for obvious reasons as they cannot today compete in quality with some of the foreign manufacturers. Therefore any import of textile machinery must fall in the group of machines which will increase the productivity in the context of appropriate technology, labour and yet be accepted by the import rules and regulations of this country.

The modernisation should not be done for the sake of modernisation, it must meet the acid test of Cost-benefit analysis taking into consideration the economics and the return on the investment.

The technology and machinery to be imported in the developing countries should take into account the following facts:

- Government's Policy
- Simple in technology
- Increase in production
- Availability of spare parts.

- Employment of labour
- Rural and community development.

The technology of the textile machinery manufacturing industry in the developing countries although apparently is not producing high speed modern sophisticated fully automatic machinery currently used by the developed countries, but it is never the less filling the most important gaps and mainly producing such machinery and equipment which is conducive to the requirement of the developing countries. It is therefore, that considerable attention has to be given to this sector by the Government in encouraging it to bring technological innovations and at the same time produce such machinery appropriate for use in the dispersed sector in most of the developing countries.

The emphasis therefore may have to be given on manufacturing machinery for small-scale production but technologically efficient and economically productive.



APPENDIX NO. III

SPINNING SPINDLES: SUMMARY AND WORLD TOTALS

(Million)

Unit Continent	Number		% Change	Maximum number active		
	1975	1976		1975	1976	% Change
Africa	4.80	4.93	+ 2.7	4.65	4.75	+ 2.2
America, North	22.43	21.95	- 2.1	21.17	20.64	- 2.5
America, South	8.20	8.36	+ 2.0	7.49	7.76	+ 3.6
Asia & Oceania	65.38	66.34	+ 1.5	55.77	58.07	+ 4.1
Europe	47.99	47.93	- 0.1	45.98	45.46	- 1.1
<b>World Totals</b>	<b>148.81</b>	<b>149.51</b>	<b>+ 0.5</b>	<b>135.06</b>	<b>135.67</b>	<b>+ 1.2</b>

LOOMS: SUMMARY AND WORLD TOTALS

The estimated world total installed capacity of  
shuttle-less looms as at the end of 1976 is around  
290,000

Unit: thousands	Automatic Looms and Looms with Automatic Attachments				Ordinary Looms			
	Number		Maximum Number Active during		Number		Maximum Number Active during	
	1975	1976	1975	1976	1975	1976	1975	1976
Africa	82.7	82.7	71.5	73.8	13.4	14.2	12.1	12.8
America, North	344.1	341.2	332.4	322.3	10.2	9.7	7.2	7.0
America, South	129.5	129.5	123.6	120.4	84.9	84.9	76.3	76.3
Asia & Oceania	792.7	795.2	735.7	734.7	646.5	636.4	578.4	579.1
Europe	605.9	591.3	587.1	576.9	220.5	213.9	193.2	188.2
World Totals	1,954.9	1,939.9	1,850.2	1,828.2	975.5	959.1	867.3	863.3

## Total

Unit: thousands	Number			Maximum Number Active during		
	1975	1976	% Change	1975	1976	% Change
Africa	97.3	99.5	+ 2.2	84.6	88.5	+ 4.6
America, North	378.2	375.2	- 0.8	362.5	352.4	- 2.8
America, South	218.0	218.2	+ 0.1	203.5	200.5	- 1.5
Asia & Oceania	1440.5	1,444.2	+ 0.3	1,315.4	1,325.9	+ 0.8
Europe	841.8	822.5	- 2.3	795.7	782.7	- 1.6
World Totals	2,975.8	2,959.7	- 0.5	2,761.6	2,749.9	- 0.4

WORLD DISTRIBUTION OF ACTIVE  
COTTON-SPINNING SPINDLES, 1964 AND 1971-74  
(PERCENTAGES)

	1964	1971	1972	1973	1974
Africa	1.94	2.55	2.71	3.11	3.14
North and Central America	17.90	16.59	16.41	16.12	15.74
South America	4.87	5.00	5.08	5.23	5.45
Asia, Australasia and the Middle East <sup>1</sup>	35.01	40.34	41.49	41.38	41.69
Europe	39.98	35.50	34.30	34.15	33.98

<sup>1</sup> Until 1970, data for Asia and Australasia included Turkey. However, from 1971 onwards, Turkey is included in Europe.

Source: International Federation of Cotton and Allied Textile Industries: Directory, 8th edition 1977 (Zurich), table I.

WORLD DISTRIBUTION OF ACTIVE  
COTTON-WEAVING LOOMS, 1964 AND 1971 - 74  
(PERCENTAGES)

	1964	1971	1972	1973	1974
Africa	1.93	2.43	2.24	3.03	3.12
North and Central America	12.50	9.09	14.44	14.30	13.77
South America	5.91	6.84	6.70	7.17	7.35
Asia, Australasia and the Middle East	39.47	47.99	45.30	45.72	45.49
Europe	40.19	33.64	31.32	29.78	30.27

<sup>1</sup> Until 1970, data for Asia and Australasia included Turkey. However, from 1971 onwards, Turkey is included in Europe.

Source: International Federation of Cotton and Allied Textile Industries: Directory 8th edition 1977, table 2.



APPENDIX No. VII

PRODUCTION OF TEXTILE FABRICS IN THE WORLD

Goods	Percentage by weight		
	1968-69	1970	1975
Woven	83	81	77
Knitted	11	13	16
Non-woven and felts	5	6	7
Others	1	-	-

APPENDIX No. VIII

COMPARATIVE PRODUCTION RATES FOR FIBROUS MATERIALS

Technique	Machines used	Relative speed
Weaving	Automatic loom(average 5 m <sup>2</sup> /hr)	1
	Shuttleless loom	2
Knitting	Circular-knitting machine (large diameter type)	4
	Tricot knitting machine	16
Non-woven fabric production	DRY: Stitch bonding machine	38
	Cotton-carding machine	120
	Wool-carding machine (big leveller)	400
	Needle loom (large width)	500
	Pneumatic system (Rando Webber)	600
	Spun-bonding machine	200-2,000
	WET: Rotoformer machine	2,300
Foumrinier machine	10,000	

INTERNATIONAL TRENDS AND PATTERNS OF  
WOVEN CLOTH PRODUCTION

<u>COUNTRIES</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>
<u>UNITED KINGDOM (Mn.m.)</u>			
Cotton	409.5	405.4	374.5
Spun rayon	73.1	65.4	55.2
C.F. rayon	143.8	157.3	133.0
C.F. synthetic	173.6	176.1	197.7
Mixtures	114.7	104.2	107.0
<u>FRANCE ( Mn.Kg.)</u>			
Cotton	154.0	131.9	148.0
Spun rayon	9.0	7.0	6.4
C.F. rayon	1.6	.9	1.4
Spun synthetic	25.7	22.7	23.8
C.F. synthetic	4.7	3.8	4.2
Rayonne	52.8	47.3	..
<u>BELGIUM (Mn. kg.)</u>			
Cotton	67.7	55.0	63.1
Rayon	32.6	27.6	30.8
Synthetic	116.6	125.3	160.7
<u>NETHERLANDS (Mn.kg.)</u>			
Cotton	38.0	27.5	32.5
Rayon	7.2	5.7	5.8
Synthetic	20.3	16.5	16.6
<u>FEDERAL REPUBLIC OF GERMANY (Mn.kg.)</u>			
Cotton	167.2	153.5	184.0
Spun man-made fibre	103.7	97.4	101.6
C.F. man-made fibre	80.8	73.5	76.5
<u>ITALY (Mn. kg)</u>			
Cotton	113.1	104.5	121.6
Spun man-made fibre	5.6	4.5	6.9
C.F. man-made fibre	11.6	11.5	13.8
Other fibres and mixtures	51.5	39.8	39.8
<u>IRISH REPUBLIC (Mn.sq.m.)</u>			
Cotton	21.9	12.2	19.4
Man-made fibre and f mixtures	10.5	10.1	15.5
<u>DENMARK (Mn.sq.m.)</u>			
Cotton	7.7	7.8	..
Spun man-made fibre	15.5	15.0	..

<u>COUNTRIES</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>
<u>NORWAY (Mn. Kg.)</u>			
Cotton	3.7	3.8	3.5
Spun man-made fibre	1.2	1.1	.8
C.F. man-made fibre	1.7	1.7	1.7
<u>SWEDEN (Mn. Kg.)</u>			
Cotton	12.9	11.9	14.8
Man-made fibre	14.2	11.1	9.6
<u>FINLAND (Mn. Kg.)</u>			
Cotton	14.6	11.5	11.9
<u>SWITZERLAND (Mn. Kg.)</u>			
Cotton	15.7	12.4	17.2
Man-made fibre	3.1	2.5	2.7
Mixtures	5.2	3.0	2.9
<u>AUSTRIA (Mn. m.)</u>			
Cotton	71.6	62.6	57.6
Spun rayon	26.2	21.0	12.9
C.F. rayon	14.7	14.3	15.0
Synthetic	67.7	45.5	53.2
<u>PORTUGAL (Mn. Kg.)</u>			
Cotton	61.0	53.2	61.3
Man-made fibre	16.1	17.0	17.4
Mixtures	16.2	8.9	8.6
<u>SPAIN (Mn. Kg.)</u>			
Cotton	77.4	62.7	58.4
Spun-rayon	5.3	5.4	5.6
- mixtures	57.5	59.3	60.8
C.F. - rayon	5.7	5.2	4.9
- synthetic	11.3	11.0	11.5
- mixtures	14.9	14.4	14.9
<u>YUGOSLAVIA (Mn. sq. m.)</u>			
Cotton and spun man-made fibre	365.5	375.5	384.1
C.F. man-made fibre	35.1	39.5	36.1
<u>GREECE (Mn. Kg.)</u>			
Cotton	28.6	..	..
Man-made fibre	4.5	..	..
<u>TURKEY (Mn. m.)</u>			
Cotton	209.9	212.4	..
<u>ARAB REP. OF EGYPT (Mn. m.)</u>			
Cotton	598.4	561.0	..
<u>ISRAEL (Mn. Kg.)</u>			
Cotton	13.6	12.6	..

<u>PAKISTAN</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>
Cotton (Mn.m.)	622.5	595.3	480.33
<u>INDIA (Mn.m.)</u>			
Mill-made			
Cotton	4,315.6	4,032.3	3,881.0
Man-made fibre and mixtures	124.5	234.7	345.0
Decentralised sector:			
Cotton	3,968.0	4,002.0	..
Man-made fibre	849.0	..	..
<u>Other Asia (Mn.m.)</u>			
Cotton	630.8	760.8	811.2
Cotton blends	356.8	441.3	485.6
Man-made fibre	110.8	201.0	240.9
Spun rayon blends	12.6	8.9	5.9
Spun synthetic blends	13.7	12.1	11.3
<u>HONG KONG (Mn.sq.m.)</u>			
Cotton	554.0	682.2	822.3
Blends	79.5	79.8	94.1
Man-made fibre	4.3	4.3	3.7
<u>REP. OF KOREA (Mn.sq.m.)</u>			
Cotton	261.4	242.8	339.7
Synthetic	313.9	434.8	541.2
<u>JAPAN (Mn.sq.m.)</u>			
Cotton	2,163.5	2,124.4	2,236.7
Spun rayon	549.2	495.8	560.4
C.F.synthetic	1,377.7	1,272.1	1,467.7
C.F. rayon	437.8	341.2	366.6
Spun synthetic	1,244.1	1,139.0	1,340.3
<u>AUSTRALIA (Mn.sq.m.)</u>			
Cotton	57.2	48.9	51.5
Rayon	19.6	16.1	17.0
Synthetic	105.5	86.9	95.7
<u>CANADA</u>			
Cotton	154.1	96.6	..
Man-made fibre	278.9	..	..
<u>U.S.A. (Mn.m.)</u>			
Cotton	4,296.6	3,716.4	4,157.3
Spun man-made fibre & mixtures	3,025.5	2,776.6	3,176.0
Continuous filament	1,794.8	1,549.5	1,828.0
Man-made fibre n.e.s.	594.5	501.5	607.0
Tyre cord and fabric (Mn.Kg)			
Rayon	33.0	14.4	11.9
Nylon and polyester	233.1	193.4	203.1
Chafer	28.8	28.1	29.2
<u>MEXICO (Mn.Kg.)</u>			
Cotton	..	..	..
Man-made fibre and mixtures	..	..	..

TRENDS IN PRODUCTION PATTERNS IN THE  
DEVELOPING COUNTRIES  
CASE-STUDY INDIA

a - Trend of Production of Yarn

(In Million Kgs.)

Year	Cotton yarn	100% man-made fibre spun yarn	Blended yarn	Total yarn
1971 ... ..	881	65	34	980
1972 ... ..	972	60	28	1,060
1973 ... ..	998	62	31	1,091
1974 ... ..	1,007	60	25	1,092
1975 ... ..	989	54	40	1,083
1976 ... ..	1,006	65	76	1,147
1977 ... ..	846	87	189	1,122

b - DETAILS OF PURE MAN-MADE FIBRES AND BLENDED  
YARN OUTPUT

(In Million Kgs.)

Type of Yarn	1975	1976	1977
100% cellulosic(viscose & acetate)	54	65	87
Polyester/cotton blended	11	12	17
Polyester/viscose blended	7	15	20
Cotton/viscose blended	20	43	135
Others	<u>2</u>	<u>6</u>	<u>17</u>
	94	141	276

c - BLENDED AND MIXED FABRICS WOVEN

(In Million Metres)

Type of Cloth	1975	1976	1977
Cotton/polyester	118	142	187
Viscose/polyester	11	24	46
Cotton/viscose	83	156	533
Others	23	23	132
Total	<u>235</u>	<u>345</u>	<u>898</u>

d - TREND OF PRODUCTION OF CLOTH

(In Million Metres)

Year	Mill Sector				Decentralised sector			Grand Total
	Cotton	100% Man- made fibre fabrics	Blended Fabrics	Total	Cotton	Blended Fabrics	Total	
1971	3,957	2	148	4,107	3,399	100	3,499	7,606
1972	4,245	1	98	4,344	3,777	101	3,878	8,222
1973	4,169	1	129	4,299	3,602	121	3,723	8,022
1974	4,316	Negligible	124	4,440	3,968	87	4,055	8,495
1975	4,032	1	234	4,267	4,002	133	4,135	8,402
1976	3,881	1	344	4,226	4,064	253	4,317	8,543
1977	3,224	7	891	4,122	3,678	567	4,245	8,367

e - CLOTH PRODUCTION

(In Million Metres)

	Cotton cloth	Blended and mixed	Total
<b>Mill Sector</b>			
1975	4,032	235	4,267
1976	3,881	345	4,226
1977	3,224	898	4,122
<b>Handlooms and Powerlooms:</b>			
1975	4,002	133	4,135
1976	4,064	253	4,317
1977	3,678	567	4,245

PATTERN OF COTTON TEXTILE CLOTH PRODUCTION

(In million metres)

Year	Coarse and lower medium Average count up to 25s	Higher medium (Average count 26s-34s)	Fine and superfine (Average count 35s and above)	Total
1970	1,687 (40.5)	1,866 (44.9)	604 (14.6)	4,157 (100.0)
1971	1,541 (38.9)	1,753 (44.3)	663 (16.8)	3,957 (100.0)
1972	1,782 (42.0)	1,917 (45.2)	546 (12.8)	4,245 (100.0)
1973	1,884 (45.2)	1,559 (37.4)	726 (17.4)	4,169 (100.0)
1974	1,826 (42.3)	1,957 (45.3)	533 (12.4)	4,316 (100.0)
1975	1,683 (41.7)	1,829 (45.4)	520 (12.9)	4,032 (100.0)

(Figure in brackets relate to 'all industries'.)

PROFITABILITY TRENDSTextile Industry: Financial Ratios

Ratios	1970-71	1971-72	1972-73	1973-74	1974-75
Gross Profits as % of net sales	6.1 (10.0)	4.9 (10.0)	7.0 (9.5)	11.2 (10.7)	7.5 (11.4)
Gross Profits as % of total net assets	7.7 (10.4)	6.3 (10.5)	9.8 (10.4)	15.1 (11.2)	10.7 (12.8)
Profits after tax as % of net worth	5.8 (11.2)	0.9 (10.5)	10.8 (10.3)	21.8 (11.6)	11.9 (13.7)

(Figures in brackets relate to 'all industries'.)

## APPENDIX NO XIII.

PRODUCTION OF WOVEN FABRICS

(Million Metres)

	<u>1974</u>	<u>1975</u>	<u>1976</u>
1. 100% Cotton Cloth			
(a) Mill Sector	4,316	4,032	3,881
(b) Decentralised Sector	3,968	4,002	4,064
Total	8,284	8,034	7,945
2. 100% Man-made Yarn Fabrics.			
(a) Mill Sector	Negligible	1	1
(b) Decentralised Sector	849	845	900
Total	849	846	901
3. Blended or Mixed Fabrics.			
(a) Mill Sector			
(i) Polyester-Cotton Fabrics	63	118	142
(ii) Polyester-Viscose Fibres	5	11	24
(iii) Polyester- Other Fibres	3	6	13
(iv) Cotton - Viscose	32	83	156
(v) Cotton - Other Fibres	21	16	9
Total	124	234	344
(b) Decentralised Sector	87	133	253
Grand Total	9344	9247	9443

PER CAPITA AVAILABILITY OF WOVEN CLOTH

Year	Estimated mid-year Population in Millions	Cotton Cloth	Per Capita Availability Metres	
			Man-Made Fibre-Fabrics	Blended Mixed/Fabrics
1974	586.06	12.88	1.36	0.36
1975	597.87	12.58	1.37	0.61
1976	609.27	11.36	1.40	0.97



TRENDS IN PRICE OF TEXTILE MACHINERY

	<u>(U.S. Dollars)</u>			<u>Increase in price 1973-1975 (%)</u>
	<u>1973</u>	<u>1974</u>	<u>1975</u>	
Blow Room	n.a.	137,500	162,500	18
Carding Engines	5,400	7,250	10,200	86
Draw Frames	7,100	8,750	10,700	51
Combers	28,750	32,800	<b>39,600</b>	38
Speed Frames (108 spindles)	18,750	23,250	32,200	72
Ring Frames (440 spindles)	13,250	15,825	24,500	85
Automatic Loom	3,000	3,600	4,600	35
Automatic Loom	1,450	1,600	3,000	200
Plain Loom	450	650	1,050	233

EXPORTS OF TEXTILES AND CLOTHING FROM DEVELOPING  
TO DEVELOPED COUNTRIES AND AREAS

Country or area of origin	Textiles & Clothing			Textiles			Clothing		
	1973	1974	1975	1973	1974	1975	1973	1974	1975
	(millions of dollars, c.i.f.)								
TOTAL	5,272	6,607	6,812	2,004	2,407	1,970	3,268	4,200	4,842
	(percentage)								
Hong Kong <sup>1/</sup>	32.1	30.3	33.6	15.1	14.2	14.4	42.6	39.6	14.4
Rep. of Korea	18.0	19.1	20.5	15.1	13.9	18.2	19.7	22.0	21.5
India	9.4	9.6	7.3	20.9	20.7	15.7	2.4	3.3	3.9
Yugoslavia	6.6	5.7	6.0	3.6	2.0	1.6	8.5	7.9	7.8
Spain	4.2	4.5	4.6	5.3	6.0	7.6	3.6	3.6	3.4
Mexico	3.9	5.0	4.2	5.0	6.8	5.6	3.2	3.9	3.6
Brazil	3.5	3.9	3.5	7.0	8.5	9.5	1.3	1.3	1.0
Pakistan	4.1	3.7	2.9	9.8	8.8	8.5	0.6	0.8	0.6
Romania	2.8	2.6	2.9	2.3	1.8	2.1	3.2	3.0	3.2
Turkey	2.4	3.1	2.6	3.8	4.8	4.8	1.5	2.2	1.7
Israel	2.1	1.8	1.8	1.6	1.3	1.4	2.4	2.0	1.9
Philippines	1.5	1.6	1.7	0.9	0.9	0.9	1.9	2.0	2.0
Singapore	2.7	2.0	1.7	1.3	1.0	1.0	3.5	2.6	2.0
Macau <sup>2/</sup>	1.5	1.2	1.7	0.3	0.2	0.2	2.2	1.8	2.3
Thailand	1.5	1.5	1.3	2.3	2.5	2.3	1.0	1.0	1.0
Colombia	1.0	1.5	1.3	1.9	2.6	2.7	0.5	0.8	0.8
Malaysia	0.6	0.7	0.9	0.7	0.7	1.3	0.6	0.7	0.8
Haiti	0.4	0.6	0.5	0.3	0.7	0.5	0.4	0.5	0.5
Egypt	0.7	0.6	0.3	1.9	1.7	1.1	0.0	0.0	0.0
El Salvador	0.2	0.3	0.3	0.2	0.3	0.3	0.2	0.3	0.3
Argentina	0.5	0.5	0.3	0.5	0.4	0.1	0.5	0.6	0.3
Jamaica	0.2	0.1	0.1	0.0	0.0	0.0	0.2	0.2	0.1
Guatemala	0.1	0.1	0.1	0.1	0.2	0.1	0.0	0.0	0.1
Nicaragua	0.0	0.1	0.1	0.0	0.1	0.2	0.0	0.1	0.0

<sup>1/</sup> A British crown colony

<sup>2/</sup> A Portuguese dependency

APPENDIX No. XVI

TRENDS IN WORLD EXPORTS OF COTTON PIECEGOODS

(In million sq.metres)

CONTINENT	YEAR :	1973	1974	1975	1976
ASIA		180.40	122.36	98.01	85.29
AFRICA		23.13	18.87	9.41	10.05
EUROPE		302.96	188.89	175.73	352.08
AMERICA		95.42	79.01	37.18	109.80
OCEANIA		29.07	40.70	12.04	23.85
	GRAND TOTAL	630.98	449.83	332.37	581.07

APPENDIX No. XVII

TRENDS IN WORLD EXPORTS OF MILL-MADE COTTON TEXTILES

(In million US \$)

CONTINENT	YEAR	1973	1974	1975	1976
ASIA		64.5	61.55	55.42	62.55
AFRICA		10.96	16.61	11.38	14.79
EUROPE		144.06	202.91	159.17	386.41
AMERICA		47.73	84.61	92.08	158.41
OCEANIA		15.69	33.03	12.40	19.08
	GRAND TOTAL	282.94	398.69	329.46	641.26

WORLD NET TRADE<sup>I</sup> IN TEXTILES BYMAJOR AREAS

(THOUSAND MILLION DOLLARS F.O.B )

	1970	1972	1973	1974	1975
<b>Developed countries</b>					
with -					
World	1.21	0.76	0.79	1.91	2.20
Developing countries	1.04	0.58	0.69	1.38	1.75
State trading countries	0.17	0.18	0.10	0.53	0.45
<b>Developing countries</b>					
with -					
World	-1.15	-0.64	-0.93	-1.48	-1.85
Developed countries	-1.04	-0.58	-0.69	-1.38	-1.75
State trading countries	-0.11	-0.06	-0.24	-0.10	-0.10
<b>State trading countries</b>					
with -					
World	-0.06	-0.12	-0.14	-0.43	-0.35
Developed countries	-0.17	-0.18	-0.10	-0.53	-0.45
Developing countries	0.11	0.06	0.24	0.10	0.10

I Exports (f.o.b.) minus imports (f.o.b.).

Source: United Nations: Monthly bulletin of statistics, various issues.

WORLD TRADE IN TEXTILES  
BY MAJOR AREAS, 1970 AND 1972-75  
 (THOUSAND MILLION DOLLARS F.O.B)

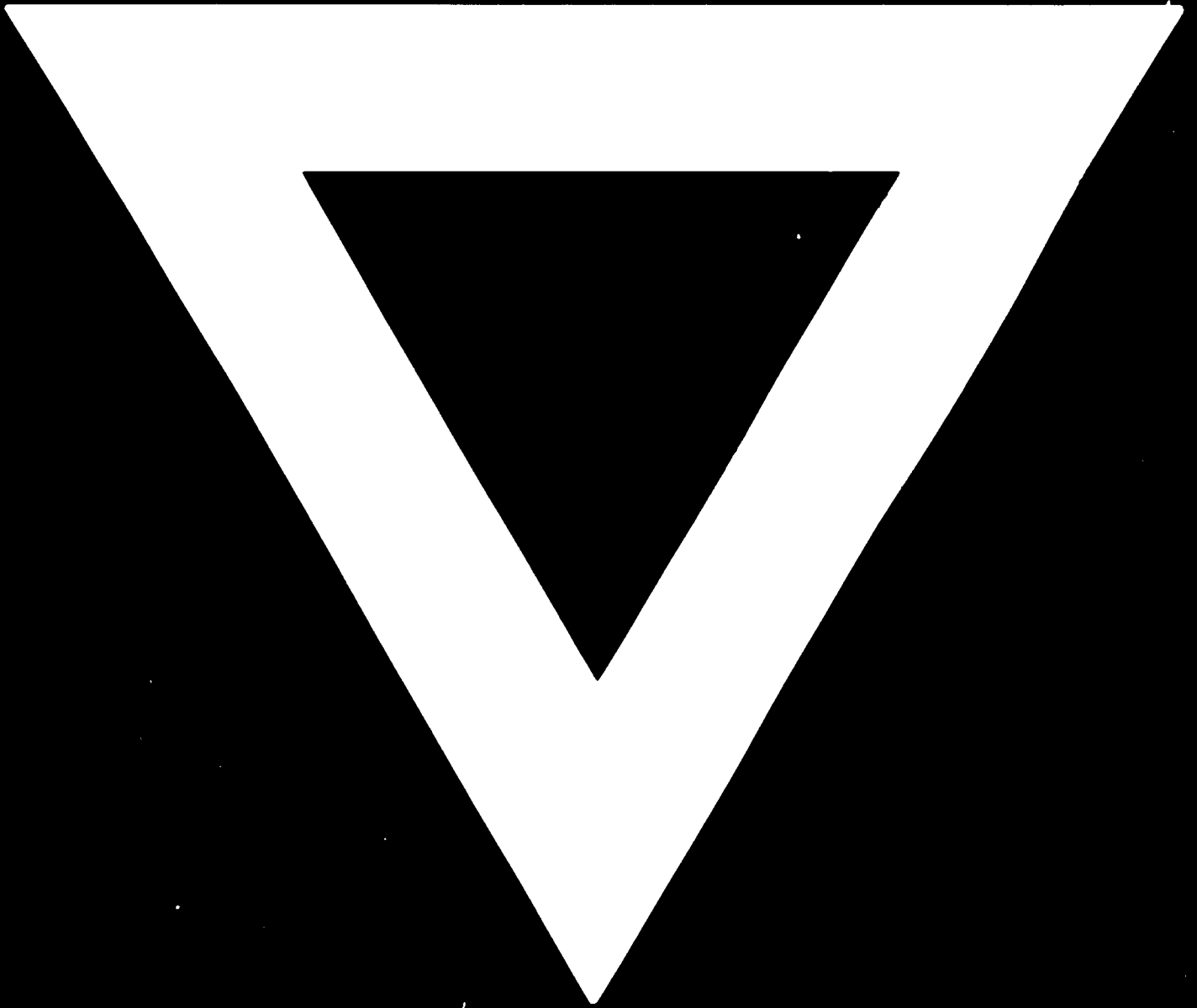
Exports from	Imports into	Developed	Developing	State	World
	Developed	countries	countries	trading	
		countries	countries	countries	
<b>Developed countries</b>					
I970		3.35	2.24	0.37	5.96
I972		4.33	2.69	0.56	7.58
I973		5.41	3.79	0.73	9.93
I974		6.38	4.88	1.22	12.48
I975		5.65	4.70	1.10	11.45
<b>Developing countries</b>					
I970		1.20	0.91	0.24	2.35
I972		2.11	1.10	0.35	3.56
I973		3.10	1.66	0.38	5.14
I974		3.50	2.00	0.57	6.07
I975		2.95	2.00	0.60	5.55
<b>State trading countries</b>					
I970		0.20	0.35	0.25	0.80
I972		0.38	0.41	0.41	1.20
I973		0.63	0.62	0.48	1.73
I974		0.69	0.67	0.48	1.84
I975		0.65	0.70	0.55	1.90
<b>World</b>					
I970		4.75	3.50	0.86	9.11
I972		6.82	4.20	1.32	12.34
I973		9.14	6.07	1.59	16.80
I974		10.57	7.55	2.27	20.39
I975		9.25	7.40	2.25	18.90

**Source:** United Nations: Monthly bulletin of statistics (New York), various issues.

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**79.11.14**