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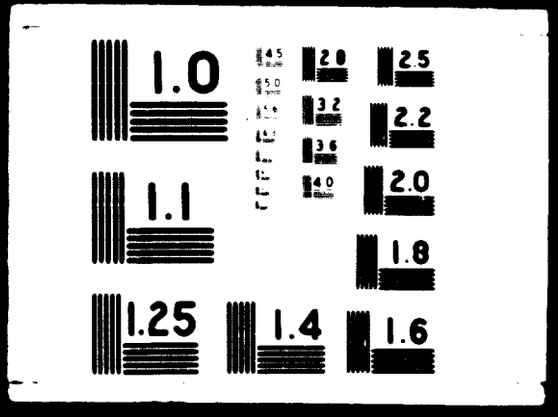

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Provisional agenda, item 2

SECTORAL STUDIES PREPARED FOR THE SYMPOSIUM

TEXTILE INDUSTRIES

Presented by the Executive Director of the United Nations Industrial Development Organization

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I. RECENT DEVELOPMENTS AND TRENDS

Introduction

1. The production of textiles in the developing world rose by some 23 per cent between 1960 and 1964, an increase of more than 1 million tons, from 4.9 to 6.0 million tons. The performance is rather better than that which was achieved in the industrialized countries, where output rose by 16 per cent, from 8.5 to 9.9 million tons. World output[1/] rose by 19 per cent, and the share of the developing countries increased by 1 per cent to 38 per cent.

Table 1

World Textile Production

('000 m. tons)

	1960		1964	
	Total World	% Developing Countries	Total World	% Developing Countries
Apparel Textiles	10.21	28.4	12.2	29.5
Jute Textiles	2.4	75.3	2.8	76.2
Hard Fibre Textiles	0.9	32.1	0.9	35.6
Total	13.4	36.6	15.0	37.7

2. The developing countries have increased their share of all three textile industries. The biggest advance took place in hard-fibre textiles (cordage, matting and sacking) where the developing countries increased their share by over 3 per cent and where output rose by 13 per cent, from 275,000 to 312,000 tons. A more rapid growth was recorded in the apparel textile sector where the output in the developing countries rose by 24 per cent from 2.9 to 3.6 million tons. Jute textile output rose by some 22 per cent, from 1.8 to 2.2 million tons.

1/ Unless otherwise stated, the "world" has been taken to exclude the centrally-planned economies. The reason for this is the lack of comparable statistics for certain products in some countries.

Apparel Textiles

Consumption

3. The consumption of apparel textiles in the developing countries has grown at much the same rate as consumption in the industrialized countries. Over the 1960-1964 period the consumption of apparel textiles in the developing countries rose by just under 21 per cent, from 3.3 to 4.0 million tons, while in the industrialized countries consumption rose by 22 per cent, from 6.5 to 7.9 million tons. World consumption rose by around 21 per cent, and the share of the developing countries in the total remained much the same at 33 per cent.

4. Some 80 per cent of the textiles consumed in the developing countries are still made from cotton and the consumption of cotton goods has been rising rapidly, by 20 per cent between 1960 and 1964, from 2.7 to 3.2 million tons. On the other hand, the consumption of textiles made from man-made fibres is still relatively modest, although it rose much faster (by 32 per cent) than did the consumption of cotton goods. The share of man-made fibre textiles in the total textile consumption of the developing countries rose only from 13 to 15 per cent and the level of consumption rose from 0.4 to 0.6 million tons.

5. In contrast to the steadily rising consumption of cotton and man-made fibre textiles, the consumption of wool textiles was fairly static in the 1960-1964 period, when it showed an 8 per cent rise, from 0.17 to 0.19 million tons. The proportion of wool goods in total textile consumption remained at 5 per cent.

6. Just over half the textile consumption of the developing countries is accounted for by the countries of the Far East with 2.1 million tons. The Latin American countries account for about a quarter of the total with 1.0 million tons, while Africa and the Near East account for the remainder with 0.5 and 0.36 million tons respectively. In terms of per capita consumption the Latin American countries are the most advanced with around 4 kilogrammes per head. The Near East and the Far East consume some 2.5 and 2.0 kilogrammes per head, while in Africa consumption is as low as 1.5 kilogrammes.

Table 2

Apparel Textile Availability by Region

('000 m. tons)

	1960	1961	1962	1963	1964
Industrialized countries					
Cotton	3,966	4,039	3,994	3,918	4,096
Man-made fibre	1,682	1,845	2,120	2,501	2,970
Wool	856	906	913	922	865
Total	6,504	6,790	7,027	7,341	7,931
Developing countries					
Cotton	2,687	2,823	2,934	3,010	3,216
Man-made fibre	438	473	511	536	578
Wool	172	174	173	175	185
Total	3,297	3,470	3,618	3,721	3,979
Africa					
Cotton	301	331	341	355	367
Man-made fibre	85	93	89	93	95
Wool	25	27	30	30	30
Total	411	451	460	478	492
Near East					
Cotton	197	223	224	235	240
Man-made fibre	55	71	82	78	83
Wool	40	48	45	44	45
Total	293	342	351	357	368
Far East					
Cotton	1,495	1,570	1,657	1,695	1,867
Man-made fibre	152	157	184	197	210
Wool	33	32	39	43	48
Total	1,680	1,759	1,879	1,935	2,125
Latin America					
Cotton	694	699	712	725	743
Man-made fibre	145	152	157	167	190
Wool	74	67	60	57	62
Total	913	918	929	949	995
Total world[a/]					
Cotton	6,653	6,862	6,928	6,928	7,312
Man-made fibre	2,120	2,318	2,631	3,037	3,548
Wool	1,028	1,080	1,086	1,097	1,050
Total	9,801	10,260	10,645	11,062	11,910

a/ See foot-note 1/ above.

Source: E.I.U. estimates based on IFCATI and FAO data.

/...

Production

7. The trend in textile production in the developing countries has closely paralleled that of consumption. Total yarn production rose by 26 per cent, from 2.7 to 3.4 million tons, between 1960 and 1964 and total cloth production by 25 per cent, from 2.9 to 3.6 million tons. The fastest growth in the period was recorded in the African countries, whose yarn output rose by 46 per cent, to 256,000 tons, and whose cloth output rose by 47 per cent, to 260,000 tons. In the Far East countries, yarn output rose by 32 per cent, to 1.9 million tons, and cloth output by 28 per cent, to 2.1 million tons. In the Near East group, cloth output rose by 31 per cent, to 309,000 tons, but yarn output rose by only 26 per cent, to 267,000 tons. The slowest growth rates were recorded in Latin America where yarn and cloth output rose by only 11 per cent, to 927,000 and 941,000 tons respectively.

8. Production in the developing countries, like consumption, is concentrated in cotton textiles. In 1964, over 88 per cent of the yarn output was still made from cotton and also 88 per cent of the cloth output. In the Far East region, which accounts for some 57 per cent of all the yarn and cloth produced in the developing countries, the proportion of yarn output which is made from cotton is now around 94 per cent, while in the weaving sector, the proportion of cotton cloth to the total is still around 92 per cent. Some 82 per cent of the yarn produced in the Near East group is composed wholly of cotton, but the share of cotton cloth in total weaving output is significantly lower, at 77 per cent. Nearly 90 per cent of African yarn output is based on cotton but only 87 per cent of the cloth output is so based. The Latin American countries also have a low cotton ratio. In 1964 cotton yarn accounted for only 76 per cent of total yarn output and cotton cloth for 82 per cent of the cloth output owing to the much greater use of man-made fibres and wool.

9. The Latin American region has the highest usage of man-made fibres in yarns, owing to extensive production facilities in the area. Yarns and cloth made from these fibres accounted for 15 per cent of total textile output in 1964. In the Far East region, where India has a very large man-made fibre industry, the production of man-made fibre yarns forms less than 5 per cent of the total, and man-made fibre cloth only 16 per cent.

Table 3

Estimated apparel textile production in developing regions
('000 m. tons)

	1960	1961	1962	1963	1964
All developing areas					
Cotton yarn	2,372	2,512	2,655	2,774	2,977
+ MMF yarn	50	63	100	123	159
Cotton cloth	2,480	2,612	2,776	2,903	3,139
MMF yarn	167	177	191	208	243
MMF cloth	245	268	271	270	276
Wool yarn	142	150	149	149	158
Wool cloth	...	156	156	157	...
Total yarn	2,681	1,839	2,995	3,131	3,378
Total cloth	2,866	3,036	3,203	3,330	3,573
Africa					
Cotton yarn	152	169	180	207	230
+ MMF yarn	5	5	6	11	13
Cotton cloth	147	166	179	195	225
MMF yarn	11	11	12	13	13
MMF cloth	19	27	28	23	22
Wool yarn	12	12	12	12	13
Wool cloth	...	...	...	...	...
Total yarn	175	193	205	232	256
Total cloth	177	205	220	230	260
Near East					
Cotton yarn	176	197	203	216	219
+ MMF yarn	7	13	20	32	27
Cotton cloth	182	208	219	241	238
MMF yarn	2	2	2	2	3
MMF cloth	19	31	33	19	26
Wool yarn	34	44	45	44	45
Wool cloth	...	...	...	...	...
Total yarn	212	242	250	262	267
Total cloth	235	283	297	303	309

Table 3 (continued)

	1960	1961	1962	1963	1964
Far East					
Cotton yarn	1,403	1,471	1,597	1,660	1,822
+ MMF yarn	14	15	32	28	59
Cotton cloth	1,481	1,535	1,660	1,711	1,906
MMF yarn	46	53	66	74	86
MMF cloth	101	105	117	135	117
Wool yarn	13	14	18	19	20
Wool cloth	28	27	32	37	40
Total yarn	1,462	1,539	1,681	1,753	1,928
Total cloth	1,610	1,667	1,809	1,882	2,063
Latin America					
Cotton yarn	641	675	675	692	707
+ MMF yarn	24	30	42	52	60
Cotton cloth	670	704	716	746	771
MMF yarn	109	111	110	119	140
MMF cloth	106	104	94	93	110
Wool yarn	83	80	74	74	80
Wool cloth	70	64	58	55	60
Total yarn	832	866	859	885	927
Total cloth	846	873	868	894	941

Notes: The figures for cotton yarn are based on data supplied by IFCATI while those for wool and man-made fibre yarn are derived from FAO sources. No account has been taken of the wastage factor in yarn production, the figures in each case representing mill fibre consumption. This results in an overstatement of cotton and wool yarn production of the order of 10-20 per cent for most countries. The overstatement is less for man-made fibre yarns as there is less wastage involved.

The cloth figures have been derived by adding the net imports of yarn to the mill consumption of the fibre and are therefore subject to the same inflationary bias as for yarns. The basic data on net imports has been calculated from FAO sources.

The geographical definition of the areas used is as follows: Africa excludes South Africa but includes the United Arab Republic. The Near East includes Turkey and Iran. The Far East excludes Japan and Mainland China. The industrialized countries exclude the Union of Soviet Socialist Republics and Eastern Europe.

10. In Africa, where man-made fibre output is restricted to the relatively small Egyptian industry, the production of man-made fibre yarns accounts for only 5 per cent of total production, but man-made fibre cloth forms over 8 per cent of total weaving output. In the Near East only 1 per cent of total yarn production is made from man-made fibres, but for man-made fibre cloth the proportion is also around 8 per cent.

11. The rising share of man-made fibre yarns in the yarn consumption of the cotton cloth industry should be noted. Between 1960 and 1964 the consumption of man-made fibre yarns by the cotton industry rose from 50,000 to 159,000 tons, and the man-made fibre content of the cotton cloth produced rose from 2 per cent to 5 per cent.

12. The wool industry in Latin America is also relatively important owing to the large wool clip in the area. Output of wool yarns now forms some 9 per cent of the total while for wool cloth the proportion is lower, at 6 per cent. The highest concentration of wool textiles is to be found in the Near East region, however, where wool forms 17 per cent of total yarn output. The wool industry is relatively unimportant for climatic reasons in the Far East and Africa. No information is available regarding the man-made fibre content of wool cloth produced but it is undoubtedly quite considerable.

Trade

13. The developing countries are still large net importers of textiles. In 1962 total imports of all textile yarns and fabrics (SITC group 65, including non-apparel textiles) amounted to some $US1,860 million of which cotton textiles accounted for some $US521 million.[2/] Total exports of all textiles in that year amounted to some $US990 million while the cotton goods exports of India and Hong Kong amounted to some $US161 million. Expressed in tonnage terms, imports of apparel textiles only amounted to some 947,000 tons while exports amounted to only 326,000 tons, leaving a deficit of 622,000 tons.[3/] By 1964, exports had increased slightly but there was still a deficit of around 602,000.[4/]

2/ United Nations Monthly Statistical Bulletin and GATT estimates.

3/ Based on FAO data.

4/ EIU estimates.

14. There has been a sharp shift in the structure of the net imports into the developing countries in recent years. In 1960 net imports of cotton textiles by the developing countries amounted to some 305,000 tons (of which 47,000 tons was yarn) and those of man-made fibre textiles to 208,000 tons (of which 128,000 tons was yarn). By 1964 the net imports of cotton textiles had fallen by 65,000 tons and net imports of man-made fibre textiles had risen by almost the same amount, to 335,000 tons. All of this increase was due to the rising net imports of yarns made from man-made fibres while cloth imports remained at the 1960 level. On the other hand, net imports of cotton yarn fell by 44,000 tons and net imports of cotton cloth by 21,000 tons. Thus while local manufacturers processing imported yarn are obtaining a growing proportion of the man-made fibre cloth market, those processing home-produced cotton yarn are obtaining a growing share of the cotton cloth market. Net imports of wool textiles by the developing countries are very small, at 27,000 tons. Most of this is made up of wool cloth, imports of which have shown little change in the period. Net imports of wool yarn appear to have been rising, however.

15. The region with the largest net imports of textile products is Africa. These are mainly composed of cotton goods and it is notable that net imports of cotton cloth have tended to fall over the period, at least since 1961. Africa is, however, a net exporter of cotton yarns and these exports seem to be rising. The Near East region is also a net exporter of cotton yarn although on a smaller scale and these exports have shown a strongly rising trend. Imports of cotton cloth have also shown some rise over the period, but net imports of man-made fibre textiles were almost four times as great as the net imports of cotton textiles in 1964. The region is now self-sufficient in wool textiles. Net imports into the Far East region have tended to decline over the period. The bulk of these still consist of yarns although these have declined. Cotton cloth imports have also tended to decline but the decline has been at a slower rate for man-made fibre cloth. It is worth noting that net imports of man-made fibre textiles are nearly three times as large as net imports of cotton textiles. Net imports of wool textiles are comparatively small although this is the largest importing region.

16. Most of the net textile imports into the Latin American region are made up of cloth, and these have been declining owing mainly to the sharp fall in the imports of cotton cloth. Imports of man-made fibre cloth have shown a strongly rising trend on the other hand. Imports of man-made fibre textiles have increased by about a third in the period. Latin America is a net exporter of wool yarns and net exports of these have been rising strongly in recent years. The region is still a net importer of wool cloth, however.

Self-sufficiency ratios

17. The relative importance of trade in textiles to the developing regions can be seen from their self-sufficiency ratios, that is, the share of production in total availability. The developing world now supplies practically all its own requirements of cotton yarn and nearly 93 per cent of its cotton cloth requirements. The self-sufficiency level for wool textiles is also high, at 85 per cent, but only 56 per cent of the requirements of man-made fibre yarns and 75 per cent of the requirements of man-made fibre cloth is supplied from within the area.

18. The region with the highest degree of self-sufficiency for yarns is Latin America, where local production accounted for 99 per cent of requirements in 1964, although domestic cloth production formed only 95 per cent of requirements.

19. The Far East region is by far the largest textile producer in the developing world, and has slightly increased its degree of self-sufficiency. The region now supplies 97 per cent of its total cloth requirements.

20. In Africa, and less so in the Near East, the level of textile production is still well below requirements. Producers in the Near East supplied 86 and 84 per cent of consumption requirements for yarns and cloth in 1964, while in Africa they supplied only 58 per cent of the cloth requirements.

Equipment and capacity

21. Cotton textiles: There were some 34.5 million spindles installed in the developing countries in 1964, a rise of 17 per cent from the 1960 level of 29.4 million. This is a notable increase in view of the fact that the total world spindleage contracted in the period by over 1 per cent to 97.9 million

units from 99 million units so that the share of the developing countries in the total rose from 30 to 35 per cent.

Table 4

Equipment installed in the cotton system

Spindles in place (mn)	1960	1961	1962	1963	1964
Total World	99.0	99.7	98.5	97.9	97.9
Developing Africa	1.5	1.7	1.9	2.0	2.0
Latin America	7.9	8.0	8.0	8.6	8.7
Near East	1.2	1.9	2.0	2.1	2.2
Far East (ex. Japan)	18.8	19.2	19.4	20.6	21.6
Total Developing World	29.4	30.8	31.3	33.3	34.5
Total Industrialized World	69.6	68.9	67.2	64.6	63.4
Looms in place ('000)					
Total World	2,037.2	2,010.5	1,994.2	1,973.9	2,022.2
Developing Africa	31.8	33.1	35.9	39.0	44.8
Latin America	200.0	200.4	210.5	223.2	212.4
Near East	37.3	43.4	45.5	47.5	47.9
Far East (ex. Japan)	311.0	321.8	337.9	349.0	360.1
Total Developing World	580.1	598.7	629.8	658.7	665.2
Total Industrialized World	1,457.1	1,411.8	1,364.4	1,315.2	1,357.0

Source: EIU estimates based on IPCATI statistics.

Ignoring statistical difficulties in timing and definition, it can be calculated that the annual output of yarn per spindle in the developing world rose from 80.7 to 86.3 kilogrammes in the period. Much the same situation is to be found in the weaving section. The number of looms installed in the developing world rose by 15 per cent from 580,000 to 665,000 units, and the share of the developing countries in the world loomage capacity rose from 28 to 33 per cent. Again if the statistical difficulties are ignored, it can be calculated that output per loom in the developing countries rose from 4,180 kilogrammes to 4,480 kilogrammes in the period.

22. Wool textiles: Information on the installed capacity for wool spinning and weaving is extremely scarce for most of the major producing countries in the world. The available statistics tend to cover only a part of the productive capacity in the factory sector, and the more up-to-date sector at that. The result is that in many countries the equipment recorded is not fully representative of the industry. There is also a lack of continuity in the statistics.

Table 5

Equipment in the wool system

	1960	1961	1962	1963	1964
Spindles installed ('000)					
Argentina	...	...	...	360	375
Brazil	302	...	...	...	...
Uruguay	...	98	...	110	110
India: worsted	137	137	140	140	141
woollen	...	...	...	66	72
Taiwan	...	...	29	...	37
Pakistan	...	...	...	...	45
Looms installed ('000)					
Argentina	...	...	...	9.2	9.2
Brazil	23.6	...	...	...	...
Uruguay	...	0.9	1.0	1.0	...
India	...	...	...	2.1	2.3
Taiwan	...	...	0.3	...	0.5
Pakistan	...	...	...	...	0.5

Source: United Nations Statistical Yearbook.

23. Man-made fibre textiles: There are no statistics for the spindleage and loomage devoted exclusively to man-made fibre textiles in the developing countries. This is because of the difficulty of separating out the spinning and weaving of man-made fibre yarn and cloth proper from that of mixtures with cotton and wool. The development of man-made fibre production in the developing countries is given in Table 6 below.

Table 6

Man-made fibre production in developing countries

('000 m. tons)

	1960	1965		1960	1965
Africa			**Latin America**		
UAR	11.3	12.1	Cuba	7.7	0.5
			Mexico	24.8	35.4
Near East			Argentina	15.3	32.6
Turkey	1.3	2.5	Brazil	44.5	56.3
Israel	0.3	1.9	Chile	2.9	6.2
			Colombia	7.9	12.6
Far East			Peru	1.4	2.3
			Uruguay	1.1	1.9
India	42.5	84.8	Venezuela	3.1	4.5
Taiwan	3.3	6.5			
Rep. of Korea	0.1	1.9	Total Developing Countries	167.5	262.0

Source: Textile Organon, June 1961 and June 1966

Jute textiles

24. In contrast to the situation prevailing in the apparel textile industry, the developing countries produce the bulk of the world's supply of jute textiles. Production has also tended to rise at a faster rate in the developing countries. Detailed statistics are not available except for India and Pakistan, but the output of textiles can be assessed from the developments in jute fibre consumption. Jute consumption in the developing countries rose by 24 per cent between 1960 and 1965 from 1,770,000 tons to 2,197,000 tons while in the industrialised countries jute consumption rose by 20 per cent and the share of the developing countries in the total rose from 75 to 78 per cent.

Table 7

Consumption of Jute in Textile Production

('000 m. tons)

	1960	1961	1962	1963	1964	Estimated 1965
World total[a/]	2,350	2,400	2,517	2,504	2,828	2,822
Developing countries	1,770	1,890	1,824	2,081	2,155	2,199
India	1,130	1,170	1,343	1,412	1,470	1,470
Pakistan	260	290	316	352	309	417
Others	380	430	165	317	376	312
Industrialized countries	580	510	693	723	673	623

a/ See footnote 1.

Source: FAO Commodity Review 1966

25. Table 7 brings out clearly the divergent trends between the developing and industrialized countries and reflects both the increased competitive strength of the developing countries and the substitution of jute sacking by other products in the industrialized countries.

26. A rising proportion of jute fibre production in the developing countries is now being processed locally. The proportion rose steadily from 56 per cent in 1960 to 76 per cent in 1965. Most of this growth can be attributed to India and Pakistan.

27. India and Pakistan dominate the industry. Indian output in 1965 was probably over two thirds of the world total. Output rose by 30 per cent over the 1960-1965 period but there has been little change in the last three years. By contrast, output in Pakistan rose by 60 per cent in the period despite a shortfall in 1964. Pakistan now accounts for some 19 per cent of world output compared with 15 per cent in 1959.

28. Small factory industries exist in other developing countries. In Thailand, output is thought to be in the region of 20,000 tons a year, a very low figure which represents only 5 to 6 per cent of the jute fibre production. Production on a significant scale also takes place in Brazil (30 to 40,000 tons), the United Arab Republic (30,000), the Republic of China, Burma, Nepal, Madagascar, Kenya,

Ethiopia, Congo and Ghana. The production of textiles in these countries tends to be rather sporadic however.

29. In India and Pakistan much of the output consists of sacking, which accounted for 44 per cent of Indian output in 1964/1965 and for 67 per cent of Pakistani output. But hessian production has been the most dynamic sector in both countries, and reflects the growing markets for hessian-backed tufted carpeting in both the United States and Western Europe. The rising output of miscellaneous jute textiles should also be noted.

Table 8

Jute Textile Production in India and Pakistan

('000 m. tons)

	Hessian		Sacking		Other	
	India	Pakistan	India	Pakistan	India	Pakistan
1960/61	372	68	533	173	118	12
1961/62	414	75	509	188	146	12
1962/63	515	86	532	207	171	10
1963/64	534	94	495	230	220	12
1964/65	527	82	574	196	219	15

Source: Commonwealth Economic Committee, Annual Review of Industrial Fibres.

30. The home consumption of jute textiles has also been rising rapidly in these two countries. The great bulk of these sales consist of sacking. There is also a sizable consumption from local production in the non-industrial sector, amounting to 3 per cent of mill output in India and to 17 per cent of mill output in Pakistan.

31. Both India and Pakistan are equipped with modern machinery. In India the spinning sector was fully modernized by 1965 and much of the loomage sector is up to date also. In Pakistan the industry is of fairly recent origin and the machinery installed is fairly up to date.

Table 9

Spindles and Looms Installed in India and Pakistan

('000 units)

	1960	1961	1962	1963	1964
India					
Spindles	1,200	1,100	1,300	1,400	1,400
Looms	61.0	57.0	61.5	68.0	69.5
Pakistan[a/]					
Spindles	122	126	136	156	169
Looms	8.1	8.4	9.1	10.4	11.4

a/ E. Pakistan only.

Source: I.J.M.A. and the Pakistan Directorate of Textiles.

32. Little information is available about capacity in the smaller producing countries. In Burma one mill has existed since 1957, with a capacity of 24 million bags a year. In the Republic of China bag capacity is estimated at 18 million units a year. Current capacity in Nepal is around 17,000 tons a year. In Ghana, the jute bag factory has a reported capacity of 4.5 million bags a year.

33. There appears to be considerable excess capacity in India, at least in the weaving sector. This may partly explain the very low unit-output levels when compared with Pakistan. Productivity has, however, been rising in India, while for Pakistan there appears to have been a decline. The rapid increase in the productivity of the hessian looms in India should be noted. Productivity in the sacking sector appears to have shown no clear trend however.

Hard fibre textiles

34. Between 1960 and 1965 consumption of hard fibres by the developing countries rose by over 15 per cent, from 275,000 tons to 317,000 tons. The expansion of hard-fibre consumption in the last two years has been due in part to the establishment of new textile industries in some countries, especially in Tanzania, Angola and the Argentine. The share of the developing countries in total world consumption rose from 32 to 37 per cent.

Table 10

Consumption of hard fibres in textile manufacture
('000 m. tons)

	1960	1961	1962	1963	1964	1965
Total World[a/]	855	868	887	908	876	859
Industrialized Countries	580	585	590	616	594	582
Developing Countries	275	283	297	292	312	327
Latin America	219	226	238	235	253	275
of which: Mexico	122	128	133	131	130	139
Brazil	43	43	44	49	64	65
Far East	40	41	42	39	41	41
of which: Philippines	16	19	20	20	20	20
Africa	16	16	17	18	18	26
of which: Kenya/Uganda	4	5	5	4	5	5
Morocco	3	2	4	3	3	3
Tanganyika	2	2	2	2	2	10

a/ See foot-note 1.

Source: E.I.U. estimates based on FAO Commodity Review 1966 and figures supplied by the U.S. Department of Agriculture.

35. There is still scope for a considerable expansion of textile manufacturing from hard fibres in the developing world. The proportion of fibre output which is manufactured locally is only around 30-32 per cent, a level which has remained fairly static for the last six years. Only 4-5 per cent of the African fibre output is manufactured in the region despite the recent installation of a large mill in Tanzania. In the Far East region the largest producer, the Philippines, consumes only some 16 per cent of its fibre output. For the region as a whole consumption forms 30 per cent of production by reason of the relatively large fibre imports into non-producing countries. Only 60-62 per cent of Latin American fibre output is manufactured in the region but Mexico now consumes some 84 per cent of its fibre output.

36. The major textile producing countries in the developing world depend to a large extent on export markets. In Mexico, the largest textile producer, some 55 per cent of the output is exported as cordage and a similar proportion prevails for the Philippines. The bulk of the exports of the developing countries are sent to the United States where they have tended to displace the output of American manufacturers. Exports have been falling in recent years however.

Table 11

Cordage exports from developing countries
('000 m. tons)

	1960	1961	1962	1963	1964	1965
Mexico	66	74	76	76	61	61
Philippines	7	10	10	11	12	10
Brazil	-	-	2	4	2	2
Cuba	7	8	6	6	5	5
Total above	80	92	94	97	80	78

Source: E.I.U. estimates based on **FAO Commodity Review 1966** and figures supplied by the U.S. Department of Agriculture.

37. While consumption of hard fibre textiles is contracting in the industrialized countries, with the advent of synthetic substitutes for hard fibres and with the introduction of processes dispensing with cordage, there is as yet no sign of a contraction of the market in the developing countries. The consumption pattern is markedly different from that in the industrialized countries as over two thirds of the total in developing countries is in woven goods, according to a FAO estimate.

Economic importance of the textile industry to the developing economies

Employment levels

38. The textile industries in the developing countries employ more labour than do those in the industrialized countries. In 1961, the last year for which information is available, some 6.7 million people were employed in textile manufacture in the developing countries as against 5.5 million in the industrialized countries. When it is remembered that the developing countries produce only half as much in tonnage terms as the industrialized countries, the low productivity of their labour force becomes apparent. This labour force, moreover, has been increasing at a faster rate in the developing countries and the increases in labour productivity have been much less. Thus, between 1958 and 1961, the labour force employed in textiles in the developing countries increased by 7 per cent as against only a 2 per cent increase in the industrialized countries. It can be reckoned that in this period the output per man employed in the developing countries increased by only 7 per cent while the increase in the industrialized countries was over 13 per cent.

39. In 1961 some 18 per cent of the labour force employed in manufacturing in the developing countries was employed in the textile industry while the ratio was only 8 per cent for the industrialized countries. In the Far East region the proportion was about 21 per cent, while in Africa it was probably considerably higher. In Latin America, with its broader industrial base, the proportion was comparatively low at 12 per cent.

40. The figures in annex IV refer to wage earners and do not therefore represent the level of employment in the cottage industry in the developing countries. Such employment plays a very important part in the textile industry in many developing countries. In India, for example, the largest non-industrialized producer, the cottage industry accounts for some 40 per cent of the total production of cotton cloth, and for most of the production of man-made fibre fabrics, and provides employment for over 6 million persons.5/

Value added

41. In 1961, the last year for which information can be obtained, the textile industry accounted for 2.3 per cent of the Gross Domestic Product of the developing countries, compared with 1.8 per cent for the industrialized countries. The differences become more marked when it is remembered that the manufacturing sector in the industrialized countries is more than twice as important to their economies than is the case with the developing countries. A more up-to-date measure can be obtained by expressing the value added in textile manufacture as a proportion of the total value added in manufacturing. In absolute terms the value added in textile manufacturing in the developing countries is only just over a quarter of the value added in this industry in the industrialized countries, but in relative terms it accounts for 12 per cent of the value added in manufacturing (1964) while in the industrialized countries the proportion is only 4 per cent.

Export earnings

42. For a limited number of developing countries exports of textiles form an important part of total exports.

5/ Asian Textile Bi-Annual 1965-1966.

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Table 12

Textile exports in 1964 (SITC 65)

(Apparel textile yarns and fabrics plus jute and hard fibre products)

	Total Exports	of which Textiles		of which to industrialized countries a/	
	$ millions	$ millions	Per cent	$ millions	Per cent
Hong Kong	874	159	18	71	8
India	1,657	552	33	302	18
Pakistan	417	86	21	36	9
Republic of China	332	39	12	7	2
Republic of Korea	87	5	6	4	2
United Arab Republic	522	67	13	19	4
Mexico	975	35	3	29	3
Colombia	447	8	2	1	-
Total above	5,311	951	18	468	9
Total all other developing countries	26,200 b/	-	-	135	0.5
Total all developing countries	31,500	-	-	603	2.3

a/ EFTA, EEC, North America.

b/ Including oil.

Source: OECD, United Nations Trade Statistics, and E.I.U. estimates.

43. For the countries listed, textiles contribute an average 18 per cent of export earnings split roughly equally between the industrialized world and other countries. For India, textiles contribute fully one third of her exports, and she alone contributes 50 per cent of the developing world's textile exports to the industrialized world. For the majority of the other developing countries their textile industry, being designed mainly for import substitution, is not a major export industry; indeed most of these countries are net importers of textiles. For these countries, textile exports to the industrialized world are a mere 0.5 per cent of total exports.

II. REGIONAL CO-OPERATION AND INTEGRATION

Outline of past progress

44. The progress of regional co-operation and integration among the developing countries has been much more rapid than could have been expected only a few years ago.

45. Latin America: The Latin American economies have made the most tangible progress in this respect with the setting up of the Central American Common Market and the Latin American Free Trade Association. The most recent development in the area has been the inauguration of the Caribbean Free Trade Agreement in December 1965 which is to become operational in 1966.

46. Africa: Economic integration has been comparatively slow in Africa. Such integration as has taken place has usually been on a sub-regional basis, among countries which have links with a metropolitan power and have historically had most of their intra-African trade with each other. The East African Common Market has come under attack recently and attempts are now being made to set up a wider East African Economic Community. The West African Customs Union was troubled by disagreements over the distribution of the duties levied on third countries and this led to the establishment of customs barriers between most member States. The Equatorial Customs Union has proved to be more effective with all domestic products and capital circulating freely within the area. The treaty was revised in January 1966 to allow for the complete harmonization of economic policies. The Maghreb Economic Union has resulted only in some bilateral trade agreements. It is hoped that M.E.U. will eventually develop into a common market.

47. The Near East: Various trade arrangements existed in the Near East in the 1950's and these have now culminated in the establishment of an Arab Common Market, which aims at the creation of a complete free-trade area by 1969 and the attainment of a full common market by 1972. Another institution in the area is the Organization for Regional Co-operation and Development (O.R.C.D.), which has just come into being. The arrangement aims at the harmonization of economic policies and the eventual creation of a common market. However, operationally O.R.C.D. is still at the discussion stage.

48. Far East: By contrast the progress of economic co-operation and integration has been slow in the developing countries of the Far East region. The only attempt at integration made in recent years was the still-born Association of South-East Asia which aimed at joint industrial projects and a free trade area.

49. None of the arrangements described above have been designed specifically to promote intra-regional trade in textiles, and indeed in many of them textile products are excluded from their provisions.

50. There are several major problems hindering the liberalization of trade in textile products between developing countries. In those countries where the textile industry is established it usually forms a substantial proportion of manufacturing activity and employment, and often it has been protected by trade barriers and other controls so that foreign competition in the products produced has been virtually excluded. The dismantling of these restrictions is in itself a formidable task and would require careful consideration of the effect on the economy in general. This is particularly true as regards the effects on employment, as in most developing countries the alternative employment opportunities are limited. Moreover, in many countries, especially in the smaller African and Near East countries, the installation of the equipment has been of fairly recent origin and there is naturally considerable reluctance on the part of the authorities to countenance any trade liberalization measure which would reduce the viability of the investment, made often at considerable sacrifice of scarce foreign exchange resources.

51. Another factor which is of major importance to some areas, especially in Latin America and parts of Asia, is the existence of a considerable degree of excess capacity. Admittedly, much of this excess is made up of machines whose operational efficiency is very low, but it tends none the less to have a depressing influence on the export prices of particular countries.

52. It has been noted above that nearly 90 per cent of the yarn output of the developing countries is made from cotton and 83 per cent of the cloth output. Yet net imports of cotton textiles account for 40 per cent of the total textile imports, and of this over 98 per cent is made up of cotton cloth. At first sight it might appear that there was considerable scope for the expansion of trade among the developing countries, but closer examination will reveal that the great bulk of

these cotton cloth imports originate from industrialized countries - especially from Japan. Moreover, the great bulk of the exports of yarn and cloth from the developing countries is sent to the industrialized countries. The reason for this trading pattern is two-fold. In the first place, the production in the developing countries is heavily concentrated in the coarser yarns and fabrics. For a large part of their product range, therefore, the developing countries tend to be in the position of producing the same products. It has been suggested by various economic theorists that the similarity of product lines is a good ground for advocating integration from the point of view of the over-all efficiency of the area. With similar product lines the more efficient firms would come to dominate the regional market and force the inefficient producers, either to increase their productivity or to concentrate production on alternative products. This theory, however, has only partial validity for the industrialized countries and has limited application in the developing countries, where there are severe rigidities in the production functions so that alternative production possibilities are few, and where the margin available to absorb the shock of unrestricted competition in the less developed countries of a region is very small.

53. Secondly, while a basic home market for the simpler textile products in the smaller developing countries can usually be relied on in view of the need for clothing and low per capita income available to buy it among the bulk of the population, the growth of textile demand has been concentrated on the more sophisticated textiles. It is these that compose the bulk of the imports of cotton cloth into the developing countries. Moreover, the few developing countries which have tried to produce the finer varieties of cotton cloth have generally suffered from uncompetitive export prices in relation to those offered by the industrialized countries, despite the fact that they tend to have lower prices for the coarser grades.

54. The preponderance of the industrialized countries in the export markets of the developing countries is explained partly by the fact that the textile industry in the former group is much more heavily concentrated in the finer yarns and weaves, and so finds it more profitable to supplement the home supply of the simpler products by imports, and partly by the existence of historical trading ties with a metropolitan power. This latter point is especially important for the former French and British colonial territories as those countries still offer significant tariff concessions.

55. For all these reasons the level of interregional trade is small. In Latin America total imports of textiles originating in the area amounted to only $US8.3 million or 11 per cent of the total imports in 1961. In developing Africa, the intra-area imports amounted to only $US18 million in 1961 or under 3 per cent of the total imports.6/ In the Far East area, only 12 per cent of Indian cotton textile exports and only 15 per cent of Hong Kong cotton textile exports were sent to other developing countries in the area in 1964, and the combined exports of both these countries, at $US33 million, formed only 23 per cent of the total cotton textile imports into the area. It is worth noting in passing that Indian world cotton textile exports in that year, at $US122 million, were 16 per cent higher than total cotton textile imports into the area from all the industrialized countries combined.7/

The scope for further co-operation

56. It should be remembered that a properly co-ordinated programme of trade liberalization involves much more than a mere reduction of trade barriers. It is necessary to accept some degree of co-ordination in investment plans so that the danger of excess production facilities can be reduced or eliminated. The co-ordination of the investment programme of the developing countries will vary widely in scope between the various regions but two broad types can be distinguished.

57. The first of these relates to countries which have an old-established textile industry which has grown up under the shelter of import protection. Typical of countries in this group would be some Latin American Free Trade Area (LAFTA) countries. The low degree of trade liberalization which has been achieved in textile products has been partly due to the high degree of textile machinery obsolescence and excess capacity prevailing in most countries. The LAFTA countries are now embarking on a massive investment programme for modernization and expansion, and it is important that their efforts should be co-ordinated in a regional framework. It should be possible to negotiate a textile industry agreement, whereby the member countries would assume collective responsibility for the

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6/ United Nations Conference on Trade and Development, Vol. VII.

7/ These trade figures are largely based on GATT estimates provided especially for this study.

investment required to remedy inequitable situations, resulting mainly from differing degrees of obsolescence. This would permit the introduction of a system, whereby tariff concessions are made contingent on the provision of technical assistance from the more fortunate countries, and, in some cases, financial assistance may also be given. Moreover, attempts should be made to establish, in principle, the degree of capital intensity to be adopted for the modernized machinery so that a more uniform range of technologies can be achieved.

58. The second type of investment co-ordination is usually much easier to achieve. It relates to countries whose individual markets are too small to allow the establishment of a viable textile industry on a national basis only, so that markets are at present supplied from imports from without the area. However, if a regional market were to be taken as the basis for investment decisions, it might be possible to make the area largely self-sufficient in textile production. Initially, the mills should be set up in those countries where the natural advantages are greatest, and agreements should be negotiated which restrict further expansion in these countries, when the market develops sufficiently, to the advantage of the non-producing countries in the group. Most of the expansion of the textile industries in East, Central and West Africa is planned to take place on this basis, and it might be possible to adopt similar policies with regard to the industries being set up in the Caribbean. An indication of the potentialities of this approach can be derived from the successful operation of the Central American Common Market. The total consumption of textiles in the area is very small at around 21,400 tons per annum, but it has been rising at nearly 8 per cent a year for the last fifteen years. The member countries supplied 63 per cent of their textile requirements in 1963 compared with only 40 per cent in 1950. In the next ten years it is planned to supply 94 per cent of the regional market from internal production. The common market has led to a considerable reduction in domestic prices, and has permitted the establishment of new mills, as well as the modernization of old ones. Favourable credit terms are available from the Central American Development Bank for the expansion and development of products which can be guaranteed a market in at least two member States.8/

8/ T.G.I.E.C., El Desarrollo Industrial en Centroamerica, ST/ECLA/Conf.23/L.37/Rev.1.

59. There are also two ways in which regional co-operation among developing countries could have a more indirect effect on their textile industries. The first of these relates to the production of textile machinery. Few developing countries possess a textile industry which is large enough to provide a market for a viable machinery industry producing the major items of textile equipment. However, the range of textile equipment is vast, and many accessories and spare parts are produced in large-scale plants which could be economically manufactured in small specialist units. It may be possible for a group of countries with small textile industries to provide an adequate market for spare parts production, possibly in two or three countries. As the shortage of spare parts is often one of the chief hindrances to the development of the textile industry in developing countries, agreement on such matters could be of considerable benefit. However, it is important to secure some standardization in the types of machines in use, so that the output of spare parts can be standardized. Again, it is important for such industries to keep abreast of the technological developments in the industrialized countries which may entail modifications to the types produced. It may be possible to negotiate agreements for local spare parts production with the major machinery suppliers in the industrialized countries, which would lower the risk of producting out-of-date accessories.

60. It has been suggested that the minimum level of employment which would be necessary in the textile industry before a specialist technical training school could be set up economically would be around 10,000 persons, while to justify the creation of a special textile department at a university or similar institution, an employment of around 50,000 persons would be necessary. This is a field where regional co-operation among small producing countries could be successful. The cost in foreign exchange of sending students to institutions in the industrialized countries would be considerably higher, both in terms of fees and living expenses, than the cost of sending them to similar institutions within a region or sub-region. While textile institutions in the industrialized countries probably have a better grasp of the latest technological developments, regional institutes in the developing countries are likely to be more aware of the difficulties which the textile industry encounters in the latter.

61. There is still considerable scope for the adjustment of the trade relationships in textile products between the developing and the industrialized countries. The Long-Term Agreement on Cotton Textiles which was negotiated by some GATT countries has so far proved to be of very limited success. This is all the more regrettable as the textile industries in many developing countries were designed partly for export markets.

III. PLANS AND PROSPECTS IN THE 1964-1975 PERIOD

Apparel textiles

62. On the basis of current plans and projections, the output of apparel textiles in the developing countries is expected to double in the next ten years or so, reaching 7.11 million tons in 1975. This would imply an annual growth rate of about 6.5 per cent, compared with a rate of 5.3 per cent in the 1960-1964 period.

63. The sharpest expansion will take place in the African region as the developing countries are making considerable efforts to reduce their dependence on imports. Total output in 1975 has been calculated at around 345,000 tons, or three and a quarter times the 1964 level. According to ECA, output in the North African sub-region, which includes the United Arab Republic is expected to double, while the level of output in East, Central and West African sub-regions may well be quintupled.[2/] This will involve an increase in the annual growth rate from 10 per cent to just over 11 per cent.

64. By contrast, the growth of textile production in the Latin American region is expected to be rather modest. The ECLA forecast,[10/] as amended by the Economist Intelligence Unit, Limited (London) (E.I.U.), implies an increase in the annual growth rate from just under 3 per cent to nearly 5 per cent. Between 1964 and 1975 output should rise by 65 per cent, to 1.55 million tons.

65. Production in the Far East should nearly double in the 1964-1975 period. Output is expected to be 96 per cent higher, at 4.05 million tons. The average annual growth rate over the period will remain much the same as in the 1960-1964 period, at around 6.5 per cent, although there will probably be a sharp rise to

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2/ The Textile Industries in Africa, E/CN.14/AS/III/24.

10/ ECLA Problems and Prospects of the Textile Industry in Latin America, E/CN.12/L.6.

8 per cent in the years to 1970 in view of the rapid additions to productive capacity that are being planned in both the smaller producing countries and in India and Pakistan. The expansion of capacity will slow down after 1970, however, and the growth rate in the 1970-1975 period has been fixed at 5 per cent.

66. It has proved very difficult to make forecasts for the Near East region as none of the major producing countries in the area have published detailed plans for the years beyond 1967. Over the 1960-1964 period, output expanded by 31 per cent or by nearly 7 per cent a year. In view of the large fibre resources of the area, its rapidly rising population, and the large quantity of cloth at present imported, it would be reasonable to suppose that the growth rate could be raised to 8 per cent in the period to 1975. Output would therefore rise by some 115 per cent to 665,000 tons.

Table 13

Forecasts of apparel textile production
('000 m. tons)

	1964	1975	Per cent of change
Latin America	941	1,550	+ 65
Africa	260	845	+225
Far East	2,063	4,050	+ 96
Near East	309	665	+115
Total	3,573	7,110	+ 99

67. There will certainly be a sharp rise in the production of textiles made from man-made fibres in the next few years in developing countries. In 1964, man-made fibre textile production (including the man-made fibre yarns used by the cotton industry) accounted for 435,000 tons or 12 per cent of the total textile output. Considerable expansions in the man-made fibre producing capacities of the developing countries are planned for the next ten years however. In the Far East an extra 155,000 tons will be available on present plans from domestic resources by 1970, and this could well rise to 250,000 tons by 1975. All of this will probably be used in the region, so that the output of man-made fibre textiles (including mixtures) could reach 425,000 tons by 1975, that is, over 10 per cent of the projected output. In Africa, there are plans for producing an extra 70,000 tons or so by 1975, and if this is added to the present output, over 105,000 tons of man-made fibre textiles

could be produced by 1975, forming 12 per cent of the projected output. Some rise in the production of man-made fibre textiles can also be predicted for Latin America. The growth in man-made fibre consumption will be much slower because of the high prices (although these will be lowered somewhat over the period) and the expansion of capacity will not be very rapid in view of the large degree of excess capacity already existing. The total production of man-made fibre textiles (including the yarns used in cotton textile manufacture) is now around 18 per cent of the total (1964), and this could well rise to between 22 and 25 per cent of the projected output by 1975, that is, 340-390,000 tons, or more than double the present level.

Non-apparel textiles

68. Forecasting the production of jute and hard-fibre products in the developing countries is rather more difficult in view of the dependence of these industries on export markets. It seems likely, however, that the growth rate over the 1960-1975 period will be lower because of the competition from synthetics and other products in the main export markets.

69. The Indian planners expect jute textile output to rise to 1.7 million tons by 1970/1971, that is, by 31 per cent above the 1964/1965 level of 1.3 million tons. In Pakistan, output is expected to rise to 640,000 tons by 1969/1970, or by 118 per cent above the 1964/1965 levels of 293,000 tons. The combined output of the two countries should, therefore, be in the region of 2.3 million tons by 1970, 44 per cent above the 1964/1965 level. This would seem to be rather optimistic in view of the poor performance of the last five years and the increasing use of synthetics, paper, and bulk handling in the industrialized countries. The E.I.U. estimate is therefore somewhat lower at 2.17 million tons or 35 per cent above the 1964/1965 level. Other than India and Pakistan, the only countries which seem to be expanding their jute textile capacity significantly, are the East and West African countries, whose combined extra output is unlikely to be greater than 70,000 tons by 1970. The total output of jute textiles by all the developing countries will probably be no higher than 25 per cent in view of the competition from other materials and packaging methods. This would imply a total output of around 3.25 million tons in 1975.[11/]

11/ In terms of fibre consumption.

70. There is no indication of a marked expansion in cordage capacity on the part of the major producing countries in the developing world. However, both the Mexican and Brazilian industries are being modernized, and this should increase output somewhat by 1975. Among the smaller producing countries, those in Africa, especially in East Africa, may be producing over 60,000 tons in that year. None the less, the growth of the industry over the last five years or so has been disappointing. Between 1960 and 1965, output in the developing countries grew at under 3 per cent a year, and it is unlikely that a much higher average growth rate can be maintained in the period to 1975 with the increasing consumption of synthetic materials in the industrialized countries. The E.I.U. has assumed a growth rate of 4 per cent in the period to 1970 to take account of the extra African output, falling to 2 per cent in the five years thereafter. This would imply an output[12/] in 1970 of 387,000 tons, rising to 426,000 tons in 1975, that is, 37 per cent above the 1964 level.

71. On the basis of the above projections, the total textile output of the developing countries can be expected to rise by 79 per cent over the 1964 level to reach 10.8 million tons by 1975.

Table 14

Forecast textile output in developing countries
('000 m. tons)

	1964	1975	Per cent of change	Annual growth rates (%) 1960-1964	1964-1975
Apparel textiles	3,573	7,110	+99	5.8	6.5
Jute textiles	2,155	3,250	+51	5.2	3.8
Hard fibre textiles	312	426	+37	3.3	3.0
Total textiles	6,040	10,786	+79	5.4	5.5

12/ In terms of litre consumption.

IV. TECHNICAL AND ECONOMIC FACTORS OF RELEVANCE TO DEVELOPING COUNTRIES

Recent technological developments

72. After a long period of relative stagnation, the productivity of the machinery in use in the textile industry has increased dramatically in the last fifteen years, and especially in the last five years. The result has been that the industry has changed from being a relatively labour-intensive to a highly capital-intensive one. Moreover, it is an industry which now requires a high rate of reinvestment, with the service life of the machines being installed reduced considerably, as new technological advances render them increasingly obsolete. The improvement in machine productivity is shown in the graphs in annex IX. In this study it will not be possible to give more than a very brief description of the main directions in which technological development has taken place.

73. Some examples of the improvement in machine speeds are especially worthy of note. In carding, for example, the throughput was stabilized at around 3-5 kilograms per hour for many years before 1950. With the rapid advances in design occurring in the mid-1950's and 1960's, it is now possible to obtain a throughput of around 25-30 kilograms per hour from machinery being marketed. Drawing frames have also undergone a sharp transformation since the early 1950's, with delivery speeds rising from 30 metres per minute to 400 metres and over. The speed of operation of the ring spinning frame has increased from 7,500 revolutions per minute in 1950 to over 15,000 in 1965.[13/]

74. Automatic winding machines are now available which are producing larger knot-free packages at considerably higher speeds. The larger package contributes substantially to a reduction in weaving costs. There have also been reductions in the labour costs involved in materials handling. In some systems the carding machines are fed automatically, and the carded slivers are also transported automatically to the drawing frames and even to the spinning frames.

75. Developments have also taken place in the opening and cleaning process. The bale picker has been replaced by high-speed rollers affixed to the carding machines, which pulverize the impurities into dust, which is then removed by a suction device, and at the same time contributes to the arrangement of the fibres.

13/ Recent Technological Achievements and Their Possible Application to Developing Countries, paper presented by T. Jedrica to the U.N.C.I.D. Textile Industry Workshop, Lodz, 1965.

Weaving

76. The major development in the weaving process in recent years has been the introduction of the "shuttleless" loom by Sulzer, a Swiss company, which came into commercial operation around 1950. The weft carrier weight was reduced from 500 to 40 grams. Other shuttleless designs quickly followed, where the weft propulsion was achieved by water jet, or on the rapier principle. These devices have permitted a very sharp rise in weaving speeds (from 250 to 500 metres of weft per minute) at the cost of a slight drop in machine versatility (this is especially the case for jet looms) compared with the latest types of shuttle looms. However, they offer considerable savings in maintenance and labour.

77. Progress in automated winding has been relatively slow until recently. A "Unifil" device is now available, which, when fixed to the loom, permits the winding of different coloured weft yarns directly on to the loom itself. This device is rather expensive, but it enables the use of larger packages, thus reducing handling costs. The efficiency of the warping and sizing machines has also been improved. The introduction of such ancillary devices as warp knotters and threaders, and automatic drop wire setters, has permitted warping speeds approaching 1,000 metres per minute to be achieved. New sizing compounds, using synthetic waxes rather than the usual glues, have permitted the reduction of the drying chamber on the sizing machine, or its complete elimination.

Man-made fibre spinning

78. Over the last fifteen years or so, the conversion technique has been widely adopted, especially for the processing of synthetic fibres. This system removes the necessity of carding and comping. The tow is cut or broken into the desired staples, and drafted into a top as a continuous process in one machine. The tow does not lose its form, although the filaments are broken down into short lengths, but is only attenuated in the drafting process. The other main development in man-made fibre spinning has been the texturizing of yarns. The advantage of texturizing is that it eliminates completely the conventional spinning processes as the twist is imparted by heat. The range of application of texturized products is also much wider owing to their superior aesthetic and weaving properties.

Worsted spinning

79. The production rate of the carding machine has been increased and better burr removing devices have been introduced. Cards are also being built wider, and the speed of the gills has been increased sharply. Most ring spinning frames now have a device to reduce the spinning tension. Very high drafts are also available, and it is possible to process both oiled and dry materials, twisted or untwisted. The number of steps in top production has been reduced, and the evenness of the top produced has been improved.

Woollen spinning

80. New processing techniques are available with higher speeds and drafts requiring a better quality wool. Much improvement has now taken place in testing methods so that it is possible to predict the yield in scouring and carding with a high degree of accuracy.[14/]

Jute spinning

81. The shortage of water in some countries has led to research into the possibility of extracting the fibre by mechanical decortication without retting. While certain decorticators have been developed for this purpose, they are not an ideal solution because fibre losses are high. However, a two-stage process has been developed whereby the stems are first treated in a "ribboner", a kind of crush decorticator, which delivers the bast in the form of ribbons or fibre bundles. These are then retted by canal retting, sprinkler retting or the application of warm water.

Cordage manufacture

82. Hard fibres are now being decorticated by automatic machines in place of the hand-fed raspidors. However, automatic decorticators are usually expensive

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14/ For a comprehensive description of the recent technological development in apparel textile production see "Textile Industries in Developing Countries", a paper prepared by V. Saxl for the UN/CID Textile Industry Workshop in Lodz, Poland, 1965.

and may require mechanical transport for the leaves. Considerable attention is now being devoted to the construction of smaller transportable automatic decorticators, but so far the results have been disappointing.

83. Advances have, however, been made in the manufacture of small-scale twine-making machines, mainly in Japan. These process two or three-ply twine on the basis of treadle operation or a small horsepower motor.

84. In many developing countries, especially in the newer producing countries, neither of these methods may be applicable. In most African countries for example, there is no tradition of organized handloom weaving. Some countries may also have too small a market to allow decentralized production, or even the establishment of more than one mill. For such countries the most economical choice may be for integrated spinning and weaving mills. In the newer producing countries the textile industry will be providing extra employment, albeit on a small scale, and by saving foreign exchange, it would also provide funds for the establishment of other labour intensive industries.

Factor inputs for the apparel textile industry

85. The main studies which have been undertaken into factor intensities have related to integrated cotton spinning and weaving in Latin America. In a recent publication, ECLA studied the production costs of mills producing under optimum balance conditions with technological levels corresponding to: A-1950, B-1960 and C-1965. It was assumed that the mills were producing the same product, and that the technological age of the machinery was uniform throughout. The principal input and output data summarized in Table 20 below.

86. It can be seen from Annex VI that the share of labour in production cost falls from 18 per cent at Level A to 12 and 9 per cent respectively at Levels B and C. The cotton inputs rise from 47 per cent to 51 and 53 per cent, while the fixed capital costs, maintenance, depreciation and interest rise from 23 to 30 per cent.

87. When there are changes in the production techniques, the ideal mill size for obtaining the greatest yield from the factors of production will differ for each technological level. In the ECLA study, mill capacity increases from 100 at Level A to 117 at B and 128 at C. Similarly, the amount of capital invested

expanded from 100 to 127 and 146, while the number of workers falls from 110 to 67 and 47. As the three mill sizes are perfectly balanced there is no scope for the reduction of costs due to the increased level of output.

88. The unit cost of production at Level C is smaller than at A or B because unit capital costs have risen less fast than unit labour costs have fallen. The savings, however, are quite small. Units costs at Level C are 10.6 per cent lower than at Level A, but only 3.1 per cent lower than at Level B. There is therefore little cost saving involved in choosing the most advanced over the intermediate level, whereas the difference between the least advanced and the intermediate level is relatively large.

Factor inputs and technological choice

The concept of technological choice

89. The basic problem of the developing countries is how to maximize employment in the textile industry, subject to the constraints that the products be price competitive, and that the investment required does not put too great a strain on scarce capital resources.

90. In recent years the shortage of manpower in the industrialized countries has become serious, and as these countries account for some two thirds of world textile production, the pressure on the machinery manufacturers has been directed towards reducing labour cost. As a general rule, new technological advances have resulted in an increase in total capital cost per unit of output which has been more than offset by the decline in unit labour costs due to the employment of fewer workers. When it is remembered that the great bulk of mill workers are still unskilled it can be seen that labour as a factor in production has become less efficient in relation to capital. This means that the straightforward substitution of capital by labour for capital should be restricted to marginal applications only, where their relative costs are much the same. A balance must be struck, which would allow the developing countries to take advantage of the major increases in machine performance which have taken place in recent years, while employing more labour, at a lower wage, in some sections of the mill, where production would be automated in countries with higher cost labour.

91. One extreme method of securing a high degree of employment in the textile industry is the division of the spinning and weaving processes into separate industries. The scope for labour-intensive methods of yarn manufacture is very limited, but in some cases it may be possible to decentralize the weaving side.

92. Another solution along slightly different lines would be the establishment of very large, modern, efficient spinning mills each producing yarn on contract for several small weaving mills. The distribution costs would be reduced because of the larger packages and fewer customers involved, especially if the small mills were all in the same area. Alternatively, it may be possible to have several small spinning mills supplying specialist yarns to a single weaving mill, which might also incorporate a finishing plant. The extra cost of the capital investment in the small mills may well be substantial, and this would not give employment to many extra workers. If however, each mill in the group specialized in a small range of standard yarns or fabrics, the rise in unit costs need not be very high.

Factor inputs for the jute bagging

93. Jute bag production can be carried out economically on a fairly small scale. In 1964, the factor inputs required to produce 200,000 bags a year on a one shift basis under African conditions were estimated as follows:[15/]

15/ ECA Report of the West African Industrial Co-ordinating Mission, E/CN.14/246.

Table 15

Factors inputs for jute bagging

	US dollars
Capital	
Land and buildings	35,500
Equipment and facilities	82,750
Working capital	38,300
	156,550
Materials and supplies	
Jute (369 tons)	115,740
Plant supplies	7,600
	123,340
Power, fuel and water	
Power connected load, 34 h.p.	4,000
Fuel	775
Water	300
	5,075
Labour	
1 skilled worker	5,000
3 semi-skilled workers	9,000
18 unskilled workers	36,000
1 manager	7,000
2 clerical staff	4,000
	61,000
Approximate annual cost	
Materials	115,740
Labour	50,000
Manufacturing overhead	23,680
Administration	10,560
Sales cost	13,000
Depreciation	10,020
Total	223,000
Approximate annual revenue	285,600

94. The mission emphasized that even smaller plants would still be economic. It might be interesting however, to examine the implications of installing larger plants. A recent exercise by FAO, also in the African context, deals with a hypothetical case of a country wishing to produce 6 million bags a year.[16/] The

16/ ECA/FAO. Industries Processing Agricultural Products other than Food, E/CN.14/AS/III/19, paper presented to the Symposium on Industrial Development in Africa, Cairo, 1966.

capital investment required would be $US1.26 million for machinery, furnishings, spare parts, electric motors (excluding the power house) and $US630,000 for buildings. All of this expenditure, except about half the cost of the buildings, would be in foreign exchange. The plant could come on stream within 2 1/2 years of placing the orders. About 50 to 60 per cent of the cost of the finished bag would be raw material cost, including the batching oil. The raw material required is 7,000 tons of fibre for 6,000 tons of bags, so that the bags would weigh about twice those produced in the first example.

Factor inputs for the cordage industry

95. Conditions in developing countries which grow the raw material lend themselves well to the manufacture of cordage and other products from hard fibres. The industry need be neither power nor capital-intensive, technology can be simple, and the economies of scale are not large. The raw material accounts for about 60 per cent of the total costs, and since spinning mills can be located near the plantations, transport costs can be small. The gross value added in manufacture varies between the half and two thirds of the value of the raw fibre.

96. The Mexican industry may serve as an example. The mills employ about 100 workers each and produce an averge of 1,500 tons of henequen manufactures a year Average capital investment amounts to $US200,000 per mill or some $US2,000 per worker. The value of output averages $US375,000 per mill, and thus about $US3,750 per worker.

Table 16

Composition of Gross Value of Output and Import Content in Hard Fibre Manufacturing, Mexico 1955

	Total	(Per cent) Import content
Raw fibre	60	0.5
Fuel and power	2	1.0
Other net inputs	6	2.0
Total inputs	68	3.5
Labour	11	-
Profit	10	-
Net value added	21	-
Depreciation	11	5.5
Gross value added	32	-
Gross value of output	100	9.0

Source: Censo Industrial 1956, Resumen General, Direccion General de Estatistica, Mexico, 1959.

Automatic devices and automation

97. Automatic devices may be designed to achieve either the reduction of labour or the improvement of the product or both. In some instances, the fact that the need for an operator to carry out an operation at a particular time is removed is more significant than a mere reduction of labour. As an example of devices in this group, automatic lap-doffing on the scutcher or package-changing on draw frames may be mentioned. Automatic cleaning devices may both reduce labour and improve quality, and are therefore worthy of careful examination. Automatic levelling devices do not increase productivity, but they improve quality and may also reduce the work required in laboratory checking. There is a definite trend towards central monitoring of qualities and quantities using electronic devices.

98. Automatic slub-catchers on winding machines improve quality and increase efficiency on the looms. Most of the automatic machinery and devices may find application in developing countries and should be carefully considered. Consideration should take into account the existing financial, labour and commercial factors, together with the technical aspects. Whenever quality is definitely being improved through automatic devices their introduction is fully justified.

99. Automation implies the manufacture of a product or part of a product with the minimum of human intervention. The output of an automated system should be automatically controlled and faults should be automatically corrected. Revolutionary approaches to techniques for producing yarn, fabric and other final products have been and are being examined. It should be noted, however, that in the field of cotton processing, all proposed or existing solutions to automation employ traditional techniques without improving the quality of the yarn compared with that obtained with modern conventional machines. Therefore, a large part of the problem is reduced to material handling. The unnecessary advantage of reduced labour can be completely offset by the excessively high cost of introducing the system, the high degree of maintenance required for the electronic controls and the susceptibility of the system to machine interference.

100. While full automation in the spinning process may not be recommended for the developing countries at this stage, automation in a continuous-flow, tension-controlled finishing plant may be advocated for bulk production.

Second-hand machinery

101. With the increased rate of obsolescence prevailing in the industrialized countries because of the rapid development of production techniques, it can be expected that the availability of second-hand machinery will increase in the immediate future. In many cases machinery is being scrapped when only five years old while it is still in good working condition, because mills wish to take advantage of more efficient processes.

102. In these circumstances it is proper to ask if the developing countries could make use of the machinery being scrapped in the industrialized countries while still in good working order. This is especially important, as in some of the smaller developing countries the benefits of modern, large-scale output machinery might be limited, with much of the capacity remaining idle for lack of markets. On the face of it, the use of second-hand machinery would save a considerable amount of foreign exchange and might be perfectly adequate under certain circumstances, provided that the textile industry operated in a protected market. This might well be the case if a small developing country were to set up a textile industry for the first time. One possibility which ought to be considered is the attachment of modern devices to second-hand machinery. This might improve performance sufficiently with a lower capital outlay than on a new machine.

103. There are certain serious difficulties, however, associated with the use of second-hand machines. In the first place, the performance of the machine might deviate considerably from the norm after some years in use. A careful evaluation must be made before purchase as there is usually no guarantee of performance. This evaluation may have to be carried out by independent experts if the purchaser does not have the necessary knowledge. Moreover, the evaluation will most likely have to take place in the plant of the seller, in contrast to the situation for new machines, where samples are sometimes lent for evaluation under the conditions of the purchaser's own factory. Again, the installation costs will generally tend to be higher, as the platforms may have to be altered, and as the machine has to be fitted in with other machines in the mill. Further, there is generally no after-sales service, and spare parts may be difficult to obtain as the machinery manufacturer may have stopped production of the particular model.

Economies of scale

General remarks

104. In many developing countries, owing to the lack of a large home market, the production of textiles has taken place on the basis of small units. In many countries, also, there is considerable under-employment, and planners may prefer to establish several small units in the hope that they will, in aggregate, employ more labour at a given technology than would be employed in a large plant producing the same output. Again, although the total cost of establishing several small plants may turn out to be considerably higher than that for a large complex, sufficient funds may be available at any one time only for the erection of small plants, especially if they are to be set up under private enterprise, and built one by one.

105. For all these reasons it is of great importance for the developing countries to establish what economies can be achieved in the larger mills. 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 need not necessarily imply the acceptance of serious cost disadvantages. The proof of this hypothesis, however, is subject to serious conceptual difficulties.

The ECLA study of cotton spinning and weaving

106. The Economic Commission for Latin America has recently made an attempt to study the economies of scale which could be obtained in integrated cotton spinning and weaving plants of various sizes.[17/] The plants were assumed to be operating at the same level of technology throughout, which was described as up to date (1964) but not characterized by the very latest technological innovations.

106. It was assumed that each of the mills studied produced only one type of cloth at a time. Three cloth types were chosen. Product A was a coarse carded fabric with an English yarn count of 8, weighing 175 grams per square metre. Product B was a medium carded fabric with a yarn count of 18, weighing 144 grams per square metre. Product C was a fine combed fabric with a yarn count of 40, weighing 130 grams per square metre.

17/ Economies of Scale in the Cotton Spinning and Weaving Industry, ST/ECLA/CONF.23/L.9.

107. The general conclusion from this theoretical study was that, while economies of scale are quite marked in the smaller size mills, from 2,000 to 10,000 spindles, the extra cost advantage is progressively reduced up to a mill capacity of 20,000 spindles, after which no further economies will accrue from a larger size. This is because variable costs form a high proportion of total production costs - as high as 80 per cent in some of the mills studied. The reduction in fixed costs, which are more affected by economies of scale, would therefore have to be very substantial to make a significant difference to total unit costs.

108. ECLA claims that an integrated mill with 18,500 spindles is the optimum for all three products as regards savings on investment, while the optimum size for savings on unit costs would be 10,000 spindles for Product A, and 18,500 spindles for Products B and C.

109. In addition to the fact that economies accrue because of the scale of production, the ECLA study revealed that the economies obtained would vary significantly according to the type of cloth produced. By and large, the finer the yarn and the closer the weave, the greater were the advantages that could be obtained from a larger scale of output. Annex VII shows how the main production coefficients varied with the scale of operations and the type of cloth produced.

110. Given the assumptions necessary to the study, it is possible to calculate the extra employment that would be created by setting up several small mills to produce the same output that could be obtained with a larger mill, and to compare this with the extra investment and higher production costs which such a step would entail in Latin America. This information is given in table 24. For arithmetical convenience the mill sizes selected are of 2,000, 10,000 and 60,000 spindles.

Table 17

Differential investment, employment and production costs between large and small mills

	Extra investment ($US'000)	Extra employment (Total units)	Extra production costs ($US'000)
Product A			
(5 x 2,000) - (1 x 10,000) spindles	1,295	300	770
(6 x 10,000)- (1 x 60,000) spindles	1,896	279	785
Product B			
(5 x 2,000) - (1 x 10,000) spindles	1,463	273	783
(6 x 10,000)- (1 x 60,000) spindles	1,537	321	744
Product C			
(5 x 2,000) - (1 x 10,000) spindles	1,628	286	836
(6 x 10,000)- (1 x 60,000) spindles	1,354	354	839

Source: Calculated from ECLA op. cit.

111. The general conclusion is that for every extra worker employed, the extra investment would amount to around $US5,000 and the increase in annual production costs to around $US2,500. It is worth noting, moreover, that less than half of the extra costs could be directly attributed to the increased wage bill.

112. If this theoretical model under Latin American conditions is considered relevant to the developing countries as a whole, there can be little doubt that the extra investment and costs necessary to run several small mills, as opposed to one large mill of equivalent capacity, would be prohibitive in relation to the small amount of employment created at the level of technology assumed. It should be remembered, however, that the ECLA model was concerned with integrated mills. The scale of output and capital intensity required nowadays for the economic operation of a non-integrated spinning mill may well be much higher than is the case for the weaving capacity necessary to absorb its output. It may therefore be possible to combine a highly capital-intensive spinning mill operating on a fairly large scale, with several small-scale labour-intensive weaving units.

Forward and backward linkages

General remarks

113. The textile industry is still one of the most common of the new industries which are being established in the developing countries. It fulfils a basic need, and a high proportion of its labour requirements is still unskilled. For fibre producing countries, it offers the prospect of increasing the value added, while reducing the import bill by a much greater amount of foreign exchange than could be earned by the export of the fibre consumed in textile production, even though the machinery may still have to be imported. Moreover, it is probable that the textile industry may provide a stimulus to the process of industrialization generally. This, however, depends on the linkages with other sectors of the economy. If these linkages are well developed, then the textile industry can certainly contribute substantially to over-all development, assuming that there is an adequate market for the goods produced. On the other hand, if the linkages are poorly developed, the textile industry will stagnate, and its impact on the economy will be small.

114. An indication of the importance of the linkages of the textile industry with other industries can be derived from a recent ECAFE study of some countries in the Far East. The relevant data are summarized in annex VIII - A and B. In each of the three countries studied, the multiplier effect of a unit of final textile demand is quite substantial. Indeed the multiplier effect was found to be greater than that for any other industry except agricultural processing. The textile industry (inclusive of made-up goods) is, of course, its own best customer, but a substantial proportion of the extra demand generated went to other sectors.

115. While the input demands of the textile industry for the products of the rest of the economy are large, textile products from only a small proportion of the inputs of textiles into the manufacturing sector are composed mainly of sacking, especially for fertilizer.

Linkages with agriculture

116. In many developing countries, the textile industry has been established to provide a market for the local fibre producing industry. However, the varieties of the fibres produced, especially of cotton and wool, may not be suitable for the range of products which the textile industry desires to produce. In many cases also, the local fibre is expensive to use, because of deficiencies in processing, packaging and handling, or because of government price-support schemes. If the textile industry is forced to meet its fibre requirements entirely from local supplies, its output may be restricted to high-cost, low-quality fabrics, which may not only be unsuitable for the home market, but also for export. It may then be necessary to impose trade restrictions to protect local production from foreign competition, while granting export subsidies to enable it to compete in international markets. The Government may therefore find itself in the unenviable position of subsidizing both the fibre producers and the textile producers. Such a policy can hardly be commended on a long-term basis. The alternative is to encourage the farmers to grow the varieties of fibre which are desired by the mills, provided that their demand is large enough, while permitting some of the higher-quality fibre required to be imported, for blending with the local product where feasible, in order to raise the quality of the end product.

117. The commercial viability of the textile industry in a fibre-producing country will therefore depend on its integration with agriculture. Aware of this, many Governments have imposed a special tax on the textile industry which is used to pay for research and development in fibre growing, and for the promotion of better methods of marketing the fibre.

118. The various agricultural industries have indirect linkages with the textile industry. For example, the output of cottonseed and cottonseed oil depends on the quantity of cotton which is ginned. Again, some man-made fibres such as rayon are based on cellulose, and this can be derived from cotton linters as well as from wood pulp. It can be reckoned, on the average, that out of every 15 tons of short staple seed cotton produced, only 5 tons will emerge as fibre after ginning; one ton of linters will be produced with a cellulose content of up to 95 per cent, and 9 tons of cotton seed will be obtained, 16 per cent of which can be converted into oil and 45 per cent into oil-cake. Another useful by-product is flume tow from cordage manufacture which can be used to stuff furniture and mattresses.

119. The agricultural sector may also be an important market for textile products. Many of the agricultural products which enter into international trade such as coffee, cocoa, oilseeds, rice, and even cotton and wool are packed in textile materials. These are made mainly from jute and hard fibres, but cotton is also widely used. The bagging market can account for a considerable proportion of the total textile output in countries which are large producers of agricultural products such as Brazil, Ghana and Nigeria, and indeed in some countries, such as Guatemala, it accounts for practically the whole output.

Linkages with industry

120. The textile industry is obviously linked directly with the clothing and furnishing industries as well as with the cordage and bagging industries. In the case of man-made fibres it is also linked to the chemical industry - petrochemicals for synthetic fibres.

121. There are few textile machinery manufacturers in the developing world, and none of them are adequate to meet the needs of the local textile industry. In India,[18]

18/ Indian Cotton Mills Federation, Annual Report 1965.

for example, loom production is running at only 30 per cent of capacity and ring frame production at around 40 per cent. Nor are the industries in Argentina, Brazil and Mexico likely to be adequate to the re-equipment needs of these countries.19/

122. The machinery produced tends to be of an obsolete variety, and delivery dates are very long. Moreover, little attention is paid to after-sales service, and availability of spare parts tends to be restricted. If imports of up-to-date machinery and spare parts are not permitted, the textile industry may soon turn into a high-cost, low-productivity industry. On the other hand, if imports are freely permitted, the local machinery industry may not be able to survive, and in any case there will be a drain on the foreign exchange reserves.

123. Many developing countries have expressed a desire to develop their own textile machinery industry but, owing to the danger of overcapacity and uneconomic production, the smaller textile producing countries may have to rely on imported machinery for some considerable period. However, it may be possible in some countries to establish some local units for manufacturing spare parts, and some of the simpler equipment under licence from foreign machinery manufacturers. This could contribute significantly to the reduction of the import bill.

Organizational factors affecting textile production

124. These factors can be analysed under two main heads - at the State level and at the mill level.

Organization at the State level

125. Protection versus free trade: It is generally accepted that the textile industry in developing countries may need a high degree of import protection to enable it to become established. It is assumed, however, that there is a good possibility of the industry becoming viable eventually. Outright protection should therefore be granted only for a limited period - say three or four years - after which a fixed reduction in the tariff level should take place automatically every year or two, until a level is reached which allows for a desired degree of import competition. Naturally, the extent to which imports can be permitted depends on the over-all balance of payments position of the country concerned, as well as on the competitive strength of the domestic textile producers.

19/ The Textile Industry in Latin America, ECLA.

126. Private enterprise versus nationalized industry: [illegible] take part in textile production and to what extent it should [illegible] many factors, most of which are political or social rather than economic. Nevertheless, the economic implications of the decision should be noted. [illegible] ownership of the textile industry can be justified on economic grounds in the following cases: (a) where the industry does not as yet exist due to lack of initiative on the part of the private sector, (b) where it cannot profitably produce certain desired products, such as yarns for the handloom sector or clothing for the armed forces; and (c) where it is largely controlled by foreign companies, the repatriation of whose profits constitutes a drain on the foreign exchange reserves. These three cases are indicative rather than exhaustive, but they do represent the most common situations prevailing in developing countries. Effective control can also be exercised over the industry without the necessity of ownership (provided that the civil service is reasonably efficient) by means of import and export regulations, production licences, raw material rationing, guaranteed markets, fiscal and monetary controls, etc.

Organization at the mill level

127. Mill balance: The process of textile manufacture involves the use of several machines, and efficient production is achieved when the desired throughput at each stage can be maintained continuously or with the minimum of under-utilized capacity. Each machine will have a certain capacity which must be fitted in with the production of the associated machines. It is especially important to ensure the minimum idle capacity for the larger machines. Mill imbalance occurs both within and between departments. With a department, the lack of adequate maintenance may mean that certain machines may have to operate either longer hours, or under forced conditions, such as excessive speeds, too heavy slivers, etc. Balance between departments should be organized from the weaving end. The looms should operate fully, and should therefore be supplied with a sufficient quantity of the right type of yarn at the right time. The effects of the change of cloth woven on the loom should be calculated well in advance so that the extent of the imbalance between the spinning and weaving departments is minimized.

/...

128. Mill controls: In the last few decades remarkable progress has been made in the administrative controls used in textile mills in the industrialized countries.[20] Tests are made continuously at all stages in the production process. These enable optimum production levels to be established for each process, which would combine maximum speeds and efficiencies with satisfactory quality. An adequate machinery maintenance programme would necessitate an inspection routine, with strict time-tables for cleaning and maintenance. The requirements for spare parts can be calculated in advance and orders placed in good time. In order to supervise these functions it is necessary to set up a mill control laboratory.

129. Mill expansion: In general, mills cannot expand their capacities in small amounts because of the indivisibility of some machinery. The minimum economic expansion of spindleage would appear to be between 3,000 and 5,000 units. One of the modern mill-planning trends is the construction of unitized mills. These are completely equipped balanced spinning plants of a determined spindleage. Provided sufficient space is allowed for in the original construction, additional units of the same size can be installed as required. The intervening walls can then be removed, and the two mills operated as one, thus reducing unit costs.

130. Mill modernization: There are three basic ways in which a modernization programme can be implemented. The first involves maintaining the existing equipment but operating it in a more efficient way. The second method is based on the partial re-equipment with up-to-date conventional machinery, combined with the reconditioning of the existing machinery wherever this is feasible economically and technically. The third method would necessitate complete re-equipment with the most modern high-output, automated machines. An examination of a modernization programme along each of these lines has recently been carried out in Brazil by ECLA.[21] It was found that unit costs could be reduced by 13 per cent merely by reorganization based on existing equipment. It did not seem to make much further difference to part cost whether the second or third method was adopted; in each case part costs fell by 18 per cent. This would seem to imply that an improvement in the administrative structure would make for the biggest single reduction in unit costs.

20/ For a detailed description of these methods see Manufacturing Controls for Textile Mills, a paper prepared by Werner Textile Consultants Ltd. for the UN/CID Textile Industry Workshop, Lodz, 1965.

21/ The Textile Industry in Brazil, ECLA, E/CN.12/623.

Training needs and problems of technological transfer

131. The problem of technological transfer in textiles is most marked at the operative level. Operative skills, and even the skills of intermediate management, such as shop foreman and maintenance workers, are relatively easy to acquire except in man-made fibre production.

Methods of technological transfer

132. There are basically two ways in which foreign technology can be obtained for textile production, and these broadly correspond to differing stages of development. The first method is to import the mill which incorporates the advanced technology, complete with the key administrative personnel; the second is to acquire patent and production rights. Generally speaking, the first method is especially applicable to countries which have little or no experience of basic textile production - natural fibre spinning and weaving. It allows the country concerned to benefit from the advanced production techniques without having first to assimilate them. The enclave system of production generally tends to have little dynamic effects on the rest of the economy however.

133. The second basic way in which advanced textile technology can be acquired by a developing country is by the granting of patent rights and production licences. This method presupposes a higher stage of development in the receiving country. It is not generally applicable to textile industries based on the natural fibres, being more often concerned with the production of yarns from man-made fibres, usually synthetic fibres such as nylon, polyesters, and polyvinyl derivatives. In the nature of things, such technological transfers are negotiated between private firms, and while the Government of the developing country may encourage such a scheme, it can hardly initiate it. As the patent transfer takes place from strictly commercial motives, very little of the advanced technology will be allowed to leak out into the economy again.[22/] The royalty payments can be burdensome. The amount is usually fixed in terms of the annual quantity produced or sold, but sometimes a fixed sum is required to be paid each year irrespective of these.[23/]

22/ It should be noted here that it is in the commercial interest of the donor firm to overvalue the benefits which can be derived from the patent transfer.

23/ At a given profit level, the reduction in unit production costs which will be permitted by the new technology clearly must be greater than the unit payments of royalties necessary to obtain it. For a formal discussion of this theorem see Ing. E. Orosco, Conocimento Tecnico Necessario Para la Industrialización de Paises Poco Desarrollados y Obstaculos que se Oponen a su Transferencia, ST/ECLA/CONF.23/6.12. A useful general study is given in The Role of Patents in the Transfer of Technology to Under-Developed Countries, E/C.5/52/Rev.1.

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134. It is worth noting that the acquisition of technology from foreign firms implies the adoption of standards applicable to the plants installed in industrialized countries. Textile machinery manufacturers in these countries are reluctant to offer anything less than the most advanced machines available, but while certain features, such as automatic transportation devices, may be superfluous in the conditions of the developing countries, and can be dispensed with, the basic mechanism of the advanced equipment is usually substantially cheaper in terms of capital cost for a given level of output.

Methods of training

135. The problems of training staff for a new textile mill in developing countries can be examined under three heads - operatives, intermediate management, and top management.

136. Operative training presents few problems. Far from becoming more arduous, operative skills are actually becoming simpler with less complicated operations being called for. In many cases operatives can be left to learn the routine by watching other workers.

137. For intermediate management and maintenance mechanics, the increasing complexity of the machinery has meant some rise in the skills necessary. Intermediate skills are best obtained abroad in the plant of the appropriate machinery manufacturers, who often make little charge for these services. The time period involved is usually from three to twelve months. The staff selected for this training will normally have some industrial experience, not necessarily in a textile mill. When they return from abroad, it is sometimes still necessary to employ expatriate staff for a short period to avoid start-up difficulties. In general, the level of intermediate skills required for the production of man-made fibres is higher than required for textile production based on natural fibres, and may take longer to inculcate.

138. The training of top management involves the largest expenditure of foreign exchange. In some cases, the key personnel may require study abroad in technical colleges or universities for two or three years before taking over control of the mill from expatriate staff. In other cases the expatriate staff alone are expected to train their successors. Expatriate staff are usually recruited - sometimes by

the firm supplying the machinery - on a two or three-year contract, and considerable pressure is brought to bear to have the staff completely nationalized at the end of that term. However, management skills consist mainly in adapting an organization to suit various circumstances rather than merely organizing a routine which is immutable. As this is a matter of experience rather than training, a period of two or three years from the start-up of the mill is probably much too short.

Training schemes required

139. Much attention has been paid recently to the technological gap between academic training at a university or technical college and practical training on the shop floor. Generally, the knowledge acquired at a university or technical college tends to be theoretical, so that academic training must be supplemented by a considerable period of practical in-plant training.

140. A general outline of a desirable in-plant training programme for the textile industry in developing countries has been discussed recently.[24/] The class should consist of not more than 25-30 persons, composed of mainly graduates or students of textile engineering with no previous experience, together with men with work experience of the textile industry or similar activities but with no academic training. The curriculum should include instruction on the applications and basic properties of both the traditional fibres and the newer synthetic fibres. Attention should be given to the potential of the modern methods of spinning and weaving including the use of automation. This should be done with actual machines similar to the ones which are to be used in the new textile mill. Some attempt should also be made here to display the versatility of the various machines and to indicate the operating problems which they might encounter in developing countries. Optimum conditions and work loads should be indicated for each machine. Much attention should also be devoted to maintenance and repair requirements. The technological knowledge thus acquired will be of limited value unless it is supplemented by studies of mill management methods including the planning of production and mill distribution, cost and labour controls and quality control.

24/ UNCID, Workshop on Textile Industries, E/C.5/101, 1965.

141. Commercial training is just as important. Some attention should be paid to the sources of commercial information, such as international textile magazines, and United Nations or other international agency publications. It is often desirable to impart even a rudimentary knowledge of market study methods, sales organization, and advertising.

Training institutes

142. Most developing countries suffer from a lack of specialist training schools for the textile industry and thus have to send students abroad with a consequent loss of foreign exchange. It is worthwhile, therefore, to examine the question of the minimum economic size of training institutes. Considering the low proportion of technically qualified workers required in the textile industry, it has been suggested that the work force should reach over 10,000 people, before a training institute for intermediate management and skilled workers specializing in the textile industry would be worthwhile.[25/] A minimum of 50,000 employees would probably be required before the erection of a special department at a university devoted to textile engineering could be contemplated. Such a department would probably have an annual throughput of ten to fifteen technicians and engineers. As many developing countries have work forces in their textile industries well below the minimum economic size, it may be possible to arrange these courses on a regional basis.

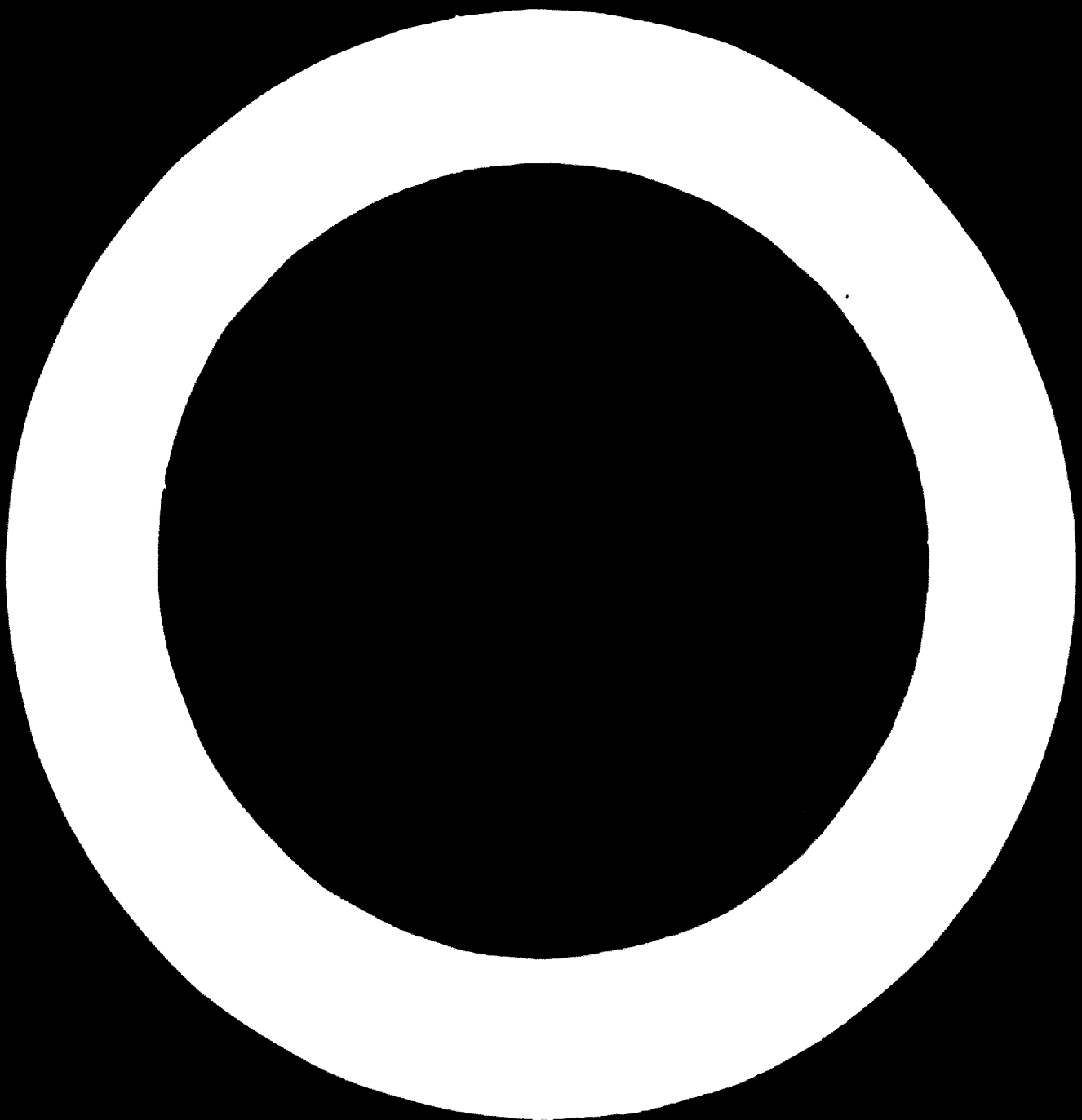
25/ R. Haour, Policies Regarding the Development and Operation of Textile Industry in Developing Countries, paper presented to the UNCID Textile Industry Workshop, Lodz, 1965.

ANNEX I

Net imports of apparel textiles by region and type ('000 million tons)

		Africa		Near East		Far East		Latin America		Total	
		Yarn	Cloth	Yarn	Cloth	Yarn	Cloth	Yarn	Cloth	Yarn	Cloth
Cotton	1960	-10.5	159.7	- 1.2	22.0	63.9	28.4	5.2	47.3	47.4	257.4
	1961	- 8.5	170.7	- 2.0	27.6	48.5	50.1	- 1.0	25.2	37.0	273.6
	1962	- 7.5	167.7	- 3.5	25.0	30.9	29.0	0.9	36.3	20.8	258.0
	1963	-12.7	160.6	- 7.1	26.6	23.1	12.1	2.8	30.2	6.1	229.5
	1964	-17.4	155.0	- 8.0	29.0	25.0	20.0	4.0	32.0	3.6	236.0
MMF	1960	12.4	61.3	24.6	29.5	69.3	37.2	21.2	15.0	127.5	143.0
	1961	20.7	61.1	42.8	26.4	67.2	36.8	23.4	17.8	154.1	142.1
	1962	22.1	54.4	50.5	29.5	82.8	34.7	25.4	20.8	180.8	139.4
	1963	21.5	59.4	48.3	27.7	89.0	34.5	26.3	21.9	185.1	143.5
	1964	22.0	60.0	50.0	30.0	90.0	33.0	30.0	20.0	192.0	143.0
Wool	1960	13.0		5.8		14.5	5.1	-12.5	4.0	29.8	
	1961	14.6		3.8		12.9	4.9	-15.4	2.9	6.0	17.7
	1962	17.3		0.2		13.6	6.3	-15.7	2.1	6.3	17.5
	1963	18.1		- 0.4		17.6	6.8	-18.7	2.0	7.9	17.5
	1964	17.0		-		20.0	8.0	-20.0	2.0	27.0	
Total	1960	235.9		80.7		147.7	70.7	13.9	66.3	184.9	420.2
	1961	258.6		98.6		128.6	91.8	7.0	45.9	192.1	433.4
	1962	254.0		101.7		127.3	70.0	10.6	59.2	207.9	414.9
	1963	246.9		95.0		129.7	53.4	10.4	54.1	199.1	390.5
	1964	236.6		101.0		135.0	61.0	14.0	54.0	601.6	

Source: Based on FAO data. The figures for 1964 are EIU estimates.



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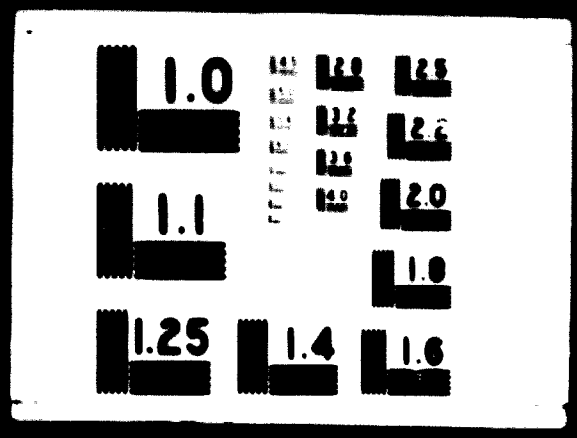
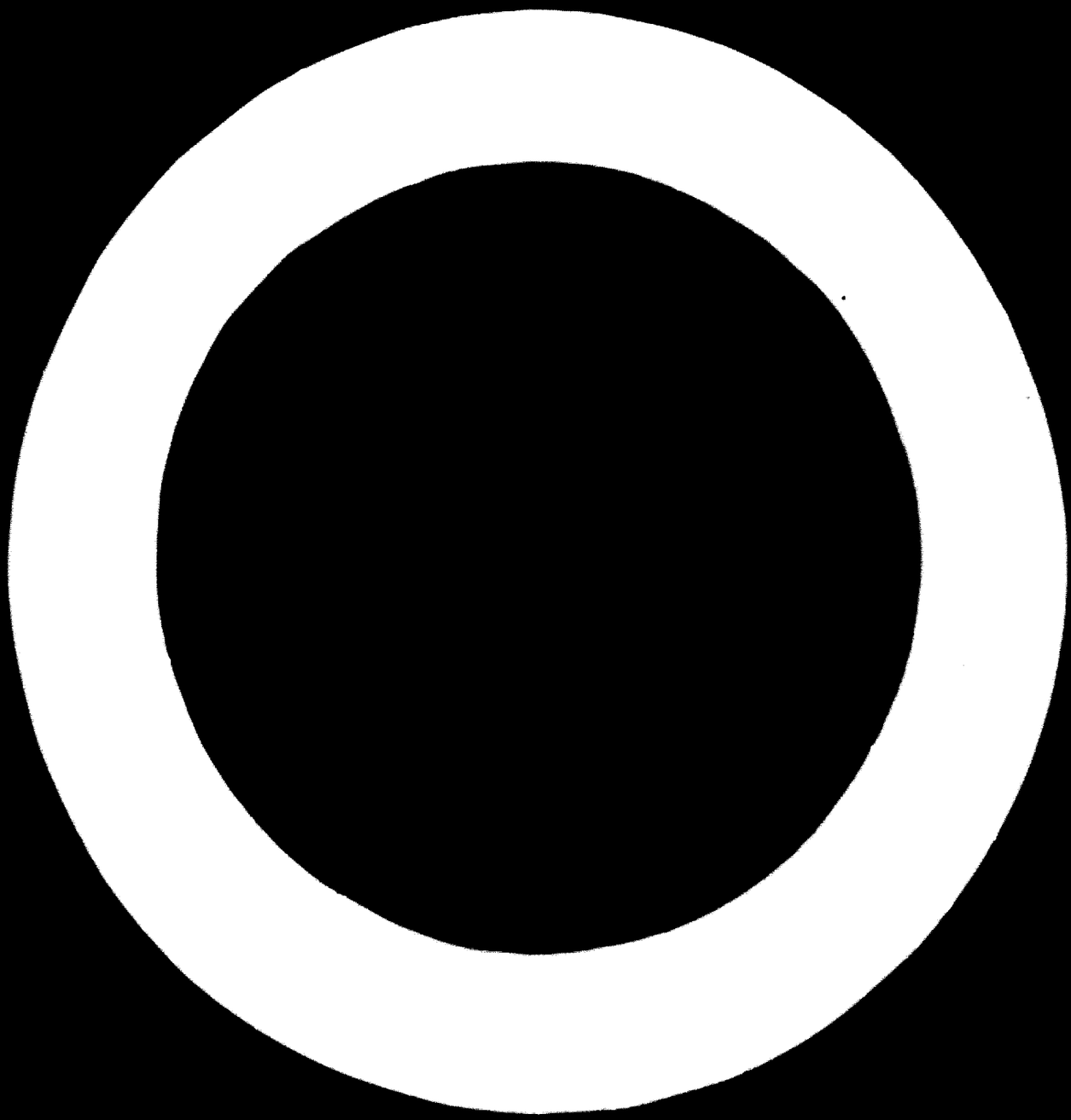


ANNEX II

Self-sufficiency ratios for apparel textiles in developing regions

(Production as per cent of consumption)

	Year	Cotton		Man-made Fibres		Wool		All Fibres	
		Yarn	Cloth	Yarn	Cloth	Yarn	Cloth	Yarn	Cloth
Africa	1960	107.4	47.0	47.7	27.9	48.0		98.9	43.1
	1964	108.2	57.7	38.0	36.7	43.3		98.3	52.8
Near East	1960	100.7	88.8	5.7	46.9	85.4		90.0	80.2
	1964	103.8	87.9	6.4	64.0	100.0		86.4	84.0
Far East	1960	95.6	98.1	39.8	75.6	47.7	84.5	90.8	95.8
	1964	98.6	98.9	48.9	83.9	50.0	83.3	93.5	97.1
Latin America	1960	99.2	99.4	83.7	89.6	117.8	94.7	98.4	92.7
	1964	93.1	95.7	82.3	89.4	133.3	95.8	98.5	94.6
Total	1960	95.9	84.7	56.8	67.9	82.6		93.5	86.9
	1964	99.9	92.6	55.9	75.3	85.4		94.5	89.8



ANNEX III

Unit output of jute looms in India and Pakistan

	1960	1961	1962	1963	1964
India[a/]					
All looms					
Tons	15.7	16.4	18.6	19.1	20.2
Index	100	104	118	122	129
Hessian looms					
Tons	8.9	10.0	12.4	12.8	12.7
Index	100	112	139	144	143
Sacking looms					
Tons	22.9	21.4	22.5	21.0	24.3
Index	100	93	98	92	106
Pakistan[b/]					
All looms					
Tons	33.5	30.9	32.4	30.9	29.4
Index	100	92	97	92	88

a/ Output per loom installed.

b/ Output per loom working.

Source: E.I.U. estimates based on figures provided by the I.J.M.A. and the Pakistan Directorate of Textiles.

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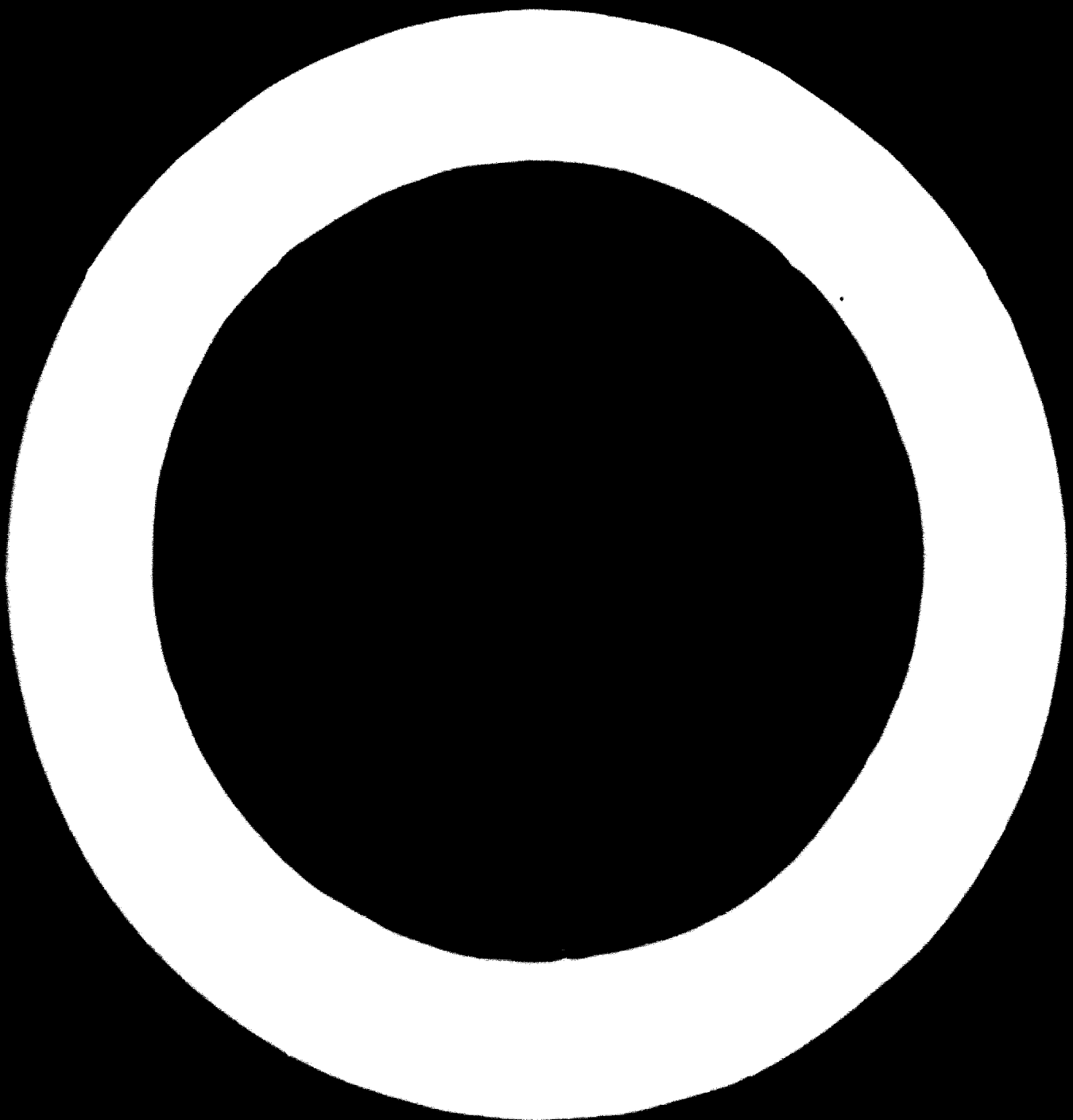


ANNEX IV

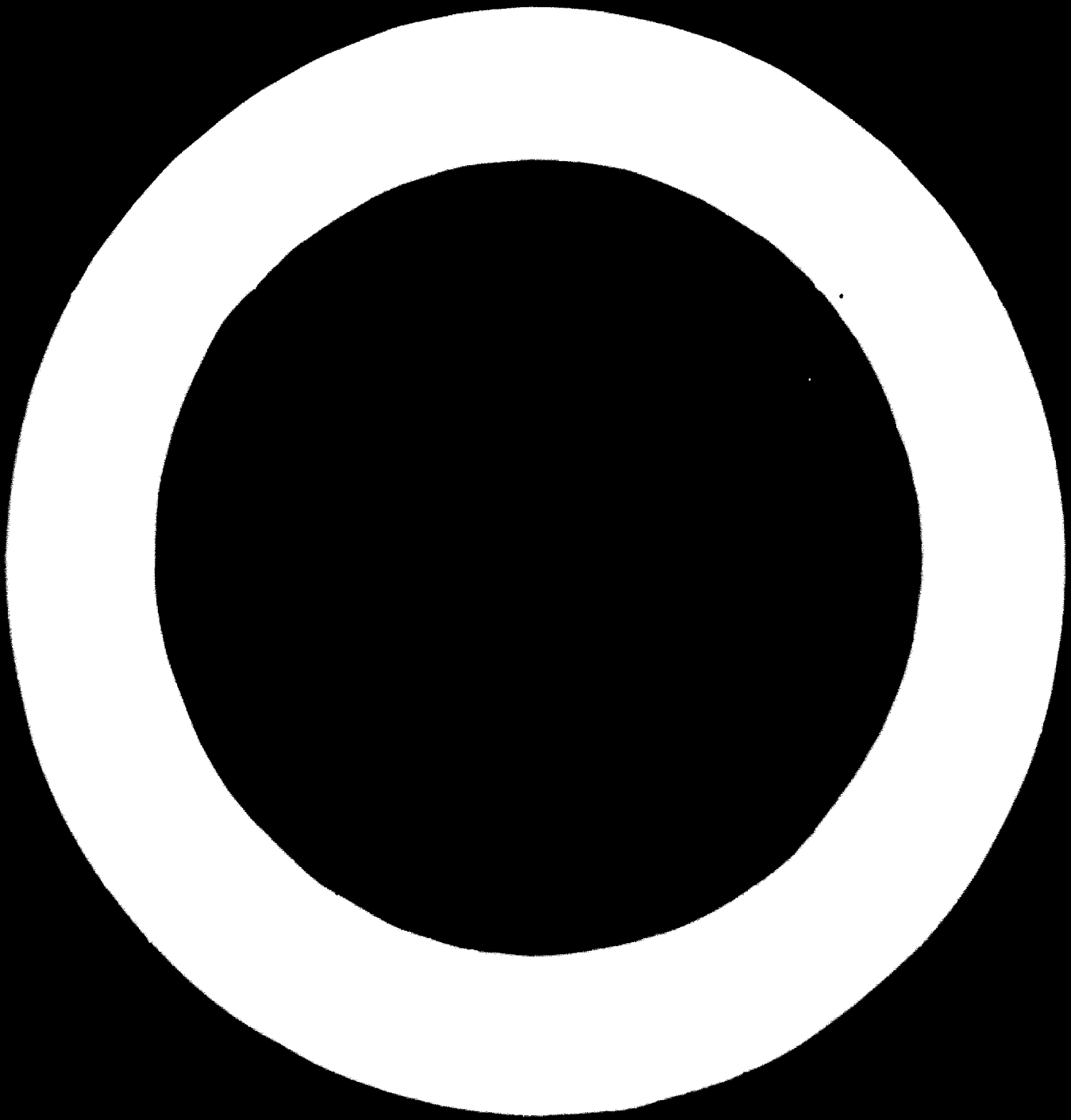
Textile employment levels 1958-1961

(A = Employment in textiles in millions, B = Share of total manufacturing employment)

	Industrialized Countries		Developing Countries		Latin America		E and SE Asia ex. Japan		Africa ex. S. Africa		Other Areas a/	
	A	B	A	B	A	B	A	B	A	B	A	B
1958	5.4	9.0	6.3	19.0	0.9	13.1	4.2	21.7	0.4	24.6	[illegible]	15.2
1959	5.4	8.7	6.6	19.0	0.9	12.8	4.5	21.7	...	...	1.2	17.3
1960	5.5	8.6	6.6	18.3	0.9	12.1	4.4	21.0	...	...	1.3	17.0
1961	5.5	8.4	6.7	18.2	0.9	11.5	4.4	20.6	...	...	1.4	18.0

a/ Including Africa from 1959.

Source: E.I.U. estimates based on the "Growth of World Industry 1938-61" Statistical Office of the United Nations.



ANNEX V

G.D.P. and Value Added in Manufacturing and in the Textile Industry
($US millions at 1958 prices)

	G.D.P.		Manufacturing Sector			Textile Industry		
	Value	% World	Value Added	% World	% G.D.P.	Value Added	% World	% Mfg.
Africa (ex. S.Africa)								
1958	22,742	2.7	2,213	0.7	9.7	315	1.8	14.2
1961	24,926	2.3	2,473	0.7	9.9	389	1.9	15.7
1962	-	-	(2,517)	0.6	-	(410)	1.9	16.3
1963	-	-	-	-	-	-	-	-
1964	-	-	-	-	-	-	-	-
E. and S.E. Asia (ex. Japan)								
1958	59,228	6.4	6,689	2.2	11.3	1,165	6.5	17.4
1961	65,562	6.2	8,629	2.3	13.1	1,340	6.5	15.5
1962	-	-	9,431	2.3	-	1,421	6.5	15.1
1963	-	-	10,435	2.4	-	1,515	6.7	14.5
1964	-	-	11,238	2.4	-	1,631	6.9	14.5
Latin America								
1958	50,600	5.4	11,600	3.7	22.9	1,177	6.6	10.2
1961	58,450	5.5	14,152	3.7	24.2	1,318	6.4	9.3
1962	-	-	14,732	3.6	-	1,282	5.9	8.7
1963	-	-	14,964	3.5	-	1,295	5.8	8.7
1964	-	-	-	-	-	-	-	-
Total above								
1958	132,570	14.2	20,502	6.6	15.5	2,657	14.9	13.0
1961	148,938	14.0	25,254	6.6	17.0	3,047	14.7	12.1
1962	-	-	26,680	6.5	-	3,113	14.3	11.7
1963	-	-	-	-	-	-	-	-
1964	-	-	-	-	-	-	-	-

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ANNEX V (continued)

	G.D.P.		Manufacturing Sector			Textile Industry		
	Value	% World	Value Added	% World	% G.D.P.	Value Added	% World	% Mfg.
Less Industrialized World (incl.S.Europe ex.Italy)								
1958	164,207	17.6	28,672	9.2	17.4	,862	21.7	13.5
1961	184,470	17.4	35,840	9.4	19.4	,364	21.1	12.2
1962	-	-	38,134	9.4	-	,519	20.8	11.9
1963	-	-	40,714	9.5	-	,828	21.3	11.9
1964	-	-	43,868	9.5	-	,029	21.3	11.6
Industrialized World								
1958	766,871	82.4	282,153	90.8	36.8	,968	78.3	5.0
1961	877,483	82.6	344,227	90.6	39.2	16,342	78.9	9.8
1962	-	-	369,620	90.6	-	17,181	79.2	4.6
1963	-	-	389,371	90.5	-	17,879	78.7	4.6
1964	-	-	417,586	90.5	-	18,577	78.7	4.4
World Total (ex.cent.planned)								
1958	931,078	100	310,825	100	33.4	17,830	100	5.7
1961	1,061,953	100	380,067	100	35.8	20,706	100	5.4
1962	-	-	407,754	100	-	22,700	100	5.3
1963	-	-	430,085	100	-	22,707	100	5.3
1964	-	-	461,454	100	-	23,606	100	5.1

Source: EIU estimates based on the Growth of World Industry 1938-61 and the United Nations Monthly Bulletin of Statistics.

ANNEX VI

Production and costs of integrated cotton mills at different technology levels

($US1000 unless otherwise stated)

	Level A (1950)	Level B (1960)	Level C (1965)
No. of spindles (1000's)	13.6	15.2	14.8
No. of looms (units)	534	530	524
Annual yarn output (tons)	2,265	2,643	2,895
Annual cloth output (1000 metres)	16.8	19.6	21.5
Total labour cost	644.1	450.7	373.1
Total workers (numbers)	668	446	315
Total workers (per 1000 metres/day)	11.9	6.8	4.4
Unskilled a/ workers (per 1000 metres/day)	10.1	4.5	3.2
Maintenance costs	54.4	76.7	87.9
Depreciation costs	227.8	302.3	350.0
Interest	534.4	679.0	780.9
Raw material costs	1,644.1	1,917.6	2,100.9
Ancillary material costs	32.9	38.4	42.0
Electricity, water, steam, costs	56.7	58.6	60.4
Sales expenditure	34.9	36.0	37.2
Overhead costs	5.0	4.0	3.8
Total production cost	3,491.8	3,742.6	3,985.5
Unit production cost ($US per metre)	0.207	0.191	0.185
Total investment	4,453.3	5,658.5	6,507.6
Equipment cost	2,387.7	3,285.8	3,805.9
Construction cost	1,024.1	1,088.5	1,254.8

a/ Including semi-skilled workers.

Source: ECLA, Choice of Technologies in the Latin American Textile Industry, ST/ECLA/CONF.23/L.33.

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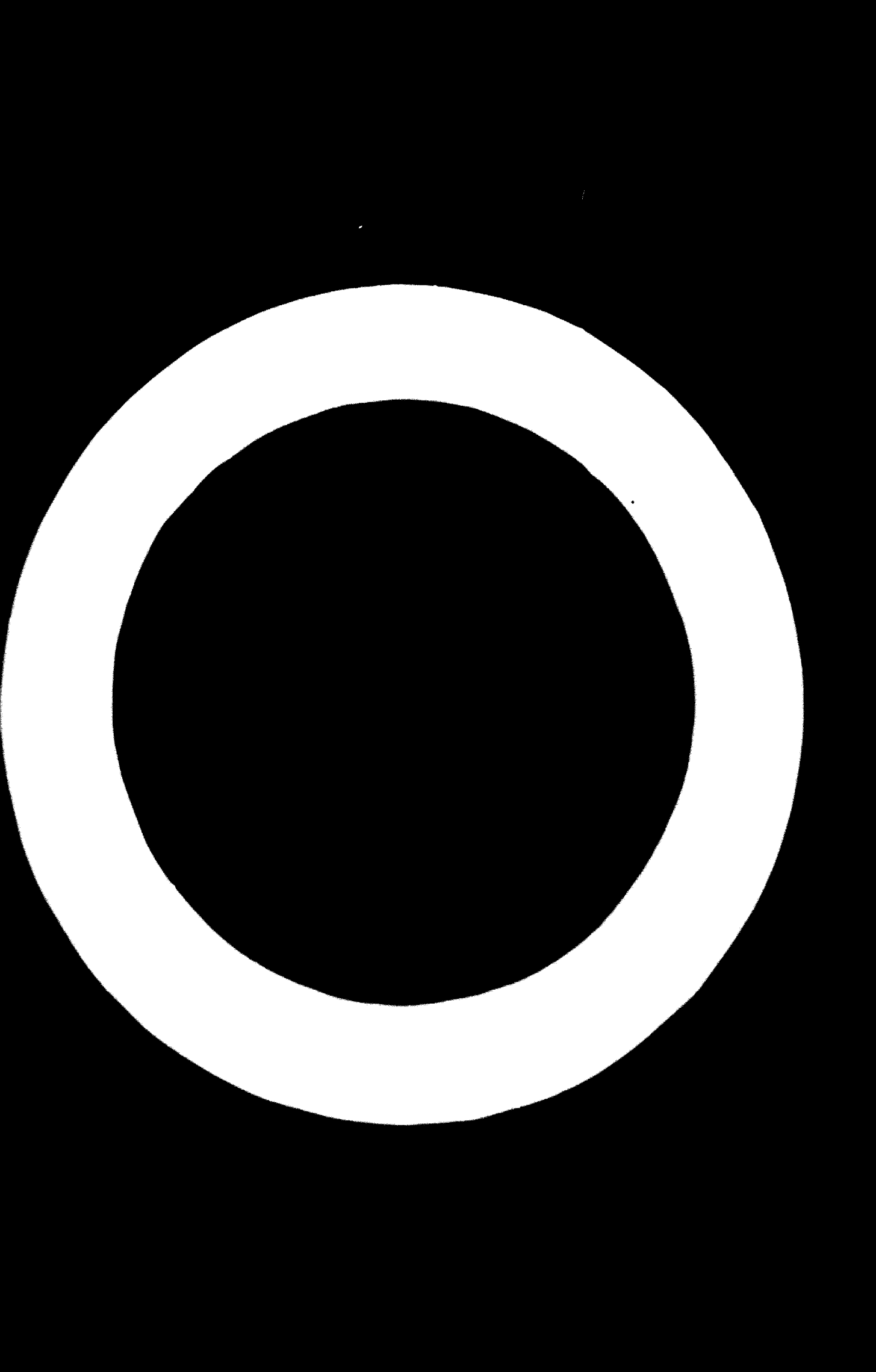

ANNEX VII

Economies of scale in the cotton textile industry

No. of spindles	2,000	6,000	10,000	18,500	60,000	100,000
No. of looms						
A	90	270	450	830	2,700	4,500
B	73	226	364	680	2,190	3,650
C	43	130	214	346	1,280	2,140
Unit investment index						
A	100	84	81	79	76	76
B	100	75	73	70	68	68
C	100	72	63	60	58	58
Unit cost index						
A	100	83	81	80	79	78
B	100	78	76	73	72	71
C	100	69	64	60	58	57
Idle capacity (%)[a/]						
A	8.5	2.3	1.7	0	0	0
B	17.5	1.1	2.1	0	0.2	0
C	30.2	13.6	4.3	1.7	0.5	0.5
Total investment ($US'000)						
A	1,386	3,501	5,635	10,132	31,914	53,163
B	1,090	2,550	3,987	7,037	22,385	37,169
C	885	1,904	2,797	4,924	15,428	25,691
Total employment (units)						
A	139	263	395	686	2,091	3,357
B	108	186	267	436	1,281	2,033
C	94	127	184	277	750	1,231

a/ Ratio of unused to total investment.

Source: "Economies" of Scale in Cotton Spinning and Weaving", ST/ECLA/CONF.25/L.9.

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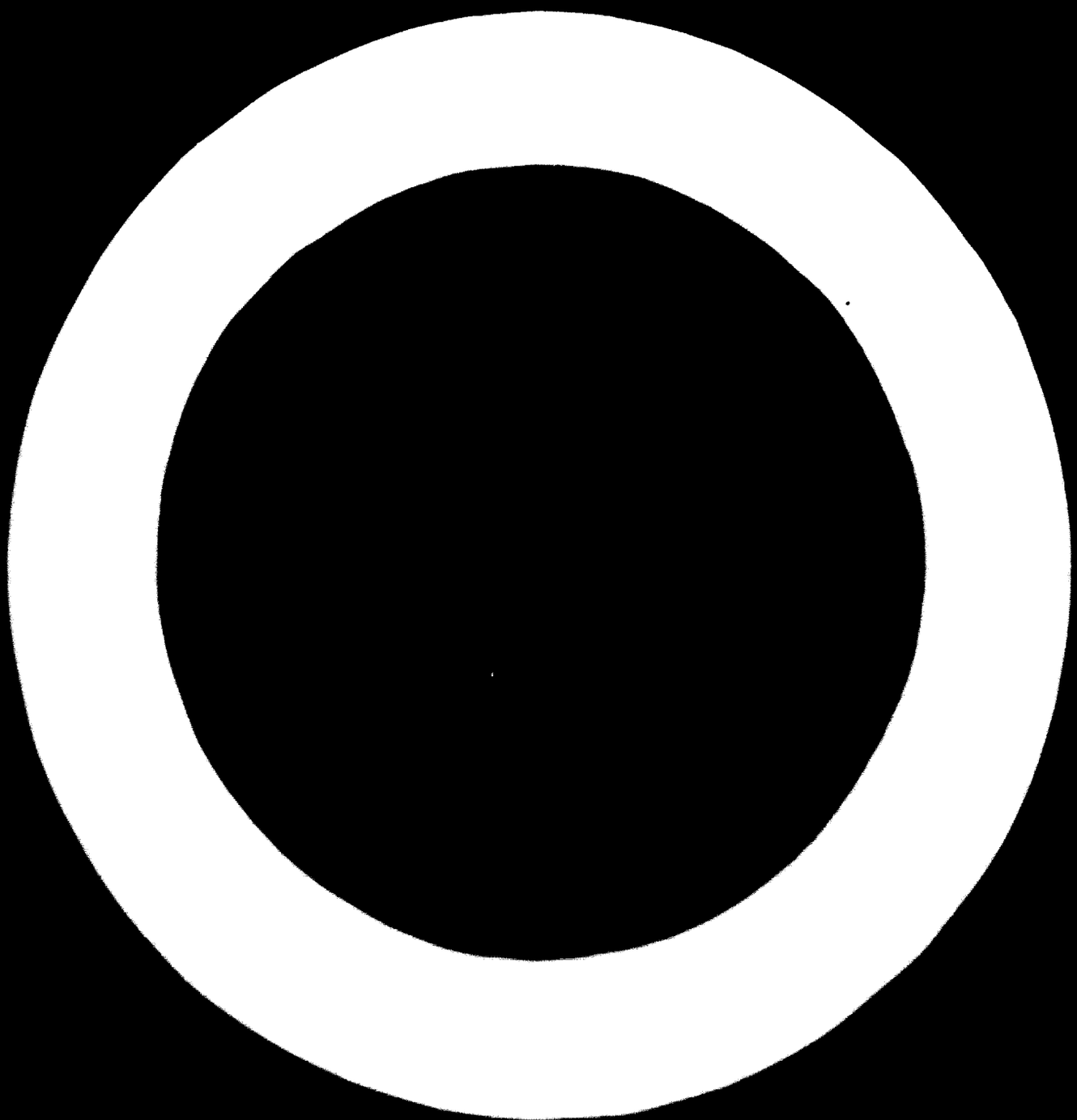

ANNEX VIII

A. Demand Generated by Sector per Unit of Final Demand for Textiles [a]

	India	Taiwan	Philippines
Total	1.641	1,976	1,557
Agriculture	0.461	0.319	0.088
Agricultural processing	0.011	0.023	0.005
Textiles [a]	1.029	1.393	1.171
Other manufacturing and mining	0.109	0.120	0.079
Service industries [b]	0.031	0.121	0.214

B. Demand Generated for Textiles [a] per Unit of Final Demand in Other Sectors

	India	Taiwan	Philippines
Total	0.085	0.052	0.014
Agriculture	0.001	0.005	0.007
Agricultural processing	0.006	0.012	0.004
Other manufacturing and mining	0.070	0.033	0.003
Service industries [b]	0.008	0.002	-

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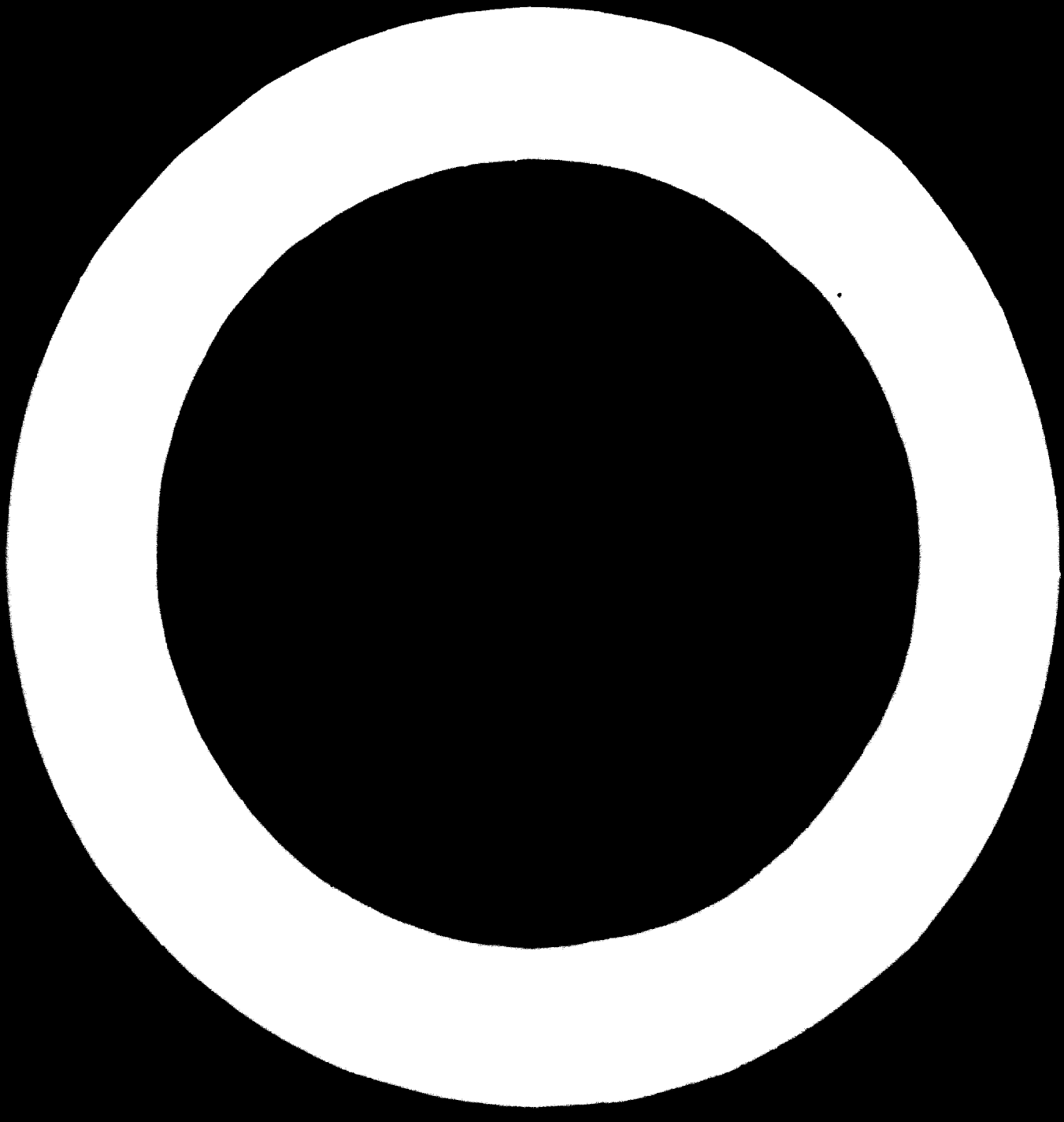
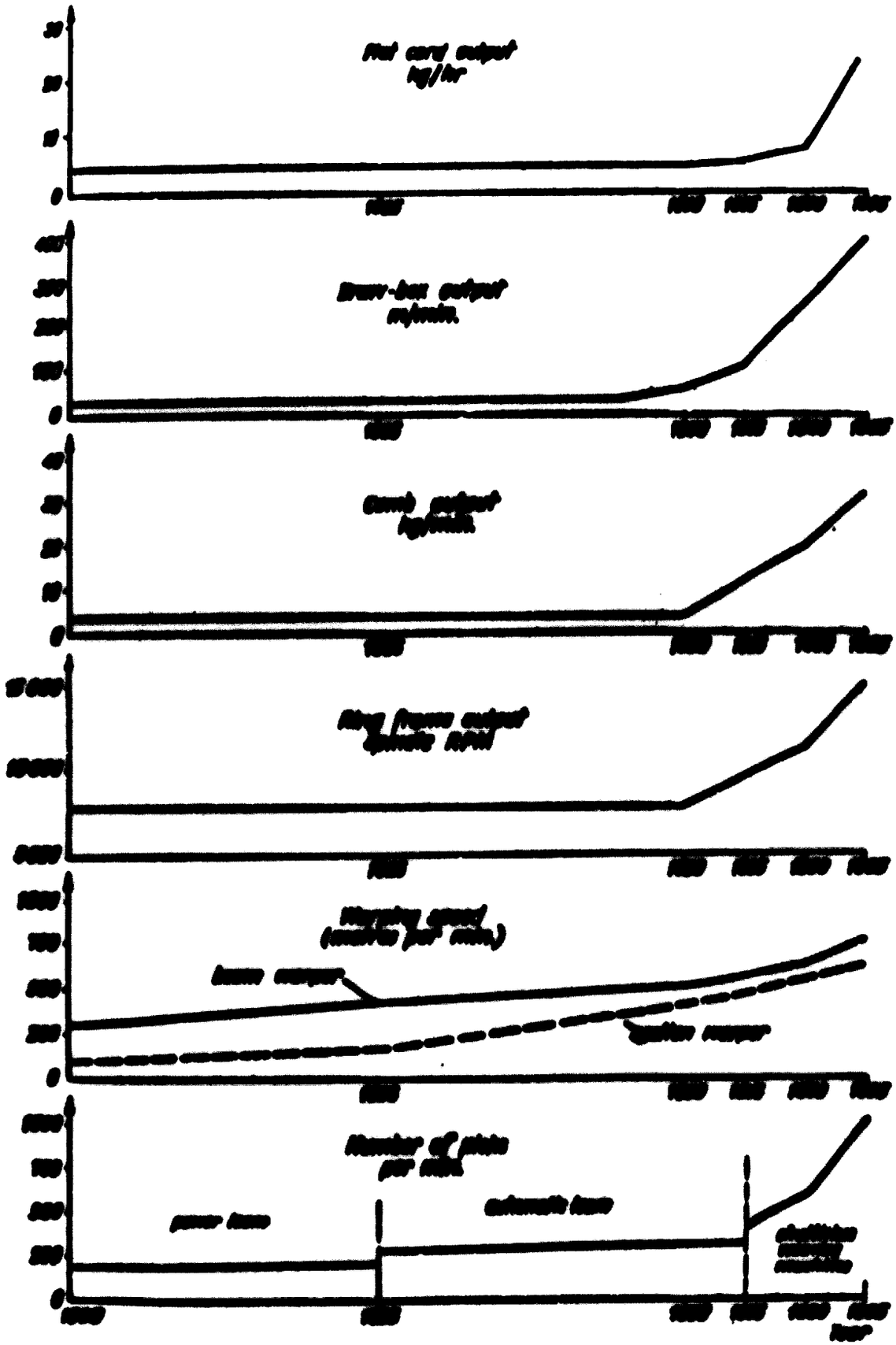
a/ Including made-up goods.

b/ Including transport, construction, and electricity.

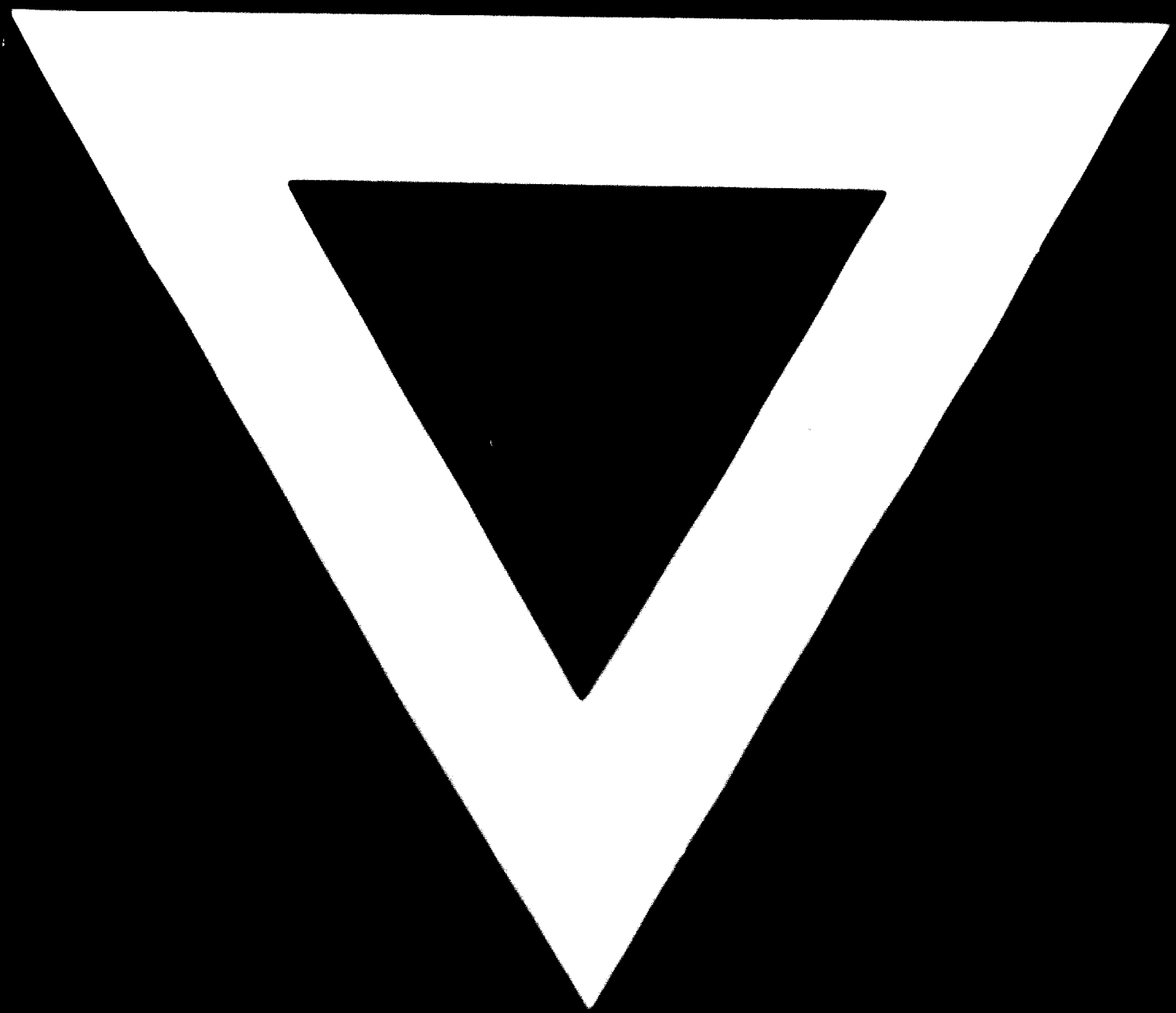


ANNEX IX

The Growing Output of Some Textile Equipment



Source: T. Johnson op. cit.



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