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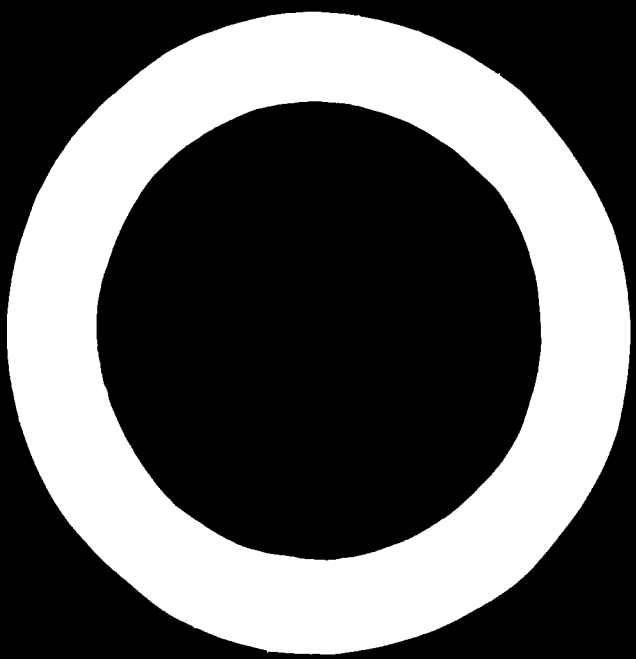
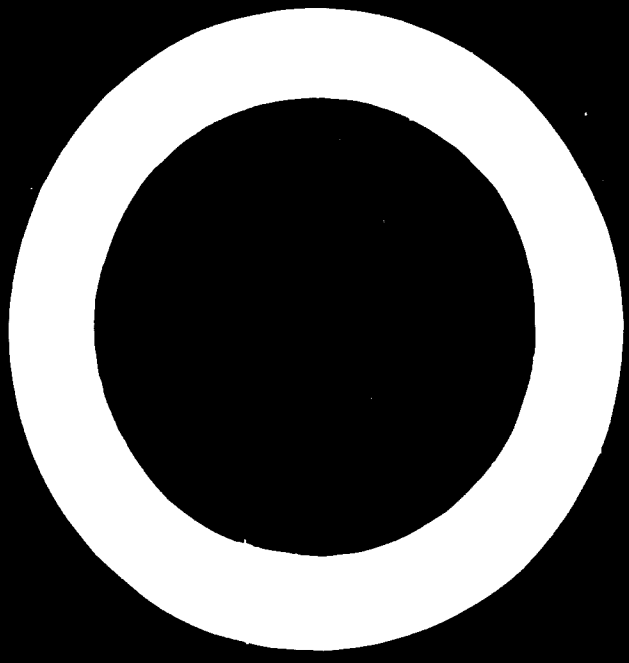
UNIDO MONOGRAPHS ON INDUSTRIAL DEVELOPMENT

Industrialization of Developing Countries: Problems and Prospects

TEXTILE INDUSTRY

UNITED NATIONS





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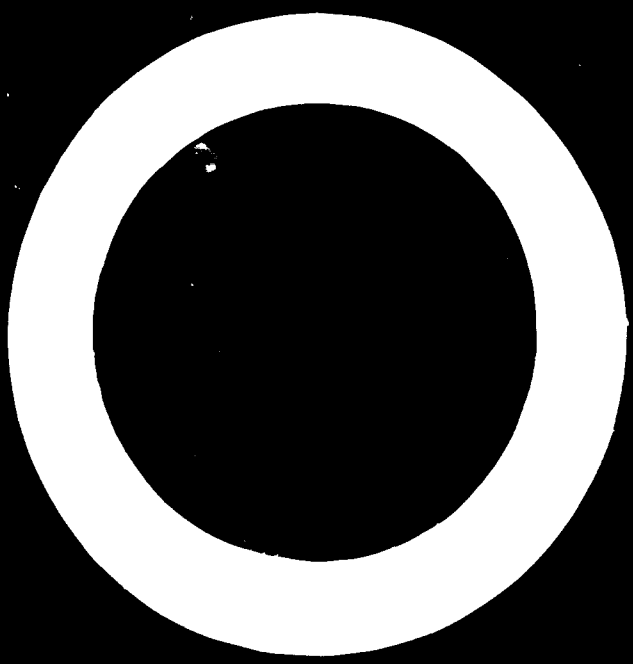

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
VIENNA

UNIDO MONOGRAPHS ON INDUSTRIAL DEVELOPMENT

Industrialization of Developing Countries:
Problems and Prospects

MONOGRAPH NO. 7

TEXTILE INDUSTRY

Based on the Proceedings of the International
Symposium on Industrial Development
(Athens, November–December 1967)

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Foreword

The International Symposium on Industrial Development, convened by UNIDO in Athens in 1967, was the first major international meeting devoted exclusively to the problems of industrialization of the developing countries. It followed a series of regional symposia on problems of industrialization held in Cairo, Manila and Santiago in 1965—1966 under the sponsorship of UNIDO and the United Nations regional economic commissions, and a similar symposium held in Kuwait in 1966 under the sponsorship of UNIDO and the Government of Kuwait.

The Athens Symposium was attended by some 600 delegates from 78 countries and by representatives of various United Nations bodies, international organizations and other interested institutions in the public and private sectors. It provided a forum for discussion and exchange of views on the problems and prospects of the developing countries which are engaged in promoting accelerated industrial development.

The Symposium devoted special attention to possibilities for international action and for co-operative efforts among the developing countries themselves, and explored the scope, means and channels for such efforts.

Studies and papers on a wide range of problems relating to industrialization were presented to the Symposium—by the UNIDO secretariat and by participating Governments, international organizations and observers. An official report, adopted at the Symposium, has been published by UNIDO.[1] Based on this documentation and the discussions in the meeting, the present series of monographs is devoted to the 21 main issues which comprised the agenda of the Symposium. Each monograph includes a chapter on the issues presented, the discussion of the issues,

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[1] *Report of the International Symposium on Industrial Development, Athens 1967* (ID/11) (United Nations publication, Sales No.: 69.II.B.7).

and the recommendations approved by the Symposium. Some of the monographs deal with specific industrial sectors; some with matters of general industrial policy; and others with various aspects of international economic co-operation. An effort has been made to make the monographs comprehensive and self-contained, while the various economic, technological and institutional aspects of the subject matter are treated within the context of the conditions generally prevailing in the developing countries.

Since economic, technological and institutional aspects are described with particular reference to the needs of the developing countries, it is felt that the monographs will make a distinct contribution in their respective areas. They are intended as a source of general information and reference for persons and institutions in developing countries concerned with problems of industrialization, and particularly with problems and issues of international co-operation in the field of industrialization. With this in view it was considered that an unduly detailed technical presentation should be avoided while at the same time enough substantive material should be offered to be of value to the prospective reader. For a more elaborate treatment of the subject, the reader is referred to the selected list of documents and publications annexed to each monograph.

The annexes also contain information on the areas in which UNIDO can provide technical assistance to the developing countries on request; a selected list of major UNIDO projects in the respective fields; and a list of meetings recently organized by the United Nations.

It is hoped that the monographs will be particularly useful to Governments in connexion with the technical assistance activities of UNIDO and other United Nations bodies in the field of industrial development.

This monograph was prepared by the secretariat of UNIDO on the basis of material submitted by Mr. R. G. Haour, Director, Compagnie d'Engineering et de Planification Industrielle Economique et Commerciale (CEPIEC) of Paris, serving as consultant to UNIDO.

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Billion refers to thousand million.

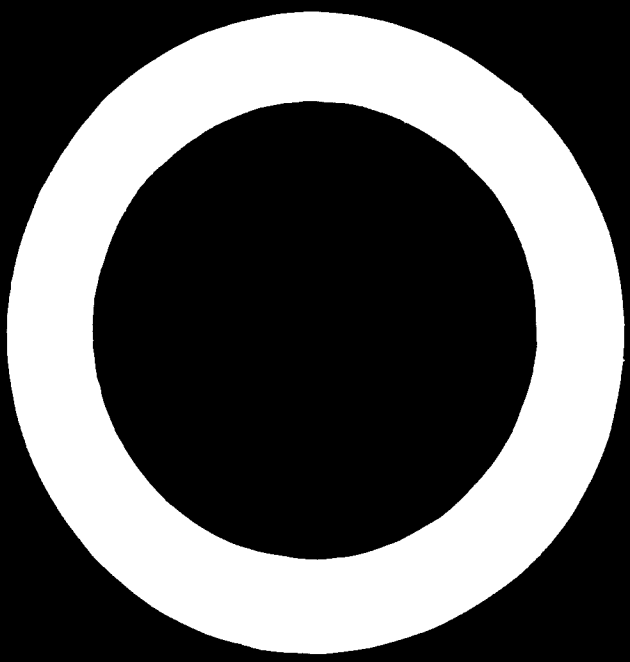
Dollar ($) refers to US dollar unless otherwise specified.

One cent (¢) equals $0.01.

Ton refers to metric ton (1,000 kg) unless otherwise specified.

The following abbreviations are used in this monograph:

ECA	Economic Commission for Africa
ECLA	Economic Commission for Latin America
FAO	Food and Agriculture Organization of the United Nations
GATT	General Agreement on Tariffs and Trade
ICAC	International Cotton Advisory Committee
IFCATI	International Federation of Cotton and Allied Textile Industries
ILO	International Labour Organisation
OECD	Organisation for Economic Co-operation and Development
p.a.	per annum
PE	polyethylene
PP	polypropylene
UNCTAD	United Nations Conference on Trade and Development
UNIDO	United Nations Industrial Development Organization



INTRODUCTION

Clothing is a basic human need, and the production of textiles is one of the oldest activities of mankind. The industrial revolution began with the mechanization of textile production, and the industrial development of the countries which are now highly industrialized owed much to the vigorous expansion of their manufacturing textile industries. Among the more advanced of the developing countries, the textile industry was likewise one of the first to be established when industrialization was begun. It generally accounts for a high proportion of employment in manufacturing industry and of value added in the manufacturing sector.

It is therefore important for developing countries to examine the advisability of establishing or expanding a textile industry and to ensure its efficient and economic operation.

In addition to animal fibres, such as wool and silk, and the growing range of man-made fibres, there are vegetable fibres yielded by over 2,000 species of plants grown in various parts of the world. Fewer than 50 of these plants, however, are processed into textile articles to any significant extent and only about ten are of real commercial importance.

In order to concentrate attention in this monograph on the essential issues, the discussion is limited to the following groups of fibres: the so-called apparel fibres (cotton, wool and man-made fibres) and the industrial fibres (jute, sisal, henequen and abaca).

Some developing countries have a long-established textile industry. For example, the cotton mill industry was first set up in India in the 1850s, and the Indian jute industry was flourishing by the end of the nineteenth century; textile manufacture began in Egypt in 1911. The importance attached to this industry by the developing countries is evident from the discussion at the International Symposium in Athens and the preceding regional symposia.

Chapter 1 of this monograph is devoted to trends since 1954 in production and consumption in the developing regions and the developed

countries. The analysis shows that consumption of apparel textiles continues to grow in all parts of the world but that in the developed countries most of the growth is taking place in those made from synthetic fibres. While consumption of industrial fibres is still expanding in the developing countries, competition from synthetic fibres in the developed countries has led to a slower rate of growth or in some cases to a decline in consumption.

The developing countries produce a growing proportion of the yarn and cloth required to meet their consumption of apparel textiles. The developing countries in the Far East have long been the most important producers of jute manufactures; production in that region has been increasing, while in the developed countries it has declined since 1963. Production from hard fibres has likewise risen faster in developing countries, taken as a group, than in the developed countries.

The more rapid growth of production than of consumption in the developing countries implies changes in the pattern of international trade; these are examined in *chapter 2*. The most marked movement is in cotton cloth, where the exports of the developing countries doubled in twelve years, while imports declined.

A description is given to the Long-Term Arrangement regarding International Trade in Cotton Textiles, which was negotiated under the auspices of GATT and came into force in October 1962.

Chapter 3 reviews the plans and prospects in the developing countries in regard to consumption and production of apparel and industrial textiles. In the case of apparel textiles, the competition between natural and man-made fibres is an important factor and, while some indications for the future may be given, the margin of possible error is probably rather large. As regards industrial fibres, the view is expressed that existing trends in the developed countries towards the use of synthetic substitute materials are likely to be maintained. Even if the developing countries continue to utilize natural fibres and their consumption expands, world consumption of hard and soft fibres may well decline, and this is likely to pose problems for the developing countries which produce them.

Chapter 4 begins by reviewing the major developments in technology since about 1950. For more than half a century prior to that date, relatively few changes occurred. The most modern machinery operates at much higher speeds than were previously possible; materials handling in the manufacturing stages has been automated. Consequently, the textile industry is now highly capital-intensive in the industrialized

countries, but the technology is flexible and developing countries have the possibility of selecting what is most appropriate to their particular circumstances.

The economies of scale and the reduction in unit costs obtainable with sophisticated technology are discussed in the light of studies prepared by ECLA. It is pointed out that non-integrated plants may sometimes provide a more economic solution than integrated spinning and weaving mills. The potential advantages and disadvantages of buying second-hand equipment are set out, and the conclusion is reached that no general rule can be laid down.

The growing use of man-made materials affects the textile industries of developing countries and may also influence other sectors of their economies. There is a serious risk of taking wrong decisions in long-range planning if these technical developments are not carefully assessed. The factors involved are analysed in detail.

The chapter concludes with a discussion of the organization of mill production, showing that scientific methods of production management and effective control of quality at all stages offer considerable scope for lowering unit costs.

In the light of the information presented in previous chapters, the considerations which determine the establishment or modernization of a textile industry are brought together in *chapter 5*. Labour and raw materials are discussed first, since these inputs generally account for over two thirds of total costs.

The contributions that a textile industry can make to general industrial development by reason of linkages on the input and output side are an important consideration, because decisions regarding the establishment or expansion of textile manufacture should be co-ordinated within the framework of a national development plan. Sources of finance for investment in textile manufacture are seldom easy to find, and in most cases the Government will have to play an active part. The Government will also have to decide whether it is prepared to protect the infant industry against imports and, if so, for how long and to what extent.

Although the case is theoretically strong for regional co-operation and integration of markets, there are practical difficulties where textile industries were established earlier and protected against imports. The opportunities for regional co-operation would seem best where the textile industry is not yet well developed or where reorganization of industries

with obsolete production equipment is taking place simultaneously in several countries of a region.

It is always desirable to prepare a feasibility study before making a major investment. If financial assistance is to be sought from an institution, such a study will always have to be presented. The type of information and the detailed estimates it should contain are discussed.

The modernization of long-established textile industries that have become out-of-date calls for measures both at the national level and at the level of the individual mill. It is desirable to make periodic nation-wide surveys of textile productive capacity and its utilization. The information collected in this way provides a foundation for sound government planning of development. Each mill management should systematically review its existing factory equipment and compare performance with that of new machinery now available. In the light of the findings and of financial possibilities, plans should be drawn up for the modernization or replacement of individual items of equipment.

Chapter 6 gives an account of the issues presented at the International Symposium, the discussions that took place and the recommendations made concerning the textile industry.

United Nations action to assist the textile industries of the developing countries is discussed in *chapter 7*. Field missions to give technical assistance lie at the heart of the programme. Nearly one half of the projects organized by UNIDO and its predecessor, the Centre for Industrial Development, have been concerned with a systematic study at the national level, in order to provide guidelines for long-term planning. One third of the projects have been more narrowly concerned with technical advice, research and development in relation to local conditions. In 1968 alone, fifteen field projects were completed.

RECENT TRENDS IN TEXTILE PRODUCTION AND CONSUMPTION

Introduction

Cotton, despite the competition of man-made fibres, still accounts for about half the consumption of apparel textiles in the developed countries and for 80 per cent in the developing countries. Inevitably, therefore, this monograph devotes a great deal of attention to cotton.

Vegetable fibres are yielded by over 2,000 species of plants grown in various parts of the world, but less than 50 of them are processed to any significant extent into textile articles and only about 10 are of real commercial importance. Animal fibres, particularly wool and silk, have for long been used to make textile goods, and the growing range of man-made fibres now gives rise to several hundreds of types of yarn.

It is necessary to be selective in order to concentrate on essential issues. The so-called apparel fibres are discussed under four heads: cotton, man-made cellulosics (referred to, for convenience, simply as cellulosics), synthetics and wool. The cellulosics, in fact, are of two kinds, viscose and acetate (rayon). The commonest of the synthetics are acrylic, monacrylic and polyester fibres and nylon.

In addition to apparel fibres (which are also used industrially to some extent), the discussion covers jute and hard fibres. With jute are grouped some allied fibres, such as kenaf and mesta. Their main end-uses are packaging (especially of agricultural commodities), carpeting and other furnishings. Sisal accounts for 70 per cent of the hard fibres; henequen and abaca (also known as Manila hemp) are the most important other hard hemp fibres used industrially. Cordage is the main end-use, but bags, sacks, floor coverings, padding and upholstery are also important outlets for hard fibres.

Owing to the lack of comparable statistics for certain products in some centrally planned economies, it has in general been necessary to

exclude this group of countries from "world" totals. They are included, however, in the case of jute and allied products.

Production and trade data for yarn and cloth made of the various fibres are not available for many countries. In order to achieve a comprehensive coverage, production has been estimated by reference to the input of raw material, except in the case of man-made fibres. Thus, cotton yarn production is equated with national availability of raw cotton, ignoring some non-mill use and wastage during manufacturing. The overstatement of output by this method is likely to be between 10 and 20 per cent for a given country, the percentage remaining fairly constant from year to year.

Except for jute and hard fibres, it is assumed that all yarn nationally available (that is, estimated production plus net imports) is converted into cloth. In fact, some yarn is consumed as such or used to make knitted goods, carpets etc. A further complication has been introduced by the development of fibre blends (mixtures of cotton or wool with man-made fibres), the precise content of which is unspecified in output and trade statistics. An appreciable element of estimation must, therefore, be accepted as unavoidable.

Clothing and knitwear manufacture are not sufficiently well documented in most developing countries to permit their inclusion in this review.

Production

Apparel yarn

Recent trends in apparel yarn production are shown in table 1, for developing regions and the world as a whole. Production in the developing countries has risen from less than 2 million tons in 1954 to 2.7 million in 1960 and 3.6 million in 1966. The fastest growth was recorded in the African group of countries, but all regions except Latin America showed notable advances. Production in the developed countries expanded more slowly than in the developing countries over the twelve-year period as a whole, but the disparity was much less in the second half than in the first.

In the developing countries, cotton yarn still averages nearly 90 per cent of all apparel yarn production, despite a faster growth rate for man-made fibre yarns. In Latin America, production of woollen and man-made fibre yarns is appreciable, so that cotton yarn represents

only about 75 per cent in recent years. In the developed countries, by contrast, production of cotton yarn has remained almost static between 1954 and 1966 (only 6 per cent growth); for woollen yarn the increase was 24 per cent, but for man-made cellulosic fibre yarns the increase was 44 per cent and for synthetic fibre yarns no less than 1,114 per cent. As a result, the share of cotton yarn in all apparel yarns has fallen in the developed countries from 61 to 44 per cent over the period.

Industrial fibres

Table 1 also shows production of the industrial fibres, virtually all of which takes place in the developing countries. Historically, India and Pakistan have produced most of the world's jute. Mainland China and, since 1960, Thailand have also become major producers, accounting jointly for over 20 per cent of world output since 1964. Production of hard fibres is more widely spread—sisal mainly in Angola, Brazil, and East Africa, henequen mainly in Mexico, abaca in the Philippines.

Apparel cloth

Table 2 shows recent trends in the production of apparel cloth. As a generalization, the developing countries produce more cloth than yarn, importing man-made fibre yarns in particular. The cotton cloth industry consumes a growing proportion of man-made fibre yarns, blended with the cotton yarn; by 1964, the proportion had reached 5 per cent for all developing countries taken together. No statistical information is available regarding the blending of man-made fibres with wool in the woollen and worsted cloth industry, but this is of considerable importance in Latin America and the Near East.

Apparel cloth production in the developing countries increased from some 2.1 million tons in 1954 to 2.9 million in 1960 and 3.8 million in 1964. Generally, this represented a somewhat faster growth rate than for yarn production. The predominance of cotton within the apparel totals is somewhat less marked for cloth than for yarn, except in Latin America. As far as the developed countries are concerned, there is little significant difference between the "mixes" of apparel yarn and of apparel cloth.

Between 1954 and 1960, the developing countries increased substantially their share in world production of apparel cloth. As regards

TABLE 1: ESTIMATED PRODUCTION OF APPAREL YARNS AND INDUSTRIAL FIBRES
(thousand tons)

	Developing regions					*Developed countries*	*World total*[a]
	Africa	*Near East*	*Far East*	*Latin America*	*Total*		
1954							
Cotton	99	128	1,028	482	1,737	4,064	5,801
Cellulosic	6	2	8	83	99	1,651	1,750
Synthetic	—	—	—	—	—	184	184
Wool	10	25	10	80	125	750	875
All apparel yarns	115	155	1,046	645	1,961	6,649	8,610
Jute and allied fibres[b]	—	—	2,324	32	2,356	—	2,356
Hard fibres[b]	322	—	152	271	745	—	745
TOTAL	437	155	3,522	948	5,062	6,649	11,711
1960							
Cotton	152	176	1,403	643	2,374	4,189	6,563
Cellulosic	11	2	46	100	159	1,971	2,130
Synthetic	—	—	—	8	8	660	668
Wool	12	34	13	83	142	886	1,028
All apparel yarns	175	212	1,462	834	2,683	7,706	10,389
Jute and allied fibres	—	—	2,484	56	2,540	—	2,540
Hard fibres	373	—	120	305	798	—	798
TOTAL	548	212	4,066	1,195	6,021	7,706	13,727

1964

Cotton	230	219	1,802	708	2,959	4,159	7,118
Cellulosic	12	3	87	109	211	2,441	2,652
Synthetic	1	1	3	32	37	1,587	1,624
Wool	13	45	20	80	158	892	1,050
All apparel yarns	256	268	1,912	929	3,365	9,079	12,444
Jute and allied fibres	—	—	3,082	75	3,157	—	3,157
Hard fibres	429	—	119	380	928	—	928
TOTAL	685	268	5,113	1,384	7,450	9,079	16,529

1966

Cotton	277	253	1,864	761	3,155	4,312	7,467
Cellulosic	14	4	94	109	221	2,378	2,599
Synthetic	1	1	10	60	72	2,234	2,306
Wool	13	45	20	80	158	929	1,087
All apparel yarns	305	303	1,988	1,010	3,606	9,853	13,459
Jute and allied fibres	20	5	3,515	110	3,650	50	3,700
Hard fibres	404	—	105	352	861	—	861
TOTAL	729	308	5,608	1,472	8,117	9,903	18,020

SOURCES: FAO, ICAC, IFCATI, Textile Organon, Commonwealth Secretariat *(Industrial Fibres)* and UNIDO Secretariat estimates.

[a] Excluding centrally planned economies, except in the case of jute and allied fibres.

[b] Data for 1957.

TABLE 2: ESTIMATED PRODUCTION OF APPAREL CLOTH AND MANUFACTURES OF INDUSTRIAL FIBRES
(*thousand tons*)

	Developing regions					*Developing countries*	*World totals*
	Africa	*Near East*	*Far East*	*Latin America*	*Total*		
1954							
Cotton	96	128	1,062	489	1,775	4,026	5,801
Cellulosic	14	21	74	90	199	1,551	1,750
Synthetic	—	—	—	2	2	182	184
Wool	10	25	23	70	128	747	875
All apparel cloth	120	174	1,159	651	2,104	6,506	8,610
Manufactures of jute etc[b]	20	—	1,800	26	1,846	510	2,356
Manufactures of hard fibres[b]	14	—	32	165	211	534	745
TOTAL	154	174	2,991	842	4,161	7,550	11,711
1960							
Cotton	141	182	1,450	646	2,419	4,144	6,563
Cellulosic	35	30	112	111	288	1,842	2,130
Synthetic	—	2	8	17	27	641	668
Wool	11	34	28	70	143	885	1,028
All apparel cloth	187	248	1,598	844	2,877	7,512	10,389
Manufactures of jute etc.	30	—	1,900	30	1,960	580	2,540
Manufactures of hard fibres	16	—	35	184	235	563	798
TOTAL	233	248	3,533	1,058	5,072	8,655	13,727

1964							
Cotton	216	238	1,817	708	2,979	4,139	7,118
Cellulosic	42	55	144	125	366	2,286	2,652
Synthetic	3	5	28	45	81	1,543	1,624
Wool	13	45	40	60	158	892	1,050
All apparel cloth	274	343	2,029	938	3,584	8,860	12,444
Manufactures of jute etc.	40	—	2,404	40	2,484	673	3,157
Manufactures of hard fibres	18	—	41	253	312	616	928
TOTAL	332	343	4,474	1,231	6,380	10,149	16,529
1966							
Cotton	261	275	1,882	761	3,179	4,288	7,467
Cellulosic	41	56	148	124	369	2,230	2,599
Synthetic	4	6	48	75	133	2,173	2,306
Wool	15	45	40	60	160	927	1,087
All apparel cloth	321	382	2,118	1,020	3,841	9,618	13,459
Manufactures of jute etc.	40	5	2,990	45	3,080	620	3,700
Manufactures of hard fibres	28	—	42	280	350	511	861
TOTAL	389	387	5,150	1,345	7,271	10,749	18,020

SOURCES: FAO, ICAC, IFCATI, Textile Organon, Commonwealth Secretariat *(Industrial Fibres)* and UNIDO secretariat estimate.

[a] Excluding centrally planned economies, except in the case of jute and allied fibres.

[b] Data for 1957.

cotton cloth, this rate of increase continued between 1960 and 1966. Because the developing countries produce a much smaller proportion of the output of synthetic cloth, the fastest-growing sector, their share in world production of all apparel cloth barely increased between 1960 and 1966.

Manufactures of industrial fibres

Table 2 also shows manufactures of industrial fibres. The bulk of jute textiles is produced in the developing countries in the Far East, where the fibre is grown. Moreover, production in that region has been growing, while in the developed countries it declined after 1963. Athough India and Pakistan dominate the industry, production on a significant scale takes place in Brazil, Thailand, the United Arab Republic and a number of other developing countries. While sacking continues to be the most important outlet for jute, hessian for backing tufted carpets of man-made fibres has shown the most dynamic growth.

In the case of hard fibres, output of manufactures has likewise been rising faster in developing countries, taken as a group, than in the developed countries. The developed countries, however, are still responsible for 60 per cent of world output.

Table 3 summarizes the production of textiles in the developing countries as a percentage of world production according to type of fibre.

TABLE 3: SHARE OF DEVELOPING COUNTRIES IN WORLD TEXTILE PRODUCTION
(percentage by weight)

	1954	*1960*	*1964*	*1966*
Cotton cloth	30.6	36.6	41.9	42.6
Cellulosic cloth	11.4	13.5	13.8	14.3
Synthetic cloth	1.1	4.0	4.9	5.8
Woollen cloth	14.6	13.9	15.0	14.7
All apparel cloth	24.4	27.7	28.8	28.6
Manufactures of jute etc.	78.4	77.2	78.7	83.3
Manufactures of hard fibres	20.8	29.5	33.6	40.6
TOTAL	35.6	36.9	38.6	40.3

SOURCE: Table 2.

While in the developed countries some 85 to 90 per cent of textile production consists of apparel textiles, the proportion is 52 to 55 per cent for developing countries as a whole and around 45 per cent for the Far East region. Most of the difference is accounted for by jute textiles.

PRODUCTIVE CAPACITY

Equipment installed in the cotton system

The number of spindles in place declined continuously over the period 1939—1964, although the rate of decrease since 1960 has been small. Over this period, the decrease was 25 per cent in the United States, 45 per cent in the European Economic Community and 80 per cent in the United Kingdom. By contrast, the number of spindles in developing countries approximately doubled over the same period, so that there has been a major geographical redistribution of capacity. The story is similar in the weaving section, although the number of looms in place in the developing countries did not grow as fast as the number of spindles. In 1965 and 1966, capacity continued to expand in the developing regions but to contract in the world as a whole. Table 4 shows the position in 1966.

TABLE 4: EQUIPMENT INSTALLED IN THE COTTON SYSTEM IN 1966

	Million spindles in place	*Thousand looms in place*
Developing regions	*37.4*	*708*
Africa	2.6	63
Near East	2.3	49
Far East	23.9	396
Latin America	8.6	200
Developed countries	*60.8*	*1,253*

SOURCE: Economist Intelligence Unit, based on IFCATI statistics.

In the developed countries, especially since the early 1950s, annual production of yarn per spindle in place and of cloth per loom in place have increased by 70 to 90 per cent. The growth in productivity in developing countries has been less than this. The technical changes underlying these figures are discussed below (chapter 4). In consequence,

the geographical shift in location of machinery has not been matched to the same extent by a change in shares of world production.

It must be remembered that fibres other than cotton are now employed by the cotton industry to a significant extent. About 25 per cent of total consumption of man-made fibres is processed into yarn on the cotton system. Furthermore, over 25 per cent of loomstage requirements in the cotton industries of developped countries is now met by man-made (spun and non-spun) fibres. The enterprises in the cotton industry no longer depend, therefore, solely on developments in the consumption of cotton for their economic viability.

Equipment installed in the wool system

Information on the installed capacity for wool spinning and weaving is so scarce for most of the major producing countries in the developing regions that it is not practicable to attempt the kind of analysis given above for the cotton system.

In Latin America, where nearly half the woollen textile output of the developing world is located, Argentina and Brazil have the largest capacity. The total for the region is somewhat below 1 million spindles and 40,000 looms in place. In most countries utilization is poor and obsolescence of the machinery widely prevalent. Some Governments have organized a programme of modernization to remedy this state of affairs.

In the Far East, India had over 200,000 spindles and 2,300 looms in place in 1964. China (Taiwan) and Pakistan are the other main producers in this region. Morocco, Turkey and the United Arab Republic are the main producers in the Middle East.

Man-made fibres

In the processing of man-made fibres into yarn, conventional textile machinery is used in some cases. The yarn may then be mixed readily with yarns of other fibres to give the desired quality. The weaving process is essentially the same as for cotton. It is not practicable to separate the production of man-made fibre yarn and cloth from that of mixtures in which cotton or wool is the predominant fibre. There are, therefore, no statistics for spindleage and loomage devoted to man-made fibre textiles.

Jute and hard fibres

Once the plant has been harvested and processed to obtain the fibres, jute, sisal etc. are spun and woven in much the same way as apparel fibres.

In the Indian jute industry, the number of spindles in place rose from 1.2 million in 1960 to 1.4 million in 1964. Over the same period, the number in East Pakistan rose from 122,000 to 169,000. In the weaving sector, India had 61,000 looms in place in 1960 and 69,500 in 1964; corresponding figures for East Pakistan were 8,100 and 11,400 respectively. Most of the machinery in India and Pakistan is fairly modern. Little information is available about capacity in other developing countries.

Mexico, followed by Brazil, is the major producer of hard fibre textiles among the developing countries. Cuba, Guatemala, Haiti and, recently, Argentina are other Latin American producers. In the Far East, the Philippines is the largest and longest established producer. In Africa, hard fibre textile industries have recently been set up in Angola and the United Republic of Tanzania. Little information regarding the capacity of installed machinery is available.

Consumption

Per capita consumption of apparel textiles

The level of *per capita* consumption of apparel textiles shows considerable variation from country to country. The disparity is partly a reflection of disparity in the personal incomes *per capita*. At low income levels, clothing is likely to absorb a relatively large percentage of the additional expenditure made possible by a growth in income; at higher income levels, however, a relatively low percentage of such additional expenditure will be devoted to clothing. It is due to the operation of this factor that *per capita* consumption is hardly rising at all in the United States. For example, table 5 shows the estimated *per capita* consumption of cotton goods and man-made fibre goods during recent years in a selection of countries. Woollen textiles have been omitted from the comparison because climatic factors play such a large part in determining their consumption.

In the foregoing table, consumption is defined as consumption of fabrics plus production of knitted goods, carpets etc., plus net imports of clothing and made-up articles. A considerable amount of estimation is included in many cases.

TABLE 5: *Per capita* CONSUMPTION OF COTTON GOODS AND MAN-MADE FIBRE (MMF) GOODS
(kilograms per capita)

	1953		1960		1964	
	Cotton	*MMF*	*Cotton*	*MMF*	*Cotton*	*MMF*
United States	11.1	4.0	10.2	4.1	9.5	6.5
United Kingdom	6.0	2.9	7.2	4.5	7.1	5.8
Netherlands	5.6	1.8	6.2	2.9	6.6	5.0
Italy	2.9	1.0	3.3	2.4	3.4	3.5
Mexico[a]	1.9	0.5	2.7	0.7	2.7	0.7
India[a]	1.6	0.1	1.6	0.1	1.8	0.2

SOURCE: GATT, *A Study on Cotton Textiles*, Geneva, 1966.
[a] Cotton fabrics only, not all cotton goods.

In the industrialized countries, most of the increase in *per capita* consumption during the decade took the form of man-made fibre goods. In the developing countries, there has been a considerable increase in consumption, although the level is still low, and this has mainly taken the form of cotton goods. Compared with 16 kg per head in the United States and 7 to 13 kg in Western Europe and Japan, the average for Latin America is nearly 4 kg, while the Middle East, Far East and Africa average around 2.5, 2.0 and 1.5 kg *per capita*, respectively.

Consumption of apparel textiles

Consumption of apparel yarn has been assumed to be identical with production of apparel cloth, as shown in table 2, and requires no further discussion. Estimated consumption of apparel cloth is derived from production by adding net cloth imports and ignoring changes in stocks. Table 6 shows these estimates in respect of the developing regions and developed countries. Owing to inadequate statistical coverage, it has been necessary to exclude wool from this table.

The consumption of apparel cloth (excluding woollen cloth) by the developing countries has risen from 2.4 million tons in 1954 to 3.1 million in 1960, 3.7 million in 1964 and 3.9 million in 1966. Compared with this expansion of 64 per cent, consumption in the developed countries increased by 58 per cent, from 5.4 million tons in 1954 to 8.5 million in 1966. The faster growth in the developing countries occurred in the period 1954 to 1960. Whereas the proportion of consumption represented

TABLE 6: ESTIMATED CONSUMPTION OF APPAREL CLOTH
(thousand tons)

	Africa	Near East	Far East	Latin America	Total	Developed countries	World total[a]
1954							
Cotton	244	152	1,114	525	2,035	3,766	5,801
Cellulosic	60	33	136	106	335	1,415	1,750
Synthetic	—	—	1	3	4	180	184
TOTAL	304	185	1,251	634	2,374	5,361	7,735
1960							
Cotton	263	192	1,476	679	2,610	3,953	6,563
Cellulosic	88	51	160	129	428	1,702	2,130
Synthetic	1	2	10	18	31	637	668
TOTAL	352	245	1,646	826	3,069	6,292	9,361
1964							
Cotton	327	230	1,807	732	3,096	4,022	7,118
Cellulosic	71	75	184	141	471	2,181	2,652
Synthetic	11	9	36	47	103	1,521	1,624
TOTAL	409	314	2,027	920	3,670	7,724	11,394
1966							
Cotton	371	288	1,831	776	3,266	4,201	7,467
Cellulosic	73	77	183	139	472	2,127	2,599
Synthetic	13	10	59	77	159	2,147	2,306
TOTAL	457	375	2,073	992	3,897	8,475	12,372

SOURCES: FAO, ICAC, IFCATI, Textile Organon and UNIDO secretariat estimates.
[a] Excluding centrally planned economies.

by cotton cloth has remained close to 80 per cent in the developing countries, it has fallen in the developed countries from 70 per cent in 1954 to 63 per cent in 1960, 52 per cent in 1964 and 50 per cent in 1966. In fact, the rise in consumption of apparel cloth in the developed countries has taken the form almost entirely of the growing use of man-made fibres, particularly the synthetic fibres. By 1966, man-made fibre cloth consumption in the developed countries had reached equality with cotton cloth consumption, and within this group synthetic fibre cloth had reached equality with cellulosic cloth.

It is believed that consumption of woollen cloth in the developing countries has expanded at about the same rate as consumption of all apparel cloth. In the developed countries, however, consumption of woollen cloth has been almost static.

There are also marked differences in the pattern of consumption between the various developing regions. In the Far East, nearly 90 per cent is based on cotton and most of the balance on cellulosics. Cellulosic fibre is proportionately most important in Africa and Latin America (about 15 per cent cellulosic and 75 per cent cotton). Synthetic fibre now accounts for 7.5 per cent in Latin America, under 3 per cent in other developing regions. Wool consumption is significant only in parts of Africa and Latin America.

Table 7 summarizes the share of developing countries in world consumption of the apparel cloths (other than woollen cloth) from 1954 to 1966.

To estimate regional consumption of apparel textiles as a whole, rather than cloth, allowance would have to be made for the trade in clothing and made-up articles. This trade may be expected to assume increasing importance in future, especially between developing and developed countries and in both directions. Unfortunately, information is lacking for many of the developing countries, and a systematic treatment of this subject is not immediately practicable.

TABLE 7: SHARE OF DEVELOPING COUNTRIES IN WORLD CONSUMPTION OF APPAREL CLOTH
(percentage by weight)

	1954	*1960*	*1964*	*1966*
Cotton	35.1	39.8	43.5	43.7
Cellulosic	19.2	20.1	17.8	18.2
Synthetic	2.2	4.6	6.3	6.9

SOURCE: Table 6.

Consumption of manufactures of industrial fibres

As indicated above, most of the raw jute is made up into manufactures in the countries where it is grown. The major part is then exported to a wide range of countries. About three quarters of exports are to developed countries, the United States being the largest importer, followed by the USSR and Australia. In the case of the hard fibres, most of the making up still takes place in certain developed countries, and some of the output is then exported. The variety of industrial products involved, some of which are manufactured from more than one of these fibres, makes it difficult to estimate final consumption, on a national or regional basis, classified according to the fibre employed.

Home consumption of jute textiles in the two main producing countries rose rapidly between 1960 and 1964: by 39 per cent in India, from 286,000 to 386,000 tons, and by 25 per cent in Pakistan, from 48,000 to 60,000 tons. Consumption of sisal manufactures in Brazil (including sisal pulp for kraft papers) would seem to have risen from about 40,000 tons in 1960 to about 60,000 tons in 1964. Likewise, consumption of henequen manufactures in Mexico has risen from about 55,000 tons in 1960 to nearly 70,000 tons in 1964. The Philippines consumes 8 to 9 thousand tons of Manila hemp manufactures.

More generally, it may be said that after the Second World War consumption of jute manufactures expanded by over 5 per cent per annum until around 1958, but the subsequent growth has been under 4 per cent per annum. In Latin America, competition from hard fibres and the spread of bulk handling techniques has slowed the increase in demand. In the other developing regions, in Japan and southern Europe, the need to transport a growing volume of agricultural commodities has caused a rapid increase in consumption of jute manufactures. In contrast, considerable substitution of synthetic fibres for jute in packaging, carpeting and other furnishings has resulted in a slower increase in northern European and United States consumption.

After a decade of steadily expanding demand, mainly in the developed countries, hard fibre producers have faced a decline since 1964, which reflects lower output of manufactures in consequence of competition from synthetics.

INTERNATIONAL TRADE IN TEXTILES

In the nineteenth century, exports of textiles from the first countries to achieve mechanized production brought substantial changes to the pattern of trade after a long period of stability. India, for example, having been for centuries an exporter of hand-woven cotton cloth, turned into a great importer of machine-made textiles. A very high proportion of textile production entered into world trade in these years. Textiles were the largest item, by value, in world exports of manufactured goods.

In the twentieth century, the development as textile producers of Japan and some developing countries—particularly India in the first half, and since 1950, China (Taiwan), mainland China, Hong Kong, Pakistan, and the Republic of Korea—has once again led to great changes in the structure of trade. Some importers of apparel textiles have become nearly self-sufficient, others are now net exporters. At the same time, other manufacturing industries in Western Europe and North America have displayed a more dynamic growth as suppliers of their domestic markets and as exporters By 1964, in consequence, textiles and clothing had come to represent only about 11 per cent of the value of world manufacturing exports, compared with 31 per cent in 1913.

Apparel textiles

The dominance of cotton began to decline between the two world wars, in regard to both production and trade, as rayon became a serious competitor. In the twenty years following the Second World War, the new synthetic fibres have become important in world trade as a whole, but remain a minor element in the trade of developing countries.

Table 8 illustrates the trends in imports and exports of apparel yarn and staple fibre by the developing countries, while table 9 gives similar information for apparel cloth.

TABLE 8: IMPORTS AND EXPORTS OF APPAREL YARN AND STAPLE FIBRE BY DEVELOPING COUNTRIES
(*thousand tons*)

	Africa		*Near East*		*Far East*		*Latin America*		*Total*	
	Imports	*Exports*	*Imports*	*Exports*	*Imports*	*Exports*	*Imports*	*Exports*	*Imports*	*Exports*
1954										
Cotton	9	12	3	1	54	20	7	—	73	33
Cellulosic	8	—	20	1	71	5	13	5	112	11
Synthetic	—	—	—	—	—	—	2	—	2	—
Wool	1	—	—	—	5	—	3	1	9	1
TOTAL	18	12	23	2	130	25	25	6	196	45
1960										
Cotton	9	20	2	3	114	67	7	4	132	94
Cellulosic	24	—	28	—	70	4	17	6	139	10
Synthetic	—	—	2	—	8	—	9	—	19	—
Wool	1	—	1	—	1	—	1	—	4	—
TOTAL	34	20	33	3	193	71	34	10	294	104
1964										
Cotton	14	28	3	1	70	55	5	5	92	89
Cellulosic	33	3	52	—	64	7	18	3	167	13
Synthetic	2	1	2	—	27	2	13	—	44	3
Wool	1	—	1	—	4	1	3	1	9	2
TOTAL	50	32	58	1	165	65	39	9	312	107
1966[a]										
Cotton	25	41	3	1	79	61	6	6	113	109
Cellulosic	30	1	29	—	68	18	18	4	145	23
Synthetic	3	—	5	1	42	4	17	2	67	7
Wool	2	—	1	—	5	2	3	1	11	3
TOTAL	60	42	38	2	194	85	44	13	336	142

SOURCE: FAO, ICAC, Textile Organon.
[a] Estimated, for some countries.

TABLE 9: IMPORTS AND EXPORTS OF APPAREL CLOTH BY DEVELOPING COUNTRIES
(*thousand tons*)

	Africa		*Near East*		*Far East*		*Latin America*		*Total*	
	Imports	*Exports*	*Imports*	*Exports*	*Imports*	*Exports*	*Imports*	*Exports*	*Imports*	*Exports*
1954										
Cotton	149	2	56	8	174	122	39	2	418	134
Cellulosic	46	—	16	3	67	6	19	3	148	12
Synthetic	—	—	—	—	1	—	1	—	2	—
Wool	4	—	1	—	5	1	2	—	12	1
TOTAL	199	2	73	11	247	129	61	5	580	147
1960										
Cotton	136	13	31	7	171	145	37	4	375	169
Cellulosic	54	1	24	3	59	11	18	—	154	15
Synthetic	1	—	—	—	2	—	1	—	4	—
Wool	5	—	2	—	6	1	2	—	15	1
TOTAL	196	14	57	10	238	157	58	4	548	185
1964										
Cotton	125	14	21	8	180	190	32	8	358	220
Cellulosic	29	—	20	—	57	16	16	1	122	17
Synthetic	8	—	5	1	10	2	2	—	25	3
Wool	4	—	2	—	6	1	1	—	13	1
TOTAL	166	14	48	9	253	209	51	9	518	241
1966[a]										
Cotton	125	15	21	7	190	241	27	11	363	274
Cellulosic	32	—	20	—	56	19	16	1	124	20
Synthetic	9	—	5	1	13	3	2	—	29	4
Wool	4	—	2	—	7	1	1	—	14	1
TOTAL	170	15	48	8	266	264	46	12	530	299

SOURCE: As for table 8.

[a] Estimates, for some countries.

Up to 1960, the developing countries as a whole were net importers of some 40,000 tons of cotton yarn per annum; since 1964, the net imports have fallen to around 4,000 tons per annum. The decline in the net imports of cotton cloth by these countries is even more impressive: from 284,000 tons in 1954 and 206,000 in 1960 to 138,000 in 1964 and an estimated 89,000 in 1969. Most of this movement is the consequence of a doubling of exports in twelve years.

Net imports of cellulosic fibre (yarn and staple) and cloth by the developing countries were around 250,000 tons per annum between 1954 and 1966, with a tendency since 1960 for cloth imports to decline.

The developing countries were negligible consumers of synthetic yarn and cloth in 1954. They imported some 23,000 tons (of which 4,000 as cloth) in 1960; by 1966, net imports had reached 85,000 tons (of which 25,000 as cloth). The growth in yarn imports was particularly marked in the Republic of Korea and China (Taiwan), followed by Hong Kong and India.

Including the small trade in woollen textiles, the developing countries as a whole were net importers of 584,000 tons of apparel yarn and cloth in 1954, 553,000 in 1960, 483,000 in 1964 and about 425,000 in 1966. Net imports of cloth are declining, while net imports of yarn remain around 200,000 tons per annum. During the period 1954—1966, exports of yarn and cloth rose from 192,000 to 441,000 tons, that is, by 130 per cent, while imports rose by only 11.6 per cent, from 776,000 to 866,000 tons.

Table 10 shows the trends in textile imports and exports, other than wool, by the developed countries as a group (excluding centrally planned economies).

By 1964, they had ceased to be net exporters of cotton yarn and by 1966 of cotton cloth as well. Yarn exports continued to increase, but more slowly than imports. On the other hand, cloth imports fell by 35 per cent while exports rose by 20 per cent between 1960 and 1966. As a result of these changes, the developed countries as a group now import cotton yarn and cotton cloth in greater tonnages than the developing countries taken as a group.

Exports of cellulosic yarn and staple by the developed countries more than doubled between 1954 and 1964; roughly one third of these exports go to developing countries, which now import much more cellulosic than cotton yarn, particularly in the Middle East. The developed countries' trade in cellulosic cloth, however, is on a much smaller scale than their trade in cotton cloth.

TABLE 10: IMPORTS AND EXPORTS OF APPAREL YARN, STAPLE FIBRE AND CLOTH BY DEVELOPED COUNTRIES[a]
(thousand tons)

	Yarn and staple fibre		*Cloth*	
	Imports	*Exports*	*Imports*	*Exports*
1954				
Cotton	52	99	163	438
Cellulosic	119	287	160	131
Synthetic	10	10	1	3
1960				
Cotton	101	123	334	459
Cellulosic	140	430	72	216
Synthetic	73	88	10	19
1964				
Cotton	132	132	391	414
Cellulosic	247	627	109	194
Synthetic	226	257	32	52
1966				
Cotton	157	151	400	296
Cellulosic	229	605	131	191
Synthetic	315	442	35	107

SOURCE: As for table 8

[a] Excluding centrally planned economies.

Trade in synthetic yarn, which was negligible in 1954, had by 1960 approached that in woollen yarn and by 1966 had come within 10 per cent of the volume of trade in cellulosics. Trade in synthetic cloth also grew rapidly, although not as dramatically as that in synthetic yarn. The developed countries now export about half as much synthetic as cellulosic cloth; this represents a tonnage similar to that of cloth exports made from wool.

Exports of woollen yarn by the developed countries in the period 1960—1966 totalled 70,000 to 90,000 tons, a notably higher level than previously. This was a consequence of increased trading among those countries, since exports to developing countries were under 10 per cent of the total. Over four fifths of the woollen yarn exports came from countries of Western Europe. The trade in woven fabrics made of wool was somewhat greater—in the range of 100,000 to 120,000 tons during most of the years 1954—1966. Here again, most of the trade was between

developed countries, and nine tenths of the exports came from Western Europe.

Including the trade in woollen textiles, the developed countries were net exporters of 480,000 to 560,000 tons of apparel textiles per annum during the period 1954—1966. Within that total, apparel cloth tended to represent a diminishing proportion. Both exports and imports rose over the same period.

While no systematic treatment of the clothing industry has been attempted in this monograph, it should be stated here that international trade in clothing, especially cotton clothing, is expanding rapidly. Both the developed and the developing countries shared in the 50 per cent increase which occurred between 1960 and 1964 in world exports of cotton clothing. China (Taiwan), Hong Kong, India, Israel and Pakistan have achieved a rapid expansion of exports, although their share of the world market is still relatively small.

This necessarily brief summary shows that the structure of international trade in apparel textiles has undergone a great change since the 1950s. In the cotton sector, the success of developing countries as exporters brought about situations in some developed countries which, in the view of those countries, caused or threatened to cause "disruption" of the market for cotton textiles. While it was recognized that growing opportunities for exports of those products should be provided, it was felt that measures were needed to ensure a reasonable and orderly development of that trade. Under the auspices of GATT, a number of countries concluded the Long-Term Arrangement regarding International Trade in Cotton Textiles, which came into force in October 1962. This agreement was originally valid for five years and has since been extended for a further three years. Including countries which acceded after 1962, the number of participating countries had reached 33 by October 1968, of which 13 are developing countries. Participating countries account for over 90 per cent of world exports of cotton yarn, over 70 per cent in the case of cotton cloth and about 80 per cent in the case of cotton clothing.

The Long-Term Arrangement provides that, as between participating countries, the quotas established in virtue of import restrictions shall be progressively increased so as to reach predetermined levels by the end of the period of its validity. Machinery is prescribed for setting the levels of quotas if import restrictions are subsequently introduced because an importing country judges that market "disruption" has been or

threatens to be caused. There is provision for consultations in order t avoid administrative difficulties and damage to the production an marketing of the exporting country.

Self-sufficiency ratios

It is customary to measure the relative importance to a developing country of trade in a given product by a "self-sufficiency ratio", which is the ratio of national production to national consumption. Where exports are non-existent or negligible, the concept has a clear meaning. Some developing countries, however, have now reached the stage normal to developed countries, where textile products are both imported and exported. Likewise, the developing regions include some net exporting countries as well as net importers, and this fact must be borne in mind when interpreting the self-sufficiency ratio of a developing region.

Subject to these reservations, the self-sufficiency ratios shown in table 11 provide a measure of the progress made in satisfying textile demand by local production.

TABLE 11: SELF-SUFFICIENCY RATIOS FOR APPAREL TEXTILES IN DEVELOPING REGIONS
(production as a percentage of consumption)

	Africa	*Middle East*	*Far East*	*Latin America*	*All regions*
1954					
Cotton yarn	103	100	97	98	98
Cotton cloth	39	84	95	93	87
Cellulosic yarn	38	10	11	91	50
Cellulosic cloth	23	63	54	85	59
1966					
Cotton yarn	106	92	99	150	99
Cotton cloth	70	95	103	98	97
Cellulosic yarn	33	7	63	88	60
Cellulosic cloth	56	73	71	90	78
Synthetic yarn	13	17	21	80	53
Synthetic cloth	5	8	26	54	28

SOURCE: Tables 1, 2 and 6.

NON-APPAREL TEXTILES

Jute

Hardly any Indian jute is exported in raw form; in fact, India is a major importer of raw jute to supplement its domestic supplies. Pakistan, on the other hand, exports in raw form about two thirds of the jute produced domestically; the proportion is declining, since manufacture is expanding faster than the production of raw jute.

In the period 1957 – 1964, the proportion of India jute manufactures exported was around 80 per cent, while the volume showed a rising trend only at the end of the period. In Pakistan, the proportion exported rose from under 50 to over 70 per cent and the volume increased about fourfold. The expansion in Pakistan continued after 1964, whereas Indian exports declined absolutely and relative to production.

India and Pakistan account for almost all exports of jute manufactures, mainly in the form of cloth and woven piece-goods, rather than yarn and cordage. Other manufacturing countries are mainly concerned with meeting home demand. Table 12 shows the evolution of exports between 1957 and 1966.

TABLE 12: EXPORTS OF JUTE MANUFACTURES 1957 — 1966
(thousand tons)

	1957	*1960*	*1964*	*1966*
India	881	862	1,064	739
Pakistan	73	191	235	363
Other major producers	109	124	115	115
TOTAL FOR MAJOR EXPORTERS	1,063	1,177	1,414	1,217

SOURCE: Commonwealth Secretariat, *Industrial Fibres*.

Hard fibres

With the exception of henequen from Mexico, a high percentage of hard fibre production is exported in raw form. Where manufacture is undertaken in the producing country, it is generally confined to domestic needs. Mexico, however, the largest manufacturer in the developing world, exports some 55 per cent of its cordage output. A similar proportion applies in the Philippines, although the volume is

much lower. The United States is the main destination of exports in both cases.

While the developed countries export manufactures of hard fibres, particularly to other developed countries, there are practical difficulties in the way of documenting this trade statistically.

Value of international trade in textiles

GATT estimated world exports of textiles at $7.7 billion and of clothing at $2.15 billion in 1964. In the case of textiles, the developing countries exported about one seventh of the world total; China (Taiwan), Hong Kong, India, Mexico, Pakistan, and the United Arab Republic, together exported textiles to the value of $938 million, equally divided between developing and developed countries. India alone contributed half the developing world's textile exports to the developed countries.

Chapter 3

PLANS AND PROSPECTS IN DEVELOPING COUNTRIES

Apparel textiles

Estimates of consumption and production of apparel fibres as a group are subject to a smaller percentage error than estimates relating to any one of the fibres. In terms of the equipment needed for spinning, weaving and other textile processes, a close assessment of the relative shares of cotton, cellulosic and synthetic man-made fibres and wool in total consumption is of limited importance. It should also be appreciated that the practice of manufacturing cloth blended from two or more different fibres is likely to increase. The usual statistical practice is to classify a fabric of mixed fibres to the fibre constituting over 50 per cent of the content. Production and trade figures for certain countries are established on this basis. However, in order to include as many countries as possible, the data presented in this monograph are largely deduced from the production of fibres. Strictly speaking, therefore, any forecasts derived from the data relate to the use of cotton, man-made fibres and wool in cloth production or consumption, although terms such as 'cotton cloth' are employed.

When the source of supply of raw material is considered, particularly the cost in foreign exchange if the material is imported, the probable trend in consumption of the various fibres is of considerable moment. An attempt must therefore be made to assess separately the prospects for each of the fibres. Since exports to developed countries are a significant element in the textile production of some developing countries, trends in consumption in developed countries cannot be ignored in this assessment.

Cotton

The future expansion of cotton textile production in developing regions will depend far less on the possibility of further import substitution than on the growth in domestic consumption and on the possibilities of

exports to developed countries, because, with the exception of A the developing regions are already almost self-sufficient in cotton or are net exporters.

In the matter of export potential, the general opinion is that i developed countries synthetic fibres will continue to gain ground a expense of cotton. Cellulosic man made fibres, which were the firs compete with cotton, accounted for about 17 per cent of total consumption during the 1950s, and their share of the total seeme have become stabilized. From 1960, however, their share again steadily, reaching 21 per cent in 1966. Recent technical developm have greatly increased the versatility of cellulosic fibres, undoubte strengthening their ability to compete in the apparel textile market only with cotton but also with synthetic fibres. The outcome of t competition will be determined by the future evolution of relat prices as well as by the performance of the fibres. Taking all these fact into account, and assuming a substantial growth in total consumpti of apparel textiles but a decline in the share of cotton, it seems lik that the consumption of cotton textiles in the developed countries w continue to increase, although very slowly.

In the developing countries, the proportion of cotton in text consumption may be expected to remain higher than in the develop countries but also to continue to decline. Any forecast of total consumptio of all fibres is very sensitive to assumptions made about future leve of income. In a forecast for the next ten or fifteen years, an optimist set of assumptions about national income may well produce figur between 15 and 30 per cent higher than those based on a pessimistic se of assumptions. On any likely assumptions, however, the consumptio of cotton textiles in the developing regions should continue to rise at faster rate than in the developed countries and reach 50 per cent o total world consumption some time between 1975 and 1980.

Productive capacity in Asia is likely to increase substantially, sinc the major importers within the region, namely, Ceylon, Indonesia, Malaysia and the Philippines, have each declared as part of their general development policy their intention to achieve self-sufficiency in cotton textiles. Consequently, the existing major exporters in Asia, in particular, China (Taiwan), Pakistan and the Republic of Korea, will be forced to rely even more heavily than in the past on exporting to the developed countries. Much will therefore depend on the textile trade policies adopted by the developed countries when the GATT Long-Term Arrangement comes to an end in 1970.

In Latin America, there is little scope for further import substitution. The problem recently has been an excess of productive capacity, including much underutilized and outdated equipment, rather than any shortage of manufacturing facilities. Modernization and replacement of existing factory equipment should enable most Latin American countries to meet the growth in demand for many years to come.

In Africa, the United Arab Republic has been the only exporting country of significance; no other country has approached self-sufficiency in cotton textiles. Among the cotton-growing countries, however, Ethiopia and the Sudan are rapidly expanding the manufacture of cotton textiles, and the countries of the East African Common Market have firm investment plans to establish integrated mills. Many African countries, however, still provide too small a market to support a modern textile industry unless sales within a subregional group can be arranged. Production has been growing faster in Africa than in any other developing region. Between 1960 and 1964, output increased by 46 per cent or, if the United Arab Republic is excluded, by more than 100 per cent. The Governments of the developing African countries are well aware of the scope for import substitution in the field of cotton textiles, and many studies of the problems involved in establishing a textile industry have been prepared by ECA. The achievement of self-sufficiency during the 1970s, however, would require far greater investments than have been needed in the recent past.

The Middle East has large resources of cotton fibres and a textile industry which has generally evolved from village handicraft production into a number of small manufacturing enterprises, although there are some larger plants constructed with government finance. None of the major producing countries in the area has published detailed plans for future expansion. In the recent past, output has risen by nearly 7 per cent per annum.

Cellulosic man-made fibres

Consumption of cloth made from cellulosic man-made fibres in the developing regions has shown signs of levelling off since 1964, while the consumption of cloth made from synthetic fibres has continued to expand rapidly. A similar pattern of consumption may be observed in the developed countries. It is probably too soon, however, to deduce that

the proportion of cellulosic man-made fibres in textile consumption continue to decline in the developing regions.

Nearly 20 per cent of cellulosic cloth consumption in the develo regions is currently met by imports, compared with about 30 per cen 1960. The proportion may be expected to continue to decline. Excep Latin America, about one half the production of cloth is based on impo yarn or staple fibre. Known expansion plans may bring Latin Ame close to self-sufficiency in cellulosic man-made fibres, but elsewh considerable dependence on imports will continue for some years to co

Synthetic fibres

Although penetration of the market for apparel textiles by synthe fibres has been far less extensive in developing than in developed countri the rate of expansion is impressive. Latin America is the developi region where the penetration has been greatest; this region has a made most progress in manufacturing synthetic fibre to meet the nee of consumption.

Whereas the statistics might be interpreted as showing that synthet fibres had gained in the developed countries at the expense of bo cellulosic fibres and cotton, it is doubtful whether in the developi regions very much ground has been gained by synthetic fibres at t expense of cotton. The higher price of synthetic cloth and its availabili from local sources are relevant factors in estimating future trends. seems reasonable to assume that the higher the *per capita* nation income the greater will be the content of synthetic fibres in the nation consumption of apparel fibres. This outcome, however, may have t await the channelling of savings into the construction of plants fo synthetic fibre production on the scale required to match consumptio Whereas cellulosic man-made fibre production can utilize indigenou raw materials such as cotton linters and wood pulp, the manufacture o synthetic fibres requires imported raw materials unless a petrochemica complex has been established locally. Even the large-scale importatio of synthetic yarn, however, may in some cases be preferable to establishin a small-scale integrated production plant, particularly for a developin country able to export the finished cloth and clothing to developed countries.

In view of the heavy investment required merely to maintain self- sufficiency in the synthetic fibre field, the expansion of consumption of

synthetic textiles in the developing regions will probably be accompanied by an increase in the volume of imports of synthetic yarn and, to a lesser extent, of imports of raw materials for manufacturing synthetic fibre.

Wool

The general trend in the world's wool industry is one of very slow expansion. In the developing regions, the proportion of wool used in apparel textiles has been declining. For climatic reasons, the wool industry is relatively insignificant in Africa and the Far East and relatively important in Latin America; in the Middle East, wool forms 17 per cent of total yarn output. In many developing countries, information concerning the wool industry is either incomplete or considerably out of date, so that it is hazardous to forecast future trends. FAO, however, has conducted considerable research into the future demand for wool. In a study published in 1967,[1] FAO estimated that in the ten years 1966—1975 annual wool production would grow by 1 to 2.5 per cent in the developing countries, by 2 to 3 per cent in the developed market economies and by 5 to 6.5 per cent in the centrally planned economies. It was estimated that annual demand (excluding the centrally planned economies) would increase at between 1.2 and 2.3 per cent, depending on the assumptions made about the growth of national income. Annual demand in the developing countries, however, was expected to grow at between 3.3 and 5 per cent, compared with only 0.9 to 1.8 per cent in developed countries. It was also anticipated that the balance of trade in woollen textiles of developing countries would be favourable in 1975 as a result of increased exports, compared with a net deficit in 1964—1965.

Both India and Pakistan, which have been largely dependent on imported yarn, have ambitious plans for expanding their production of woollen textiles. It may prove feasible to expand local production of yarn and to import more raw wool, concurrently with such expansion.

In Africa, the consumption of woollen textiles is extremely low outside the three producing countries—Algeria, Morocco and the United Arab Republic. Little change is foreseen in this situation.

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[1] FAO, *Monthly Bulletin of Agricultural Economics and Statistics* November 1967.

Conclusions

It must be evident from the foregoing discussion that the cont of various fibres in the consumption and production of textiles will the result of the interplay of a number of factors. Moreover, consumption pattern in particular developing countries will be influen by the decisions reached in regard to the production of man-m fibres.

The effect of the trends that have been discussed in this sect may be illustrated by table 13 comparing the pattern of consumpt in 1966 with the type of pattern that may emerge by 1975. The ta should be regarded as impressionistic rather than as an attempt a detailed forecast.

TABLE 13: THE CHANGING PATTERN OF CONSUMPTION OF APPAREL TEXTILES: ESTIMATES FOR 1966 AND INDICATIONS FOR 1975
(thousand tons)

	Developed countries		*Developing countries*	
	1966	*1975*	*1966*	*1975*
Cotton	4,200	4,500	3,300	4,500
Cellulosic fibre	2,100	2,300	480	600
Synthetic fibre	2,100	5,000	160	400
Wool	1,000	1,100	150	200

As regards the production pattern, it seems probable that t developing countries as a whole will manufacture well over 90 per ce of indicated cloth consumption in 1975. In the case of cotton, they m even become net exporters to the developed countries. About one th of cellulosic man-made fibre and one half of synthetic cloth consumpti may be imported from the developed countries.

JUTE AND ALLIED FIBRES

FAO has made detailed studies of trends in the consumption a production of jute,[2] on which the following remarks are based.

The chief alternative use for land under jute cultivation is rice, a

[2] FAO, *Agricultural Commodities: Projections for 1975 and 1985* and *Mont Bulletin of Agricultural Economics and Statistics* December 1967.

the allocation between these two uses is determined mainly by price expectations and anticipated crop yields. Since demand for rice is expected to grow faster than demand for jute, it is considered unlikely that the area under jute cultivation will greatly expand. Nevertheless, an improvement in yield may result in higher output by 1975.

Consumption of jute manufactures is expected to continue to expand appreciably in the developing countries, especially in those countries where jute is grown. Roughly one half of world consumption, however, takes place in the developed countries (including the USSR and the centrally planned economies of Eastern Europe), and the prospect in this group of countries is for a stagnation or even a decline in consumption, assuming that jute continues to lose ground to substitute materials in both its main end-uses (see chapter 4). There is, therefore, a serious danger of excess supplies of raw jute in relation to requirements by 1975.

While other minor uses of jute exist, they seem unlikely to develop into large-scale outlets in the future. Research may bring new uses to light, but it is impossible to say whether they would be less susceptible to the competition of synthetic materials than the known uses of jute. India and Pakistan both have plans to increase the output of jute manufactures; other developing countries may tend to do the same in order to stimulate economic development and save foreign exchange. Increasing competition and excess manufacturing capacity may well result.

The conclusion seems almost inescapable that the price of jute manufactures will tend to decline. It may well be that the importance of export trade both in jute manufactures and in raw jute will decline in the future, until most of the world's jute is consumed in the countries where it is cultivated. It is not suggested, however, that there will be a sudden rapid decline in the use of jute. On the contrary, in many developing countries its use may continue to expand for many years, while consumption in the developed countries levels off and then begins to decline.

HARD FIBRES

FAO has likewise done much research into the future demand for hard fibres.[3] As in the case of jute, there is growing competition from synthetic material. The FAO study group estimated that world demand

[3] Hard Fibres Projections for 1975; for full reference see annex 3 under "Food and Agriculture Organization".

for the main categories of hard fibre products would decline in the te years to 1975 unless hard fibre prices remained consistently lower tha the levels of 1967. These estimates were made on the assumption of n technological change; the search for new uses, if successful, could alt the perspective.

Suitable land for growing hard fibres is not a limiting factor in mo producing areas, and supplies would tend to adjust upward or downwar to a period of high or low prices. Grave social problems might aris however, in countries where predominantly small holdings were rendere uneconomic by low prices.

Expansion of local manufacture may ease the problems create by a production surplus in developing countries which have hither exported hard fibre as such. In most cases, however, the loss of expo earnings will be serious unless export markets can be developed for th manufactures. This will not be easy in the case of traditional hard fib products, owing to keen competition from existing manufacturers ar from synthetic substitutes.

In this situation the search for new outlets which would consum large quantities of hard fibre and are not subject to the threat competition of synthetics assumes great importance. This matter discussed in chapter 4.

Chapter 4

TECHNICAL AND ECONOMIC FACTORS OF RELEVANCE TO DEVELOPING COUNTRIES

THE MANUFACTURING PROCESS

Many different machines are used in the transformation of natural and man-made fibres into cloth. No attempt is made here to provide a comprehensive description of the process; it is desirable, however, to indicate briefly the basic stages in textile production and to relate them to recent developments in technology.

Cotton spinning

The pre-marketing process of ginning separates the lint from the cotton seed. The tightly packed bale which is delivered to the mill still contains, however, a considerable quantity of impurities. The cotton or short-staple system is the simplest of the conventional processes for converting fibres into yarn. The four basic stages of production are:

Opening, blending and cleaning,

Further cleaning and parallelization of the fibres to form a sliver;

Making the sliver homogeneous, thinner and more coherent;

Spinning the yarn and preparing it for weaving.

After the beating and screening operations of the first stage, the cotton emerges as a lap or continuous sheet of loose fibre. The carding machine further separates the fibres and removes the remaining impurities. For fine yarns a combing machine then removes the short fibres and lays the remaining ones parallel.

The slivers, emerging from the cards, undergo the processes of doubling, drawing and roving—the latter imparting a slight twist. They are then fed into the spinning frames. Depending on their end use, weft yarns are sometimes and warp yarns are generally doubled; both are wound onto cones.

Wool spinning

After scouring to remove grease, wool can be spun into yarn eithe on the woollen or the worsted system. The former is a relatively sho process resulting in a yarn in which the fibres are disposed at rando angles to one another; the latter gives a smooth yarn, tightly twiste with a high degree of fibre parallelization.

Processes in principle not very dissimilar from the cotton syste remove impurities and card, comb and form the wool into slivers or top which are then drafted in a series of drawing operations and spun int yarn.

Man-made filament yarn and staple fibre

All man-made fibres are produced in a basically similar fashio whether the raw material is a natural polymer (cellulose) or a synthet one (polyamide, polyester, acrylic and so forth). After melting dissolving into a liquid, the material is extruded in the form of continuo filaments whose thickness depends, *inter alia*, on the diameter of th holes in the spinneret.

Specially designed machines produce yarn from the continuo filaments. In an alternative process, the filaments are cut into stap fibre of predetermined length. These are then spun into yarn of any the conventional spinning systems. The continuous filament tow ma also be converted directly into top. This is done in a so-called tow-to-to converter.

Other natural fibres

Leaf and leaf-stem fibres, such as sisal, henequen and abaca a obtained by scraping the pulpy material away from the plant. Vario decorticating machines perform this operation, ranging from larg expensive stationary machines on plantations to small transportable one

The bast fibres (flax, hemp, jute and allied fibres, ramie) are obtain by soaking—or "retting"—the stalks for a long time in water until th fibres have been separated by a biological process.

The spinning process for all these natural fibres involves cleani and laying the fibres parallel in a homogeneous sliver, essentially in the cotton system.

Weaving

The spun yarn must first be prepared for weaving. The weft has to be wound on a pirn if a shuttle loom is used. The warp threads are assembled as required in a warping machine and are then usually strengthened against abrasion in the loom by sizing. In the loom the warp threads are alternately raised and lowered and the weft threads passed between them.

The weaving process is substantially the same whether natural or man-made fibre yarn or a yarn blended from several different fibres is employed. The same mill may at various times weave cloth from a wide variety of fibre yarns. Rolls of cloth are transferred from the looms to the clothroom, where the fabric is inspected and mended; the yardage is then measured and the pieces are weighed and packed.

Recent technological developments

After more than half a century of technological stagnation, the production capacity of textile machinery has increased dramatically since about 1950. Traditionally, textile manufacture has been a labour-intensive industry. The rising cost of labour in the developed countries was a strong incentive to produce machinery operating at higher speed or combining a number of processes, and to introduce the automated handling of materials between processes. As a result, textile manufacture can now be a highly capital-intensive industry, and the machinery installed may become obsolete long before it is worn out. In these circumstances, a high rate of utilization of machinery must be continuously achieved in order to make profits and thus to re-invest in machinery embodying the latest technical advances.

This does not mean that the developing countries have to adopt the most modern and sophisticated technology. On the contrary, it means that they have a wider range of machinery than in perhaps any other industry to suit the particular ratio of capital to labour cost, the availability of skills and the size of the market. Many developing countries need guidance in exercising this choice wisely, and the United Nations has sought to provide technical assistance in this respect (see chapter 7). A brief description of the main directions in which technological development has taken place is given below.

Cotton spinning

In bale opening and cleaning, new machinery has been developed, the manual feeding of the blending feeders has been eliminated and the cards can be fed direct from this stage, thus eliminating the scutcher.

The introduction of metallic card clothing was a significant improvement in cotton processing. Rapid advances in card design have raised the throughput obtainable to over 20 kg per hour, compared with under 5 kg in 1950. The output of combing machinery has likewise risen, from under 4 kg to over 20 kg per minute.

The carded slivers can be transported automatically to the drawing frames, and it is possible to spin directly from the draw-frame sliver by the so-called ultra-high drafting system, thereby eliminating roving. The delivery speeds of drawing frames (about 30 metres per minute in 1950) now exceed 400 metres per minute. In 1950, ring spinning frames operated at 7,500 rpm; the current operation is at 12,000 to 15,000 rpm.

Although still under development, mention should be made of break or open-end spinning, which represents a new processing concept. Instead of the conventional system of spindle/ring/traveller, the spinning is carried out on this machine by centrifugal force.

Wool spinning

As with cotton spinning, there are new techniques involving higher speeds and higher drafts. These require better-quality wool. Better methods of testing now make it possible to predict with a high degree of accuracy the yield in scouring greasy wool and in carding.

Worsted spinning

Carding machines now work faster and are more efficient at removing burrs. The number of steps in the production of the top has been reduced, and greater evenness is obtained. Very high drafts may be utilized, and it is possible to process both oiled and dry materials, twisted or untwisted.

Jute and hard fibre processing

Shortage of water in some countries makes it desirable to find an alternative to retting for jute. The soft fibres are often too fine for mechanical decortication, which can lead to unacceptably high losses. Alternative means of separating jute fibres are under development.

Hard fibres can now be decorticated by automatic machines in place of the hand-fed raspadors. Such machines, however, are usually expensive and may require mechanical transport for the leaves. The alternative of a smaller but transportable automatic machine is under investigation.

Man-made fibre spinning

The use of the tow-to-top conversion technique has already been mentioned. The other main development in spinning man-made fibres has been the texturizing of synthetic fibres and yarn. Texturizing completely eliminates the conventional spinning processes, and the resulting bulk yarn can be used for a great variety of purposes.

Weaving

The weft yarn can be spun directly onto loom pirns instead of first being wound onto regular spinning bobbins. Automatic devices knot successive feed package ends and repair yarn breaks. Warping machines currently operate at 750 to 900 metres per minute (500 in 1950) and have automatic devices for warp knotting and threading, drop-wire pinning and reeding. Synthetic sizing compounds have reduced or even eliminated the drying chamber of the sizing machine. The preparation of size may be automated, with control of stretch and moisture, leading to closer control of fabric quality and weaving efficiency.

Of all the equipment used in conventional cotton manufacture, the loom is the item whose design fluctuates most widely. The automatic shuttle loom is the basic level of modern weaving technique. The addition of manual battery filling or box loading of the shuttle constitutes the second level of sophistication. The automatic loom equipment with its own pirn winder eliminates the need for battery filling. Finally, there are the shuttleless looms which feed weft yarn directly from large packages and can weave two fabric widths simultaneously. Propulsion of the weft is achieved by air or water jet or on the rapier or yarn carrier principle. These devices permit a very sharp rise in weaving speeds, although with some loss of machine versatility.

Cost of modern technology

Many of the technological developments described above require heavy capital investment. At the beginning of the century, a loom might be bought for $60; a modern shuttleless loom can cost over $10,000. Admittedly, this is an extreme case. Heavy capital expenditure on the most modern equipment is economically justified if the resulting high output can be marketed and if high labour costs can be cut by installing the equipment. An OECD study published in 1965[4] showed that a modern textile mill in Western Europe working on three shifts required a capital investment of from $15,000 to $25,000 per employee and that a mill with 10,000 spindles should be regarded as the minimum balanced unit. In Canada, where labour costs are higher, the investment per employee is about $38,000 and the minimum economic unit would be in the range of 20,000 to 30,000 spindles. In the United States, the capital/labour ratio reaches $50,000 per operative.

Economies of scale: apparel textiles

With the latest technology, the installation of 10,000 spindles implies an annual production of some 2,000 tons of yarn. In many developing countries, this output would supply the annual textile needs of over 1 million inhabitants. It is therefore of great importance to establish whether the trend towards large-scale production units, so marked in the developed countries, must be followed by the developing countries in order to achieve competitive costs of production and an acceptable rate of return on capital invested.

Economies of scale fall into two distinct categories. First, there are those which arise from the possibility of organizing the manufacturing process more efficiently when the volume of output increases, but without the processes themselves undergoing any fundamental change. Machinery and equipment are available in a limited range of sizes, and sometimes the minimum size may have a productive capacity greater than required. It is rarely possible to balance the productive capacity of equipment at each of the many stages of manufacture, and there will always be some idle machine time. As the installed production capacity grows, however, there is a reduction in the proportion of machine time which

[4] *Modern Cotton Industry;* for full reference see annex 3 under "Other sources"

must be idle, even when the plant as a whole is operating at maximum output. Larger machines, producing a larger output, need not require more operatives to attend them. Economies can be expected in respect to machine maintenance, stocking of spare parts and so on.

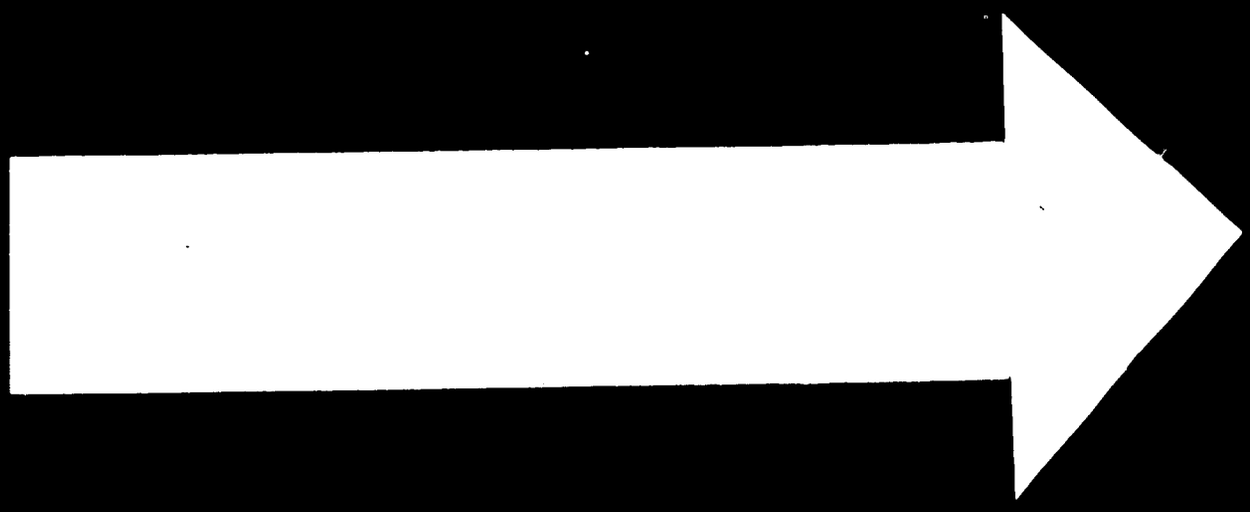
A theoretical study published by ECLA in 1966[5] investigated the significance in integrated cotton spinning and weaving plants of this category of economies of scale. The study was based on up-to-date technical practice in Latin America in 1964, excluding the very latest innovations. Twenty-four models were constructed, based on mills of eight sizes and three alternative types of cloth. The size of mill ranged from 2,000 to 100,000 spindles, with corresponding weaving equipment. This size range is fully representative of the range to be found in the Latin American textile industry.

Except for one cloth type (a fine combed fabric), the unit production and unit investment costs for a mill with as few as 6,000 spindles were only 6 to 11 per cent higher than for a mill with 100,000 spindles. Unit production and investment costs rose sharply as capacity decreased from 6,000 to 2,000 spindles. On the assumptions made in the ECLA study, therefore, the minimum economic size associated with this level of technology would be a little below 6,000 spindles. As to the optimum economic size, this was regarded as one which would have unit costs about 3 or 4 per cent above the minimum, bearing in mind the difficulty of raising capital for large-scale production units. A mill with about 18,500 spindles would be necessary to achieve these cost levels.

The second category of economies of scale includes those obtained by adopting changes in the manufacturing process, essentially through the use of machinery operating at faster rates, when the volume of production reaches a level that can absorb the output of such machinery. However low the ratio of labour to capital costs in a developing country, factory production on even the smallest scale is likely to produce cheaper cotton cloth than hand-looming in a cottage industry, such as India maintains because of the large numbers employed in this industry in rural areas. Even if attention is confined, however, to levels of technology in current use, the range is still very wide owing to the technical developments that have taken place in recent years.

As a companion study to the investigation just described, ECLA examined the influence of the level of technology on production costs

[5] Economies of Scale in the Cotton Spinning and Weaving Industry; for full reference see annex 3 under "Economic Commission for Latin America".



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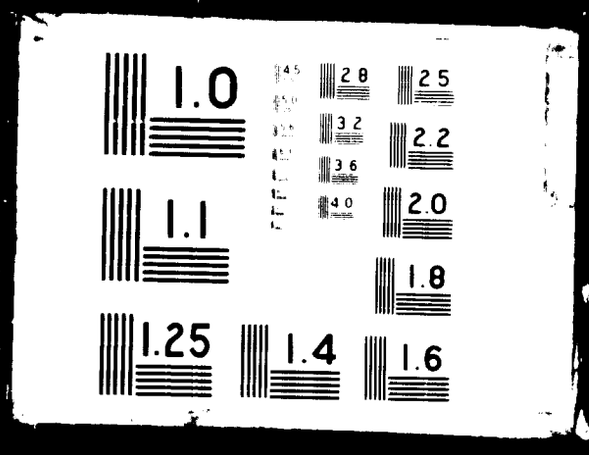

TABLE 14: DATA FOR INTEGRATED COTTON MILLS IN LATIN AMERICA

	Level A	*Level B*	*Level C*
Capital investment ($1,000)	4,453.3	5,658.5	6,507.6
Number of spindles installed	13,600.0	15,200.0	14,800.0
Number of looms installed	534.0	530.0	524.0
Yarn output (tons p.a.)	2,265.0	2,643.0	2,895.0
Cloth output (1,000 metres)	16,800.0	19,600.0	21,500.0
Number employed	668.0	446.0	315.0
Cost of cloth (dollars per 1,000 metres)[a]	176.0	156.0	149.0
Return on investment[b] (percentage)	28.1	32.6	33.3

SOURCE: ECLA, document, E/CN. 12/746.

[a] Excluding any allowance for remuneration of the entrepreneurial skills exercised and the capital invested.

[b] Gross margin before tax, assuming cloth is sold at $250 per thousand metres. The return compares with an average interest rate for long-term credits of 12 per cent.

in an integrated cotton spinning and weaving mill.[6] Machinery was classified into three broad groups relating to technology current in 1950, 1960 and 1965, and referred to as levels A, B and C respectively. The three levels were then applied in models containing about 15,000 spindles. The exact production capacity of each model was, however, determined by the size of machinery available at the relevant level of technology, so as to produce conditions of optimum balance. The object being to illustrate the effect of technology on cost, it was implicitly assumed that the full output could be sold in all cases. It was further assumed that a single type of cloth, of plain weave, would be produced. Table 14 gives the capital investment in each case, including pre-operational costs and working capital, plant capacity, output, numbers employed, cost and profitability.

There are variations in economic factors from one country to another, and it is not suggested that too great weight should be attributed to the calculations based on these theoretical simplified models. Nevertheless, the changes in the relative use of labour and capital between levels A and C are extremely striking. Some of these changes are illustrated in the form of index numbers in table 15.

In setting up a mill, the entrepeneur will have to balance the difficulty of acquiring the larger amounts of capital required for levels B or C compared with level A against the reduction in costs which might be

[6] Choice of Technologies in the Latin American Textile Industry; for full reference see annex 3 under "Economic Commission for Latin America".

TABLE 15: COMPARISON OF RESULTS OF DIFFERENT LEVELS OF TECHNOLOGY IN INTEGRATED COTTON MILLS IN LATIN AMERICA
(index numbers: level A = 100)

	Level B	*Level C*
Cloth output p.a.	117	128
Capital invested	127	146
Capital per metre of cloth p.a.	109	115
Capital per person employed	190	310
Number employed	67	47
Number employed per metre of cloth p.a.	57	37
Cost of cloth per metre[a]	92	89
Gross margin p.a.[b]	147	174

SOURCE: As for table 14.
[a], [b] See footnotes a, b, to table 14.

achieved; he may also be less confident that the domestic market could absorb the higher output obtainable in the latter two cases.

Where the Government of a developing country is participating in the establishment of a mill, it may be anxious to secure employment opportunities; from this point of view level A clearly offers the greatest advantages. The ECLA report judges that level B is likely to be most advantageous to Latin America, on a balance of considerations.

It should be noted that this ECLA study does not investigate the further economies that might be obtained in a mill of even greater capacity, such as might be set up if the domestic market were sufficiently large or there were prospects of export trade. The conclusions are not intended for adoption elsewhere without further investigation; the study does illustrate, however, the kind of analysis that can be undertaken in order to arrive at a decision.

Non-integrated plants

The spinning and weaving processes can be divided into separate industries. This frequently occurs in the case of man-made fibres where, as was shown in chapters 1 and 2, the developing countries rely considerably on imported yarn. The practice is less common in the case of cotton or wool, since integration generally makes it easier to control quality and reduces production costs.

There is, however, less scope for using labour-intensive methods for

manufacturing yarn than for weaving cloth. According to the circumstances of a developing country, it may be desirable to examine various combinations such as a small number of large modern spinning mills supplying several small specialist weaving mills; or, in the case of specialist yarn, several small spinning mills supplying a single weaving mill that might also incorporate a finishing plant. Some additional transport costs between spinning and weaving plants have to be incurred, but may not outweigh the advantages. Finishing operations such as bleaching, dyeing and printing are not discussed in this monograph, but it may be said that they generally benefit from economies of scale.

Economies of scale: jute and hard fibre processing

A mission sponsored by ECA investigated the feasibility of jute bag production in West Africa in 1964.[7] It concluded that production could be organized on a fairly small scale for a modest capital outlay. It was estimated that 700,000 bags could be produced annually on a single-shift basis for an investment of $156,500. Twenty-five persons would be employed. The selling price of these bags would be broadly comparable with that of imports. The mission was of the opinion that even smaller plants might be economic.

An exercise carried out by FAO in 1966 examined the implications of installing a much larger plant in an African country.[8] The capacity in this model was 6 million heavy-duty bags per year, and the total capital investment was estimated at about $2.5 million. On the assumption that raw jute could be imported at $160 per ton and bags at 27 cents each, the net savings in foreign exchange were estimated at $500,000 per annum using imported fibre or $1.62 million if a locally produced fibre could be used. The estimated cost of bag production, however, was not quoted.

The manufacture of cordage and other products from hard fibres need not be capital-intensive, and a simple technology can be employed. Material accounts for over 60 per cent of total costs and there seem to be few economies of scale. Moreover, spinning mills can be located near the plantations, so that yarn rather than fibre is transported.

[7] *Report of the West African Industrial Co-ordinating Mission*; for full reference see annex 3 under "Economic Commission for Africa".

[8] Industries Processing Agricultural Products Other than Food; for full reference see annex 3 under "Economic Commission for Africa".

For these reasons, cordage manufacture should be a suitable industry for most developing countries where the hard fibre is grown. As already indicated, there is competition from synthetics in the export market, but manufacture to meet domestic needs could be based on natural fibres and would require little protection against the competition of imports made from synthetic material.

Selection of machinery

In the discussion of economies of scale, reference has been made to various levels of technology. It does not follow, however, that the same level has to be adopted at every stage of production. In any particular mill, at each stage of production, the combination of labour and capital should be selected that gives the optimum result. In general, modern textile factory equipment consists of a basic machine unit, which delivers its output at a predetermined rate, and a number of devices, many of them optional, which control quality or move material on or off the machine. The cost of some of these devices is appreciable in relation to the basic machine cost. By an appropriate selection of devices, the degree of automation can be adjusted to local cost factors.

The immediate availability of spare parts is particularly important in developing countries where they are not locally manufactured. The cost in terms of lost production if machinery lies idle while spare parts are obtained from abroad is nearly always far greater than the capital cost of holding spare parts in stock. When a new mill is starting up, particular care must be taken to stock parts that are likely to be needed for early replacement owing to inexperienced handling of the machinery by operators. In other words, the pattern of consumption of spares will not depend at the outset solely on wear and tear of the machinery.

Second-hand machinery

The rapid pace of technical development in the industrialized countries during recent years has sometimes led to machinery being scrapped when only about five years old in order to make way for even more efficient models. The purchase of such used equipment, if in good condition, should be of particular interest to a development country, since it would save foreign exchange; in any case, the higher output

that could be achieved with the most up-to-date machinery might not be marketable.

The potential disadvantages, however, should also be recognized. There would probably be no guarantee of performance by the vendor, and an evaluation might have to be made by independent experts. It would also be essential to discover whether the manufacturer was producing spare parts and offering maintenance service after ceasing production of the particular equipment. There would probably be longer delivery dates for spare parts of an obsolete model, and it would therefore be prudent to carry larger stocks than for new machinery. Finally, the machinery must be expected to require more frequent maintenance than new equipment, and maintenance personnel might have to be of a very high standard of technical competence.

Development of synthetic materials

Since the ability to produce natural fibres is one of the principal resources of some of the developing countries, the dynamic development of competing materials by the industrialized countries creates considerable problems for them. These substitute materials may be manufactured in fibre form and then processed in the same way as natural fibres, in which case another raw material has become available to the textile industry. Sometimes, however, they may be manufactured in other forms, such as film, sheet or tapes, from which articles are made to compete with products of the textile industry other than apparel.

New materials are being developed in the industrialized countries at an accelerating rate, and the prices of these synthetic materials generally show a downward trend as a result of large-scale production and improved processing techniques.

Moreover, the supply of synthetic materials can be more easily controlled and adjusted to fluctuations in demand than the supply of natural fibres, which depends on climatic conditions, sometimes in only a few areas of the world. One of the consequences of this difference is greater stability in the price and quality of synthetic materials than in those of natural fibres; such stability is always regarded as an advantage by the consuming industry.

Most man made materials are more expensive originally than the natural fibres. However, each time the price of a natural fibre increases sharply in consequence of the supply and demand relationship, a further

impetus is given to the use of its substitute, and the natural fibre does not always regain in the lost markets once its price falls again.

In the case of apparel textiles, man-made fibres have rarely had the advantage of price, but they have gained acceptance by offering a superior performance, in some respects compared with the natural fibre. In developed countries, where incomes are high and personal services are expensive and scarce, the easy-care qualities of synthetic fibres have proved an important competitive advantage. In other social conditions a different consumption pattern will result, particularly since the price differential between man-made fibres and cotton is greater in the developing than in the developed countries. Cotton or wool are still regarded as giving a superior performance in certain respects; this is evident from the efforts of the manufacturers of man-made fibres to develop a range of different textures.

Substitutes for jute and allied fibres

The two major end-uses for woven jute fabrics are heavy-duty bags and carpet backing. For many years there was competition in the bag market from multi-wall paper and polyethylene film bags, but it seemed unlikely that jute bags could be replaced for all uses. In the carpet-backing market there was no serious competitor to jute. Since about 1964, however, fabrics made from polyolefin woven tape have been offered commercially, and these now threaten to provide an almost complete substitute for jute in both major end-uses.

The material for heavy-duty bags may be high density polyethylene (PE) or polypropylene (PP); the latter is also used for carpet backing. The tape is produced by extrusion, thus eliminating all the extensive pre-spinning and spinning operations required for jute. It can be made into fabric on existing textile machinery after minor modification. Owing to the woven construction, bags made from synthetic material are suitable, like jute but unlike paper and plastic, for commodities that must "breathe". Since, however, the weave is of flat tapes rather than of round or oval yarns, they have better barrier qualities than jute bags. They are also more resistant to damage by water, most oils, chemicals, solvents and micro-bacteria. The tape has considerably greater tensile strength than jute and can therefore be woven on higher-speed looms. Owing to this last factor and the lower specific gravity of the synthetic material, the weight of the bag is generally 15 to 30 per cent of the weight

of the jute bag with which it competes. The woven tape bags, however, may not stand extreme temperatures as well as jute and have a greater tendency to slip when stacked.

Owing to the ruggedness of jute cloth, there is a large second-hand market for jute bags. It is not yet clear whether bags made from woven tape will have an equally high second-hand value, nor how important this question will prove to be in any competition between the two.

In terms of technical performance, therefore, there would seem to be few bag uses where the woven tape variety is inferior. As a general rule, relative prices will determine which is to be bought, and cost studies show[9] that the synthetic products may already be produced in the developed countries at a lower cost than the jute bags.

Most carpets and rugs have some form of backing to give them strength and stability. In woven carpets, the backing yarns are woven into the fabric as the carpet is being made. In tufted carpets, the primary backing is pre-woven and the tufts are stitched into it. Synthetic tape has so far proved suitable only for tufted carpet backing, but this is where the fastest growth in demand seems likely to occur in the developed countries. The superiority of jute may persist as backing yarn for woven carpets and as a secondary backing for a growing proportion of tufted carpets, to give them greater dimensional stability and "creep" resistance.

Woven synthetics, however, are widely regarded as only an interim development between jute and non-woven synthetic backings. A defect of any woven backing is that the unevenness of the surface causes needle deflection, with consequent weakening of the fabric, on the modern, high-speed tufting machines with closely spaced needles. Non-woven backings cause little or no needle deflection. While they are still in the experimental stage and there are technical difficulties to be overcome, it is clearly possible that non-woven backings will eventually cost less than woven synthetic backings and offer a superior performance. The competition to be faced by jute will then be still more acute.

Competition from woven synthetics is not confined to developed countries; the production of PP bags has begun in Chile, Indonesia and Peru for shipment of fish meal and in China (Taiwan) for wool packs.

[9] Study Group on Jute, Kenaf and Allied Fibres; for full reference see annex 3 under "Food and Agriculture Organization".

Substitutes for hard fibres

In the developed countries, hard fibres are used mainly as cordage. Synthetic materials can give as good or better performance in almost every application, so that only lower prices can protect the hard fibres from the competition of synthetics.

Over one half of cheaper and nearly all expensive marine cordages are now made of synthetics. For fishing nets, the greater strength, durability and resistance to water of synthetic materials have enabled them to capture almost the entire market.

In the important market for agricultural twines, competition from synthetics was initially slight for reasons of price; to obtain the bulk necessary for baler twine, the synthetic twine material must include PP as a component, and when first made commercially it cost more than $0.60 per lb. By 1967, large-scale production had brought the price of PP in Western Europe and the United States down to between $0.20 and $0.25 per lb. Neither cordate nor woven tape bags account for more than 5 per cent of total FF consumption, and the future cost of PP will be determined mainly by its many other applications. The aforementioned FAO study group has suggested that a further reduction of 25 per cent in PP prices may take place by 1975. On this assumption hard fibres will face increasingly severe competition in the market for agricultural twine.

For packaging and tying twine, sisal has faced competition from a number of substitutes, such as adhesive tape, plastic cord and paper string, and has undoubtedly lost ground.

In the developing countries, the consumption pattern is markedly different from that of the developed countries. According to FAO estimates, over two-thirds of the consumption in developing countries is accounted for by woven goods, mainly bags used to pack agricultural commodities such as coffee and cotton. In this sector, therefore, there is potential competition from woven synthetics and jute, especially in countries where hard fibres are not grown.

The countries that grow hard fibres may be able to offset partially the loss of traditional export markets for fibres or for cordage by expanding cordage manufacture for domestic consumption. Nevertheless, it is highly desirable to find additional high-volume outlets. Among the newer uses for hard fibres are tea bags, sausage casings, reinforced plastics, building boards, carpets and pulp for kraft and speciality papers. Carpets and pulp for paper would seem the most promising

outlets from the point of view of volume. The consumption of sisal in Western Europe for carpeting has expanded during the 1960s, but the competition from other natural and synthetic fibres is considerable. Pulping sisal has proved a technical success in Brazil, but the kraft papers manufactured in this way have yet to be proved outside the Brazilian market.

Organization of mill production

As with other manufacturing industries which involve several production stages, both skill and judgement are required to equip or expand a textile mill in such a way as to reduce to a minimum the lack of balance in productive capacity both within and between departments.

However well balanced the factory equipment may be, the operation of the mill will at all times depend on the type of cloth ordered and the volume of orders. The effects of changes in the production programme should be calculated well in advance so as to minimize the risk of imbalance between the spinning and weaving departments of an integrated mill. Balance between departments is organized by beginning at the weaving end and working back through the production stages.

To avoid the increased costs resulting from inefficiency in organizing the work or controlling the quality of the products, modern scientific methods of production management have been introduced in the textile industry in developed countries. Efficiency levels, which ensure the maximum speed consistent with satisfactory quality, are established for each process. Quality control operates continuously at all stages in the production process. Actual performance is regularly compared with standards. Machinery maintenance is planned according to a programme based on experience and includes an element of preventive maintenance. While changing economic conditions have forced the management of mills in the developed countries to devise detailed measures of this kind, most such measures can be adopted in mill management regardless of the level of technology employed and will result in a significant reduction in manufacturing costs.

Another consequence of the increasing cost of equipment in textile mills is the practice of operating on a three-shift basis, generally 23 hours a day for six days a week. The remaining hour of the day is used for machine adjustment and maintenance. The incidence of depreciation on production costs is evidently reduced by this practice, but it is usually

necessary to pay higher wage rates for night work, the amount of the premium depending on social and economic conditions. In some circumstances the premium for night work may increase labour costs by more than the resultant saving in the cost of machinery depreciation per unit of output. If the machinery is second-hand or old, more time will be required for maintenance, and the scope for continuous operation will be limited.

CONSIDERATIONS DETERMINING THE ESTABLISHMENT OR MODERNIZATION OF A TEXTILE INDUSTRY

As noted in the introduction, the textile industry has spearheaded industrial development in most countries and provided a high proportion of the employment created in the manufacturing sector. It is therefore natural that the establishment or expansion of a textile industry should often be under investigation in developing countries.

As stated in chapter 2, some developing countries, particularly in the Far East, possess textile industries that are fully competitive in the world market, even to the point where the developed countries have introduced import quotas to limit what they regard as a disruption of their domestic markets. There is said to be excess productive capacity for cloth manufacture in the world as a whole. The question is sometimes raised whether in these circumstances developing countries that have so far made little or no progress in textile manufacture should initiate or expand their activities in this field. It is pointed out that a newly established industry generally has to be protected by import duties for many years and that such protection is paid for by the consumers in terms of higher prices. The Government will also lose the duties on imported textiles if substitution by local manufacture takes place. It is also said that in countries that do not grow their own cotton the saving in foreign exchange will not be impressive because the pressure of international competition makes it possible to import cotton piece-goods at little more than the value of the cotton that would be used in locally manufactured products.

To a large extent, arguments of this kind can be put forward against establishing almost any industry in a developing country. Indeed, it is rare that the substitution of local manufacture for imports can be justified in the short term. The developing countries do not wish to be confined to the role of suppliers of raw materials to the already developed countries, and a longer-term perspective is necessary in order to decide

where and when the textile industry should be developed. This chapter will look into the considerations which must be weighed in deciding policy in this matter.

Labour requirements and training

For the most part, spinning and weaving do not require a highly skilled labour force. Even in a modern, integrated mill less than one quarter of the labour force need consist of skilled workers. Such industrial training as is required can be of fairly short duration. Since labour is usually plentiful in developing countries, the supply of this input will not present a problem.

Textile wages are relatively higher in comparison with general wage rates in developing than in developed countries; in absolute terms, however, wages in developing countries are much lower. What counts is the labour cost per unit of output rather than the labour cost per hour.

Wide differences in labour productivity have been observed in developing countries even when substantially the same type of production equipment is installed in the mills. The variation is from a performance that broadly matches the best-managed mills in Europe and the United States to one involving a labour force twenty or more times larger. There are many reasons for these disparities, and it is important to make a realistic estimate of the labour productivity obtainable in any given situation.

When a new mill is established, the training of operatives should begin at the time the machinery is installed. On the spinning side, the training is a relatively easy process; weavers require much longer training and loom fixers may require up to six months. After training, the operatives will become progressively more efficient and without an increase in numbers can be redistributed to form two shifts instead of one, and finally three shifts.

Intermediate skills are generally best learnt abroad, in the plant of the appropriate machinery manufacturers, and may involve from three to twelve months' training. Such training should therefore be organized soon after orders for machinery have been placed.

The necessary training for higher technical positions in the mill may require two or three years in a technical college or university abroad. This must be supplemented by a considerable period of practical in-plant training.

Somewhat higher skills are needed in the production of man-made fibres. In this case the more advanced technology is transferred by the grant of patent rights and a licence to produce.

It is nearly always necessary to supplement the training programme of local nationals by the recruitment of expatriate staff to manage the factory and complete the systematic training of local counterparts to replace them. Despite the cost involved, the expatriate staff will be needed for at least three years.

Raw material supplies and prices

While labour may account for 15 to 30 per cent of total costs, according to the level of technology selected, raw material generally accounts for well over 50 per cent.

The developing countries' most important single apparel fibre is cotton. Among countries that do not grow cotton, developing countries are unlikely to be able to import it more cheaply than can developed countries. On the other hand, the price of cotton is lower in many producing countries, partly because transport costs are lower or nil. Sometimes, however, it is government policy to maintain domestic cotton prices at a higher level than world prices, for example, in Peru and the United Arab Republic, as well as in the United States. Wool is a comparatively small item in the textile production of most developing countries, and prices seem generally to be above those in the developed countries.

Although domestic availability of cotton or wool is not essential for the establishment of a textile industry, in a developing country, it offers a number of advantages. For example, in addition to important savings in foreign exchange, there are savings in transport costs, since natural fibres contain many impurities that are removed only after arrival at the mills and account for up to 20 per cent by weight of a cotton bale and up to one half the weight of greasy wool.

The cotton grown in a developing country may not necessarily be of the right quality for the products it is desirable to manufacture there. Short or medium staple cotton is unsuitable for combed yarns of fine count, while long staple cotton is poorly utilized if spun into coarse or medium-count yarns. Different qualities of wool are likewise suitable for different products.

For reasons discussed in chapter 4, the share of man-made fibres in the consumption of apparel textiles is likely to remain smaller in developing than in developed countries for many years to come. However, any developing country which aims to establish an export trade in textiles to developed countries in addition to supplying its own market will have to be prepared to offer cloth made from man-made fibres, with or without the admixture of natural fibres. The key advantage of the developing country will usually be that its wage rates are lower than those in developed countries; it can use this advantage to export not only fabric but also made-up textile articles and garments.

Even when requirements for man-made fibres for the domestic market are supplemented by the export activities of the textile industry, their volume may not be sufficient to justify local manufacture. Since few developing countries have the petrochemical complex needed to supply the raw material for synthetic fibres, synthetic yarn or staple fibre must generally be imported. However, the cost in foreign exchange can be recouped many times over if cloth or made-up articles embodying synthetic fibre can be exported as well as sold in the domestic market.

The technique for producing cellulosic fibre has long been established, and the raw materials required are indigenous to almost every country; yet only fourteen developing countries were engaged in its manufacture by the middle of 1968, and generally the scale of operation was small. While the price of cellulosic fibre in Japan, the United Kingdom and the United States compares with that of certain grades of cotton, in most developing countries it is from three to five times higher. Local manufacturers are protected from the competition of imports by high tariffs or quota controls and possibly have only a limited incentive to break out of the vicious circle of low consumption and high cost, small-scale production.

The case for establishing cellulosic fibre production is particularly worth investigating by a developing country that does not produce cotton but has ample resources of wood for pulping. If 15 to 20 per cent viscose rayon staple is blended with cotton, experience shows that there will be no adverse reaction from the consumers, even in countries where clothing has for centuries been made from pure cotton.

The cost of plant for viscose rayon manufacture will be between $2 million and $5 million per 1,000 tons annual capacity, some of which will not involve the expenditure of foreign exchange. The import of 1,000 tons of cotton, depending upon its quality and the movement of prices, will entail foreign expenditure in the range of $600,000 to

$1 million. In terms of foreign exchange expenditure, therefore, the partial substitution of imported cotton by domestically manufactured viscose rayon looks promising. The difficulty lies in producing the staple fibre at a sufficiently low price for the blended "cotton type" cloth to be salable in the domestic market.

In the case of man-made fibres, the cost of transport is not a major factor for two reasons: first, the material is delivered in pure form to the mill, so that wastage is negligible; second, the price is generally higher in relation to weight than that of natural fibres.

Woven polyolefin tapes have been mentioned as a serious competitor to jute and hard fibres. A developing country that does not grow one of these fibres might consider the manufacture of bags for agricultural produce and other items from this woven tape. The polyolefin material will in most cases have to be imported, but the extrusion of film and slitting into tapes is a quite simple process that can be applied on a small scale. The tapes can be woven into fabric on conventional textile equipment.

Locational factors

In choosing the location of a textile mill, a number of other locational factors have to be taken into account, but most of these, such as availability of power and transport, apply to all manufacturing activities. A certain degree of humidity is necessary in spinning cotton and wool in order to prevent excessive fibre breakage. With the development of modern air-conditioning machinery, the climate within the mill can be controlled to suit requirements, although this adds to capital and operating costs. A textile mill uses appreciable quantities of water; the quality of the water is thus important.

Contribution of a textile industry to general industrial development

In most developing countries, capital and foreign exchange are scarce, while labour is relatively plentiful, with the exception of skilled labour. The textile industry accommodates itself fairly well to this situation. Although it is tending to become more capital-intensive, a much smaller investment outlay is required than in many other industries to establish the capacity to meet domestic demand. Government planners

might wish that it could absorb more labour without becoming uncompetitive; in any case, there is generally no serious problem in manning the industry.

For countries that grow the fibres, a textile industry holds out the prospect of accumulating foreign exchange for use in other areas of industrial development, because far more foreign exchange will be saved by the reduction in cloth imports than could be earned through exporting the amount of fibre consumed in textile production, even after allowing for the import cost of textile machinery. In countries that do not grow textile fibres, the establishment of local textile manufacture will still result in some saving of foreign exchange, but this is not a decisive argument. Industrial development in some other sector might prove to be a wiser investment in these cases.

In the nineteenth century, the development of the textile industry in Europe and the United States had a dynamic impact on the national economy; this was particularly true in the case of Great Britain. The textile machinery was also manufactured in Great Britain; the wages earned by the large labour force employed in the textile industry stimulated consumer demand, including the demand for textiles. The impact on a developing country in the twentieth century is likely to be less marked. The textile machinery will not be locally manufactured; a relatively small labour force will be employed owing to changes in technology. Much depends on the connexions between the textile and other industrial sectors of the economy. It is important, therefore, to analyse the input and output of the textile industry.

The input demands of the textile industry for the products of the rest of the economy are large. The multiplier effect of an additional unit of final demand for textiles is quite substantial. In the first place, it generates additional demand within the agricultural sector if the fibres are grown locally. However, a substantial proportion of the extra demand generated goes to other manufacturing sectors.

Where textile fibres are locally produced, this linkage is of great importance, and co-ordination within the framework of a national development plan is highly desirable. The varieties of fibre grown may not initially be the most suitable for the products that the textile industry desires to produce. Deficiencies in the processing, packing and handling of the fibre may make it expensive to use. The consequence may be the production of high-cost, low-quality fabric, unsuitable for the home market and impossible to export. It is not unknown for a Government to support the price of natural fibres as part of its agricultural policy and

then resort to import restrictions and export subsidies to aid the textile industry. No Government can regard this situation with any satisfaction, and most of the changes may have to occur on the agricultural side.

Even when not itself a large employer of labour, the textile industry may indirectly provide far greater employment in the agricultural sector in growing the fibre.

The textile industry is obviously linked to clothing, furnishing, cordage and bagging. To the extent that man made fibres are used, it is also linked to chemicals and petrochemicals. Textile machinery industries have been set up in a few developing countries, but their experience has not been encouraging. The equipment needs of their local markets have been too small and erratic to enable them to develop successfully, and the models they make tend soon to become obsolete. Most developing countries may have to rely on imported machinery for many years to come. In some of those countries, however, it may be feasible to manufacture certain spare parts which are required in large volume. Some of the simpler items of equipment might be manufactured, but, since a modern mill installation is conceived as a unified process, this equipment would have to match more complex items and would therefore have to be manufactured under licence from a foreign firm.

Textile products form only a small proportion of the input of other sectors of the economy, apart from the bagging industry, which uses jute, hard fibres and sometimes cotton cloth to make bags for packing agricultural products such as coffee, rice and oilseeds for export markets and, in the manufacturing sector, sacks for fertilizers.

Investment and finance

It is clear from the discussion in chapter 4 that the investment required for a textile mill of a given size depends greatly on the level of technology which is considered appropriate, bearing in mind the size of the market and the ratio of capital to labour costs.

The size of investment also depends on factors such as the average count of yarn to be spun and the structure and width of the cloth to be manufactured. In the finishing department there are large variations depending on the type of finish required by the market. It is also impossible to generalize about the cost of construction and items such as the treatment of water and effluents and, where they have to be installed, power supply and air-conditioning.

Generally speaking, the older textile industries in the developing countries were originally financed by expatriate private enterprise. Since 1945, there has been increasing government investment both in those countries and in the newer producing countries. Sometimes the Government has negotiated foreign aid from another Government or a private consortium. The capital required to meet expenses before the factory starts operations is often difficult to amass in a developing country, where private investors may be used to seeing a quick return on their money. The sum involved is of the order of one third of the total initial assets of the enterprise and a substantial part of it will be spent on advance training of personnel.

It is generally less difficult to arrange a medium-term credit to purchase and import the necessary equipment. The supplier of equipment will frequently grant credit up to 80 per cent of its value. Local expenditure on building, construction and so on can sometimes be financed from local sources. In most developing countries, the Government will have to play some part in organizing the finance, even if a significant part of the investment comes from private sources; it may have to offer special incentives to attract local capital and give guarantees for the treatment of foreign capital.

Protection versus free trade

A feasibility study will not infrequently show that the establishment of a textile industry is impossible without a substantial degree of protection against imports. An assessment should be made of the possibility of the new industry's becoming competitive after a determined period of time, and it is reasonable to set targets for increasing the efficiency of operations as experience is gained and for achieving economies of scale as the size of the market grows. Unless a competitive cost position can be foreseen in due course, it may well be that the available funds should be used to develop another industrial sector.

Protection should be granted for only a limited period, after which it should be reviewed with the intention of progressively reducing tariffs on imports. In most developing countries, local production of textiles will be confined to a small number of mills; this situation is unlikely to provide sufficient pressures to improve efficiency without a certain degree of competition from imports. It is evident that the balance of payments position of the country concerned, as well as the competitive strength of

the domestic textile producers, will influence the Government in deciding its course of action. If, however, the establishment of a local industry results in a substantial increase in the price of clothing, the growth of consumption is restricted and a vicious circle created in which high prices are defended by reference to low sales and sales cannot be increased without lowering prices.

Regional co-operation and integration

During the 1960s, Governments have engaged in far-reaching negotiations aimed at increasing the degree of regional co-operation among them and in some cases at introducing economic integration. Such negotiations stem from a growing awareness of the difficulty of establishing viable modern industries in countries whose population and natural resources are small. In addition, developing countries that have already achieved a substantial measure of industrialization are concerned lest the progress of economic integration in Europe and expansion in North America may adversely affect their future development if their industries do not have access to multinational markets. Progress in such negotiations is apt to be slow because of the complexity of the problems and the diversity of interests to be reconciled.

None of the arrangements has been designed specifically to promote intra-regional trade in textiles; indeed, textile products are excluded from the provisions of some agreements precisely because the textile industry was set up in most countries under the protection of trade barriers and other controls and usually accounts for a substantial proportion of national employment and manufacturing activity. If, moreover, the installation of equipment for textile manufacture in a given country has been of fairly recent origin, it is natural that the Government should be extremely reluctant to envisage any measure of trade liberalization which would reduce the viability of an investment made at considerable sacrifice of scarce resources.

A further difficulty is that production in all developing countries is heavily concentrated on the coarser yarns and fabrics for which demand is greatest, so that their ranges are competitive rather than complementary. Many developing countries therefore import only the finer varieties of cloth and the more sophisticated textiles. In general, this sector of the market continues to be supplied by imports from the developed countries, on grounds of price and availability. For all these reasons, the

level of intra-regional trade is small, and its value is lower than that of the exports from developing countries to developed countries.

While, therefore, there may be good expectations of negotiating agreements on a regional basis in parts of the world where the textile industry is not yet well developed, for example, in Africa, the situation is much more difficult where old established textile industries are protected against imports. Some of these industries suffer from highly obsolete machinery and excess capacity. It would be desirable for Governments to attempt to ensure that the necessary and inevitable modernization of these textile industries is carried out, with due regard to the benefits obtainable from regional co-operation.

Marketing

Before the establishment of a domestic textile industry, a distribution network will have been developed over the years, based on specialist importing agencies. When locally manufactured supplies of textiles become available, much of this network of distribution can still be used, but the new mills have to develop their own sales and marketing staff and decide whether any changes in distribution methods should be introduced. Good contact with distributors and with large customers is essential for the planning of mill operations. Entry into export markets, if contemplated, will entail a considerable effort, including market surveys, the choice of reliable distributors in other countries and advertising.

Feasibility studies

The technical problems involved in establishing a textile industry are the same whether it is to be entirely State-owned, entirely privately owned or jointly financed by private and public money. Regardless of the ownership structure, financial assistance will be sought from one or more institutions of a national, foreign or international character. In support of the request for a loan, it is necessary to prepare a feasibility study describing the project and assessing its profitability. The report on the project should include the following:

A survey of the market;

An estimated programme of production;

Preliminary proposals for design of the mill;

An estimate of the investment, showing land and buildings fixed assets, pre-operating expenses and working capital;

A forecast of income and expenditure for at least five years, based on the estimated cost of production and anticipated selling prices;

A cash flow forecast and estimate of credit requirements;

Forecast balance sheets for at least five years.

The feasibility report should also indicate any special facilities to be obtained from the Government in accordance with existing legislation and, if need be, such additional concessions as the initiators of the project may seek from the Government in order to make it viable. The preparation of such a study requires the employment of specialists. International or bilateral technical assistance may be requested in some cases in order to finance this work (see annex 1).

The market survey usually involves an inquiry among importers, wholesalers and retailers because import statistics are insufficiently detailed. Based on the results of the survey, a limited range of cloths is selected for manufacture, in order to produce economically. If the pattern of consumption is very diversified and the volume for each quality of cloth is low, the project should probably be discontinued or studied again on a regional basis.

The production programme should indicate probable output for five years, taking into account growth in consumption and any observable trends in the pattern of consumption, such as demand for finer or wider fabrics, or for blends of natural and synthetic fibres.

Where a project is concerned with the expansion of existing capacity in a developing country, a survey of existing mills is desirable to ascertain whether more efficient use of production capacity, perhaps with some additional investment in certain production stages, would enable the increased demand to be met without erecting a new mill. Capital is so scarce and foreign currency so precious that any unnecessary duplication of investment should be avoided.

A suitable location for the mill must be selected. The supply of raw materials and especially of man-made fibres must be studied in the light of the considerations discussed earlier in this chapter.

In the design of the mill, two extremes have to be avoided. At one extreme there is the tendency to adopt the most sophisticated techniques in automated or electronic equipment, even including experimental machines that have not been thoroughly tested in the developed countries,

and the results have often been disastrous. At the other extreme, because labour is abundant and wages low, there are factories employing thirty times the number of workers that would be employed in the United States to produce the same output. Even though the labour is paid about 10 per cent of the United States wages, the higher cost of labour per unit of output is likely to do more than offset lower depreciation charges on less expensive machinery. A comparison should be made of several combinations of machinery and labour before a choice is made. It is desirable not to risk producing more than the market can absorb but instead to allow in the plans for an extension of the factory as soon as demand grows sufficiently. Some increases in output can then be obtained by optimizing the activity in each section of the mill and gradually adding to the equipment until an optimum size has been reached. Beyond this point, further expansion can be expected through the replacement of outdated machinery by more productive equipment.

In preparing cost estimates, it must not be overlooked that the expenses of the new factory will be higher than those of long-established competitors. Labour will be less productive until skills grow with experience. Expatriate staff will have to be employed in senior management positions for several years at higher salaries than will be commanded by the nationals who will eventually replace them. The mill will not achieve full production for between one and a half to two years, even if market potential and costs have been accurately forecast. During the build-up, production costs will inevitably be higher than normal.

It is unlikely that many developing countries will feel able to attempt to export the products of a newly established textile industry. In two particular situations, however, this may be successful. First, an enterprise in a developed country may decide to discontinue the production of standard goods in that country because it has become uneconomic, and may be interested in transferring the production equipment to a developing country; the standard goods manufactured there would then be imported by the developed country and sold in the domestic market. The problems of export marketing would therefore not arise. The second case is that of the making-up industry, which does not require heavy capital investment but requires a substantial labour force. If well organized in a country where labour rates are low, such an industry can be competitive internationally in making such articles as shirts and underwear. The capital requirements can be further reduced if the industry initially worked on a commission basis for the account of firms in a developed country.

Modernization programmes

The problem of modernization is especially acute in the older textile-producing countries of Latin America and the Far East. Action is required at the national level and at the mill level in order to deal effectively with this situation.

Nation-wide measures

An appropriate body such as a Ministry of Industry or an association of textile manufacturers should survey the industry's productive capacity periodically, sending out detailed questionaires to obtain information on the age of machinery, its utilization and output. Periodical surveys of this type are the rule in all developed countries and also take place in many developing countries.

These surveys provide a foundation for sound government planning of industrial development, taking into account the relationships between industry, agriculture and services. Having reviewed the likely development of consumption and export prospects, the Government will be in a position to decide whether it should give any special aid to the textile industry and, if so, what form it should take.

Measures at the mill level

The work needed to complete the national questionnaires is itself of value to the management of an individual mill, particularly when in due course a comparison can be drawn between the published average results for the country as a whole and the position in a given mill.

A systematic review of management methods and the improvement of mill controls will often lead to a significant reduction in the cost of production without any expenditure on modernizing the production machinery. In many mills, statistics are compiled which convey valuable information that the management fails to use to correct mistakes or reduce wastage in the production processes. With improvements in production scheduling, stock control, costing and so forth, the total potential savings were estimated at 13 per cent of unit costs in a survey of the Brazilian textile industry by ECLA, and there is no reason to suppose that the potential savings are negligible in any country.

An aspect of cost saving that is frequently neglected is the utilization of raw material wastes. In a cotton mill, for example, a large proportion of the waste occurring in the early production stages can be re-cycled into the spinning process for blending with the unprocessed cotton. Fibres that are too short can be processed to manufacture coarse yarns, to the extent required by the market, and the balance can be used to make cotton wool, drawing on supplies from more than one mill if possible. A cotton-wool factory can also utilize first-cut linters (if cotton is grown in the country) or the lowest grade of cotton; the manufacturing process is simple and the investment required is small. Further uses for cotton wastes are in the manufacture of shoulder pads for garments and mattress fillings.

In most developed countries, wastes of cotton, wool and rayon, blended or otherwise, are used in the production of non-woven fabrics. This is a comparatively recent development, and a full-scale market survey would be useful to evaluate the possibilities.

A technical review of the existing machinery and equipment and a comparison with the cost and performance of machinery now available will indicate which equipment should be entirely replaced; it will also enable medium-term and long-term plans to be drawn up for the modernization of certain equipment, geared to the profit-earning capacity of the enterprise or as part of a proposal to raise additional finance. The programme of modernization should be prepared with full regard to the stages of the production process in order to cause the least disturbance to the balance of the production flow.

In some cases, however, it may be found that, instead of replacing each piece of old equipment by its up-to-date counterpart, the entire manufacturing process should be reviewed. It may be possible to introduce new machines that combine the work of several existing machines or to mechanize the handling of materials.

If the mill does not have its own market research department, it should obtain guidance on long-term trends in textile consumption by commissioning a market survey every one or two years. Where changes in demand are forecast, they carry implications in regard to the type of equipment that should be installed in the mill.

Chapter 6

THE INTERNATIONAL SYMPOSIUM ON INDUSTRIAL DEVELOPMENT: ISSUES, DISCUSSION AND RECOMMENDATIONS

The issues, the discussion and the recommendations approved are presented in this chapter.

THE ISSUES[10]

The textile industry, catering to a basic human need, is one of the oldest manufacturing industries and usually one of the first to be established in a country in the process of industrialization. For this reason it is of considerable importance to developing countries, both as a source of income and as a source of employment. In developing countries, the textile industry employs nearly 25 per cent more workers than in industrialized countries; in terms of value added in manufacturing, the textile industry is about three times as important to developing countries as to industrialized countries.

The textile industry is often regarded as a traditional and static rather than as a dynamic industry, and labour-intensive rather than capital-intensive. This image of the industry was true until about fifteen years ago when, after over half a century of technological stagnation, the picture changed. Production capacity of machinery has increased dramatically; advanced automation is now being applied at all stages of fibre and fabric processing; an entirely new range of raw materials has been developed whose share in total world fibre supply is already one third and is increasing rapidly; new production methods have been developed which, in concept, deviate from the traditional textile processes.

Developing countries with long-established textile industries are faced with a rapidly changing pattern of products and processes, with growing international competition and with difficulties in utilizing existing production capacities; the same problems affect the prospects of building up a viable textile industry in other developing countries where production

[10] From UNIDO, Issues for Discussion: The Textile Industry, 1967 (ID/CONF. 1/A.10) (mimeo.).

lags behind consumption. The problems facing the textile industry in the developing countries as a result of new developments were discussed extensively at the United Nations Interregional Workshop on Textile Industries in Developing Countries held in Lodz, Poland, in September 1965. The following issues presented for discussion by the International Symposium reflect, *inter alia*, the recommendations adopted in Lodz. Assistance by UNIDO, through its various technical assistance programmes, is available to help the developing countries in resolving these and other problems facing the textile industry (see annex 2).

Policies of plant modernization

The productivity of the textile industry in developing countries is generally low. The textile industry in developing countries, although employing more labour than the same industry in industrialized countries, produces only half as much in terms of tonnage. There is an urgent need to modernize existing plants and to improve the efficiency of operations by introducing better equipment, improving production flows, mill control systems and repair and maintenance programmes, and establishing proper labour training schemes.

International technical assistance could be effective in planning and implementing these actions, but it is important that they be supported by a consistent government policy which provides suitable incentives. Such government measures may include fiscal and credit incentives and suitable tariff and pricing policies. The new textile equipment, whether for the modernization of old plants or the establishment of new industries, must meet the two sometimes conflicting requirements of most developing countries: it should be sufficiently modern for the output to be competitive, but it should not result in reductions in the labour force at the expense of higher capital costs. An effort should be made to choose a technological level which strikes a proper balance between these two requirements.

Training problems

These increasingly complex problems, related to all aspects of production, impose heavy demands on intermediate and top management. Inadequate management has been said to be the largest single cause of the poor performance of the textile industry in developing countries. The main scope for action, therefore, is in the training of management and supervisory staff. The alternatives suggested are instruction in industrialized countries or the establishment of regional or subregional training institutes for the textile industry, with the possible assistance of

the United Nations and its specialized agencies. The establishment of training centres on a national basis would probably be economically sound in a relatively few cases. It has been estimated that, before a technical school can be considered worth while, there must be a work force of 10,000 persons, and that a special textile department attached to a university, from which between ten and fifteen technologists graduate annually, is justified with a minimum work force of 50,000 persons. In most developing countries, the size of the textile industry is well below these figures.

Textile plant size and economies of scale

In many developing countries, the production of textiles has taken place mainly on the basis of relatively small units. The reasons for this may have been lack of a large domestic market, lack of sufficient funds available at a particular time, and the hope that small units, in the aggregate, would employ more labour at a given level of technology than a larger plant producing the same output. It is generally assumed that economies of scale in the textile industry are not as important as in many other industries and that therefore a policy of concentrating production in small units will not necessarily result in serious cost disadvantages. This assumption, however, cannot be considered generally valid. In an integrated mill, economies of scale in spinning are quite marked in smaller mills of from 2,000 to 10,000 spindles, lessening progressively up to a mill capacity of 20,000 spindles, after which no further economies of scale will be obtained from a larger size. Economies of scale vary significantly according to the type of cloth produced; the finer the yarn and the closer the weave, the greater are the advantages of a larger scale of output. In a non-integrated spinning mill, the scale of output and capital intensity required for economical operation is probably higher. It may be possible to combine a highly capital-intensive spinning mill, operating on a large scale, with several small-scale, labour-intensive weaving units. These units could be established either on a national scale with suitable government incentives or on a subregional basis in areas where national markets are too small.

Raw materials

The availability of local raw materials has often provided the main incentive for the development of a textile industry. It is important to ascertain, however, whether the available raw materials fully correspond to the types of products to be manufactured. The use of raw materials

of too high quality means that resources are squandered, while the use of raw materials of too low quality results in technical problems, uneconomical production and low quality end-products. A further result of inappropriate use of raw material is the often very restricted range of products in the textile industry of many developing countries. The scope may be widened by introducing blends of natural and man-made fibres. Correct blending of regenerated cellulosic fibres increases the range of yarn counts obtainable from a given type of cotton, facilitates production and improves the performance characteristics of the end-product. Improvements in the standard of living can be expected to result in an increased demand for easy-care properties of garments, and these demands may be met by the use of synthetic fibres, either in pure form or in blends with natural fibres. It is important that the industry conform to the world-wide trend by provision for the use of man-made fibres in any programme to establish new textile industries in developing countries.

The production of synthetic and regenerated cellulosic fibres involves distinct economies of scale, and the minimum economical scale may well be far too large to justify production in most developing countries unless the production is planned to satisfy the requirements of several countries in the region. The feasibility of establishing production of man-made fibres either on a national or subregional basis should be investigated in connexion with the general planning of the textile industry. This has been specifically recommended by the regional symposia, and most recently by the Symposium on Industrial Development in Africa, held in Cairo early in 1966.

Co-ordination of development efforts

To co-ordinate the actions by government and private industry in their efforts to increase the productivity of the textile industry, the establishment of national textile development councils or similar bodies might be considered. Both government and industry would be represented on these councils, the function of which would be to collect and disseminate statistical information on production, productivity, sales, trade and prices and to establish production and quality standards and specifications. They would also prepare forecasts of market requirements and trade trends and work out long-term plans for the development of the textile industry.

THE DISCUSSION[11]

The four categories of textile industry

It was apparent from the discussion that national textile industries might generally be classified into four categories and that each category presented a significantly different set of problems.

The first category included developing countries that were in the process of establishing a new textile industry or had done so recently in the expectation that the textile industry would permit considerable foreign exchange economies to be made on essential imports and also, in many cases, would permit domestic sources of raw materials and labour to be utilized. The second category included developing countries in which the textile industry was already successfully established, supplied most of the needs of the domestic market and either had already developed an export trade or had reasonable prospects of doing so if access could be facilitated and textiles produced of an appropriate quality. The third category included developing countries in which domestic requirements were met by a textile industry that had grown obsolete but was protected from the competition of imports by high tariffs. Those industries required modernization and reorganization. The fourth category included industrialized countries with a high consumption of textiles *per capita* and also a growing sophistication in the products consumed. With the rise in wage rates in those countries, their textile industries tended to be threatened with obsolescence and growing competition from imports.

While it was recognized that big changes had taken place in recent years in the role of developed and developing countries in the international textile trade, it was evident that the developing countries were concerned about the obstacles to their efforts to penetrate the markets of the developed countries. It was feared that the entry of more developing countries into this export trade and the attempt to expand its volume might lead to difficulties. A proposal was discussed for programming world textile production with the object of achieving a rational specialization. The debate of this proposal showed a divergence of views: it was pointed out that many developing countries had to increase their foreign exchange earnings by exporting manufactured goods; some developed countries, on the other hand, had been perturbed by the social

[11] See also *Report of the International Symposium on Industrial Development, Athens 1967* (ID/11) (United Nations publication, Sales No.: 69. II. B. 7) paras. 288—301.

and economic consequences of a declining activity in the textile sector of their economy as the result of a rapid growth in imports.

It was considered that the problem required examination in greater depth by the appropriate international organs, such as UNCTAD and GATT, but that UNIDO might assist the developing countries in identifying specialized lines of production to complement the range of textile goods manufactured in the countries to which they hoped to export. It was felt that self-sufficiency for all types of textile products was not in the economic interests of either the developing or the developed countries.

Economic aspects of establishing a textile industry

The opinion was expressed that the textile industry required more labour per unit of output than many other industries, even in the industrialized countries where it had become capital-intensive. The labour force was considered relatively easier to train in the textile industry than in most others. For those reasons, the textile industry often seemed an attractive starting point for industrialization, particularly where the necessary raw materials were locally available to supplement an abundant supply of labour. Nevertheless, it was important to provide appropriate training at all levels, including management. It was suggested that UNIDO, together with the regional economic commissions, should review the methods and means of training used in all existing textile training schools in developing countries. The result of that survey would indicate the extent to which some countries might be able to help their neighbours by accepting trainees and whether additional institutions were required on a regional or subregional basis, for which international technical assistance might be organized. At the university level, the possibilities should be explored of combining teaching with research work and advisory services; because of the small numbers involved, such activities would probably have to be organized on a regional or sub-regional basis.

The importance was stressed of national and regional studies of the textile industry in both developed and developing countries, making use of the latest available data. Such studies should also take into account the linkages with agriculture and other industrial sectors.

Technical considerations

The influence of economies of scale was discussed, including the findings of the studies conducted by ECLA. It was pointed out that it became increasingly difficult beyond a certain size to achieve efficient management even with more productive equipment, and that there was a greater risk of restrictive business practices if the domestic market was small.

The selection of equipment was extensively discussed. It was stressed that the level of automation should be determined with reference to the relative scarcity of capital and abundance of labour in developing countries. Automatic devices were generally justified where they could produce a significant improvement in product quality.

It was pointed out that modern high-speed machinery could lead to a reduction in costs only when it could be utilized to the maximum. In the finishing section, in particular, the capacity of the most efficient machines was high compared with the size of the market in many developing countries. Automatic screen printing tended to be preferable to roller printing when a large variety of patterns had to be produced in small quantities.

It was agreed that the purchase of second-hand machinery might sometimes be justified, but there were many possible disadvantages and the most careful examination and safeguards were essential before purchase. There were cases, however, in which the second-hand machinery was still quite modern and the supplier was willing to give some guarantee of satisfactory operations. Spare parts and technical service might not be easily obtainable from the manufacturer for very old equipment. It was pointed out that the introduction of international standards for components and spare parts of textile machinery could increase the degree of interchangeability and that this would simplify maintenance.

Attention was drawn to the importance of using raw materials appropriate to the textile products to be manufactured. UNIDO was asked to assist developing countries in selecting the appropriate materials. It was considered that the growing trend towards the use of man-made fibres would apply to some extent in the developing countries and that the implications needed careful study, since economies of scale in the production of man-made fibres were such that the requirements of several countries in a region could most economically be met by a single plant. Generally the synthetic fibres required a larger scale of production than cellulosic fibres. It was therefore felt that regional co-operation should be

encouraged, and it was recommended that UNIDO should conduct feasibility studies in that field jointly with the regional economic commissions.

It was pointed out that jute and hard fibres, which were mainly used for purposes other than apparel, faced increasing competition from synthetic materials. That could have serious social and economic consequences for the developing countries where such natural fibres were produced and, in many cases, converted into manufactured goods.

In discussing the modernization of the textile industry in certain developing countries where the industry was long established and had become inefficient, reference was made to previous United Nations studies on the subject. It was recommended that national policy should not be limited to financial measures for installing new equipment but should provide for scrapping the old equipment and, in some cases, reorganizing the structure of the industry. The opportunity should be taken to negotiate measures of regional co-operation in the course of formulating national programmes for modernizing the textile industry.

It was stressed that success in modernization would depend, in most countries, on action by private industry as well as government. The establishment might be considered of national textile development councils or similar bodies, with representation of all interested parties, to co-ordinate measures to increase productivity, raise quality standards and plan the long-term development of the textile industry.

Recommendations approved[12]

The following recommendations were made to UNIDO and, where appropriate, to other international organizations:

> To survey, upon request and in co-operation with the regional economic commissions, the existing training and research facilities for textiles with a view to increasing the effectiveness of present institutions and, in collaboration with other agencies such as the ILO, to promote the establishment of such institutions on a regional, subregional or national basis;
>
> To assist in advising on adequate plant sizes and characteristics for the types of products to be manufactured and in the selection of appropriate raw materials and machinery;

[12] See also *Report of the International Symposium on Industrial Development, Athens 1967* (ID/11) (United Nations publication, Sales No.: 69. II. B. 7).

To undertake feasibility studies for the production of man-made fibres, with particular reference to the availability of basic raw materials required, and their influence on the production of natural fibres;

To study certain special aspects of the textile industry such as printing, with special reference to small runs and utilization of waste, and, in co-operation with other agencies, the possibility of introducing international standards in textile machinery components and spare parts with a view to their interchangeability, as well as the problems of the hard fibre industry, especially those arising from the substitution of natural fibres by synthetics;

To assist Governments, upon request, in the programming of the development or reorganization of the textile industry;

To undertake studies on the textile industry based on the latest available data and forecasts of expansion of production capacity, both in industrialized and developing countries;

To draw the attention of UNCTAD and GATT again to the question of access to world markets for the textile products of the developing countries, taking into account the situation of those developing countries which are less advanced in the development of their textile industry.

Chapter 7

UNITED NATIONS ACTION IN THE TEXTILE INDUSTRY

United Nations action to assist the textile industries of the developing countries may be divided into field and supporting activities. The former include the assignment of experts and missions to developing countries. The latter include organizing various types of meetings and preparing studies on problems connected with textile manufacture in the developing countries; arranging training courses and study tours; and providing information by means of specially prepared reference documents or in reply to written requests.

Field activities

Nearly half the technical assistance projects in the textile industry organized by UNIDO and its predecessor, the Centre for Industrial Development, have been concerned with a systematic study on a national level designed to help Governments in their long-term planning. One third of the projects have been more narrowly concerned with technical advice, research and development in relation to local conditions. The remaining projects have been either feasibility studies or visits to individual mills to deal with particular difficulties.

According to the nature of the project, an expert or a team of experts or a consulting firm has been employed. During 1968, fifteen field projects were completed.

Supporting activities

Meetings and preparation of research papers

Meetings of expert working groups, workshops symposia and also, on occasion, seminars, all enable persons who are actively engaged in the textile industries of developing countries to exchange experiences in

handling their problems, which frequently have many characteristics in common. An additional benefit derived from these meetings is the guidance which they provide UNIDO in formulating its policies and programmes, by updating information concerning conditions and possibilities in various countries and identifying problem areas.

Sometimes special papers are prepared for discussion at these meetings, while in other cases the need for a research paper becomes evident from the discussions at the meeting. In addition, the reports and observations made by field experts may indicate the need for studies and surveys, with the object of resolving specific problems which they have encountered.

The first interregional workshop on textile industries in developing countries was organized by the Centre for Industrial Development in September 1965, in Lodz, Poland. This has been followed by meetings of expert groups to prepare advice on the selection of textile machinery in the cotton and wool and worsted industries and on processing problems. Another expert group is taking up matters of quality control in the textile industry.

In-plant training of engineers and technicians

Vocational training and the training of foremen is carried out by the ILO, mainly within the framework of technical assistance projects in the developing countries. UNIDO organizes in-plant group training programmes in industrialized countries for engineers and higher technical personnel from the developing countries.

An in-plant group training programme for the textile industry was launched in 1967 in co-operation with the Textile Research Institute in Lodz, Poland. The programme lasted for five months, was designed for twenty participants and has since been repeated every year. Its aim is to upgrade the theoretical knowledge of the participants and to provide them in a relatively short time with concentrated practical experience in the textile industry. This is accomplished by giving them the opportunity for practical work in laboratories and production enterprises under close and continuous supervision of experts. The experience of the programme in Poland has confirmed the usefulness of such training for engineers and higher technical personnel from the developing countries; UNIDO hopes to expand facilities for in-plant training.

Future developments

The activities described above are likely to expand because they have proved their worth. The technical assistance given on the spot by experts may be expected to remain the most important element in the services provided through United Nations action. Certain areas are indicated below on which emphasis might especially be laid in future work.

Regional co-operation

Experience has shown how difficult it is to introduce regional co-operation in the textile industry after it has been established on a national basis. It is therefore desirable to endeavour to secure the advantages of organization on a regional basis in those parts of the world where a common market or a customs union is being discussed or negotiated and relatively little textile manufacture has so far been established. UNIDO might give assistance in preparing feasibility studies on a regional basis. It would be advisable at the same time to make a survey, in collaboration with other United Nations specialized agencies, of existing facilities for training and, where appropriate, to make recommendations for setting up regional training centres and textile engineering courses at universities.

Transferring production facilities from developed to developing countries

As already noted, particularly in chapter 1, the developed countries are tending to abandon the production of many standard lines of textile goods, which in the past formed the basis of their export trade, and to concentrate on the more sophisticated items or sophisticated finishing stages. Developing countries, particularly in the Far East, are now the major suppliers of the abandoned items, not only to other developing countries but also to developed countries. There have recently been cases in which textile enterprises in developed countries have physically transferred facilities for mass production to developing countries, because lower unit production costs could be obtained in that way, and have sold the output in their home markets.

The making up of garments has been the commonest example of this type of transfer. Other sections of the textile industry where the

capital investment needed is relatively small, the labour content is relatively high, and the crucial factor for success is know-how might be transferred in the same way. UNIDO might assist by organizing preliminary studies to identify the sectors of the textile industry most appropriate for transfer and the factors that must be present in order to achieve success. Such studies would serve to bring existing opportunities to the attention of industrialists in the developed countries and would help developing countries to devise measures to attract such transfers.

Use of man-made fibres in developing countries

Although the share of man-made fibres in the consumption of apparel textiles is much smaller in developing than in developed countries, the tendency is for this share to expand. Moreover, in some countries the area grown to cotton may have to be reduced in future, in order to increase the production of food crops as population grows, and this factor will also encourage substitution of man-made for natural fibres. Preparatory research in anticipation of this trend would seem advisable.

UNIDO might organize an investigation into the most economical means of using cellulosic fibres blended with the lower qualities of cotton, because the regular length and thickness of the cellulosic staple fibre might result in cloth that was both acceptable to the consumer and cheaper than existing cotton cloth.

In many developing countries the traditional forms of men's clothing are giving way to European-style suits. For this fashion to be generally adopted, however, a suiting fabric is needed with the appearance of light-weight woollen fabric but made from blended man-made fibres and selling at a price that the majority of the male population can meet. UNIDO might organize a study of the technical problems involved in meeting this requirement and of the minimum size of the production unit required for this purpose.

Criteria for the selection of textile equipment

Expert groups are engaged in formulating a set of guidelines on the selection of textile machinery. While it is not the province of the United Nations to make a comparison between the different models on offer, there would be value in preparing a manual, especially conceived for

purchasers in the developing countries, which would serve as a check-list of the advantages and disadvantages from the technical, economic and financial point of view of the offers made by different manufacturers. In preparing such a manual, special attention would have to be given to the finishing stages of textiles manufacturers from man-made as well as from natural fibres. It would include guidance on equipment for bleaching, mercerizing, dyeing, printing, stentering, resin treatment and shrinking. The knitting as well as weaving section could be included in the manual. Meetings of additional expert groups should be organized to prepare guidelines on the selection of equipment for all these sections of the industry.

New techniques

UNIDO will develop its investigations of novel processing methods, such as open-end spinning and shuttleless weaving, with the object of assessing their suitability for use in the developing countries.

International textile trade policy

Textiles are one of the most important examples of exports of manufactures from developing countries. Not only has this export trade led to strong competition between developing and developed countries but it is also likely to involve increasingly strong competition among the developing countries. Governments in both exporting and importing countries nearly always intervene to modify the effects of the free play of competition in the international textile trade.

While trade policy is predominantly the concern of other United Nations bodies, UNIDO is inevitably concerned with the repercussions on the textile industries in the developing countries. A sound assessment of export possibilities may be as important in economic planning as accurate estimates of the growth in domestic consumption. The matter is one of considerable complexity, which may warrant the establishment of a joint study group by UNIDO and other interested United Nations bodies.

Annex 1

UNIDO ASSISTANCE IN THE FIELD OF TEXTILE INDUSTRIES

A. Areas relating to the development of the textile industry in which UNIDO is in a position to provide technical assistance

Raw material utilization, including the use of man-made fibres;
Feasibility and pre-investment studies;
Development planning on national and regional levels;
Introduction of mill control systems and repair and maintenance programmes;
Selection of equipment in connexion with expansion and modernization programmes;
Marketing;
Establishment of research and testing laboratories;
Training;
Promotion (developing, implementing, evaluating) of manufacturing industry projects;
Techno-economic evaluation of competitive processes and changing technology, adaptation of new technologies to requirements of developing areas.

B. Selected major technical assistance projects

The projects listed below relate to the activities of the United Nations Industrial Development Organization since its establishment in 1967. The list excludes projects carried out under the predecessor organizations of UNIDO (the former Division of Industrial Development up to 1962 and the Centre for Industrial Development up to 1967). Since the projects are listed for illustrative purposes, the names of countries have been omitted. The programmes under which the projects are implemented are shown as:

SIS	Special Industrial Services of UNIDO
UNDP/TA	United Nations Development Programme, Technical Assistance Component
UNDP/SF	United Nations Development Programme, Special Fund Component
RP	Regular Programme

Projects implemented or under implementation by UNIDO in areas related to the textile industry

AFRICA

Feasibility study for cotton yarn production for export (SIS)
Techno-economic survey (SIS)
Survey on technical production facilities and marketing situation (SIS)
Viability study for a blanket factory (SIS)
Assistance to the textile dyeing and finishing industry (SIS)
Textile Quality Control Centre (UNDP/SF)

THE AMERICAS

Wool research (UNDP/TA)
Quality control in the textile industry (SIS)
Assistance to textile mills, integrated and others (SIS)
Consultancy in textile industry (SIS)
Assistance in reorganizing the textile industry sector (SIS)

ASIA AND THE FAR EAST

Feasibility study on the kenaf industry (jointly with FAO)
Textile industry rehabilitation programme (UNDP/SF)
Product development for the jute industry (UNDP/SF)

Annex 2

MEETINGS, SEMINARS AND WORKING GROUPS ORGANIZED BY UNIDO

	Location	*Date*
Expert Group Meeting on the Selection of Machinery in the Cotton Industry	Vienna	23—27 October 1967
Expert Group Meeting on Processing Problems and Selection of Machinery in the Woollen and Worsted Industry with special reference to the Developing Countries	Bursa, Turkey	5—9 November 1968
		Proposed date
Expert Group Meeting on Quality Control in the Textile Industry	Vienna	March 1970
Expert Group Meeting on the Selection of Machinery for the Dyeing and Finishing Industry	Vienna	June 1970

Annex 3

SELECTED LIST OF DOCUMENTS AND PUBLICATIONS ON TEXTILE INDUSTRY[1]

UNITED NATIONS

CENTRE FOR INDUSTRIAL DEVELOPMENT (PREDECESSOR OF UNIDO)

Industrial Development in Asia and the Far East. Vol. IV. Development of Key Industries (E/CN.11/752 (Vol. IV); E/CONF.54/R.B.P./2) (Sales No.: 66.II.B.22).

Industrial Development in the Arab Countries (ID/CONF. 1/R.B.P.6) (Sales No.: 66.II.B.23).

Report of the United Nations Interregional Workshop on Textile Industries in Developing Countries held in Lodz, Poland, from 6 to 27 September 1965 (ST/TAO/SER.C/88) (Sales No.: 66.II.B.29).

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Report of the Symposium on Industrial Development in Africa, 1966 (E/CONF. 1/R.R./1).

Report of the Asian Conference on Industrialization, 1966 (E/CONF. 1/R.R./2).

Report of the Symposium on Industrial Development in Latin America, 1966 (E/CONF. 1/R.R./3).

Report of the Symposium on Industrial Development in Arab Countries, 1967 (ID/CONF. 1/R.R./4).

Technological and Economic Aspects of Establishing Textile Industries in Developing Countries, 1967 (ID/7).

Profiles of Manufacturing Establishments, 2 vols. (ID/SER.E/4 and 5) (Sales No.: 67.II.B.17 and 68.II.B.13).

Report of the Expert Group Meeting on the Selection of Textile Machinery in the Cotton Industry held in Vienna from 23 to 28 October 1967 (ID/WG. 8/1).

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[1] Symbols and Sales Numbers of United Nations documents and publications are given in parentheses after the titles.

Lodz Textile Seminars. 1. Textile Fibres (ID/SER. D/3/1) (Sales No.: 70.II.B.6, Vol. 1).

Lodz Textile Seminars. 2. Spinning (ID/SER. D/3/2) (Sales No.: 70.II.B.6, Vol. 2).

Lodz Textile Seminars. 3. Knitting (ID/SER. D/3/3) (Sales No.: 70.II.B.6, Vol. 3).

Lodz Textile Seminars. 4. Weaving and Associated Processes (ID/SER. D/3/4) (Sales No.: 70.II.B.6, Vol. 4).

Lodz Textile Seminars. 5. Nonconventional Methods of Fabric Production (ID/SER. D/3/5) (Sales No.: 70.II.B.6, Vol. 5).

Lodz Textile Seminars. 6. Textile Finishing (ID/SER. D/3/6) (Sales No.: 70.II.B.6, Vol. 6).

Lodz Textile Seminars. 7. Testing and Quality Control (ID/SER. D/3/7) (Sales No.: 70.II.B.6, Vol. 7).

Lodz Textile Seminars. 8. Plant and Power Engineering (ID/SER. D/3/8) (Sales No.: 70.II.B.6, Vol. 8).

Sectoral Studies Prepared for the Symposium: Textile Industries, 1967 (ID/CONF. 1/21) (mimeo.).

Issues for Discussion: The Textile Industry, 1967 (ID/CONF. 1/A.10) (mimeo.).

Report of Expert Group Meeting on Processing Problems and Selection of Machinery in the Woollen and Worsted Industry (ID/33). [Working Title, to be published in 1970.]

Economic Commission for Africa

Report of the West African Industrial Co-ordinating Mission, 1964 (E/CN. 14/246 and Corr. 1) (mimeo.).

Clothing Industries in the East African Sub-Region, 1965 (E/CN. 14/INR/95) (mimeo.).

Industries Processing Agricultural Products Other than Food, 1966 (E/CN. 14/AS/III/19) (mimeo.).

Textile Industries in Africa, 1966 (E/CN. 14/AS/III/24) (mimeo.).

The Textile Situation in West Africa: Markets—Industries—Prospects, 1966 (E/CN. 14/INR/129) (mimeo.).

Economic Commission for Latin America

La industria textil en América Latina. 1. Chile (Sales No.: 63.II.G.5).

The Textile Industry in Latin America. 2. Brazil (Sales No.: 64.II.G.2).

La industria textil en América Latina. 3. Colombia (Sales No.: 64.II.G/Mim. 2).

La industria textil en América Latina. 4. Uruguay (Sales No.: 64.II.G/Mim. 5).
La industria textil en América Latina. 5. Perú (Sales No.: 64.II.G/Mim. 3).
La industria textil en América Latina. 6. Bolivia (Sales No.: 64.II.G/Mim. 4).
La industria textil en América Latina. 7. Paraguay (Sales No.: 65.II.G/Mim. 6).
La industria textil en América Latina. 8. Argentina (Sales No.: 65.II.G/Mim. 7).
La industria textil en América Latina. 9. Ecuador (Sales No.: 65.II.G/Mim. 8).
La industria textil en América Latina. 10. Venezuela (Sales No.: 65.II.G/Mim. 9).
La industria textil en América Latina. 11. Mexico (Sales No.: 66.II.G/Mim. 1).

Economies of Scale in the Cotton, Spinning and Weaving Industry, 1966 (ST/ECLA/CONF. 23/L. 9) (mimeo.).

Choice of Technologies in Latin American Textile Industry, 1966 (ST/ECLA/CONF. 23/L. 33) (mimeo.).

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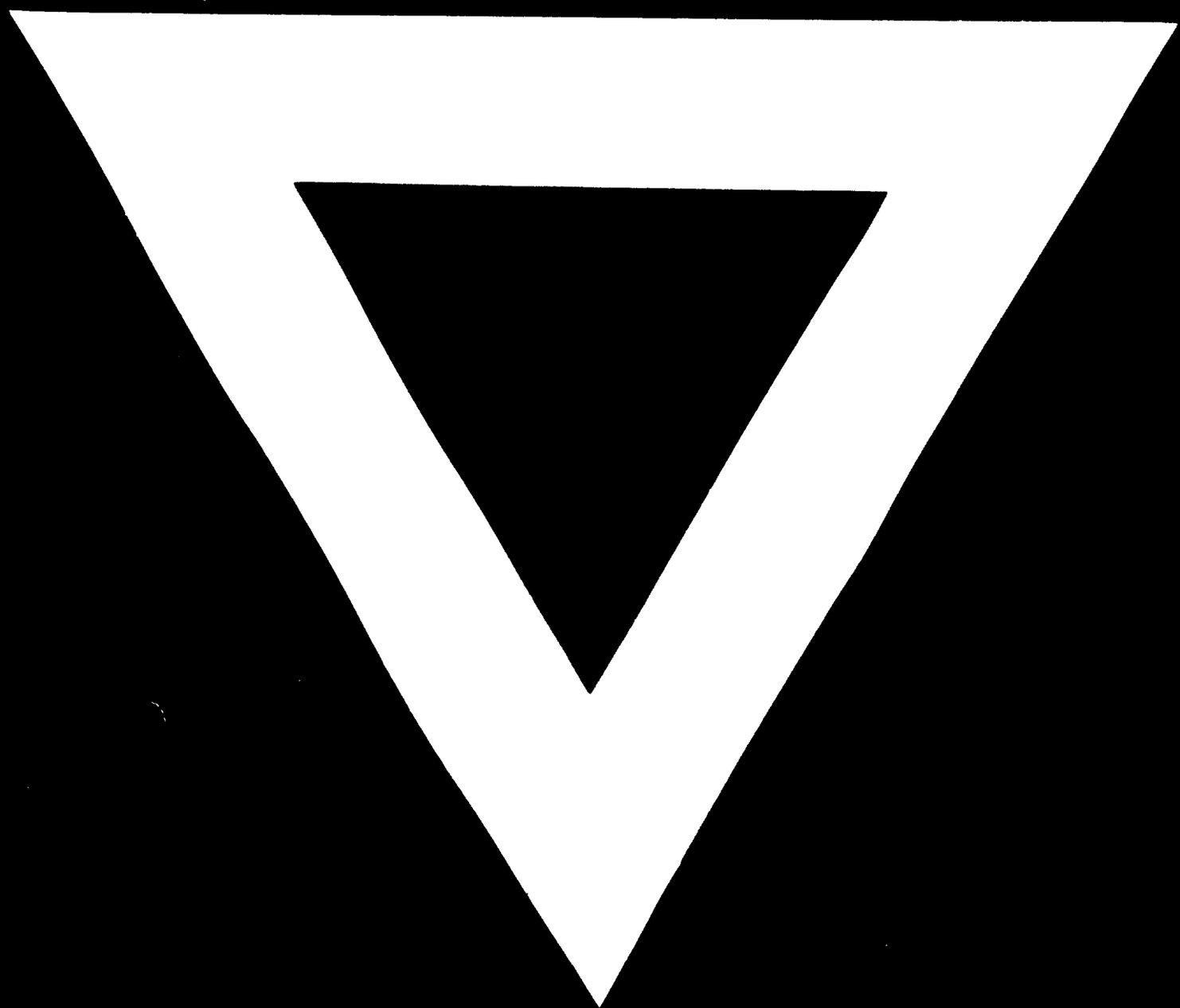

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