

9. Setting of Export Targets and Requirements for Achievement of Targets

9-1. Setting of Export Targets

9-1-1. Estimating Domestic Consumption

Table I-9-1 shows the volume of textile consumption per head in Thailand, and is based on a survey carried out by the Food and Agriculture Organization (FAO). In 1982 total textile consumption was 126,800 tons, or 2.6kg per individual head of population. Fig. I-9-1 combines data derived from the survey on consumption for individual countries and the national income per head. By using the relationship between national income per head and textile consumption per head, it is possible to estimate future domestic textile consumption in Thailand against national income.

Table I-9-2 shows the details of calculations used to reach those estimates. An estimate of the size of the population for each year is reached using Fig.I-9-2. Then the future constant national income (NNP) per head for Thailand is calculated as follows. Constant NNP of 1987 is transformed from the current NNP of 1987 using the current NNP of 1982 as a base. As the growth rate of the GNP during the five-year period of the 6th Plan spanning from 1987 to 1992 has been settled at 8.0%, the increase in the constant NNP should be settled at 8.0% up to 1992 and then at a rate of 5.5% until the year 2,000. As well as converting these NNP values in the future to the values per head using the estimated future population, the constant national income per head in U.S. dollars is worked out using the 1982 exchange rate of 23 baht/U.S.\$.

A look at Fig. I-9-1 showing textile consumption reveals that there is a large variation in textile consumption for the same level of income. This is thought to be caused by three main factors: 1- the difference in the required volume and kinds of clothing due to the seasonal variation of climate throughout the year in the country; 2- the difference in the ratio between the personal income and prices, especially prices of textile products; and 3- the appropriateness or inappropriateness of the exchange rate. The absolute position of Thailand within the upper and the lower limit does not change even if national income per head does change, and from this it is possible to derive the level of textile consumption per head against national income per head, and by multiplying this by the total population, domestic consumption of textiles in terms of volume is calculated. This is shown in the right column in Table I-9-2 which shows textile consumption. It is possible to arrive at an estimate for domestic consumption of 150,000 tons for 1987, 180,000 tons for 1990, and 280,000 tons for the year 2,000.

Table I-9-1. Per Capita Fiber Consumption in Thailand

Fiber	1982		1983		1984		Total	
	Cotton	Man-made	Natural	Total	Cotton	Man-made		Natural
Production fl. staple		31.1		94.6			37.0	107.4
Imports fl. staple		63.5		29.1			70.4	30.7
Exports fl. staple		4.2		18.1			3.7	22.3
Mill consumption	128.1	105.5		233.6	127.0	105.0	115.7	243.6
Import								
Yarn	0.3	3.2	0.6	4.1	0.8	6.2	1.1	8.7
Fabrics	4.7	7.6		12.3	6.5	10.5	6.8	18.5
Clothing	0.2	0.5		0.7	0.1	0.1	0.2	0.7
Others	1.2	5.7	0.1	7.0	1.2	7.1	1.1	8.1
Total (actual)	6.3	17.1	0.6	24.1	8.5	23.9	9.2	35.9
Total (fiber)	7.3	18.1	0.7	26.1	9.8	25.2	10.5	38.9
Export								
Yarn	0.6	0.7		1.3	0.4	0.8	0.2	0.8
Fabrics	18.9	27.9		46.8	18.1	26.4	20.7	52.0
Clothing	14.5	51.8	0.3	66.6	17.1	60.3	23.1	93.9
Others	3.3	2.3	0.3	5.9	2.4	4.1	3.7	8.6
Total (actual)	37.3	82.7	0.6	120.6	37.9	91.6	47.7	155.2
Total (fiber)	43.6	89.0	0.7	133.3	44.4	98.7	56.1	172.0
Balance	-36.3	-70.9	0.3	-106.9	-34.7	-73.4	-45.6	-133.2
Home use	91.8	34.7	0.3	126.4	92.4	31.6	82.3	110.6
Total fiber				126.8			27.8	110.6
Population (millions)				48.5				50.6
Availability per caput (kgs)				2.6			2.5	2.2

Source: World Apparel Fiber Consumption Survey (1987) by Food and Agriculture Organization of the U.N.

Note: Except for blankets, carpets, etc.

Total fiber (1,000 ton)

Availability per caput (kgs)

	125.7	122.8	111.1
	2.59	2.48	2.20

Fig. I-9-1. Fiber Consumption and Income for Selected Countries/Regions

		1981	'82	'83	'84	'85	'86	'87	Future 1990	2000	
Yarn (tons)											
Exports	Cotton	397	600	400	200		15,675	20,312			
	Manmade fiber	20,344	700	800	600		14,614	17,762			
	Total	20,741	1,300	1,200	800		30,289	38,074	60,000		
Imports	Cotton	1,346	300	800	1,100		4,538	10,525			
	Manmade	7,774	3,200	6,800	7,600		10,362	20,308			
	Total		4,100	7,600	8,700		14,900	30,833	10,000		
Difference (export surplus)			-2,800	-6,400	-7,900		15,389	7,241	50,000		
Woven and knitted fabrics (1,000 yd2)											
Exports	Cotton	95,215	152,390				207,600	242,000			Average weight
	Manmade fiber	292,571	327,586				380,400	349,500			
	Total	388,333	480,137				588,000	591,500	780,000		97.5 g/yd2
	Converted to weight (tons)		46,800	44,500	52,000		57,300	57,700	80,000		
Imports	Cotton	20,065	16,740				37,200	90,800			
	Manmade fiber	109,591	77,586				168,200	258,000			
	Total	144,801	111,511				205,400	348,800	180,000		110.3 g/yd2
	Converted to weight (tons)		12,300	17,000	18,500		22,660	38,470	20,000		
Difference (export surplus)							34,640	19,230	60,000		
Export surplus of yarn and woven and knitted fabrics (tons)							50,030	26,471	110,000		
Garment											
Export	Volume (1,000 pcs)	137,820	144,919	167,059	209,580		312,986	459,114	670,000		460 g/piece
	Weight (tons)		66,600	77,600	93,900		143,970	211,190	310,000		
Imports	Volume (1,000 pcs)	949	1,137								620 g/piece
	Weight (tons)		700	200	700		(c) 1,000	(c) 1,000			
Difference (export surplus) (tons)							143,000	210,000	310,000		
Export surplus total (tons)							193,000	236,500	420,000		

(E): Estimated

Source: TTMA and other trade statistics

Source: FAO

Fig. I-9-2. Projections of Population of Thailand

Based on population statistics of 1970 to 1986, five-year moving average of population growth rate (growth rate over previous fiscal year) extended to 2000 and projections of population calculated from population growth rate.

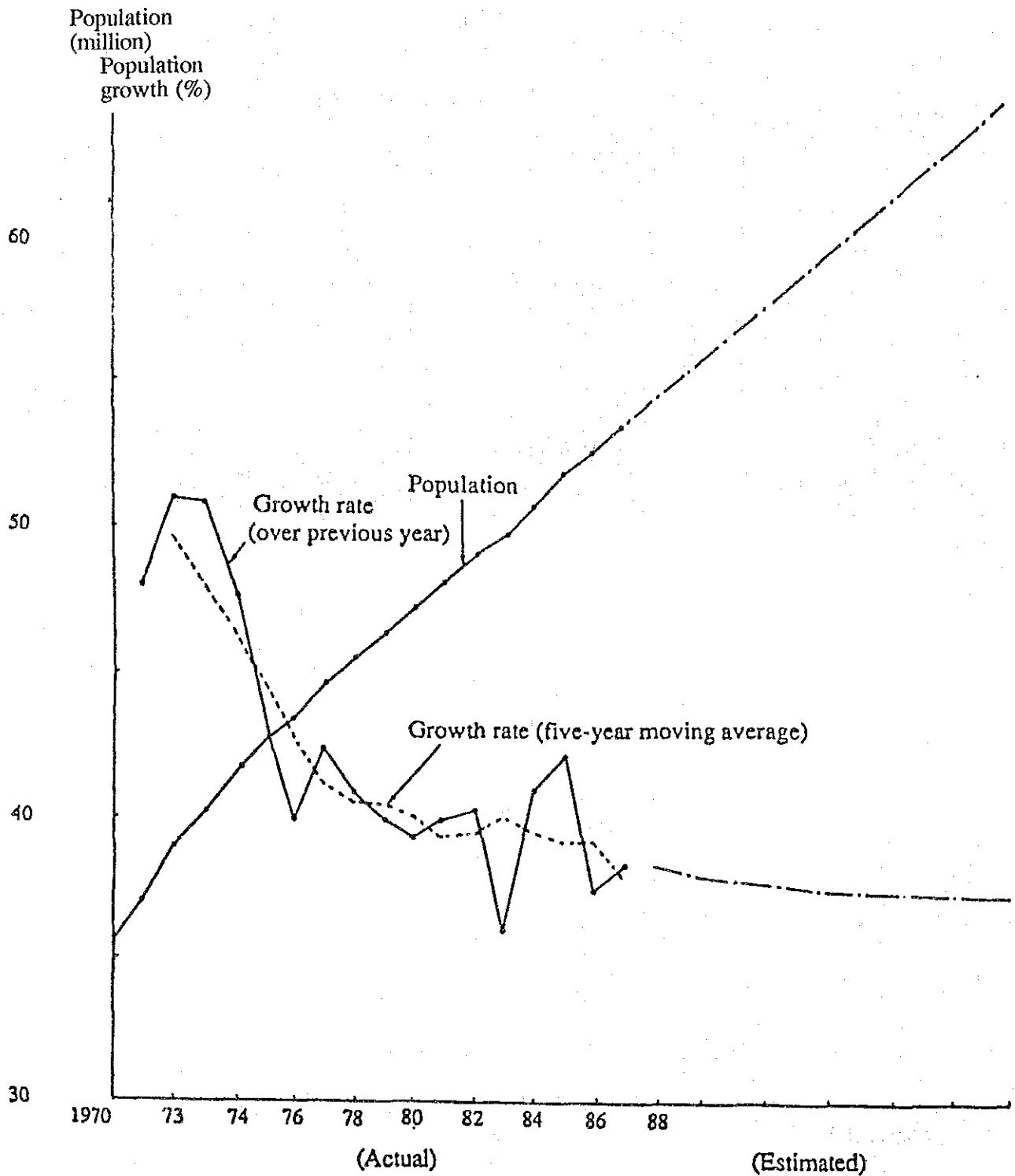


Table I-9-2. Projections of Domestic Fiber Consumption in Thailand

	Population		Current GNP		Consumer price index		Constant GNP		National income		Constant NNP		Domestic fiber consumption	
	No. of persons	Growth (%)	M Baht	1982=100	Inflation (%)	M Baht	Growth (%)	M Baht	M Baht	M Baht	M Baht	US\$ (82.23B/B)	Per capita (Kg)	Total consumption (tons)
1982	48,846,927	2.03	807,072	100.0		807,072		662,678	662,678	13,566	590	2.60	126,800	
83	49,515,074	1.37	903,353	103.8	3.75	870,702	7.9	734,151	707,615	14,291	621	2.68	132,790	
84	50,583,105	2.16	961,961	104.6	0.85	919,657	5.6	773,277	739,271	14,615	635	2.72	137,403	
85	51,795,651	2.40	996,802	107.2	2.43	929,853	1.1	801,449	747,620	14,434	628	2.70	139,759	
86	52,545,529	1.45	1,077,104	109.2	1.85	986,359		859,185	786,799	14,974	651	2.76	144,908	
87	53,397,745	1.62	1,199,220	111.9	2.47	1,071,689	8.7	950,323	849,261	15,904	691	2.86	152,782	
88	54,273,468	1.64		116.0	3.65	1,157,424	8.0		917,202	16,900	735	2.97	161,464	
89	55,143,844	1.60		119.5	3.0	1,250,018	8.0		990,578	17,964	781	3.09	170,607	
90	56,007,570	1.57		123.1	3.0	1,350,019	8.0		1,069,824	19,101	830	3.22	180,383	
91	56,870,087	1.54		126.8	3.0	1,458,021	8.0		1,155,410	20,317	883	3.36	190,956	
92	57,734,512	1.52		130.6	3.0	1,574,663	8.0		1,247,843	21,613	940	3.51	202,369	
93	58,600,530	1.50		133.2	2.0	1,661,269	5.5		1,316,474	22,465	977	3.60	211,012	
94	59,467,818	1.48		135.9	2.0	1,752,639	5.5		1,388,880	23,355	1015	3.70	219,980	
95	60,336,048	1.46		138.6	2.0	1,849,094	5.5		1,465,269	24,285	1056	3.81	229,589	
96	61,204,887	1.44		141.4	2.0	1,950,731	5.5		1,545,859	25,257	1098	3.91	239,543	
97	62,080,117	1.43		144.2	2.0	2,058,022	5.5		1,630,881	26,271	1142	4.03	250,033	
98	62,961,655	1.42		147.1	2.0	2,171,213	5.5		1,720,579	27,327	1188	4.15	261,074	
99	63,855,710	1.42		150.0	2.0	2,290,629	5.5		1,815,211	28,427	1236	4.27	272,708	
2000	64,756,076	1.41		153.0	2.0	2,416,614	5.5		1,915,048	29,573	1286	4.40	284,927	

Method of estimation for 1987 on

Growth rate taken from Fig. 2 and population growth in each successive year calculated.

Inflation rate, together with 8% GNP growth, considered 3.0% and considered 2.0% in 1993 on.

Real growth rate considered 8% during sixth five-year plan and subsequently 5.5%.

Figures for year based on NNP as of 1982.

US\$1=23B in 1982.

Per capita consumption derived from Fig. 1 and NNP.

Total consumption derived by multiplying by population

Source: Population: Registration Division, Local Administration Department, Minister of Interior.
National Income, GNP and Consumer Price Index 1979-1987: Office of the National Economic and Social Development Board.

9-1-2. Estimating Output

With the release of controls governing equipment in 1987, approval has been given for a total of 1.02 million new spindles according to the combined figures of the Ministry of Industry and the Board of Investment. This represents a 49% increase over the 2.070 million spindles which had been approved as of 1987. Although it is thought that not all of the approvals will be acted on, it has been reported that orders for 700,000 spindles have been placed with machinery manufacturers. By adding this to the present level of equipment, it is estimated that there will be 3.0 million spindles by 1990 and 3.6 million spindles in operation by the year 2000. Table I-9-3 shows the estimated yarn production capacity of 600,000 tons per annum for 1990 and 720,000 tons for 2000, calculated by production rate of 200kg/spindle-year. Because, as previously mentioned, the estimated domestic consumption is 180,000 tons for 1990 and 280,000 tons for 2000, roughly 420,000 and 440,000 tons of yarn will have to be exported in some way or other in 1990 and 2000 respectively. The import volume of yarn and fabric which are not obtainable on the domestic market will have to be added to these figures for export.

Table I-9-3. Number of Spinning Facilities and Production Thereof

		1981	'82	'83	'84	'85	'86	'87	(Unit: tons)	
									Future	
									1990	2000
Raw cotton										
Production	Cotton	67,399	61,507	42,703	41,729	27,799	35,529	20,041		
	Manmade fiber	113,098	97,780	114,168	115,527	127,072	133,406	140,504		
Factory input	Total	180,497	159,287	156,871	157,256	154,871	168,935	160,545		
	Cotton	129,150	131,866	144,301	158,512	177,777	222,239	256,853		
	Manmade fiber	119,505	115,859	125,057	133,438	137,405	149,172	161,034		
Total		248,655	247,725	269,358	291,950	315,182	371,411	417,887		
Yarn										
Production	Cotton	97,271	101,213	109,687	118,837	131,472	169,470	192,709		
	Manmade fiber	135,166	130,399	141,882	153,359	161,482	184,145	204,003		
	Total	232,437	231,612	251,569	272,196	292,954	353,615	396,712	600,000	720,000
Yield (%)		93.5	93.5	93.4	93.2	92.9	95.2	94.9		
No. of spindles (1,000)		1,548	1,599	1,786	1,802	1,937	1,955	2,068	3,000	3,600
Production per spindle (kg/spindle)		150.2	144.9	140.8	151.1	151.3	180.1	191.8	200	
Domestic fiber consumption			126,800	132,790	137,400	139,760	144,910	152,780	180,380	284,930
Export surplus			104,800	118,780	134,800	153,190	208,710	243,930	420,000	435,000

Expansion permits MOI 529,948 spindles
 BOI 491,960
 Total 1,021,908

(Standard production per spindle
 30'S spinning, 160 kg/spindle
 20'S spinning, 260 kg/spindle)

9-1-3. Required Volume of Exports

The amount of woven fabric, knitted fabric, and garments in terms of weight has been calculated by the FAO in order to come up with textile consumption volumes. Table I-9-6 shows the tonnage for exports and imports based on these calculations. Imports of fabric have been calculated in terms of 110g/yd², exports 98g/yd², imports of garments at 620g/piece, and exports at 460g/piece. An appropriate figure for fabric in terms of tonnage is justified as the reasonable volume by using Table I-9-4 showing the average tonnage for fabric produced in Thailand and the actual figures for 1982, and the tonnage of standard items shown in Table I-9-5. Though the kinds of exports and imports of woven fabric, knitted fabric, and garments vary from year to year, by applying these calculated values to imports and exports for 1987, as is shown in Table I-9-6, exports of yarn, woven fabric, and knitted fabric amount to roughly 100,000 tons and imports to roughly 70,000 tons. When this level of imports is assumed to continue, in 1990 it will be necessary to export 500,000 tons (420,000 + 70,000). But under current conditions, with textile exports at less than 100,000 tons, more than 200,000 tons of garments are exported.

Table I-9-4. Weight of Fabric

	Total fabric production (1,000 yd ²)	Weight conversion (input yarn weight/fabric (g/yd ²))
1980	1,481,164	139.5
1981	1,568,105	141.3
1982	1,702,450	138.2
1983	1,793,475	138.7
1984	1,927,342	137.2
1985	2,025,341	138.6
1986	2,220,126	139.1
1987	2,788,140	137.6

Average: 138.78

Actual 1982 Figures

	Imports	Exports
Fabric volume (1,000 yd ²)	111,511	480,137
Fabric weight (tons)	12,300	46,800
Weight (g/yd ²)	170.3	97.5

Source: Fabric volume: TTMA materials
Fabric weight: FAO materials (1987)

Table I-9-5. Weight of Standard Products

Name	Warp	Weft	Warp density	Weft density	Weight (g/yd ²)
T/C poplin	42's	42's	133.4 end/inch	72 pic/inch	95
T/R tropical	24's	24's	62	60	99
T/R poplin	40/2	40/2	88	46	145
C poplin	45	45	136	72	90
T/R serge	30/2	30/2	86	65	196
T/R garberdine	44/2	40/2	136	60	178

Table I-9-6. State of Imports and Exports and Targets by Product

		1981	'82	'83	'84	'85	'86	'87	Future 1990	2000	
Yarn (tons)											
Exports	Cotton	397	600	400	200		15,675	20,312			
	Manmade fiber	20,344	700	800	600		14,614	17,762			
	Total	20,741	1,300	1,200	800		30,289	38,074	60,000		
Imports	Cotton	1,346	300	800	1,100		4,538	10,525			
	Manmade	7,774	3,200	6,800	7,600		10,362	20,308			
	Total		4,100	7,600	8,700		14,900	30,833	10,000		
Difference (export surplus)			-2,800	-6,400	-7,900		15,389	7,241	50,000		
Woven and knitted fabrics (1,000 yd2)											
Exports	Cotton	95,215	152,390				207,600	242,000			Average weight
	Manmade fiber	292,571	327,586				380,400	349,500			
	Total	388,333	480,137				588,000	591,500	780,000		97.5 g/yd2
	Converted to weight (tons)		46,800	44,500	52,000		57,300	57,700	80,000		
Imports	Cotton	20,065	16,740				37,200	90,800			
	Manmade fiber	109,591	77,586				168,200	258,000			
	Total	144,801	111,511				205,400	348,800	180,000		110.3 g/yd2
	Converted to weight (tons)		12,300	17,000	18,500		22,660	38,470	20,000		
Difference (export surplus)							34,640	19,230	60,000		
Export surplus of yarn and woven and knitted fabrics (tons)							50,030	26,471	110,000		
Garment											
Export	Volume (1,000 pcs)	137,820	144,919	167,059	209,580		312,986	459,114	670,000		460 g/piece
	Weight (tons)		66,600	77,600	93,900		143,970	211,190	310,000		
Imports	Volume (1,000 pcs)	949	1,137								620 g/piece
	Weight (tons)		700	200	700		(e) 1,000	(e) 1,000			
Difference (export surplus) (tons)							143,000	210,000	310,000		
Export surplus total (tons)							193,000	236,500	420,000		

(E): Estimated

Source: TTMA and other trade statistics

9-1-4. Setting Targets

It has been stated that based on the increase in production capacity brought about by increased spinning equipment it will be necessary to export half a million tons by the year 1990. But how does this level compare on a worldwide basis? Table I-9-7 shows the export value of textiles and garments in comparison with the total population of East Asian and ASEAN regions. The scale of exports and ratio per population for Thailand are small compared to those of South Korea, Taiwan, and Hong Kong. By comparing Thailand with other countries on the basis of the phases of development outlined in Fig. I-9-3 and I-9-4, it can be concluded that Thailand's textile industry has just entered its adolescence. Being a cotton producing country and also being blessed with the basis of a cotton industry and superior labor resources it would initially seem realistic for Thailand to aim at a level of at least \$200-300 million/ 1 million population as is the case for South Korea and Taiwan. This would mean increasing its present level of exports 10-fold.

As this is an extremely long-term target, for the time being export targets of 420,000 tons plus the amount imported and 440,000 tons plus the amount imported should be set for 1990 and 2000 respectively. Policies aimed at realizing these targets are now to be examined.

Table I-9-7. Export of Textile Products of East Asian and ASEAN Regions

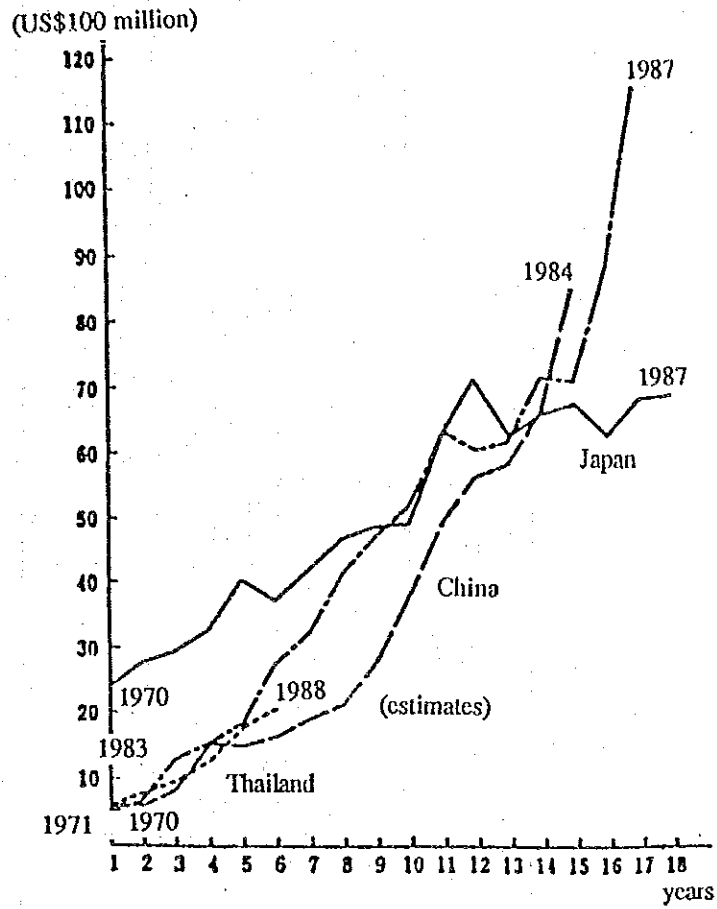
(Unit: US\$100 million, %)

	1980	1986	1987	Average growth rate	Population (mil.)	US\$100 mil./ Mil. persons
World total	960	1282	1430	5.9		
Japan	55.9(5.8)	61.8(4.8)	62.1(4.3)	1.5	122.1	0.51
S. Korea	51.5(5.3)	86.9(6.8)	117.0(8.2)	12.4	42.1	2.78
Taiwan	42.2(7.0)	73.6(5.7)	91.3(6.4)	11.7	19.8	4.62
Hong Kong*	67.6(7.0)	123.8(9.7)	166.6(11.7)	13.8	5.6	29.75
Total for three Far East regions	161.3(16.7)	284.3(22.2)	374.9(26.3)	12.8		
Thailand	4.7(0.5)	11.9(0.9)	20.0(1.4)	23.0	53.4	0.37
Indonesia	1.4(0.1)	8.3(0.6)	10.0(0.7)	32.4	170.2	0.06
Singapore	8.0(0.8)	11.0(0.9)	13.0(0.9)	7.2	2.6	5.00
Philippines	3.5(0.4)	3.5(0.3)	4.0(0.3)	1.9	57.4	14.35
Malaysia	3.3(0.3)	5.0(0.4)	5.5(0.4)	7.6	16.6	0.33
ASEAN total	20.9(2.2)	39.7(3.1)	52.5(3.7)	14.1		
China	46.3(4.8)	72.5(5.7)	95.5(6.7)	10.9	1060.0	0.09
Total of above	284.4(29.6)	458.3(35.7)	585.0(40.9)	10.9		

Source: U.N., GATT, and trade statistics of different countries (Chemical Fiber Monthly, July 1988)

- Note:
1. Total of yarn, woven fabrics, garments, etc. (AITC 65.84)
 2. Average growth rate is yearly rate for 1980 to 1987.
 3. Partial estimates for 1987.
 4. Figures in parentheses are percent composition.
 5. Asterisk(*) indicates inclusion of reexports.

Fig. I-9.3. Trends in Exports of Textile Products in Key Asian Countries



Source: Chemical Fiber Monthly, June 1988.

Fig.I-9-4.Development Stage of Textile Industries (Textile Trade Balance)

(1) Developing Economies of Asia

Total	T	A	1965	1970	1975	1980	1985	1986	1987
Surplus	Surplus	Surplus	India Pakistan China	India Pakistan China Taiwan	India Pakistan China S. Korea Taiwan	India Pakistan China S. Korea Taiwan Thailand	India Pakistan China S. Korea Taiwan Thailand Indonesia	India Pakistan China S. Korea Taiwan Thailand Indonesia	India Pakistan China S. Korea Taiwan Thailand Indonesia
	Deficit	Surplus	Hong Kong S. Korea Taiwan	Hong Kong S. Korea	Hong Kong	Hong Kong Philippines	Hong Kong Philippines Malaysia Sri Lanka	Hong Kong Philippines Malaysia Sri Lanka	Hong Kong Philippines Malaysia Sri Lanka
Deficit	Deficit	Surplus			Thailand Singapore Philippines Malaysia Sri Lanka	Indonesia Singapore Malaysia Sri Lanka	Singapore	Singapore	Singapore
	Deficit	Deficit	Thailand Indonesia Philippine Malaysia Sri Lanka	Thailand Indonesia Philippines Malaysia	Indonesia				

(2) Advanced Industrialized Nations

Total	T	A	1965	1970	1975	1980	1985	1986	1987
Surplus	Surplus	Surplus	Italy Japan	Italy Japan	Italy	Italy	Italy	Italy	Italy
	Surplus	Deficit	U.S. France U.K.	France W. Germany U.K.	U.S. Japan	Japan	Japan	Japan	Japan
	Deficit	Surplus			France				
Deficit	Surplus	Deficit			W. Germany U.K.	W. Germany U.S.	W. Germany U.S.	W. Germany U.S.	W. Germany Japan
	Deficit	Deficit	W. Germany U.S.	U.S.		W. Germany France U.K.	U.S. France U.K.	U.S. France	U.S.

Source: U.N. Trade Annual, trade statistics of each contry

Note: T: textiles, A: apparel

9-2. Requirements for Achievement of Targets

9-2-1. A Breakdown of Reaching Targets

Let us now examine how to break down the 420,000 tons of exports plus the amount of imports into yarn, woven and knitted fabric, and garments.

Table I-9-8 shows the total amount of yarn produced by spinners, imported and exported, that is, the amount of yarn which is consumed as woven fabric and knitted fabric in Thailand. The 94,000 weaving looms and 50,000 knitting machines consume 380,000 tons of yarn. Under the recent temporary lifting of restrictions on equipment, approval for 8,000 weaving looms and 187 knitting machines was given by the MOI and BOI. At the end of the year, increasing number of knitting machines is said to be 5,000. This equals an increase in capacity of roughly 35,000 tons. However, with an additional spinning capacity of between 200,000 to 320,000 tons it will not be possible to process roughly 160,000 tons of this yarn by machine, thus putting pressure on the market price and making an increase in exports necessary.

Let us now take a look at whether it is possible to export this amount of surplus yarn. Table I-9-9 shows restrictions imposed by the United States, Canada, and the EC on textile imports from Thailand. Given the quota imposed by the U.S and controls placed on increases by Canada and the EC there is not much hope for an increase in exports to these countries at the present time.

Table I-9-10 and I-9-11 show Japan's imports of cotton yarn and cotton fabrics. Imports of cotton yarn and blended cotton yarn come from South Korea, Pakistan, and China. As the yarn is comprised of mainly 40'S carded yarn and 20'S carded yarn, it would be possible for Thailand to export its spun yarn to Japan provided that conditions relating to quality and price were met. It would be possible for Thailand to aim at exports of spun yarn to Japan of about 20-30,000 tons out of Japan's total imports of approximately 190,000 tons. However, as is shown in Table I-9-12, a comparison of the Thai market price for yarn and the price of yarn imported into Japan shows that when the additional costs of freight to Japan and import duties, etc are added, Thai yarn is not in a very favorable position with regard to price.

Table I-9-8. Weaving and Knitting Production Capacity and Production

	Yarn input into factories (for weaving and knitting) (tons)			Woven fabric production (1,000 yd2)						Knitted fabric production (1,000 yd2)			
	Cotton yarn	Manmade yarn	Total	Cotton	Manmade	Total	No. of looms	Productivity/unit	Cotton	Manmade	Total	No. of knitting machines	Productivity/unit
1980	95,753	110,893	206,646	758,505	672,320	1,430,225	67,769	21.11	12,040	38,899	50,939	30,008	1.70
1981	100,365	121,213	221,578	788,510	723,250	1,511,760	70,674	21.39	12,494	43,851	56,345	31,711	1.78
1982	106,883	128,459	235,340	851,520	794,112	1,645,632	72,533	22.69	12,760	44,038	56,818	33,137	1.71
1983	111,530	137,179	248,709	885,765	846,604	1,732,369	77,215	22.44	13,559	47,547	61,106	35,377	1.73
1984	117,950	146,391	264,341	936,210	927,927	1,864,137	79,456	23.46	14,332	48,873	63,205	39,222	1.61
1985	124,295	156,501	280,796	984,180	971,454	1,955,634	79,612	24.56	15,310	54,397	69,707	40,767	1.71
1986	137,850	171,070	308,920	1,060,347	1,080,189	2,141,536	79,655	26.89	20,300	58,290	78,590	43,982	1.79
1987	180,943	202,693	383,636	1,360,011	1,232,111	2,692,122	93,684	28.74	29,980	66,038	96,018	50,106	1.92

Source: Thai Textile Manufacturing Association

Expansion permits

Looms

Knitting machines

MOI 5,255 units, BOI 2,708 units, Total 7,963 units (8.5% increase)

" " BOI 187 units (5,000 units at the end of the year)

The increased capacity due to the increase of 8,000 looms and 5,000 knitting machines amounts to 250,000 (1,000 yd2) (converting to 35,000 tons weight), which is not sufficient for the 200,000 tons to 320,000, tons increased capacity of the spinning facilities. Therefore, about 165,000 to 285,000 tons of yarn would have to be exported or 42,000 to 72,000 looms would have to be added.

Table I-9-9. Restrictions of Various Countries on Textiles

Quotas of Bilateral Textile Agreement Between U.S. and Thailand
Group I.

200	(sewing yarn, retail yarn)	875,000 lb	(400 tons)	Total 6,685
300	(guard yarn)	5,618,000 lb	(2,550 tons)	
301 poly	(comber yarn)	5,618,000 lb	(2,550 tons)	
301-0	(other comber yarn)	1,123,600 lb	(510 tons)	
604	Manmade staple fiber)	936,758 lb	(425 tons)	
A	(acrylic yarn) quota	543,994 lb	(250 tons)	
313	(sheeting)	14,008,404 yds		101,409 1,000 yd
314	(poplin broad)	29,369,789 yds		
611	(chemical short woven fabrics)	4,430,195 yds		
226/613~5	(printed woven fabrics)	19,169,063 yds		
315	(printed woven fabrics)	18,388,888 yds		
317/326	(satin)	7,763,049 yds		
219	(dack)	8,059,851 yds		
369-L	(wool)	2,300,000 lb		
669-P	(polypropylene bags)	2,471,920 lb		

- Yearly Growth Rates of Quotas Under Bilateral Agreement With Canada (1987 to 1991)
 Thai textiles 6.0% (8.5%) Parentheses indicate flexibility swing _____
 Apparel 5.2%(7.9)
- Average Growth Rates of Quotas Under Bilateral Agreement With EC and Thailand (1988 to 1989)
 Thai textiles 3.6%, apparel 5.5%

Table I-9-10. State of Import of Cotton Yarn and Cotton Fabric of Japan

	Cotton yarn		Cotton fabric
	1,000 bales	tons	1,000m2
1980	378.4	68,657	2,224,394
1981	408.0	74,028	
1982	609.0	110,497	
1983	552.0	100,155	
1984	887.4	161,010	469,197
1985	966.5	175,362	457,111
1986	8,557.0	155,258	506,188
1987	1,029.6	186,811	559,630

Source for Tables 10, 11, and 12 are materials of Japan Spinners' Association.

Table I-9-11. Key Exports of Cotton Yarn to Japan 1988

(Unit: tons)

	S. Korea	Pakistan	China
Total	23,260	152,537	36,125
40'S card yarn	11,140		14,970
20'S card yarn	816	101,044	12,465

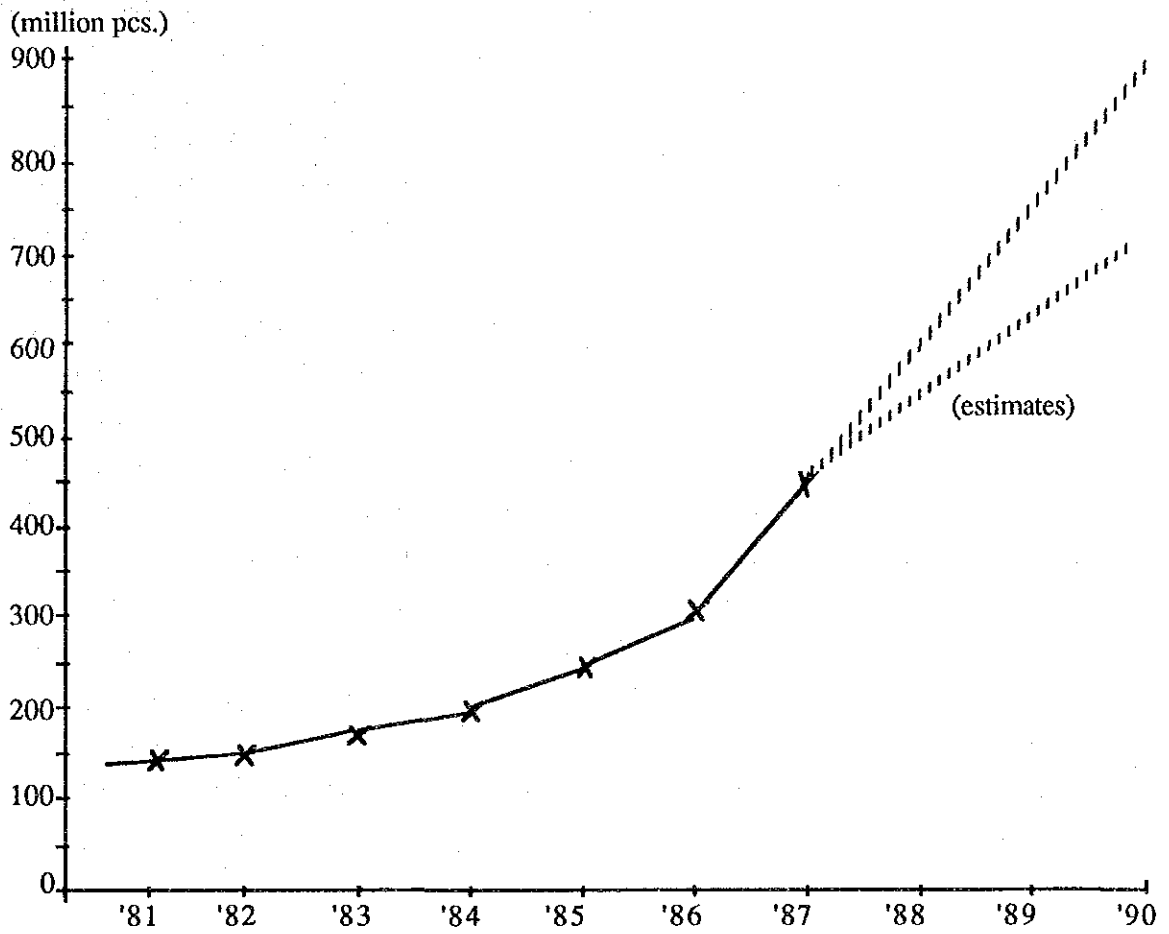
Source: Japan Spinners' Association

Table I-9-12. Price of Cotton Yarn Imported into Japan 1988

Price of yarn imported into Japan	Market price of yarn in Thailand		
	yen/kg	B/10 lb	yen/kg
Cotton 85% or more, 30.7S or less, card yarn	553-606	32s 420-520	460-570
" 47.2S " "	390-436	40's 500-530	550-580
" 25.4S " comber yarn	508	20's 360-430	400-470
Cotton less than 85%, 25.4S or less, card yarn	721-1527		
" 30.7S " "	962-1536		
" 47.2S " "	412-463		
" 30.7S or less, comber yarn	450-486		
Polyester cotton mix spun	403-456		

Thai market prices from News Synopsis September 19, 1988.
Source: Japan Spinners' Association

Fig. I-9-5. Trend for Garment Exports



As shown in Table I-9-6, the increase in the amount of fabric exports has slowed down since 1984. As is the case with cotton yarn, exports to the United States are not promising, thus making it necessary to aim at exporting to Japan and countries in the Middle East which do not impose quotas. Fabric imports once more become a problem here. Fabric imports for 1987 are put at 348.8 million square yards in Table I-9-6, and as has already been said in 4-4 this figure includes 170.0 million yd² of cheap fabrics from China and other countries. Similarly, the 30,000 tons of imported yarn includes 10,000 tons of cotton yarn and 7,500 tons of blended cotton yarn. These imports were brought about as the result of the sudden rise in the price of cotton yarn and cotton fabric on the Thai market which began in 1986. Therefore, it is thought that with the gradual completion of additional spindles and the increase in supply the high price will subside and the level of yarn and fabric imports will revert back to the level prior to 1985. Taking this into account, yarn imports for 1990 as shown in the right column in Table I-9-6 have been put at 10,000 tons, the level prior to 1985, and fabric imports at 180.0 million yd² (20,000 tons). It has been estimated that it will be possible to export 60,000 tons of yarn (a 50% increase over 1987, and 20,000 tons to Japan) and 780.0 million yd² of fabrics (a 30% increase over 1987, aimed at Japan and the Middle East). Given these figures the anticipated level of garment exports can be put at 310,000 tons (670.0 million pieces), or a 45% increase over 1987. The increase in garment exports is shown in Fig. I-9-5.

The above targets are included in Table I-9-13.

Table I-9-13. Export Targets for 1990

(Unit: ton)

	Imports	Exports	Excess of Exports
Yarn	10,000	60,000	50,000
Woven Fabric and Knit	20,000	80,000	60,000
Garments	—	310,000	310,000
Total	30,000	450,000	420,000

This export total of 420,000 tons has been arrived at by subtracting the 180,000 tons of domestically consumed yarn from the 600,000 tons of yarn which is supplied to weaving and knitting factories. Table I-9-14 shows the value of textile exports targeted for 1990. 1987 values are used for the unit price, and the Consumer Price Index for 1990 which is provided in Table I-9-2 has also been used.

Table I-9-14. Value of Targeted Exports for 1990

	1987			1990		
	Volume	Price	Unit Price	Unit price adjusted to CPI	Volume	Price
Yarn	38,074 tons	3,168.3 MB	83.23 B/kg	91.56 B/kg	60,000 tons	5,493.6 MB
Woven Fabric & Knit	591.5 M yd ²	8,459.9 MB	14.30 B/yd ²	15.73 B/yd ²	780 M yd ²	12,269.4 MB
Garments	459,114 1,000 pcs	36,349.4 MB	79.17 B/pcs	87.10 B/pcs	670,000 1,000 pcs	58,355.2 MB
Total		47,977.6 MB				76,118.2 MB

Source: News Synopsis, Sep. 19, '88

Origin: Customs Department

9-2-2. Requisites for Reaching Targets

(1) Raw Materials

On the basis of a yield rate of 95% for spinning, 631,000 tons of raw cotton are required to produce 600,000 tons of yarn. Out of the 417,887 tons of raw cotton supplied to spinners in 1987, 61.5% or 256,853 tons comprised of cotton and 19.6% or 82,000 tons of polyester staple. If the same ratios are applied for 1990, 388,400 tons of cotton and 124,000 tons of polyester staple will be required. Although at the present time production capacity for polyester staple stands at only 70,000 tons, this capacity is expected to increase to 116,400 tons with the completion of expanded equipment by Teijin and Thai Melon. In addition to this, three new companies are engaged in setting up equipment. However, as all of this equipment is not expected to be in operation until 1990 the shortfall of 7,600 tons will have to be imported.

(2) Spinning

Although the details of new equipment are not known, because it will be necessary to export yarn and fabric to Japan, it will, as has already been mentioned, be necessary to modernize equipment, and moreover, to install machinery which can produce the new types of materials (e.g. higher count yarn, 2-ply yarn, fancy yarn, and blended yarn with

wool or linen) required by the garment market. As at the present time requests from the garment market are not adequately transferred to the spinning industry, additional investment and the renewal of equipment will be necessary in the near future.

(3) Weaving

As shown in the right column in Table I-9-3, there will be a 200,000 ton increase in spinning production between 1987 and 1990, thus taking output from 400,000 tons to 600,000 tons. However, as is shown in Table I-9-6, as a result of an increase of yarn exports from 38,000 tons to 60,000 tons and a decrease in imports of yarn from 30,000 tons to 10,000 tons the amount of yarn supplied to weaving and knitting factories will increase by 158,000 tons ($200,000 - (60,000 - 38,000) - (30,000 - 10,000)$). Approval has recently been given for an additional 8,000 weaving looms and 5,000 knitting machines with a fabric production capacity of 250,000,000 yd² (this is comparable to 35,000 tons of yarn). Refer to Table I-9-8, bottom column. Accordingly, there is a shortage of weaving looms to treat with 120,000 tons (158,000 - 35,000 tons of yarn). In other words, 29,000 weaving looms are required.

As has already been mentioned, in order to provide yarn to the garment manufacturing sector in line with the plan for large-scale garment exports, it will be necessary for the government to announce that it will give approval for additional equipment to meet the number of weaving and knitting machines required. Because these additionally approved machines will be used to make fabric for export to Japan and for making high-grade garments which are also exported to Japan, it is necessary to give priority to weaving looms such as air jet looms, and rapier looms which do not cause defects in the fabric. Because these looms have a higher number of revolutions than shuttle looms, fewer will be needed. With the trend towards an increase in cotton knits shirts, a priority should also be given to circular knitting machines. However, as is shown in Table I-9-8, care should be taken in setting the quota for approvals for weaving and knitting machines due to the fact that the productivity of circular knitting machines is $1.92 \times 1,000 \text{ yd}^2/\text{year}$, that is, one-fifteenth that of weaving looms which produce $28.74 \times 1,000 \text{ yd}^2/\text{year}$.

(4) Dyeing Factories

As has been mentioned in this report, commission dyers producing standard items have a reserve of production capacity and are rather cautious in regard to expansion due to the restrictions on increasing weaving looms for producing standard fabric and the shift from the spinning of yarn for weaving over to yarn for circular knitting. Because of these factors, in addition to the suppressed dyeing fees caused by the high market price of

standard woven fabric and increased import tariffs for dye stuff, all of the dyeing companies interviewed for the survey indicated that they are not inclined to expand their equipment. Consequently, the industry will have to prepare itself for a shortfall in dyeing as a result of the substantial increase in spinning and weaving equipment. This will mean that it will be difficult to obtain dyed materials required for the manufacture of garments, and that grey fabric will have to be exported and dyed fabric imported.

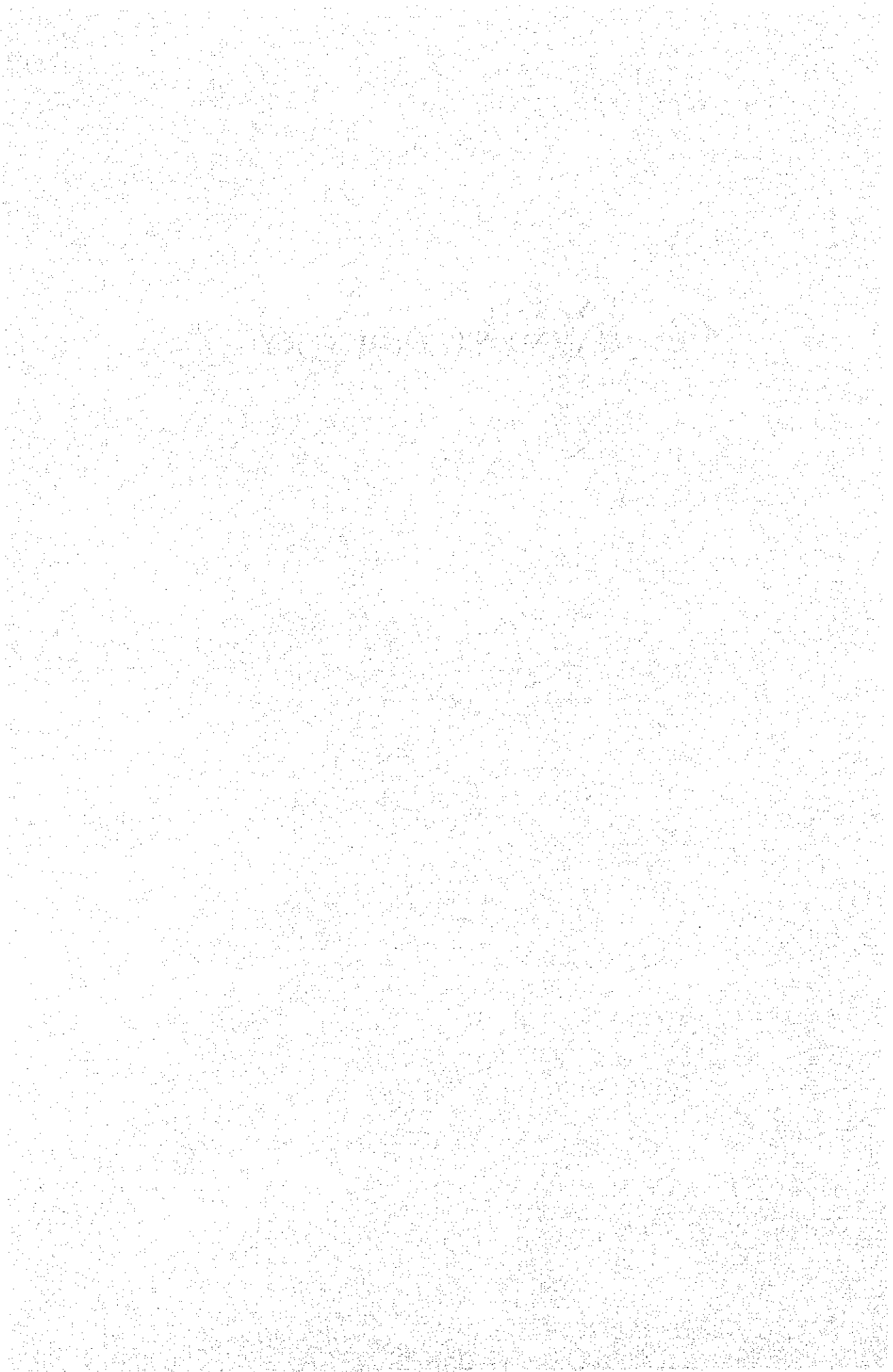
There are many problems facing dyers with regard to increasing their plant and equipment. These include the year or more it takes to receive delivery of dyeing and finishing machines which come from Japan and Europe, controls on the use of well water, and high rates for using water for industrial use. There is some concern that plans for increasing spinning equipment and those for the promotion of exports will be thrown into chaos as a result of this bottleneck in the dyeing sector.

It is necessary for the government to undertake a survey of dyers in order to determine how many dyers are able to increase equipment and how many are not, and also to determine the dyeing capacity required for the smooth flow of fabric to the garment manufacturing sector. In addition, it needs to come up with a plan for establishing an industrial estate which provides facilities for the supply of water for industrial use and the total treatment of waste water. As it will take several years for this to be realized, measures must be taken over the next several years to prevent chaos from occurring in the market as a result of this bottleneck in dyeing.

10. Policies and Regulations

———— This is dealt with collectively, including textiles, in section 9. Policies and Regulations in Part-II. Garment Industry. ————

**PART-II
GARMENT INDUSTRY**



PART-II. GARMENT INDUSTRY

1. Industry Outline

For a long period of time the Thai textile industry was a cottage industry which centered on the hand weaving of cotton and silk. The industry's first step towards modernization came in 1934 when the Thai government established a factory in which it installed 3,232 spindles and 72 weaving looms for the purpose of manufacturing military uniforms for supply to the Royal Thai Army. Then later, in the 1950s the textile industry suddenly rose to power with the establishment of manufacturers such as the Bangkok Weaving Mills Ltd, and the Thai Knitting Factory Co., Ltd, which concentrated on cotton knit and woven cloth. The government at that time did not follow a policy of forming joint ventures with foreign capital as a means of industrialization, and instead promoted policies involving national capital and local capital.

It was not until the early 1960s that the Thai textile industry started to achieve real growth. The Board of Investment was established in 1959 and three years later in 1962 the Industry Investment Promotion Act was enacted in order to promote industrialization with the direct induction of foreign capital playing a leading role. Then, as a result of the substantial increase in import tariffs levied on textile products such as cotton products, there was an inflow of foreign capital into the upstream and midstream sectors and production in these sectors expanded. The Industry Investment Promotion Act of 1962 promoted a flow of foreign capital into Thailand which mainly comprised of Japanese textile capital. A total of as many as 44 projects (21 of which were joint ventures with Japanese capital) started operations between 1960 and 1966 after receiving BOI incentives, and rapid growth was seen in the spinning and weaving of cotton and also in the blended fiber processing sector. This led to the commencement of the production and export of nylon, polyester, and polyester and cotton spinning products. By 1972 the self-supply ratio for cotton yarn, cotton cloth, and for cloth made from manmade fiber was virtually 100%, and the self-supply ratio for synthetic yarn reached 85%.

With the completion of production bases both upstream and midstream, in 1967 the BOI made the export-oriented garment industry a promotion industry, and set out to foster the industry as an export-oriented industry.

In 1967 and 1968 there were 15 instances of companies receiving investment incentives from the BOI. In 1971 Thailand changed its course abruptly when it ceased being an importing country as far as textile trade is concerned, and instead became an exporting nation. Since then garment exports have increased rapidly due to a greater

capacity to supply materials for export garments and government policies aimed at providing assistance (in particular the tax refund system).

However, more and more controls were placed on importing textiles on the world market. These included the 1961-62 STA (Short-term Arrangement Regarding International Trade in Textiles), the LTA from 1962 to 1973, and the MFA (Multi-fiber Arrangement) which also covered blended fiber and wool products.

Before Thailand joined the MFA in 1976, it signed a bilateral agreement with the United States in 1971. According to the agreement, controls on volume were relatively moderate for Thailand compared to other Asian NIES (6% annual increase, with wool products at 1%). It could be said that this guaranteed Thailand's subsequent stable increase in exports.

Nevertheless, while garment exports were increasing Thailand began to face difficulties in supplying the materials for garments and meeting the quality standards which were demanded by overseas markets. Material imports grew rapidly as a result of two main factors: (1) there was a lack of variety in garment materials which could be supplied domestically because domestic supply consisted mainly of standard products; and (2) improvements in technology and quality in the midstream sector, especially in the dyeing and finishing stages, lagged behind.

Coupled with the tax refunds for business taxes and tariffs imposed on imported materials for use in export production, consigned production and processing for exports by overseas buyers took root within the export garment industry. As a result, garment exports grew while the reciprocal linkage connecting the upstream and downstream remained inadequate. Building a base on which to improve quality and engage in product development in order to meet export demand has subsequently become an urgent task requiring attention.

1-1. Position Within Thailand's Manufacturing Industry

By 1984 the manufacturing sector's ratio of Thailand's GDP had surpassed that of the agricultural sector, and in 1987 it accounted for 21.3% of GDP, making it a growth sector in the nation's economy (Table II-1-1).

In 1987 the garment sub-sector (wearing apparel) accounted for 15.5% of the total amount of added value produced by the manufacturing sector. In 1986 it overtook the food processing sector to become the largest sub-sector within the Thai manufacturing sector (Table II-1-2).

Table II-1-1. Gross Domestic Product at Current Factor Cost by Industrial Origin

Industrial origin	(Millions of Baht)											
	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	
Agriculture	99,399	119,093	133,562	152,302	162,404	156,155	184,972	174,431	169,156	184,114	194,321	
Crops	62,759	77,318	86,023	101,218	105,526	99,798	120,730	112,665	104,803	108,262	113,222	
Livestock	10,521	9,961	12,394	15,431	15,768	13,933	18,920	16,809	14,910	19,810	23,282	
Fisheries	7,856	10,340	9,454	8,107	10,609	10,975	12,357	11,332	12,756	15,815	14,529	
Forestry	5,710	7,001	8,914	8,347	9,267	8,312	8,763	8,938	8,733	8,343	9,134	
Agricultural services	3,772	4,480	4,288	5,447	6,681	7,006	6,175	6,791	7,438	7,125	7,207	
Simple agricultural processing products	8,781	9,993	12,489	13,752	14,553	16,131	18,027	17,896	20,516	24,259	26,947	
Mining and quarrying	10,707	14,075	15,183	18,044	18,289	22,371	24,152	30,488	36,509	31,177	35,373	
Manufacturing	63,866	78,935	92,516	111,661	135,493	140,289	154,801	174,506	183,956	201,529	228,377	
Construction	19,296	23,898	26,426	33,783	36,959	40,089	46,319	55,218	55,891	55,603	60,922	
Electricity and water supply	5,177	5,982	6,704	7,627	11,209	15,899	17,088	18,574	23,540	28,636	31,434	
Transportation and communication	22,090	26,982	31,822	37,587	45,415	54,989	60,190	69,134	77,354	85,953	95,717	
Wholesale and retail trade	53,199	64,169	67,495	74,262	100,130	109,323	100,948	97,199	95,374	109,759	125,293	
Banking, insurance and real estate	9,318	11,752	13,809	16,435	16,390	21,369	25,408	30,722	32,324	34,824	39,292	
Ownership of dwellings	16,236	17,617	19,475	22,650	25,722	29,244	33,046	35,505	39,268	42,144	44,983	
Public administration and defence	16,336	19,829	23,484	30,711	33,281	39,697	44,582	45,019	48,545	50,539	53,127	
Services	43,125	52,937	63,889	77,224	88,132	103,203	114,042	126,908	133,565	146,875	163,672	
Gross domestic product at factor cost	358,749	435,269	494,365	582,286	675,424	732,628	805,548	857,704	900,482	971,153	1,072,511	

Source: NESDB

Table II-1-2. Gross Domestic Product at Current Factor Cost by Industrial Sub-Sector

Industrial origin	(Millions of Baht)											
	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	
Food	11,834	13,987	14,294	17,781	29,730	29,035	26,780	34,301	34,732	32,883	32,668	
Beverages	7,009	8,399	10,123	10,401	12,006	14,620	16,084	19,154	21,035	20,978	21,978	
Tobacco	5,295	5,505	6,353	7,448	9,392	9,619	10,481	11,170	11,447	12,134	12,943	
Textiles	9,485	12,036	15,390	17,035	18,997	19,131	19,157	20,807	22,118	27,322	34,701	
Wearing apparel except footwear	7,394	8,712	10,524	14,072	17,463	19,338	22,601	26,917	30,365	35,508	45,599	
Leather, leather products and footwear	1,399	1,724	2,077	2,843	3,389	4,046	5,063	5,387	5,860	7,287	10,113	
Wood and wood products	4,196	3,809	5,671	5,815	4,721	4,634	4,957	5,176	5,168	5,432	7,365	
Furniture and fixtures	1,524	2,288	2,184	2,881	3,141	2,969	3,100	3,496	3,570	3,743	4,739	
Paper and paper products	817	1,102	1,686	2,103	2,439	2,640	2,749	2,897	3,064	3,920	4,277	
Printing, publishing and allied industries	1,066	1,277	1,508	2,229	2,612	2,916	3,276	3,424	3,570	3,498	4,436	
Chemicals and chemical products	2,588	3,254	3,881	4,797	5,608	5,806	6,374	7,245	7,839	8,786	9,869	
Petroleum refineries and petroleum products	4,450	5,680	9,021	11,493	11,615	10,626	12,690	13,590	15,150	25,673	25,407	
Rubber and plastic products	2,464	2,794	3,843	4,191	4,306	4,465	5,471	5,450	5,813	6,014	7,130	
Non-metallic mineral products	3,250	3,681	4,473	5,209	6,938	7,835	8,789	10,498	10,502	10,287	11,578	
Basic metal industries	2,321	2,722	3,528	3,655	3,332	3,004	2,862	2,840	3,709	3,201	3,312	
Fabricated products	2,460	3,105	3,509	3,920	4,533	4,824	5,348	5,839	6,250	6,552	7,371	
Machinery	2,287	2,679	2,978	3,674	5,057	5,807	6,566	6,467	5,602	6,094	6,706	
Electrical machinery and supplies	1,779	2,291	2,869	3,389	3,733	4,434	5,766	6,608	5,938	7,650	9,160	
Transport equipment	7,583	9,473	9,884	11,416	12,997	12,040	15,469	15,769	10,961	11,772	14,928	
Other manufacturing industries	2,231	3,140	3,815	5,579	7,452	8,571	10,761	11,015	11,763	14,859	20,216	
Total value added	81,432	97,658	117,611	139,936	169,461	176,360	194,344	218,050	224,456	253,593	294,496	

Source: NESDB

Whereas at the end of 1980 apparel exports accounted for only 3.7% of total exports, in 1987 garment exports increased by 78% over the previous year and were worth a total of 37.111 billion baht, or 12.4% of the country's exports.

The proportion of textile product exports comprised by garments and textiles (yarn and cloth) reversed in 1981, and in 1987 apparel comprised more than three-quarters of the total export value of textile products.

The number of production workers employed in the garment industry reached 506,000, or one-fourth the number employed by the industrial sector. According to the 1985 industrial census, there were roughly 15,000 garment manufacturing businesses in the whole of Thailand which employed 9 or more workers. Half of the 15,000 employed 19 workers or less. Also, there are approximately 1,850 (1988) factory industries registered with the Ministry of Industry, and more than 90% of these companies are located within the Bangkok metropolitan area.

Four distinctive features of the garment industry are:

- (1) In recent years it has continued to grow as an export industry and it has become the country's largest export industry;
- (2) It has a strong capacity to absorb labor in proportion to the amount of added value;
- (3) Apparel companies situated in the Bangkok metropolitan area are mainly responsible for the production of garments for export;
- (4) There are a great many cottage industries located in and around that area which produce for the domestic market.

1-2. Changes in Exports and Imports

Accounting for 15.5% (1987) of the amount of added value produced by the manufacturing sector, and employing 23.1% of the total number of production workers employed within the manufacturing sector (for 1986 and includes private companies and family labor), and also accounting for 12.4% (1987) of the country's total exports, the Thai garment industry is the country's largest industrial sub-sector.

(1) Changes in Export Value

Table II-1-3 shows the percentage of exports comprised by apparel products since 1980. It also shows that apparel exports have rapidly increased its share of exports. While in 1980 they accounted for as little as 3.7% of total exports, starting that year they expanded at an annual rate of 33.6%, and by 1986 apparel had overtaken rice to become the country's leading export item.

Table II-1-3. Export Performance of Major Products (1980-1987)

Upper row = Value (million baht)

Medium row = Share (%)

Lower row = Change from previous year (%)

	1980	1981	1982	1983	1984	1985	1986	1987
Rice	19,508	26,366	22,510	20,157	25,932	22,524	20,315	22,703
	14.6	17.2	14.1	13.8	14.8	11.6	8.7	7.6
	25.1	35.2	-14.6	-10.5	28.7	-13.1	-9.8	11.8
Rubber	12,351	10,841	9,490	11,787	13,004	13,567	15,116	20,539
	9.7	7.1	5.9	8.0	7.4	7.0	6.5	6.8
	0	-12.2	-12.5	24.2	10.3	4.3	11.4	35.9
Maize	7,299	8,349	8,330	8,486	10,147	7,700	9,261	3,928
	5.5	5.5	5.2	5.8	5.8	4.0	4.0	1.3
	29.3	14.44	-0.2	-1.9	19.6	-24.1	20.3	-57.6
Tapioca products	14,887	16,446	19,752	15,387	16,600	14,969	19,888	20,661
	11.2	10.7	12.4	10.5	9.5	7.7	8.2	6.9
	50.5	10.5	20.1	-22.1	7.9	-9.8	27.5	8.3
Prawns	1,961	2,136	2,764	3,164	2,799	3,439	4,391	5,749
	1.5	1.4	1.7	2.2	1.6	1.8	1.9	1.9
	-17.3	8.9	29.4	14.5	-11.5	22.9	27.7	30.9
Tin	11,347	9,091	7,773	5,265	5,280	5,647	3,096	2,344
	8.5	5.9	4.9	3.6	3.0	2.9	1.3	0.8
	22.6	-19.9	-14.5	-32.3	28.5	7.0	-45.2	-24.3
Sugar	2,975	9,572	12,932	6,338	5,222	6,247	7,271	8,573
	2.2	6.3	8.1	4.3	3.0	3.2	3.1	2.9
	-38.0	221.7	35.1	-51.0	-17.6	19.6	16.4	17.9
Integrated circuits	6,156	6,193	5,930	5,829	7,352	8,248	12,818	15,179
	4.6	4.0	3.7	4.0	4.2	4.3	5.5	5.1
	112	0.6	-4.2	-1.7	26.1	12.2	55.4	18.4
Textile products	9,843	12,570	14,005	14,351	19,155	23,578	31,268	48,555
	7.2	8.2	8.8	9.8	10.9	12.2	13.4	16.2
Textile	4,663	5,391	5,797	5,230	6,528	8,474	10,228	11,445
	3.5	3.5	3.6	3.6	3.7	4.4	4.4	3.8
Apparel*	4,980	7,179	8,208	9,121	12,627	15,104	21,040	37,110
	3.7	4.7	5.1	6.2	7.2	7.8	9.0	12.4
	37.3	44.2	14.3	11.1	38.4	19.6	39.3	76.4
Precious stones	3,240	4,486	4,671	6,214	6,129	6,350	8,150	11,550
	2.4	2.9	2.9	4.2	3.5	3.3	3.5	3.9
	44.0	38.5	4.1	33.0	-1.4	3.6	28.3	41.7
Total	133,197	53,001	159,728	146,472	175,237	193,366	233,383	299,853

*Apparel; CCCN 6002 ~ 6110

Source: Bank of Thailand

(2) Exports By Destination

A look at exports by destination shows that an overwhelming proportion of exports were exported to the United States. However, this high ratio of U.S.-bound exports peaked in 1984, after which it dropped sharply. In its place, the component ratios of exports bound for the Middle East and the EC have expanded (Table II-1-4).

Exports to Saudi Arabia, the U.A.E., and other Middle Eastern countries account for more than one-third of exports to non-quota countries. Exports to Japan, the country with the largest garment market among non-quota countries, comprised 1.1% of exports in 1985. However, this increased to 3.3% of total exports in 1987.

Whereas in 1985 the ratio for garment exports to countries which impose quotas against those which do not impose quotas was 72:28, by 1987 this ratio had altered to 57:43.

(3) Changes in Items

Women's and infant outer garments (CCCN6102: dresses, blouses, coats & jackets) have constantly accounted for more or less 40% of all export items (Table II-1-5).

Following next with sizeable shares are knit and crochet apparel (CCCN6005: sweaters, shirts), men's apparel (CCCN6101: suits, trousers), and knit and crochet undergarments (CCCN6004). Men's undergarments (CCCN6103) and women's and infant undergarments (CCCN6104) account for only a small share of exports. A look at the average rates of increase recorded over the period from 1980 to 1987 shows that men's undergarments (CCCN6103) and brassieres and corsets (CCCN6109) levelled off.

(4) Features Of Export By Item and Destination

The proportion of the value of exports to the United States comprised by women's and infant outer garments has continued to decrease since 1985. In contrast to this, exports of these items to the Middle East and to the EC have sustained high levels. Whereas the proportion of these items exported to Asian NIES and ASEAN countries have been declining, exports to Japan have expanded rapidly over the past 2-3 years.

Knit and crochet outer garments exported to the United States and Europe have accounted for 80% of the total for the past ten years.

Although a large proportion of men's outer garments are exported to the U.S., this share has continued to decrease. Exports to the EC and the Middle East, on the other hand, are stable.

Table II-1-4. Apparel Exports by Destination

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
U.S.A.	1,220,778 (44.8)	1,189,769 (32.4)	1,249,817 (25.1)	1,855,357 (25.8)	2,190,500 (26.7)	3,302,460 (36.2)	5,870,929 (46.5)	6,308,946 (41.8)	4,908,376 (23.3)	7,707,373 (20.8)
Japan	52,065 (1.9)	103,056 (2.8)	107,741 (2.2)	104,420 (1.5)	101,804 (1.2)	81,613 (0.9)	97,445 (0.8)	181,829 (1.2)	418,716 (2.0)	1,310,048 (3.5)
EC	559,597 (20.5)	1,007,959 (27.5)	1,703,563 (34.2)	2,492,296 (34.7)	2,601,055 (31.7)	2,463,307 (27.0)	2,838,655 (22.5)	3,366,849 (22.3)	6,686,810 (31.8)	11,289,804 (30.4)
NIEs & ASEAN	78,527 (2.9)	104,672 (2.9)	142,187 (2.9)	345,189 (4.8)	568,979 (6.9)	580,630 (6.4)	533,352 (4.2)	797,121 (5.3)	1,196,824 (5.7)	2,188,315 (5.9)
Middle East	372,282 (13.7)	530,341 (14.5)	791,690 (15.9)	1,207,541 (16.8)	1,296,802 (15.8)	1,319,962 (14.5)	1,457,288 (11.5)	1,941,744 (12.9)	4,074,613 (19.4)	6,714,533 (18.1)
North Europe	300,637 (11.0)	476,734 (13.0)	522,478 (10.5)	521,147 (7.3)	561,990 (6.8)	509,211 (5.6)	569,871 (4.5)	584,043 (3.9)	869,325 (4.1)	1,258,692 (3.4)
Total	2,725,064	3,666,476	4,980,396	7,179,271	8,208,033	9,121,190	12,627,505	15,103,891	21,040,044	37,111,254

Source: Foreign Trade Statistics of Thailand

Table II-1-5. Export Performance of Apparel Products (1980-1987)

	1980	1981	1982	1983	1984	1985	1986	1987
6002	6,170,050 0.12	8,482,491 0.12	18,714,953 0.23	15,245,828 -18.5	46,061,385 0.36	75,481,400 0.63	54,615,658 0.26	70,690,663 0.19
6003	9,971,151 0.20	7,267,143 0.10	4,156,005 0.05	16,578,789 0.18	38,391,307 0.30	59,593,410 0.39	74,312,023 0.45	147,929,988 0.40
6004	239,539,168 4.81	310,225,619 4.32	403,581,337 4.92	549,464,232 6.02	862,581,977 6.83	1,016,838,412 6.73	1,542,591,982 7.33	2,580,711,016 6.95
6005	799,074,811 16.04	1,233,188,222 17.18	1,207,952,138 14.72	1,317,568,187 14.45	2,135,852,444 16.91	2,846,956,873 18.85	3,927,594,056 18.67	7,398,470,517 19.94
6101	921,718,034 18.51	1,260,609,861 17.56	1,365,843,284 16.64	1,400,252,743 15.35	2,085,508,136 16.52	2,571,253,798 17.02	3,735,212,059 17.75	6,309,102,742 17.00
6102	1,955,943,171 39.27	3,003,106,442 41.83	3,606,269,887 43.94	4,138,433,352 45.37	5,062,261,874 40.09	5,664,524,649 37.50	7,732,717,860 36.75	14,819,291,616 39.93
6103	716,437,867 14.38	897,643,545 12.50	1,104,446,817 13.46	1,056,318,230 11.58	1,625,623,995 12.87	2,174,971,882 14.40	2,682,643,382 12.75	3,971,240,375 10.7
6104	127,932,340 2.57	182,065,121 2.54	217,160,358 2.65	328,086,195 3.60	400,460,291 3.17	328,629,349 2.18	557,144,910 2.65	777,044,896 2.09
6105	1,771,558 0.04	3,191,743 0.04	9,435,602 0.11	7,447,009 0.08	35,137,564 0.28	65,315,426 0.43	131,610,245 0.63	149,003,639 0.40
6106	3,306,518 0.07	5,919,428 0.08	10,210,286 0.12	7,409,109 0.08	10,026,155 0.08	41,381,640 0.27	171,921,416 0.82	276,676,271 0.75
		79.0	72.4	-27.4	35.3	312.7	315.4	60.9

Upper row = Value (million baht)

Medium row = Share (%)

Lower row = Change from previous year (%)

6107	1,865,899	5,276,010	7,680,190	19,160,886	7,554,604	7,998,605	12,943,949	45,959,631
	0.03	0.07	0.09	0.21	0.06	0.05	0.06	0.12
		182.7	45.5	149.4	-60.5	5.8	61.8	255.0
6108	836,419	578,669	1,827,696	1,442,069	478,740	3,099,162	27,672,161	4,982,144
	0.02	0.01	0.02	0.02	0.00	0.02	0.13	0.01
		-30.8	215.8	-21.0	-66.8	547.3	792.8	-81.9
6109	140,338,347	157,628,597	103,656,602	83,340,142	116,091,892	142,021,859	306,767,617	472,284,149
	2.82	2.20	1.26	0.91	0.92	0.94	1.46	1.27
		12.3	-34.2	-19.5	39.2	22.3	116.0	53.9
6110	55,554,470	104,087,625	147,097,759	180,444,344	201,475,306	86,398,025	62,413,225	88,185,699
	1.12	1.45	1.79	1.98	1.60	0.57	0.30	0.24
		87.3	41.3	22.6	11.6	-57.1	-27.7	41.2
Total	4,980,459,803	7,179,270,516	8,208,032,914	9,121,190,915	12,627,505,670	15,104,646,510	21,040,160,543	37,111,573,346
	100	100	100	100	100	100	100	100
		44.1	14.3	11.1	38.4	19.6	39.2	76.3
Grand total	133,197	153,000	157,728	146,472	172,127	274,463	335,994	437,925
(million baht)	3.72	4.69	5.1	6.2	7.3	5.5	6.2	8.4
		14.8	4.3	-8.2	17.5	59.4	22.4	30.3

Source: Customs Office, Dept. of Business Economics, Ministry of Commerce

Remarks: 6002: Gloves and mittens knitted or crocheted

6003: Socks and stockings

6004: Shirts, pantyhose, undergarments

6005: Sweaters, women's, girls' and infants' dresses

6006: Overcoats, suits, trousers, jacket blazers

6102: Dressers, skirts, blouses, sarongs

6103: Men's and boys shirts and undergarments

6104: Women's, girls' and infants' shirts

6105: Handkerchief

6106: Shawls, scarves, veils

6107: Ties, bow ties, cravats

6108: Collars, tuckers, fallas for women's and girls' garments

6109: Brassieres, corsets, corset belts

6110: Gloves, mittens not knitted or crocheted

While the proportion of knit and crochet undergarments exported to the U.S. and Scandinavia are decreasing, exports to the EC are expanding at a stable rate. In 1987 exports of these items to Japan increased more than ten-fold over the level for the previous year.

While the proportion of men's, women's, and infant undergarments exported to the U.S. is fast decreasing, exports of these items to the Middle East are expanding at a significant rate (Fig. II-1-1).

1-3. Industry Structure

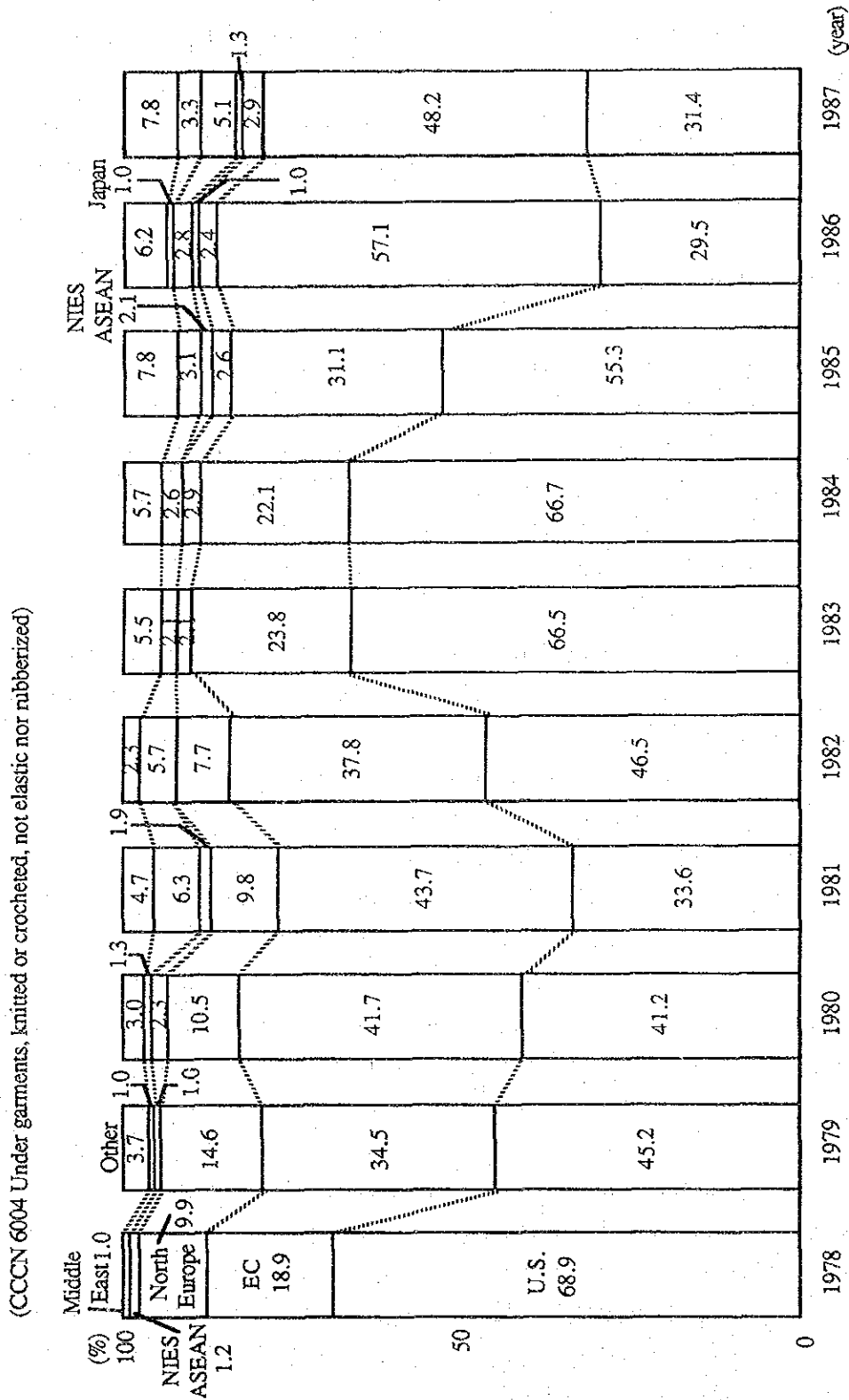
According to related sources, there are approximately 18,000 garment manufacturers throughout Thailand, and most of these are cottage industries which produce for the domestic market. Details are not known about manufacturers which are not registered. As of 1984 some 1,458 manufacturers had registered with the Ministry of Industry (Table II-1-6). Information tells us the figure increased to 1,850 in 1988.

According to criteria used in Thailand for determining company size on the basis of the number of employees (workshop: 1-9 employees, small-scale: 10-49, medium-scale: 50-199, large-scale: more than 200) 82.1% of all manufacturers were either workshops or small-scale. Also, the industry has a dual structure as 38.5% of the total work force are employed by large-scale plants.

As for the number of companies involved in producing exports, it is estimated that there are between 1,100 and 1,400. This estimate has been reached on the basis of two factors: (1) a manufacturer is required to register with the Industrial Works Department of the Ministry of Industry to be eligible to receive an export quota from the Ministry of Commerce; and (2) it is thought that in addition to the 270 companies which are members of the Thai Garment Manufacturers Association (excluding trading companies) the subsidiaries and group companies affiliated to these members brings the total to three times that number. According to a TGMA executive, these member companies and their associated companies account for between 80-85% of Thailand's garment exports.

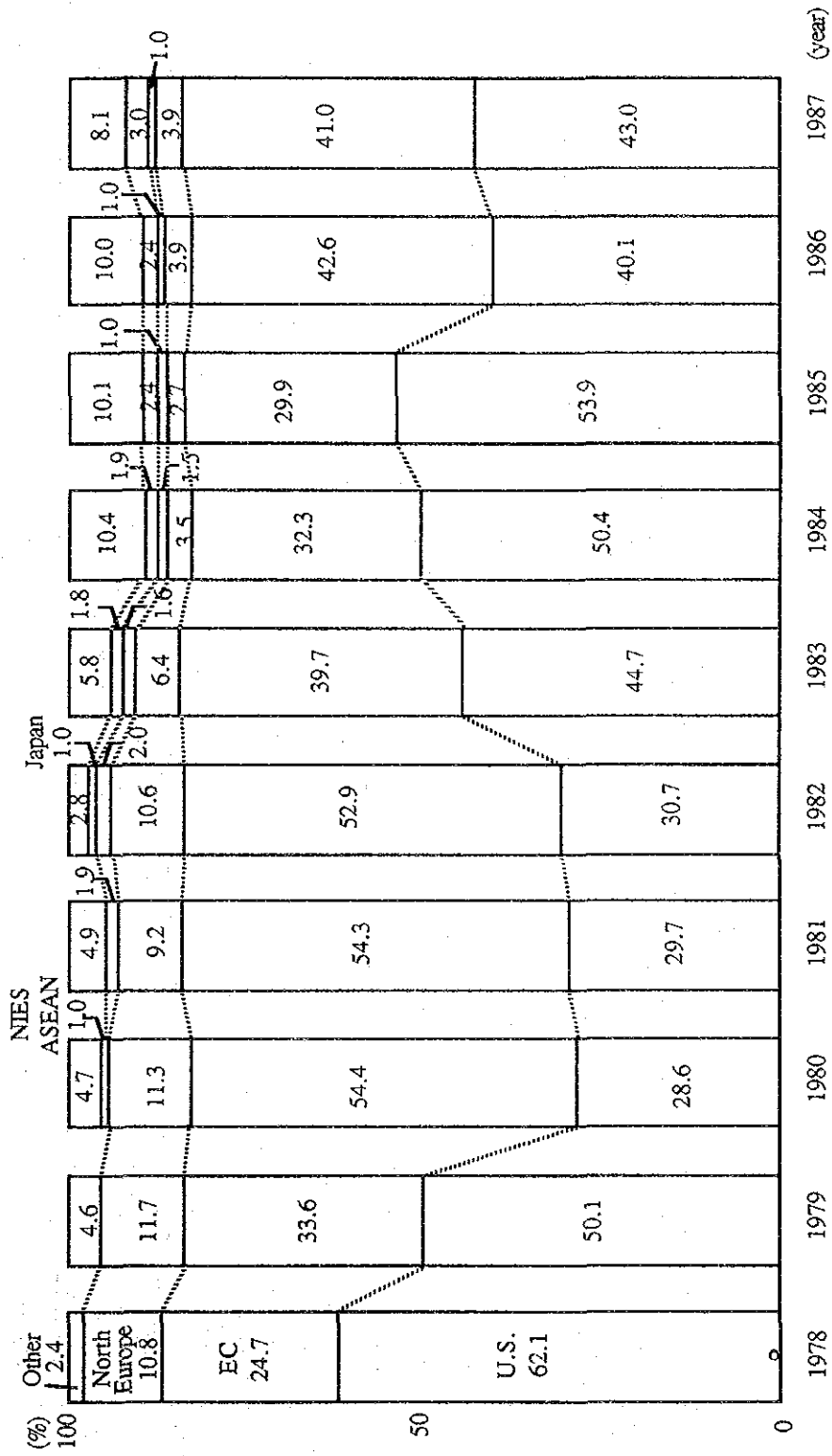
In 1984 the top seven companies exporting garments (excluding trading companies) accounted for 14.6% of total apparel exports. On the basis of a ranking of 20 (includes trading companies) for garment turnover in 1986 given to a Japanese company interviewed as part of the survey (in 1988 it had 1,600 sewing machines and 2,430 workers), and a ranking of 29 for a local company (800 sewing machines, 800-900 workers), it has been estimated that there are about 15 to 16 large-scale companies which have more than 1,000 sewing machines.

Fig. II-1-1. Thai Garment Exports by Destination

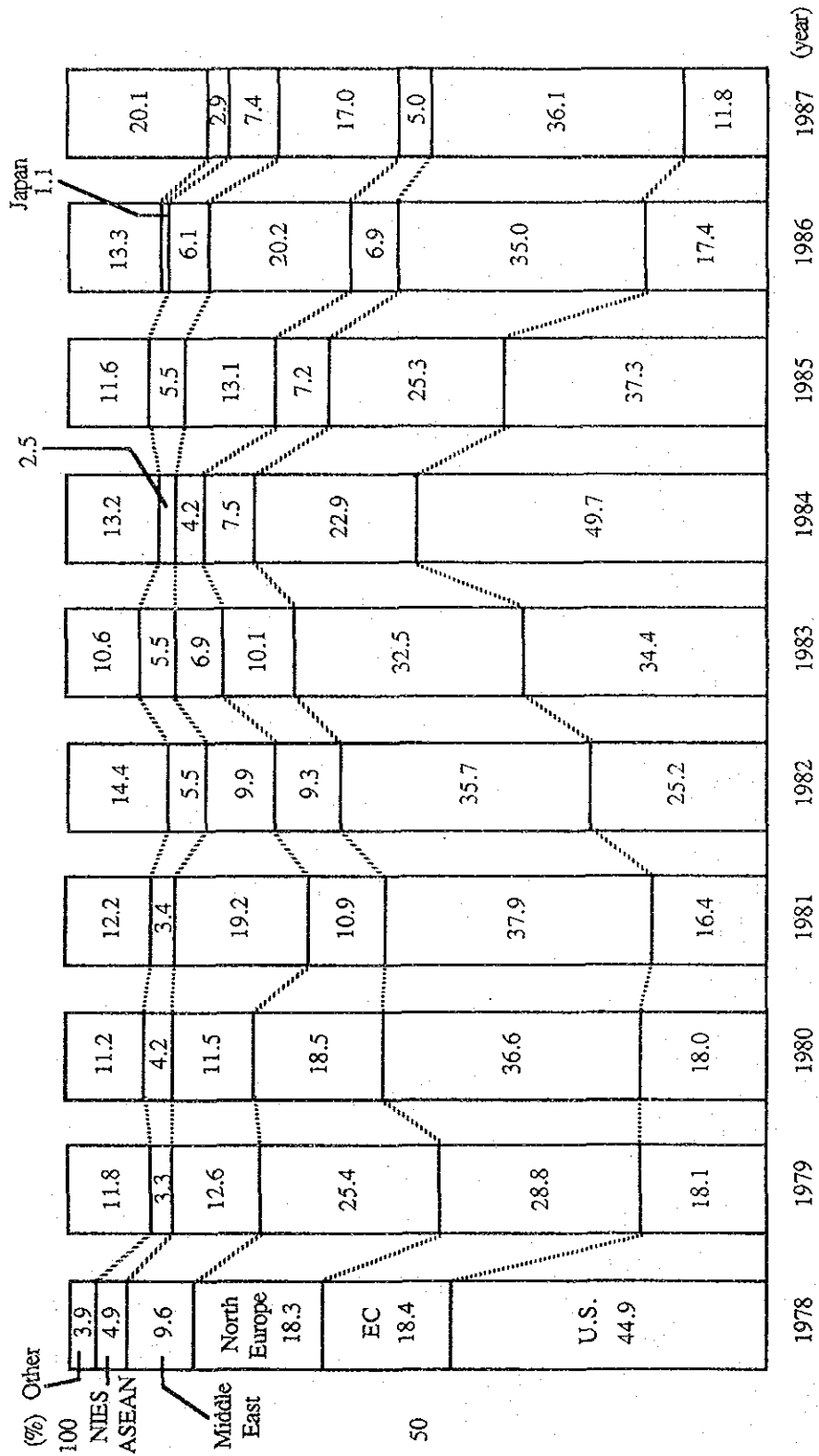


Note: Middle East includes Bahrain, Kuwait, Saudi Arabia and the United Arab Emirates.
 EC includes 12 countries.
 Source: Foreign Trade Statistics of Thailand

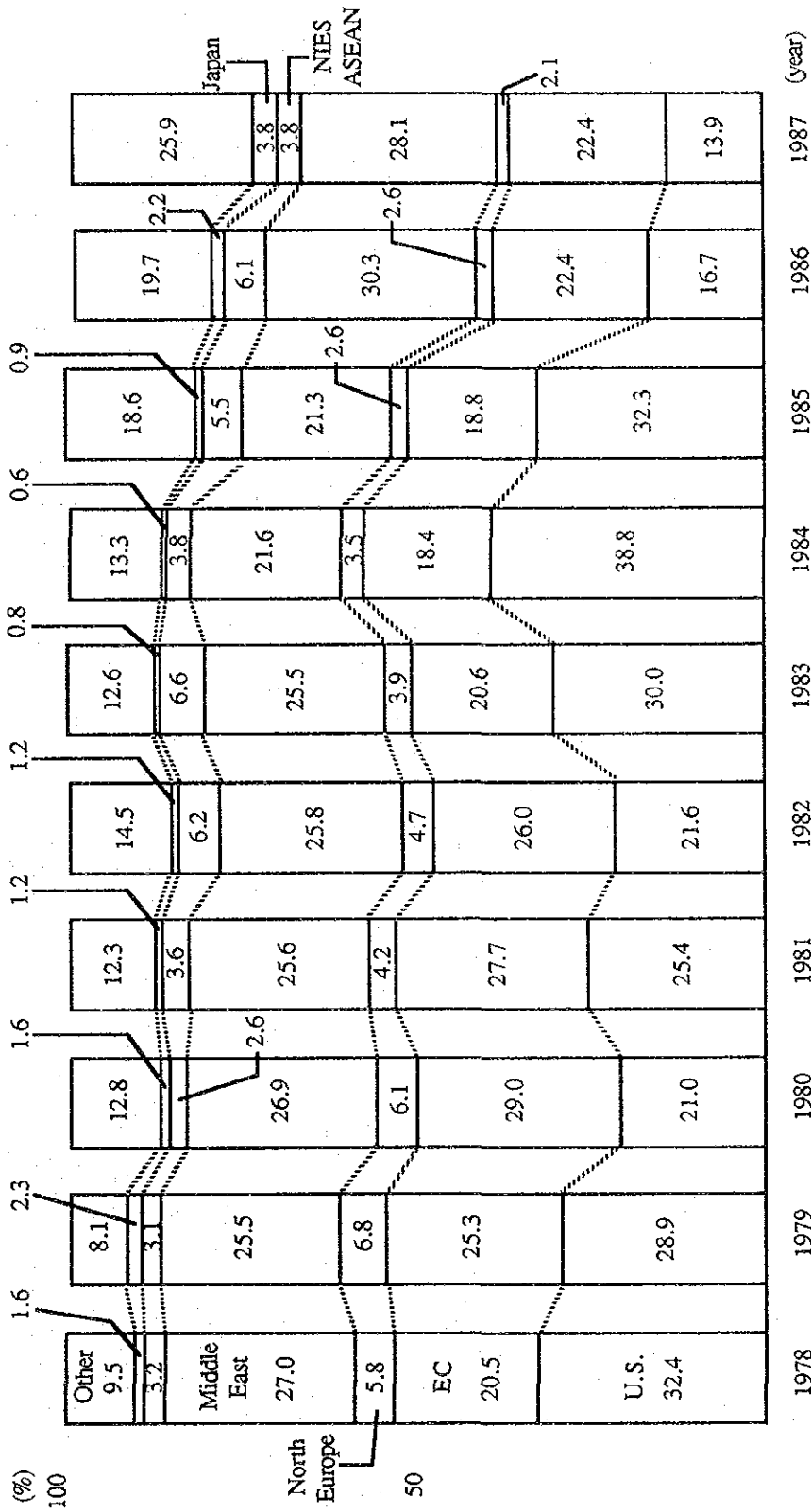
(CCCN 6005 Outer garments and other articles, knitted or croched, not elastic nor rubberised)



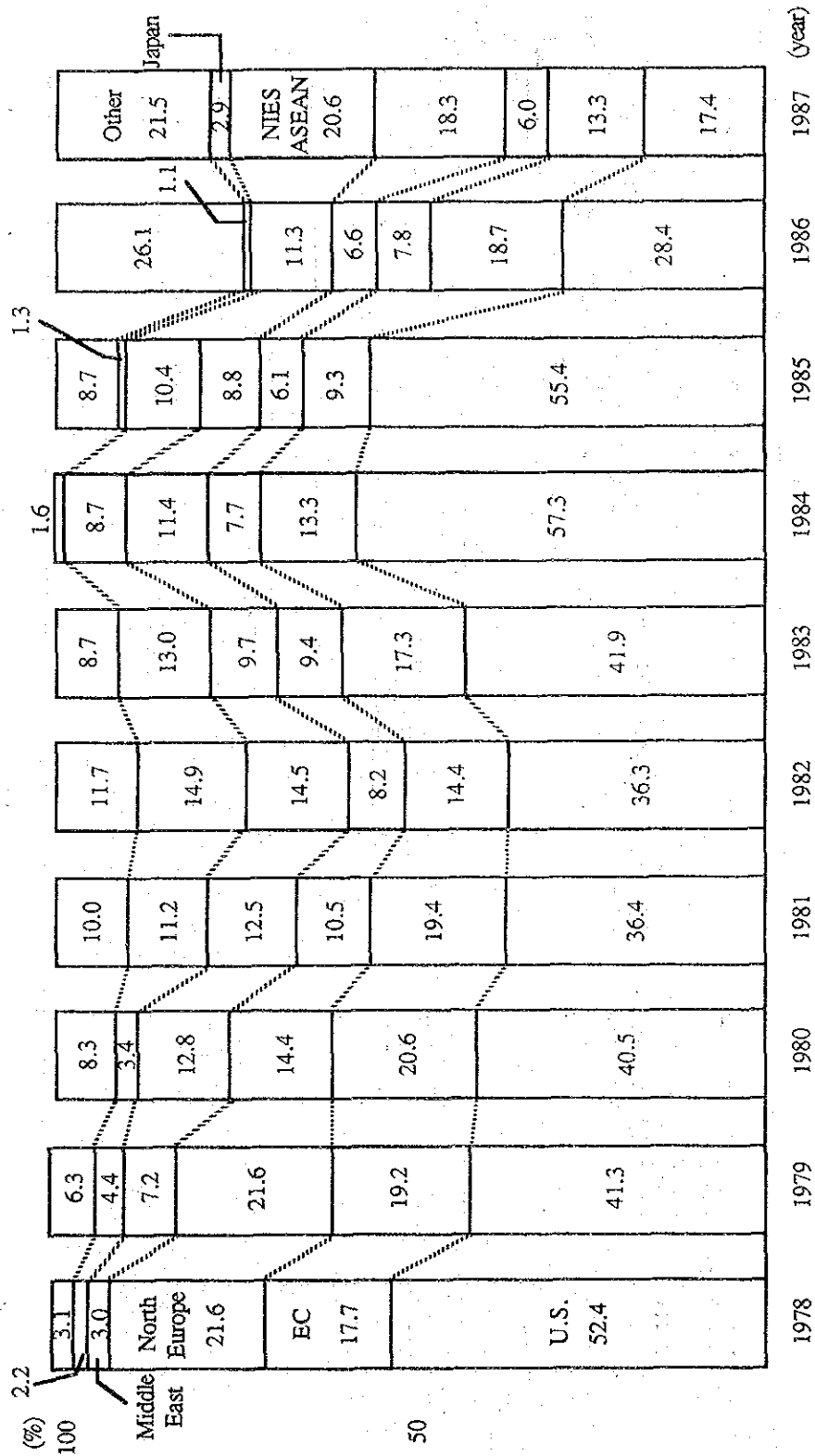
(CCCN 6101 Men's and boys' outer garments)



(CCCN 6102 Women's, girls' and infants' outer garments)



(CCCN 6103 Men's and boys' under garments, including collars, shirt fronts & cuffs)



(CCCN 6104 Women's, girls' & infants' under garments)

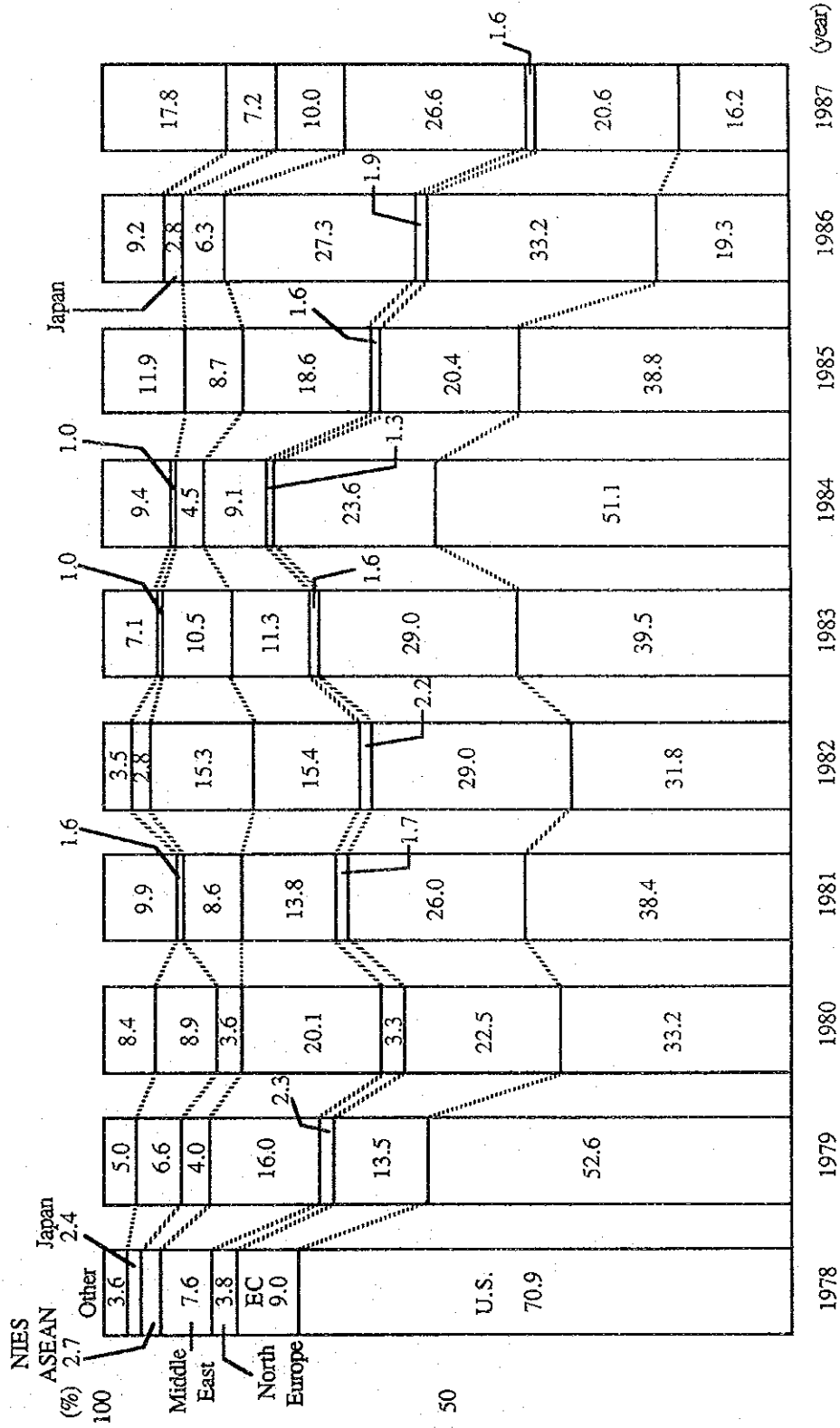


Table II-1-6. Factories Belonging to the Spinning & Weaving, Garment, and Sewing Sector in Thailand (1984)

No. of Employees	Spinning & Weaving			
	No. of Companies	Component Ratio	No. of Employees	Component Ratio
1-19	664	49.0	6,512	4.0
20-49	371	27.4	11,580	7.2
50-199	201	14.8	18,667	11.6
200-299	21	1.5	5,207	3.2
300-	98	7.3	119,565	74.0
TOTAL	1,355	100.0	161,531	100.0

No. of Employees	Garment & Sewing			
	No. of Companies	Component Ratio	No. of Employees	Component Ratio
1-19	709	48.6	15,227	12.1
20-49	489	33.5	29,191	23.0
50-199	205	14.1	33,478	26.4
200-299	23	1.6	9,413	7.4
300-	32	2.2	39,429	31.1
TOTAL	1,458	100.0	126,788	100.0

Note: 70 of the spinning plants and 400 of the weaving plants are main plants.

Source: Ministry of Industry;

1-4. Industry Groups & Government Organizations & Their Activities

The following industry groups belong to the Thai textile industry:

* The Thai Garment Manufacturers Association (TGMA) - established 1973

The association was established for the purpose of promoting the manufacture and export of garments. It is approved under The Trade Association Act.

* The Thai Fashion Association- established 1987

A voluntary organization which was established for the promotion of fashion.

The Thai Garment Manufacturers Association (TGMA) is the largest association involved in the production and export of garments.

(1) TGMA

1) Members

As of the end of 1988 approximately 300 companies belonged to the association. Of this number 40 are trading companies, and the remaining 270 are either manufacturing or export companies.

2) Diagram of organization (Fig. II-1-2)

3) Member qualifications

* Ordinary member

To qualify companies must be corporations and also registered companies. They differ from other type of members in that they have the right to vote at the Annual General Meeting and may join the association's committee. They are also eligible to become committee members.

* Associated member

Garment-related companies which are corporations.

* Honorary member

An individual who has assisted in the running of the association, and who has been approved by the association's committee as a member.

4) Membership fees

* Ordinary member

The standard fee for becoming a member is 3,000 baht. However, annual fees are determined on the basis of the number of machines (or flat knitting machines) a company has in its possession.

less than 100 machines	2,500 b/year
101-1,000	2,500 + 25 b/ for every machine
over a 1,000	

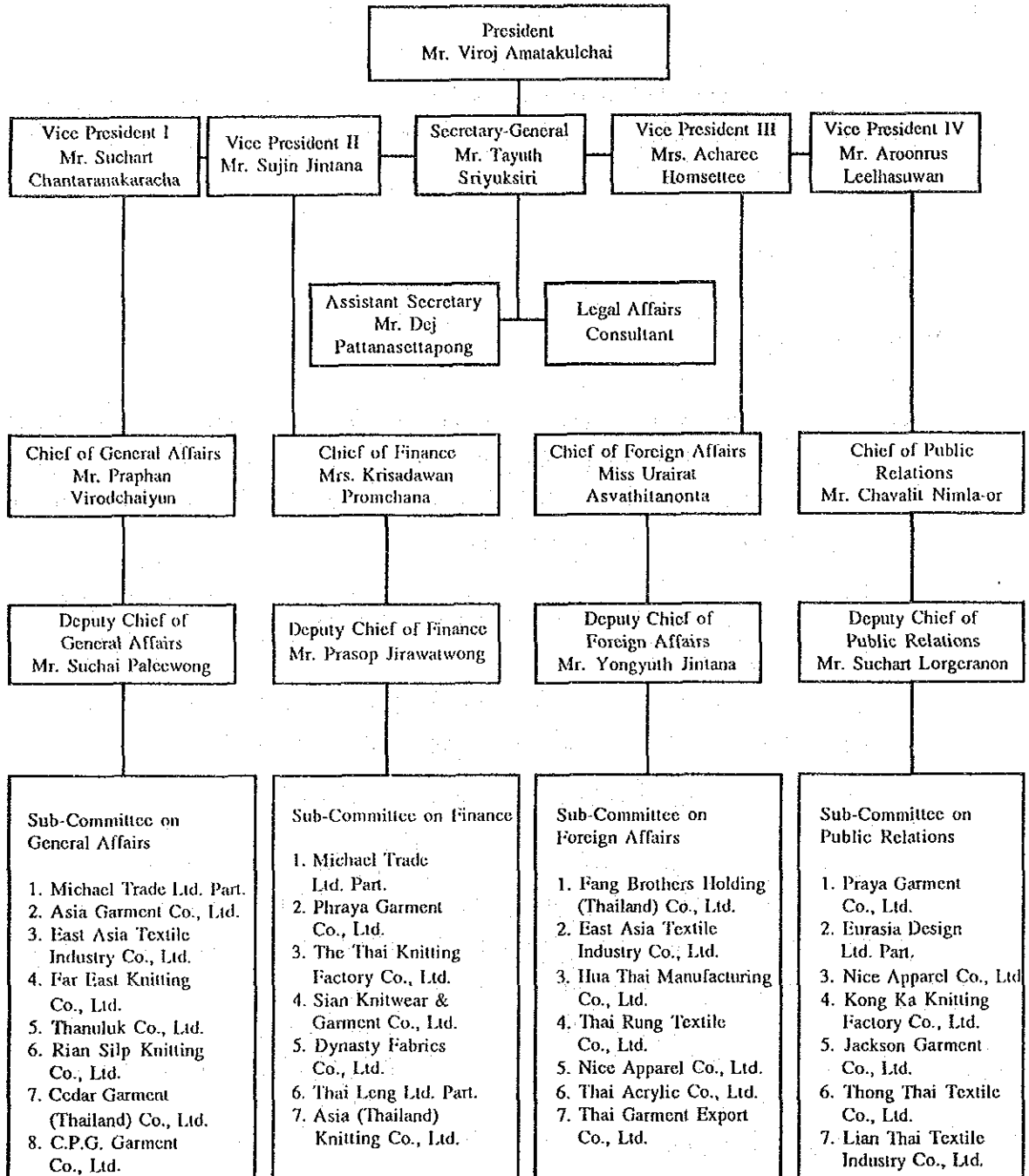
* Associated member

It costs 3,000 baht to become a member. The standard annual fee is 6,000 baht.

* Honorary member

No fees apply

Fig. II-1-2. The Thai Garment Manufacturers Association (TGMA) Organization Chart



5) Committee of the Association

The committee represents the association in overseas negotiations. There are between 5-11 members on the committee, from which a chairman, vice-chairman, secretary, and treasurer (principal and vice) are selected.

In addition to the above outline of the organization of the committee, its activities involve the following: [1] the association holds close discussions with the government in which it makes its opinion known when the government is involved in negotiations with other countries and the MFA; [2] similarly, it gathers the opinions of garment manufacturers and exporters which are not members and holds discussions with the government; [3] it works on improving administration related to textiles as a whole, particularly the problem surrounding duties, and informs the government of the complaints and opinions of its members; and [4] the mutual exchange of information between its members.

In addition to these activities it dispatches lecturers to the Occupational Training Center and helps in preparing its curriculum, provides assistance to product displays, takes part in overseas trade fairs and trade missions, and holds seminars in cooperation with the Department of Export Promotion within the Ministry of Commerce. Also, the association's chairman is a member of the joint government and private "Textile Industry Development Committee (TIDC)" so that he can propose solutions to problems to the government and discuss overall textile policy.

The association's success in exercising influence over policies and in the promotion of the garment industry as a whole is attributed to the fact that the majority of the country's garment exporters belong to the association. According to one influential member, although at the present time there are about 270 members if trading companies are excluded, those 270 members produce roughly 60% of Thailand's garment exports, and this figure becomes as high as between 80-85% of export value if the subsidiary companies and affiliated companies of these members are included.

(2) The Thai Fashion Association

The association was established by Somchai Kaewthong of the Kai Boutique and ten other young designers. To become a member one has to be engaged in work related to design.

(3) TID (Textile Industry Division)

The division is controlled by the Department of Industrial Promotion of the Ministry of Industry and was established in 1972 with UNDP assistance. It is a public organization and the only one in Thailand which is concerned with technology, management training, and testing and inspection related to textiles.

1) Members

The division has 70 full-time members and 70 part-time members, making a total membership of 140.

2) Diagram of organization (Fig. II-1-3)

3) Functions

- * To hold training seminars and provide technical guidance to private companies;

Training consists of production and process management training and technical guidance in machinery and equipment for supervisors and foremen, and training in skills for ordinary workers.

- * Testing & inspection service;

Inspection of textile raw materials and products. At the present time 60% of requests for inspection concern quality inspection required for exporting.

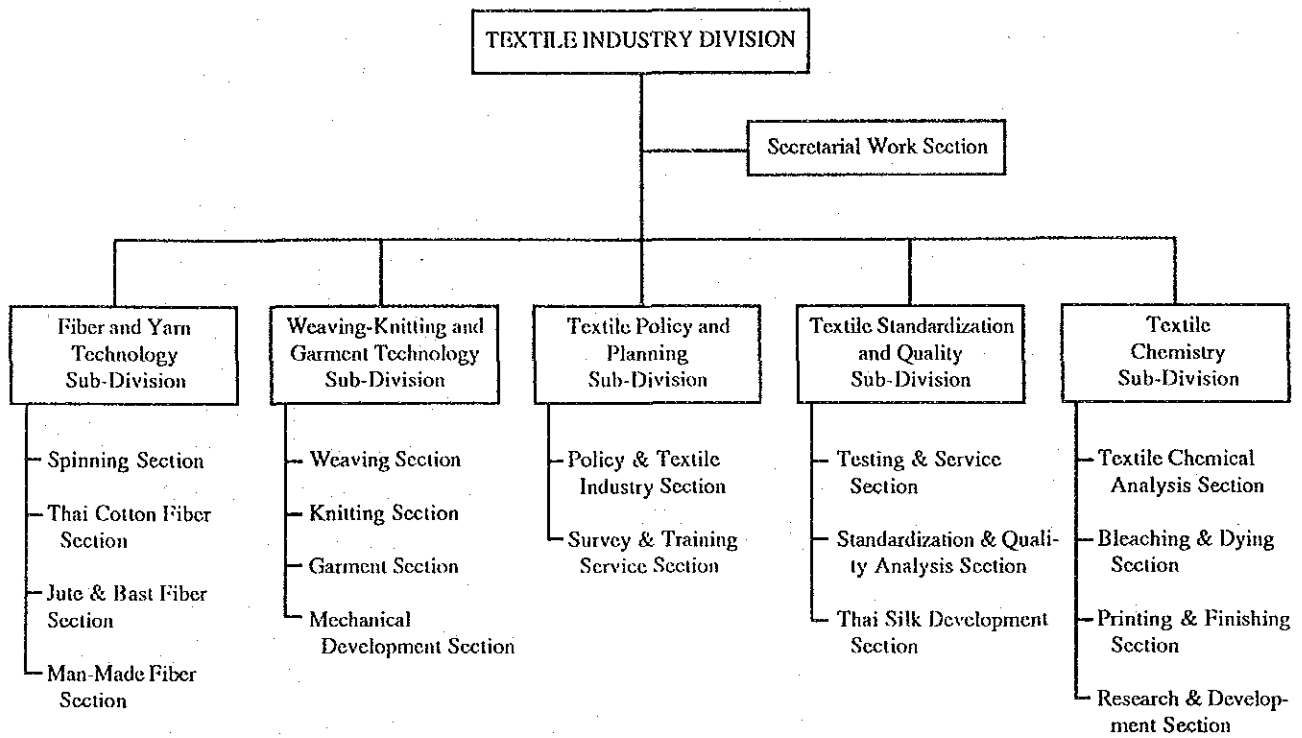
- * Guidance in the design of woven fabric

* Textile material development service and a research and technical information service relating to production technology

* It also functions as the secretariat for the Textile Industry Development Committee's sub-committees.

Because the TID was originally established with the purpose of raising production and technical capacity in the upstream and midstream sectors, it provides relatively little technical guidance to the garment sector in comparison to the amount of guidance it provides on textiles. It has also been suggested that this is because it possesses only two industrial sewing machines. However, a seminar which it held jointly with JETRO several years ago on "How to Use Lining" proved very popular. Detailed training and guidance on each of the various production stages is required in order to raise the added value and quality of garment products.

Fig. II-1-3. Textile Industry Division (T.I.D.)

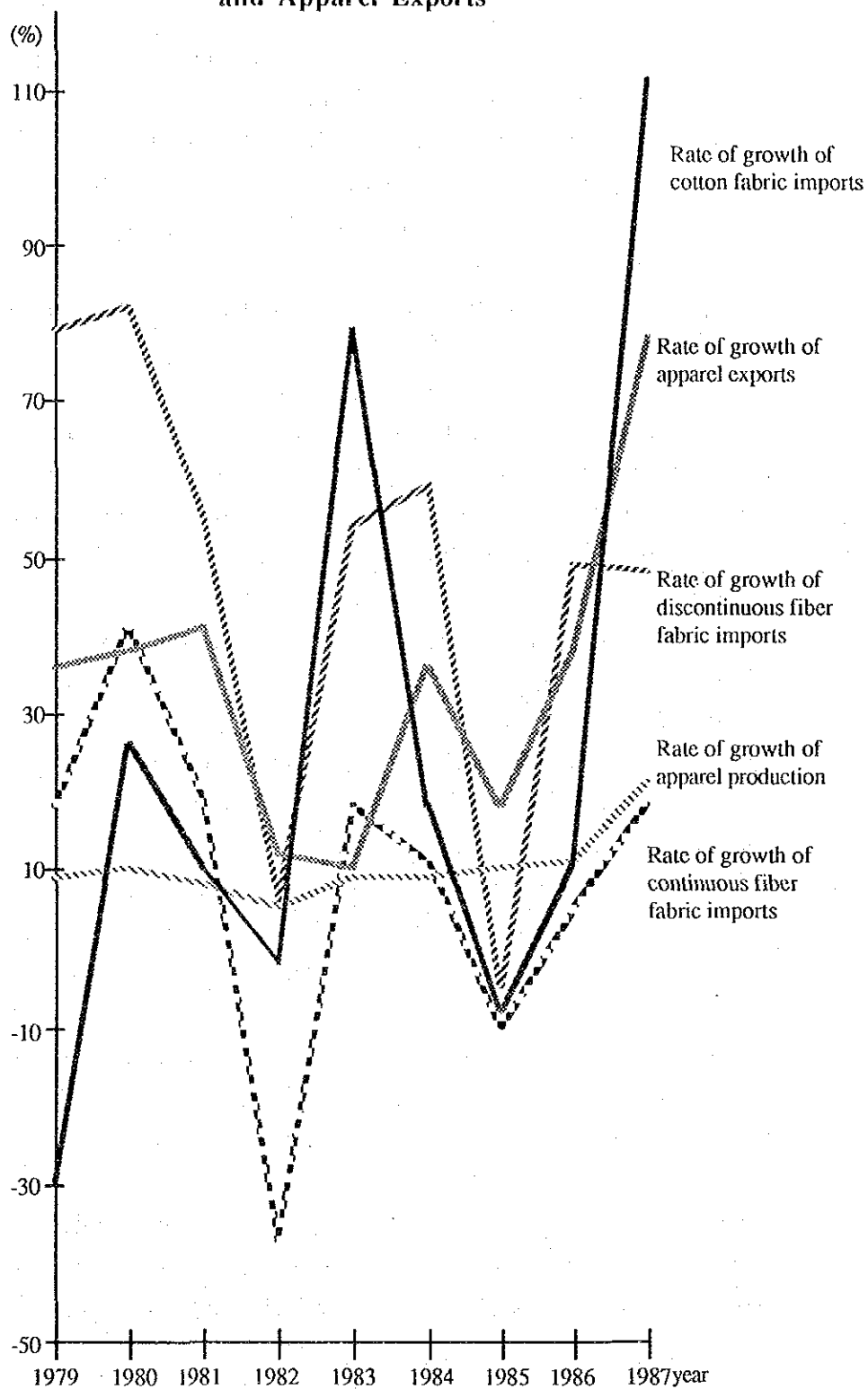


1-5. Problems and Countermeasures

The Thai garment industry has suddenly turned into an export industry as a result of the increase in supply capacity of the upstream sector. However, the expansion of exports has brought with it the following types of problems:

- (1) Fig.II-1-4 below shows the rate of increase over the previous year for apparel exports and for woven fabric imports. It shows that the increase in exports has been met by an increase in the import of cloth, particularly cloth made from long fiber. As has been mentioned earlier, this can be attributed to the limited variety of materials supplied;
- (2) It is thought that, with the exception of Japan, it will be difficult for market diversification brought about by the export quota system to continue at the same speed as it has over the past three to four years. Access to the Japanese market and marketing strategies formed on the basis of the income levels of each different overseas market are required in the future;
- (3) While the exact reasons for the sharp increase in exports in 1986 and 1987 are not clear, it is thought that the main reason is foreign factors, that is the appreciation of the currencies of Thailand's main competitors (Taiwan, South Korea, etc) since September 1985. Accordingly, as the exchange rates of its competitors stabilize improvement of quality and cost reductions will play an increasingly important role in strengthening its international competitiveness;
- (4) The picture that can be pieced together from the interviews held with those concerned with textile companies, is that there are within the Thai garment industry about 15 to 16 companies which possess more than 1,000 sewing machines, 35 to 40 which have from 500 up to 1,000, and more than 900 companies which have less than 500 machines. Latecomers to the industry are concentrated in the medium-size range which have around 500 machines, and they have a high level of interest in new markets like Japan. While medium-scale companies essentially are in the position of being able to meet product quality, small lot production, and short delivery, as represented by Japanese market requirements, in the case of Thailand the only companies with the management resources necessary to achieve this are the large-scale companies.

Fig. II-1-4. Comparison of Rate of Growth of Fabric Imports and Apparel Exports



Source: Foreign Trade Statistics of Thailand (Unit: Bahts)
 Rate of growth of apparel production is based on TGMA statistics. (Unit: pcs.)

2. Production Activities and Technology

When considering the garment industry from the standpoint of manufacture, there are several differences compared with other general manufacturing industries.

The garment industry is one of the oldest industries historically speaking. This is due to the fact that it produces something which is essential, is an industry which can be started by anyone from the minimum unit of a family up to a factory organization with very limited capital investment, is labor intensive in form, and has easily taken the position as of basic industry in countries during their industrialization periods using inexpensive, young female labor.

From the standpoint of the labor force, the ratio of manual labor using sewing machines and other equipment is overwhelmingly high and further the work is delicate, stressing nimble fingers and sharp eyesight. Also, compared with other manufacturing industries, workers can become full-fledged sewers after only a relatively short training period. Due to these factors, the labor force is comprised of primarily young workers, in particular female workers, for whom wages can be kept low. Further, this is an industry in which subcontracting can be easily organized. Therefore, as shown in statistics relating to Japan, given in Table II-2-1, the labor productivity per capita worker is lower compared with other industries.

Regarding facilities, machinery able to handle the minimum unit processes are arranged by the man-to-man method. As clear from Table II-2-1, however, even in Japan where labor-saving facilities are relatively widespread, the capital investment per capita worker in the garment industry can be kept noticeably lower than in other industries.

From the standpoint of siting of production factories, in the industrialization period, the factories are located in the large cities, their environs where young workers can be easily assembled, but the young workers are drained off into later starting industries and along with this the factories begin locating in the rural areas where young workers and small sized subcontractors can be readily found. There is a strong tendency for the factories to be dispersed to the rural regions along with the collapse of the rural industries.

The Thai garment industry, according to 1984 statistics of the Thai Ministry of Industry, encompassed a total of 1458 factories and 126,788 workers, but it is believed that the industry has since far exceeded these levels and is continuing to grow rapidly.

**Table II-2-1. Operational Indicators of Small and Medium Enterprises
in 1987**

(Unit: 1000 yen)

Industry	Annual Value-added Production Per Worker	Capital Equip- ment Value Per Worker
Overall average of manufacturing industries	8,570	1,753
Average of food industry	8,998	1,558
Average of textile industry	6,440	869
Readymade garments (suits etc.)	5,343	347
Women's and children's wear	6,421	701
Work uniforms and school uniforms	10,206	641
Fabric products	5,207	250
Average of lumber and wood product industry	8,848	1,735
Average of furniture and fixture industry	6,236	822
Average of printing and bookbinding industry	8,017	1,954
Average of rubber product manufacturing industry	8,804	1,870
Average of leather product manufacturing industry	13,655	441
Average of nonferrous metal industry	10,475	2,219
Average of casting and forging industry	10,431	2,768

Source: Small and Medium Enterprise Agency

In the current local survey, visits were made to 36 companies and 38 factories among these and an attempt was made to obtain a grasp of the current state of the Thai garment industry, as will be mentioned later. Note that the 38 factories surveyed employed a total, not including the workers of two private companies where such figures were not available, of 31,835 workers. The breakdown of the factories by number of workers was as follows:

1000 workers or more	12 factories (maximum 5000 workers)
500 to 999 workers	9 factories
100 to 499 workers	11 factories
Less than 100 workers	4 factories (minimum nine workers)

2-1. State of Facilities

From the field survey, the documentary survey, etc., the following may be said upon viewing the state of facilities of the Thai garment industry:

- There has been a strong upward trend in the installation of production facilities, mostly sewing machines, since around 1984.
- Thailand basically relies on imports for its facilities, with most of these being old style models from Taiwan, South Korea, and Japan. In particular, there has recently been an increase in imports of used machinery of Taiwan make.
- In this way, there are many companies whose main facilities are comprised of used, old style equipment, and due perhaps to this, there are strong calls in the industry for replacement of facilities.
- While still only partial, the large sized corporations and the factories engaged in the production of high quality garments are taking the lead in introducing computers for drafting, marking, and office work, such as inventory control. There are signs of this spreading in the future.

2-1-1. Nature and Size of Main Facilities

(1) Cutting sector

1) Bolt spreading tables and cutting tables

In general, since this has a direct effect on the yield of the materials, when spreading out bolts, it is best in terms of eliminating waste and rationality to spread them out as widely as possible. Therefore, Japan considers the length of the bolts and uses bolt spreading tables of usually 50 meters' length. The factories visited, however, had tables of 25 meters' length, with many factories using tables of even smaller sizes. It is the exceptional factory which is equipped with 50-meter bolt spreading tables.

A feature of the Thai garment manufacturers is that even companies having subcontractors often perform the cutting themselves. Due perhaps to this, the majority of the companies surveyed were observed as having a sufficient number of cutting tables for the number of their cutting processes. However, no standardization was seen in the idea of cutting space, leaving much room for improvement, including improvement of the space for storage of the bolts before cutting and the cut pieces.

2) Cutting machines

The majority of the companies use rigid blade type standard electric powered cutting machines.

About two factories were observed using small, circular cutters and six companies were using band knives, which are in wide use in Japan, for a total of at least eight companies observed, but the extent to which these have spread is still

low, it may be said. Further, only four companies were observed using notched tooth blade crank presses and only six of those machines were installed.

3) Others

Bolt spreaders, which are normally installed in the cutting sector, are still installed in only limited instances: almost all companies are spreading the bolts manually. During the survey, seven bolt spreaders were counted in two companies and all were manual types. Further, one company was equipped with a texograph or copier for pattern marking and four companies were equipped with a total of eight bolt inspection machines (maximum three in one company) - all small figures. The extent of spread of such related equipment in the cutting sector is thus considered to be still low.

(2) Sewing sector

The mainstay of the sewing sector is of course the sewing machine. According to materials of the Bangkok Japanese Chamber of Commerce and Industry, there are 2,480,229 sewing machines, including cottage industry types, in the country (1985), of which about 7% or about 160,000 are estimated to be industrial sewing machines. Further, about 80,000 industrial sewing machines are installed in the 179 companies registered at the Ministry of Industry. The average number of machines installed per company in this group is 447, indicating a considerable concentration of machines in these firms.

Note that a survey of the Osaka Textile Institute dated January 1989 reported there were over 200,000 industrial sewing machines.

The extent of spread of industrial sewing machines in the companies covered by the current field survey was unknown, but there was found to be 14,133 industrial sewing machines in the 26 sewn garment manufacturing factories for which the numbers of machines was known - an average per factory of 543.6 machines, meaning 1.79 workers per machine. Among these companies were a large corporation with 1600 sewing machines and a company with more sewing machines than workers.

1) General use sewing machines

Most of the general use sewing machines are lock stitch industrial use sewing machines. Almost all processes are performed using these. Among the companies surveyed, there were two or so still using very old types of sewing machines, but almost all factories had sewing machines which might have been old style, but were well cared for and were performing relatively well in use.

Overlock sewing machines used for hem stitching, buttonhole sewing machines, button sewing machines, etc. were also equipped in the factories in numbers balanced with the number of lock stitch sewing machines installed.

Depending on the production items, several of the requisite twin needle sewing machines, double chain stitch sewing machines, and interlock sewing machines were observed in the medium and large sized factories, but it is believed that these have not yet spread that far.

Note that the purchasing price of general use lock stitch sewing machines as learned during the survey was about 18,000 bahts/unit for a new Japanese make.

2) Specialized (automatic) sewing machines

Specialized (automatic) sewing machines mean machines which perform the sewing for several types of processes all at once or can sew changing curves or handle other complicated processes by combination with a cam etc. They show their power in production of special items or in specialized production processes.

An auto pocket welting machine is used by specialized pants' makers for attaching pockets and can perform a dozen or so processes, including cutting, attaching, and hemming, all at once. Further, the finish is extremely neat. The efficiency is reported to be over five times that of a general use machine, but only two factories could be observed to have them in the field survey.

In addition, specialized machines widespread in Japan, such as auto serging machines used for neatly sewing up fabrics with straight lines and curved lines, pattern seamers used for sewing various collars with sharp angles or curves, and long seamers used for beautifully sewing up all at once long fabrics such as in the side seams of pants, were not found in the current survey. In addition, from the comments of related parties talked with during the survey period, it is judged that the specialized machines and automatic machines which spread so rapidly in Japan and other advanced garment producing countries from 1980 on have not made almost any headway in the Thai garment industry.

2-1-2. State of Modernization

Regardless of the size of the export ratio, some of the companies with relatively large numbers of production items showed a tendency toward a division of labor, commissioning out the sewing processes from the start, but the majority of the garment companies basically produced with the assumption of integrated, mass production of single products at their own factories. The prerequisite of this mass production is an

inexpensive, abundant supply of labor. Therefore, the machinery used is for taking over work which can be handled manually and no more than that.

In other words, it will not be until the future that companies employ sophisticated machines and specialized machines in search of rationalization and streamlining of product or advanced function, high performance machines for supplementing the skills of individuals and leveling out differences in skills so as to enable a qualitative conversion of the products.

However, such advanced function, high performance machines display their effectiveness under conditions of a certain degree of specialization in the production items, so in the case of the Thai garment industry, where the tendency is strong at present for single factories to have diverse production items, the prerequisites would be the promotion of specialization to certain items and grades produced and the increase of the operating rates of the equipment.

2-1-3. State of Maintenance and Safety

Insofar as the companies surveyed showed, there was no great difference in the state of maintenance of key facilities in operation compared with Japan and the NIE's. However, a majority of the companies either had insufficient technical knowledge to deal with breakdowns or else could not take timely measures against them or both.

Further, the companies were not at a stage where they could take organizational measures with respect to preventive maintenance of the facilities so as to prevent breakdowns in advance and keep the facilities in the best state. During the factory inspections, idle machines were observed which were left standing without any periodic maintenance.

With the exception of some of the cottage industries, all the factories seemed to have had some form or another of maintenance personnel, but only eight of the companies were clearly judged to have specialized maintenance personnel. The numbers of personnel in seven of these are shown in detail in Table II-2-2.

Table II-2-2. Numbers of Specialized Maintenance Personnel in Total Number of Employees

No. of employees	No. of sewing or knitting machines	No. of specialized maintenance personnel
1,000	600 (s)	5
400	300 (s)	3
500	250 (s)	10
220	180 (s)	3
1,000	800 (k)	8
938	500 (k), of which 250 in operation	10
900	672 (k), of which 70 being introduced	6

Almost all the companies visited without exception complained about the shortages in and difficulties of securing specialized maintenance personnel. Further, frequent complaints were made about the increasing fierce scouting of specialized maintenance personnel.

2-1-4. Others

(1) Space for facilities

Efficiency in garment production may be said to lie in the motion control of the workers and depends largely on the requisite space (area) around the facilities which enables workers and items to move most efficiently.

To improve yields, the cutting tables should advantageously be as long as possible. The width must be 1.8 meters when using a rigid blade type cutting machine. Further, 1.2 meters is required as a passageway.

When providing band knives, an area of about 6.5 m² is required for the machinery and the work space. In addition, about 3.5 m² is required for the storage of materials before cutting and about 6.5 m² is required per person for sorting out the cut items.

The sewing machinery (primarily sewing machines and ironing tables) differ depending on the item being produced, but in general an area of 5 m² or more per machine is required. In the sewing process, recently, increased introduction of high performance, high efficiency machines is expected, so it is important that sufficient leeway be given in space.

Further, the finishing presses require an area of about 10 m² per unit. It is desirable that the place for arranging the products be as large as possible.

Several of the large sized factories surveyed were operating with a sufficient margin of space at both the cutting floors and the sewing floors, but the other majority of factories suffered from an imbalance in the floor space for different production sectors due to expansion etc., so some sectors had facilities installed in unreasonably small spaces. In particular, factories had much too little space around the cutting tables and for sorting the cut items. In each factory, there was a relatively suitable amount of space laid aside around the equipment on the sewing floors, primarily sewing machines and it is judged that more than enough space was secured in all but a handful of small and medium sized companies.

(2) Shipment packaging

Some of the companies were observed to be using belt conveyor systems for sorting and moving out products and thus engaging in neat work, but in general, most factories were quite messy when it came to the state of the final storage and packaging area for the products. Particularly noticeable were the following points:

- Products were directly stacked on the floor for sorting and bagging work.
- Products were moved around without use of conveyors, wagons, or baskets.
- The area for arranging products was too small and the number of hangers was insufficient.
- There were no steel racks or wooden shelves or else there were too few, hindering efforts to arrange the products. Further, the packed boxes were stacked directly on the floor, resulting in the lowermost box becoming wet.
- No factories were observed to be regulating the humidity at the product storage area.

(3) Work environment and facilities

1) Lighting

One of the reasons why young workers are advantageous to the garment industry is their good eyesight. In particular in the sewing process, it is necessary to secure suitable lighting so as to raise the work efficiency and also to protect eyesight. Lighting of 300 lux or more is appropriate for work tables. Overall lighting rather than partial lighting is preferred. Further, it is desirable that the light source be directly above the work tables.

From the viewpoint of lighting, none of the factories relied on partial lighting. Almost all of the factories were observed to secure sufficient lighting

through a clever combination of natural sunlight and overall lighting, but there were many factories in which the work lines and light sources were not necessarily properly aligned.

2) Air-conditioning facilities

Garment products are extremely susceptible to dirt, so it is desirable in the sense of prevention of fouling by sweat and dust to install air-conditioning facilities with a dust collecting ability.

In the survey, several factories were found to prohibit entry onto the work floor with shoes on in the sense of preventing the products from becoming dirty, but despite this a tendency for slow introduction of air-conditioning facilities was observed, primarily among the small and medium sized companies.

3) Others

Garment production is primarily handled by young, female workers and produces highly fashionable products, so to boost the desire of the workers to produce, it is much more important to provide a good working environment than in other industries. In regard to this, the main things given consideration to in Japan are pleasantness, in particular color coordination and noise reduction, on the production floor and in the toilets, cafeterias, resting places, and other secondary facilities. Among the factories surveyed, none of the companies except a female lingerie manufacturer were judged to be giving sufficient consideration to these points.

The garment industry is one in which the will to produce of the workers largely governs the productivity and for this reason alone creation of a pleasant working environment will in the future become an important factor having an indirect effect on cost competitiveness.

2-2. Technical Level and Quality

2-2-1. Fabrication of Samples and Pattern Designs

At the present time, almost all original designs are supplied by the customers, so the main part of the design work consists of maintaining the quality demanded and getting the products effectively on the production lines of the factories so as to minimize costs. In some exceptional cases, customers provided not only detailed written specifications but also patterns themselves and even dispatched production supervisors, it was reported.

Product design, which primarily consists of fabrication of patterns, only naturally has a direct effect on the quality of the products and further largely governs the production

efficiency, determining such basic elements as the yield of the fabric, the absolute number of work hours, the process organization, and the layout of workers and machinery. Therefore, the quality of the product design has a direct effect on the prime costs themselves.

For this reason, the engineers in charge of product design must have a sufficient grasp of sewing techniques, control techniques, and the situation in their own factories. Further, knowledge relating to the machinery, jigs, and tools, the skills of the workers, and motion studies are also important factors. In addition, knowledge about materials necessary for securing the quality demanded, in particular, the stretch and shrinkage error of the surface fabric, reverse fabric, and core fabric, includes elements which cannot be handled by processing technology alone and thus sufficient knowledge must be built up based on experience.

In the current survey, 14 companies were able to give clear figures as to the number of personnel specializing in product design. Among these was a women's lingerie manufacturer with as many as 100 design personnel in its single factory. Four companies responded merely that they had such personnel, and two that they did not. As for the remainder, the situation is not clear, but it may safely be judged that they have no design personnel.

In general, all the companies strongly complained about the overwhelming shortage of engineers for handling pattern making in product design and desired quick countermeasures to be taken. Some of the companies were beginning to place their hopes on new graduates of specialized schools as the source of supply of personnel.

In relation to this, there were strong complaints made on the shortage of cutting chiefs and there were reports of scouting going on among companies.

With regard to the level of design knowhow, there are extremely limited opportunities for learning specialized knowledge in school education, so on-the-job training is relied on almost exclusively. However, due to the lack of instructors having such advanced, specialized knowledge, companies are not sufficiently able to perform such training in practice. The basic data required for design development was also not seen. In actuality, the companies seemed to rely on design magazines from Europe, Japan, etc.

2-2-2. Production

(1) Mode of production

The mode of production of the Thai garment industry, as stated in Chapter 5-2-2, is primarily one of production on order using customer designs. Another feature of this system of production is the greater number of large scale factories compared with Japan and the production by them of vast amounts of diverse products using large numbers of sewing machines and workers.

From this viewpoint, there are few companies specialized, like in Japan, in T-shirts, slacks, men's jackets, women's blouses, etc. The companies take the strong stance of producing anything that is ordered. When there are many production items being handled, as above, it would be desirable to organize the lines in the factories so as to be specialized in individual production items and to rationally dispose the facilities and workers to correctly conform to the production of the products and also to improve productivity and quality by maintaining and upgrading skills. No company was clearly recognized throughout the term of the field survey as organizing specialized production lines with this intent.

The majority of the companies organized their production lines basically using the progressive bundle system. Many of primarily the small and medium sized companies were organizing their lines according to types of machinery. The Thai garment producing companies produce large varieties of items in each factory and despite this the large corporations etc. are engaged in mass production. Only one company was organizing its processes according to the synchronized system, which is spreading in South Korea, Taiwan, and the other NIE's due to its great effect on this form of production.

The reasons why this synchronized flow of work system has not yet spread are that the production lines are not specialized, of course, and also in large part that Thai companies are backward in terms of simplification, specialization, and standardization of work. In particular, the delay in standardization of work has an effect on all matters relating to production and quality.

Further, with the exception of one foreign capital affiliated company which was dispersing and commissioning out all its sewing processes to a large number of companies, even the large corporations have at the most only a handful of subcontractors to which they let out part of their processes. Not much headway has been made in a division of labor in the field of production. This fact shows that garment manufacture in Thailand in principle is characterized by all manufacturing processes being held in the factories.

The features mentioned above are becoming entrenched in Thailand. Leaving aside matters of production efficiency, the international market is moving in the direction of small run production of diverse items and high qualities and class. From the standpoint of measures to deal with this situation, technology intensiveness, and specialization of production methods, there is cause for apprehension over the future.

(2) Number and role of production control and quality control staff

In the Thai garment companies, the complaint heard the most during the term of this survey was the shortage of human resources able to grasp production overall, produce production plans, and reorganize the processes accordingly in an effective manner.

As shown in Table II-2-3, of the 38 factories visited in the field survey, only six factories gave detailed responses as to the number of specialized staff they had for production control. This backs up the above.

Table II-2-3. Number of Production Control Staff in All Employees

No. of employees	Export ratio of products	No. of production control staff
1,600(s)	15%	1 person/team
1,000 (s)	80%	3 persons
750 (s)	100%	3 persons (all foreigners)
700 (s)	100%	1 person
500 (s)	100%	3 persons
750 (k)	100%	15-30 persons/sector

Aside from Table II-2-3, there were multiple responses that production control staff were deployed, but in almost all cases, the managers themselves or foreign supervisors take charge of this.

The garment producing industry differs considerably from other manufacturing industries in that the basis of the production control lies in the method of organization of manufacturing lines for the products and the control of the movement of the workers.

In regard to this, the significance of production control has not sunken in that much, with many of the companies vague as to who had the responsibility over process planning and control of implementation. As reasons for this, mention may be made of such fundamental matters as learned from the interviews as the absence of engineers who have mastered the technology for garment production through all processes from product development to design and the production processes, the absence of engineers capable of

process analysis for each product and motion control based on the same, and the absence of control data for performing production control.

Regarding the quality control staff, as shown in Table II-2-4, 19 of the 38 factories were confirmed as having permanent quality control personnel of some type or another - specialized or double duty.

The quality control personnel shown in Table II-2-4 in most cases are more of inspection personnel by nature and are not engaged in quality control in its pure sense. In general, many companies station such inspectors for each process (line). The percentage of such inspection staff in all the employees of the companies surveyed was about 5%, higher than the approximately 3% of Japan, and reached 12.5% in one medium sized company experiencing rapid growth.

The reason for the large number of inspection personnel is that the companies have not prepared work standards for their workers or quality specifications or standards regarding the demanded quality and that in almost all cases the check of the products is not performed by the workers, but is left to the judgement of the line foremen or specialized inspectors.

In general, the inspection personnel go about their inspections while directly involved with the production, but there were at least six companies counted which stationed specialized inspectors.

Table II-2-4. Number of Quality Control Staff in Employees

No. of employees	Export ratio of products	No. of quality control staff
5,000 (s)	95 ~ 98%	12%
2,430 (s)	100%	5%
1,900 (s)	100%	20
1,700 (S)	100%	154 (of which, 14 specialized)
1,200 (s)	30%	15
1,020 (s)	100%	34 (of which, 4 specialized)
1,000 (s)	71%	1 in 30
1,000 (s)	80%	17
700 (S)	100%	45
500 (s)	100%	1
400 (s)	85%	50
400 (s)	100%	18 ~20
250 (s)	100%	10
220 (s)	100%	7 (of which, 3 specialized in outside orders)
200 (s)	80%	10
120 (s)	100%	1/line
1,000 (k)	100%	50
900 (k)	100%	35
260(k)	100%	1/line

(3) Production process

1) Features of process organization

When producing garment to meet certain quality demands, several sewing methods and orders of processes are conceivable. Which means are selected and what order is followed have a large impact on the process organization and layout, govern the operating rates of the workers and facilities, and in the final analysis affect the productivity (product cost).

To deal with this, it is necessary that the work and the order of work be made as simple, specialized, and standardized as possible for each process set and it is desirable that they be synchronized.

This of course is conditional on the arrangements for matters assumed in process planning, such as schedule changes and breakdowns of facilities, and the setting in advance of various methods for dealing with the same.

Further, in a case as has occurred recently where market needs become diversified and the mode of production shifts toward small run production of diverse items, flexibility must be given to such conditions.

The process organization of the Thai garment producing factories, as judged from the survey, generally uses the process-wise layout and depends on the progressive bundle system, as mentioned earlier. This method of production is usually suited to mass production of limited items where the assumption is continuous production. However, some of the companies surveyed were shifting to the synchronized system method.

In the majority of the factories of the companies surveyed, however, the following matters were observed inhibiting any improvement in productivity due to use of these methods:

- The cutting process and the sewing process are too far apart in distance or else are mixed together.
- The manual work and machine work are mixed together.
- The lines are organized against the order of processes or else criss-crossed.
- The channels of movement of products, semifinished products, and workers are too long and the loads on the channels are too great.
- The places where the jigs, tools, and yarn are kept are too far from the work positions, so the workers have to stand up or else have to move too far.
- There is insufficient space for placing parts or semifinished pieces, which hinders work efficiency.

- The flow of parts (fabric) around the workers is diverse and the principle of picking up pieces from the left and pushing them off from the front is not being observed.
- The state of progress of work on each line cannot be immediately judged visually.
- The means of conveying parts and semifinished goods are not suited for the speed of progress of the work.

These matters were observed in all factories irregardless of the factory size or capital affiliations, but there was a tendency for less problems such as these in factories receiving guidance from capable foreign engineers.

These problems in the garment industry have to be resolved in that the industry depends on productivity as a major factor of competitiveness and have a bearing on the operating rate of all the equipment and the work efficiency of the workers. In other words, these problems have to be eliminated in order to achieve a smooth flow of fabric and rhythmical work.

To resolve these problems, knowledge and practical experience in process analysis in accordance with production items, motion studies, planning of equipment, etc. are essential, but today's Thai garment producing industry has few production planning engineers well versed in labor intensive mass production. This is a fundamental problem.

2) Motion control of workers

Due to the national characteristics of Thailand, the Thai workers are, overall, hard working. Insofar as the factory inspections showed, the work motions of the workers are excellent. In particular, young female workers are diligent and careful in processing their work.

However, nowhere was the structure of work, which differs with each item produced, correctly analyzed and set up. The basic motions based on motion control were not correctly set or followed through. In particular, there remains considerable room for basic study of the distance of motion, method of gripping materials, method of folding and straightening out materials, the operating state and idling position of sewing machines and irons, the method of cutting yarn, the method of putting together lots, etc.

Further, these elements of motion control are always set based on the relationship with motion time, but as mentioned earlier since there are no standards for basic process control, there is much wasteful motion and too much work and the motion time is very unstable.

3) Work efficiency

Work efficiency, only naturally, differs depending on the production item. Further, even with the same item and same specifications, there are differences depending on the production facilities, production method, skill of the workers, etc. and differences depending on the factory.

The work efficiency of the Thai garment industry was estimated by comparing the amount of production of the factories covered by the field survey and the standard amount of production in Japan for basic product specifications, thus giving a comparison with Japanese productivity. Table II-2-5 shows the results.

Table II-2-5. Estimates of Thai Garment Productivity Compared with Japan

Item	Productivity compared with Japan (%)	Production per capita direct worker in Japan (pc/day)
Dress shirts	30 ~ 50	24.5 ~ 28.4
Knit shirts	50 ~ 75	20.0 ~ 22.5
Jackets	approx. 30	12.3 ~ 14.2
Blouses	approx. 60	24.5 ~ 28.4
One-piece dresses	approx. 30	6.9 ~ 7.9
Polo shirts	25 ~ 35	33.8 ~ 38.6
Children's wear	approx. 30	22.5 ~ 27.0
Long pants	approx. 80	108.0 ~ 129.0
Bluejeans	approx. 75	23.5 ~ 27.0
Cardigans	25 ~ 50	24.5 ~ 28.1

Source: "Production per capita direct worker in Japan" taken from "Sewing Machine Handbook", edited by Sewing Efficiency Institute.

Looking at another analysis of the efficiency of garment production in Thailand, a Japanese engineer in a major Japan-Thai joint venture who studied the Thai garment industry for many years analysed the efficiency in the case of production of "basic specification men's dress shirts" to be as follows:

	Rate of automation (%)	Production (pc/man-day)
Japan	50	54.0
South Korea	20	37.0
Thailand - Factory of engineer	0	21.8
Thailand - Other factories	0	15 ~ 16
Japan - Assuming 0% rate of automation		approx. 32

The amount of production analyzed by the engineer is remarkably higher than that in Table II-2-5, but this is because the analysis was made on superior companies of Thailand and Japan having equal competitiveness with his factory. Even among the superior companies, the productivity of Thailand compared with Japan would be close to the rates shown in Table II-2-5.

The low productivity is due in large part to the low operating rate of modernized facilities, but is more due to the undeveloped management system for promoting the preparation of basic materials such as time and motion studies on production, a prerequisite for modernization of facilities, and action on the same.

To maintain and raise market competitiveness through inexpensive labor, it is essential to positively promote studies on such work and strengthen the management system. The improvement of productivity and the start of production of complicated items involving large numbers of parts and many processes, in which the ratio of labor costs is high in other countries, are essential as strategies for the future.

By way of reference, Table II-2-6 shows the ratio of labor costs and the standard number of processes in garment products in Japan.

Table II-2-6. Ratio of Labor Costs in Total Prime Costs and Standard Number of Processes in Japan

	Ratio of labor costs (note 1) (%)	Standard no. of processes (note 2) (Processes)
Menswear, coats, and other men's outerwear and general readymade clothing	42.8	129 ~ 200
Work, sports, and health outerwear and school uniforms	39.8	70 ~ 119
Women's and children's outerwear	36.0	71 ~ 112
Dress shirts, undershirts, and other outerwear and underwear	29.3	52 ~ 59
Sweaters, sports shirts, and other knits	29.0	15 ~ 41

Note: 1. Taken from "Fiscal 1987 Indices of Prime Costs of Small and Medium Enterprises", edited by Small and Medium Enterprise Agency

2. Taken from "Sewing Machine Handbook", edited by Sewing Efficiency Institute

4) Use of attachments

Attachments are jigs and tools used attached to the sewing machines and primarily are used for the following purposes:

- Enabling even unskilled workers to place work on sewing machines accurately
- Enabling difficult processes to be handled accurately and easily
- Enabling several processes to be handled at one time

Attachments are relatively simple in construction but help secure and improve work efficiency and sewing quality. Numerous types have been developed and put into use in Japan. Insofar as the inspection of Thai garment producing factories showed, these attachments are only rarely seen, except where initially provided with the sewing machines. The number of factories seemingly studying them was also very limited. It is judged that attachments are not yet being used on an organization-wide basis.

The attachments themselves are relatively low in price and in the future it would be desirable that attachments from Japan be introduced and their use promoted. Note that when selecting sewing machines, there are machines where

attachments can be easily attached and those where attachment is difficult. Full study should be made on the purposes of attachments and care given to this point.

5) Control of delivery

Judging from the field survey, there were very few companies, irregardless of the size of the factories, with sections specializing in control of delivery and shipment. Most were controlling the same based on the judgement of individual staff members in charge of delivery, shipment, and packaging or else based on daily discussions between the staff in charge and the staff for process control.

These methods are not of themselves of particular concern, but nowhere was there observed anyone engaging in control of delivery on an organizational basis using long term projections, i.e., coordinating production plans with a continuous, overall grasp of the number of lots ordered, the state of procurement of materials, the seasonal changes in the number of workers, the state of outside orders, etc.

In particular, regarding garment products, which are seasonal and fashion items, it is important to record when each item was delivered with respect to the delivery commitment and the amount of the item delivered and to reflect based statistically into the production plans the overall average and data to suppress fluctuations. It is necessary to repeat this and build a system for establishing monthly targets and making improvements.

In regard to this, the trend in products is toward small run production of diverse items and the markets are moving in the direction of customers delaying their decisions on specifications as much as possible. At the present time, therefore, garment production is considered one of the industrial fields in which the necessity for modern statistically-based delivery control techniques is rising.

Regarding the reasons for delayed deliveries, there was absolutely no mention of internally caused problems. Mainly, the following external factors were mentioned:

- The delays caused by import procedures for materials, the companies relying on imports for much of the material used.
- The delays caused by dyeing processes due to the dyeing businesses overload of orders
- The prolonged shipping periods caused by the deteriorating port situation

All of these pose problems to the export garment industry, which handles seasonal products. In particular, the prolongation and uncertainty of the shipping periods may be said to be critical.

(4) Product quality

1) Features of quality control

Quality control in the Thai garment industry, as mentioned previously, is more of inspection by nature, with large numbers of personnel engaged in the inspection. This is judged to be due to the facts that most companies have not established compulsory, minimum work standards for each type of work and that production is being performed by the work methods of the individual workers. In other words, inherent work standards which workers should be well acquainted with have not made their way to all the workers. The workers perform their tasks according to their own sense or discretion and the differences in the same result in variations in work quality. The companies attempt to keep these within a fixed range through inspection, so fine themselves with more than a necessary increase in the number of inspection personnel.

In regard to this, it would be desirable for companies to move in the direction of thoroughly training the workers in work standards for each type of product to be strictly observed in the cutting, sewing, and finishing processes and reducing the number of inspection personnel. The majority of the inspectional personnel should be diverted to inspections of different, irregular portions of same items arising due to the specifications demanded by customers. The trend in the export garment market is toward a change from mass consumption of basic items to fashion items with short life cycles and smaller lot sizes and such a system is essential for dealing with this.

Another feature of the inspections was the small number of factories which were inspecting received shipments of purchased materials, primarily fabric and yarn, or inspecting bolts before processing. In other words, the techniques and habits for checking materials from suppliers before use are undeveloped. Uneven weaves, uneven dyeing, fouling by the chemicals used, oil, etc. may not be considered a problem on the domestic market, but are major problems in exports.

As mentioned earlier, quality control in the Thai garment industry primarily consists of inspections. Inspections, however, are not part of quality control. Quality control in its true sense means overall control which guides production keeping in mind at all times how inexpensively and efficiently products of a quality meeting the specifications, irregardless of the ease or difficulty of the product specifications, can be produced.

The items which are controlled include, as in other manufacturing industries, productivity, fastness, durability, handling, safety to the human body,

and other basic matters plus, in the case of the garment industry, as factors meeting the sense and desires of the consumer, beauty, lightness, suppleness, and other factors which can change any which way upon personal judgement. At the present time, neither of these have permeated the Thai industry as a standardized system. In the future, the former physical conditions will have to be standardized, along with confirmation methods, by a public organization or industrial organization so as to come up to the standards of the international market. Further, it would be desirable for the latter to be standardized within each company according to their own characteristics and to be renewed at timely periods in accordance with market trends.

At the same time, it will be of course necessary for companies to organize so as to educate the workers in quality based on team activities, QC circles, etc. and to promote a substantive control system.

2) Problems in quality

There are a thousand and one different checkpoints relating to the quality of garment products for each type of product, from the external appearance to the various physical properties, but the current factory survey did not get around to objective extraction of related problems in quality such as tearing strength, rupture strength, seam and pile strength, tensile strength, and other properties of strength or dye fastness, iron resistance, dry cleaning resistance, moisture absorption, and other physical properties.

Listed below are the various problems in products or production quality which were frequently observed or heard about in the factories surveyed. Note that some of these matters were well controlled in some of the factories and that these matters are not necessarily common to all factories, but they were judged as generally prevalent.

- Rolled up bolts were directly stacked on the floors, with no consideration given to prevent dirtiness. Further, some factories stacked them up crosswise, causing defects in the cloth. In particular, this was a problem with knitted fabrics.
- The checks made on the bolts before the start of production were haphazard. There were also insufficient numbers of bolt inspection machines.
- Many factories were haphazardly stacking semifinished products or products before packing on the floor, causing fouling. Further, the finishing processes were performed in high humidity and temperature environments, causing fears of staining by sweat. Note that recently there

has been an increase in factories banning entry into the workplace with shoes, cleaning the floors, prohibiting workers from bringing in food or drinks into the workplace, installing air-conditioning facilities, etc. in the sense of preventing such staining and adherence of dust and dirt from the outside and hair.

- As knitting and sewing defects, there were a noticeable number of skipped stitches, crooked seams, insufficient stitch margins, and an imbalance in left and right seams.
- There were differences in the cut shapes of top and bottom fabrics cut at one time due to the excess number of fabrics piled up for the cutting or the poor clamping of the same.
- During the sewing, the differences in the cut of the top and bottom fabrics was corrected by scissors, resulting in improper dimensions of the products.
- Use of fixing pins was observed, but there is a danger of complaints arising due to pins left in unintentionally.
- There were many differences in the color of the products. This was due to *the generally small size of dyeing vats and the difference in color with each vat* and also to the lack of records made when preparing samples or else the failure to use such records.
- The dyeing technology was generally poor. In particular, uneven dyeing often occurred.

Putting all this together, the Thai garment industry has not built up much experience in discrimination of products and lacks sufficient reference materials for the same. Further, there is insufficient guidance and training for producing good quality items. The responses to this have been piecemeal, it may be said. In particular, companies are not researching the effects the overall appearance of the products has on the grade of the products and the feeling of the consumers. These subjective factors have not penetrated through to the designers and workers.

(5) Technical knowledge

The engineer engaged in the production of garments requires basic knowledge on several technologies in order to ensure specifications presented by customers are met or that products are made as desired with full consideration given to the customers' wishes.

Judging from the field survey, there is an insufficient number of experts in various fields of basic technology in the garment industry as a whole. Some companies have

those duties handled by foreign experts or else by Thai engineers trained in foreign companies.

1) Knowledge on fabric characteristics

Knowledge on fabric characteristics is a basic condition for garment production. In the survey, it was judged that there was considerable knowledge about cotton, linen, wool, and other natural fibers, but not what may be called sufficient knowledge on polyester, acrylic, and other manmade fibers. As an example, in the case of TC and other cotton mixes often used in Thailand, not only the feel, but also the physical properties differ depending on the count of the yarn used, needless to say, and the mixture ratios and knitting methods. Therefore, when cutting or sewing, fine care is required as the amount of stretch or shrinkage of the fabric and the direction of the same. Further, one must be very familiar with the changes in these in the finishing processes or during use.

In particular, the differences in work due to the stretching or shrinking of the surface fabric, reverse fabric, core fabric, etc. are difficult to understand with just processing technology, so a study must be made on this based on sufficient knowledge before the start of production. Further, it is judged that there is insufficient knowledge on methods of stabilization of fabrics before cutting for fabrics such as knitted fabrics or wool fabrics which suffer from large distortion during the knitting, are unstable, and shrink or stretch considerably.

2) Knowledge on cutting precision

If the precision of the shape, dimensions, markings, perforations, etc. are poor, a problem of course arises in quality, but this also places a large burden on the sewing work and causes problems in efficiency as well. With regard to such precision, there are suitable tolerances set for each product, but the majority of the factories were not seen as specifically instructing their workers on the range of tolerances. Workers were observed working very carefully on unnecessary portions. This problem arises due to the lack of knowledge about other related processes. An arrangement would be desirable wherein the workers could share basic knowledge on all the processes of production in a balanced fashion.

3) Knowledge on dyeing

One thing pointed out regarding product quality by most of the garment producing factories was the problem with dyeing technology. Some companies had in-house dyeing processes, but these were the relatively large sized companies. Most of the companies consigned the work to specialized dyeing businesses. Therefore, there was a problem in that they could not control what went on there. The majority of the companies, however, leave everything about

dyeing to the dyeing businesses. The companies must, at the very least as the side placing the orders, have basic knowledge on the dyeing methods, order, the types of dyes used, the properties, temperature, etc. of the treatment water, etc. so as to enable them to place correct orders. Further, they must have knowledge on inspection and means of inspection for uneven dyeing, color differences, fading, etc.

4) Knowledge on adhesives

Due to the short time that core fabrics have been used, use of adhesives is not that widespread. This is an area in which study on future use would be desirable in the sense of improving work efficiency. In this case, study on the combination of fabric materials and adhesives, the density of use of adhesives, etc. would be necessary.

5) Knowledge on finishing temperature

The surface temperature of irons and finishing presses has a fine effect on the quality of finish of the garment. It is necessary to finely control the temperature according to the fabric material involved. In particular, polyester and acrylic fiber type fabrics are extremely sensitive to the value of the surface temperature and the planar distribution of the same. If the finishing temperature rises above 120°C, these fabrics may rapidly decompose. Further, in the case of a finishing press, there is a difference in temperature between the center portion of the press surface and the peripheral portions. This difference in temperature must be grasped and fully controlled or else the finish will be unbalanced.

At the present point of time, almost nothing was heard about such a problem, but it is projected that use of finishing presses will rapidly increase in the future, so this problem should become greater and come under the spotlight. Research is required to deal with it.

Note that the relationship between the properties of the materials and the processing temperature is closely related not only to the finishing means but also the dyeing, mentioned earlier. In the future, it will also have a large bearing on cutting and sewing, in which it is projected that high temperatures will be caused along with the higher speeds of the cutters and sewing needles, so similar research is required here too.

2-3. Problems and Countermeasures

(1) Modernization of facilities

In the garment producing industry, production efficiency is of more importance than in other manufacturing industries. Therefore, the introduction of automated facilities or multifunctional machines for raising productivity is unavoidable if the industry is to maintain and raise its future competitiveness. Such modern facilities, however, are not only expensive, but also generally have lower operating rates than general use sewing machines etc., so when introducing them, caution should be taken to select models appropriate to the production items and to establish production lines which can effectively draw out the capabilities of the facilities.

Toward this end, it is necessary to build close relations with general trading companies and manufacturers of such facilities so as to stock up on knowledge about such facilities. Further, it would be important to learn the method of putting together actual production lines through visits to factories of overseas counterparts etc.

Further, there are many types of attachments and other jigs researched and widespread in Japan etc. which are relatively inexpensive. It is necessary to fully study and make use of these together with the production facilities due to their great effectiveness in improving productivity and quality.

(2) Improvement of working environment

The garment industry is a labor intensive one which uses primarily young workers. The products are selected by the consumers on the basis of the feelings and must be both functional and beautiful. Therefore, the workplaces producing such products must be neat and orderly, must be kept clean throughout, must be shut out from outside dirt, and must be always kept beautiful. Further, proper air-conditioning, lighting, welfare facilities, etc. must be installed. In the past, the factory environment was never taken up much in seminars etc. and was not considered important, but in the future seminars and other activities to bring this matter to the attention of the industry will be necessary in view of the nature of the products. In particular, it would be desirable that such efforts cover the means of conveying products and semifinished products and packaging methods as well.

(3) Product Planning and Production Design

The majority of the Thai garment exporters depend on the designs and brand names of their customers. In the long term, however, it would be desirable for the companies to reach a level where they can produce products based on their own plans. A

fundamental condition for this is obtaining an accurate grasp of the product trends in the international market. Toward this end, it will be important to have an organization which can collect overseas information and provide information services to the industry.

A realistic means for this would be for the industrial organizations and the DEP to take the lead and establish an organization for acquiring information from similar overseas organizations and offering a domestic information service. This domestic service could be through the publication of a periodic industrial journal by the industrial organizations, which could be maintained and operated using revenue from membership fees and advertising revenue from the journal.

On the other hand, regarding the training of personnel interested in product planning, consideration may be given to augmentation of the Rajamangala Institute of Technology (Tewes Campus and Garment Technical Center), but it would also be possible, particularly for training product planners with a good fashion sense, to separate and make independent the garment design course recently established at the Applying Arts Department of Silapachorn University so as to provide in-depth, special education.

In both cases, however, there is a tremendous shortage of educators, so for the time being the most realistic method would be to engage foreign experts as lecturers and expand the system for tapping the private sector for teachers, a program which is already partially underway. These educators, it should not be forgotten, must be augmented by experts in market research, production control, etc.

Further, it would be effective for the industrial organization to take the lead and establish a corporate scholarship system for students which would create a system for training capable personnel and making employment in the industry after graduation obligatory. For this, it would be necessary for the government to consider extending funding to the industrial organizations if needed.

Production design engineers differ from the personnel in charge of product planning and are required to be well versed in all the fields of technology required for effectively placing customer plans or company plans on the production lines. Therefore, they must have basic physical and chemical knowledge about the fabrics and further must have a sharp awareness of industrial and aesthetic design. They must also know all about the production methods. From this viewpoint, they may, without exaggeration, be said to have the right of early decision when it comes to the productivity and production quality of garments.

Development of human resources in this area is not easy in that both a certain degree of sense or feel regarding the products and pure engineering knowhow are required. The same means of training as for the product planning personnel would be possible, but in this case the fastest way to deal with the situation would be to place

emphasis on such training in the short-term course of the Rajamangala Institute of Technology.

(4) Production system and production control

Product trends on the international market are becoming increasingly diversified. There are various schools of thought on the best production system for such a situation. At the two extremes are mass production of limited items and short run production of diverse ones. Fundamentally, however, one should aim at establishing production lines able to cope with the shorter life cycle of products. At the present time, production systems which stress just expansion of the volume of production are prevalent. Due to the increased diversity of production items, many places end up ignoring the improvement of quality and production efficiency in their production.

However, it is not wise to continually reorganize production lines for each product ordered. Rather, an attempt should be made to accumulate knowledge and skill regarding stabilization of quality and production efficiency by maintaining several product-specialized production lines and thus aiming at production lines able to produce a number of products at any time.

There are various schools of thought too regarding the establishment of such production lines depending on the facilities, the structure of the factory building, and the floor area, so expert analysis and guidance are required for each case. Experts able to organize processes to adapt to the circumstances are in extreme short supply in Thailand, so training of such experts is an urgent task along with the training of general production controllers.

These specialized jobs require a certain degree of experience in production and it is judged that a practical effect would be difficult to obtain with school education in Thailand, which is shallow when it comes to practical knowhow relating to production control, so the establishment of a separate place for retraining people with practical experience in factories and providing organized, practical education would be the most effective.

The reeducation of practitioners would require a certain amount of production facilities, inspection and testing facilities, and also classrooms. Further, it is estimated that due to the shortage in human resources in Thailand, for the time being instruction would largely have to be given by foreign experts. Therefore, it would be desirable for a public institution to organize a training center.

In such a case, it is judged that the best means of organization and operation for the circumstances would be for the training center to function as an internal organ of the TID or an affiliate of the TID and to charge for the admission of private sector engineers.

In addition, it would probably be practical for the center to serve as a base for planning and holding a series of seminars on production and QC for the industry.

(5) Improvement and control of quality

At the present time, quality is judged based on the customers' standards or judgement in the majority of cases. Due to the nature of the products, private companies should study about quality on their own and decide on elements on which to base their own judgements. In actuality, however, no companies, except for a handful of very superior ones, are establishing their own in-house standards. Each of the companies will have to resolve this on their own in accordance with the items they produce, but it would be desirable for some government organization to provide guidance on the standards and methods of judgement for the physical and chemical properties of garment products so as to make them conform to the requirements of the overseas markets. Specifically, it will be necessary to augment the product inspection function of the TID, formulate substantive inspection methods and inspection standards, and propose a TIS-established organization and also to increase and improve the private sector commissions of inspection and issuance of inspection certificates to far over the current level to make the results valid internationally.

This would of course have to be accompanied by replacement and augmentation of facilities and securement of personnel, but effort should be made, together with the concept of the center, to share facilities, personnel, and foreign experts. Actual inspection work could be helpful as practical training for students when conducted under the supervision of expert instructors.

Further, by adding to the center activities a curriculum of roving guidance to companies on quality control, it would be possible for students to receive instruction in the field while viewing factories and products other than their own and also the companies would be able to receive direct guidance as to quality and quality control methods. Creation of such a system would be effective.

(6) Technology for production

Among the various technologies have a direct bearing on production, the problem ones may be roughly classified as technologies relating to production control engineering and engineering technologies related to manufacture.

Production control, simply speaking, consists of continuous control of the production activities so that the quality levels set are observed and the required amount of production and delivery schedules are achieved with the lowest prime costs. Roughly speaking, it may be subdivided into production plans, design control, procurement and

inventory control, equipment plans, establishment and coordination of process, schedule, and personnel plans, quality control, shipment control, maintenance and safety, and other control elements. Thailand, however, is weak in practical implementation in these areas, not only in the garment industry, but in all manufacturing industries.

In the case of the garment industry, among these control elements, there is a noticeable shortage in particular of capable control engineers for the design of production lines and process settings. This is believed to be due to the fact that the industrial education given at the universities and technical colleges of Thailand tends strongly to be based on the assumption of production of single items and is not suited for dealing with mass production. In this regard, it would be desirable to reorganize the curriculum at places of higher learning aimed at supplying medium level production control experts to shift the stress to control engineering for mass production. In addition to control theory, instruction based on human motion studies and other matters would be essential, so it would be important to promote a system for finding lecturers in the industrial world, including foreign countries.

The weak point in manufacturing-related engineering technology is the underdevelopment of bleaching, dyeing, printing, and other treatment technologies. In particular, there are numerous methods of dyeing depending on the purpose of the dyeing and these can be combined in various ways according to the characteristics of the fabric material, so a considerably wide range of knowledge on processing and inspection technologies and accumulation of the same are necessary.

In addition, a realistic measure would be to incorporate the technical knowledge relating to materials and manufacturing skills into the functions of the afore-mentioned training center so as to broaden the base of medium level engineers in the industry as a whole.

A trend has recently appeared in Thailand too of an increase in companies using small capacity computers. As of the moment, these are mostly used as a means for office management, but even in the current field survey, a garment producing company was observed to be incorporating a CAD system into its production.

In Japan, companies have developed numerous apparel CAD systems based on their own unique needs for handling everything from product planning, including color coordination, to fabrication of patterns. Many companies are also starting to use comprehensive production systems where these are linked with CAM systems for handling selection of materials, instructions for procurement, cutting, control over the number of semifinished and finished products, work instructions, delivery control, etc.

The same sort of thinking is expected to spread throughout the Thai garment industry in the very near future, so it would be desirable to start research into technology

for utilization of such systems to allow the industry to handle them as part of the modernization of their facilities. This would require the engineering ability to convert the basic software attached to such systems to meet with the production characteristics and production items of the respective factories. The personnel in charge of this would have to be individuals or groups with a wide range of detailed knowledge on factory production, so there is still time to train the personnel for this field if starting now. Further, to use CAD and CAM systems for production, the prerequisite would be the establishment of clear, basic standards for design, manufacture, and production control for each factory, so it is important to proceed with work on this as well.

Basically, each company should proceed in accordance with its own situation, but for the time being it is thought best that the industrial organizations and TID join together for research.

3. Supporting Industries

3-1. Procurement of Materials

The Thai garment producing industry is in the middle of a period of rapid growth thanks to its abundant labor force, but the industry is being confronted by a severe shortage of materials.

The state of domestic and overseas procurement of materials for each factory visited in the current survey was as explained in Chapter 5, it is possible to roughly classify the state of procurement here as shown in Table II-3-1.

Table II-3-1. State of Procurement of Materials

Companies with almost 100% import ratios	4	(of which four were exporting almost 100% of their products)
Companies with 50% or more import ratios	8	(of which eight were exporting almost 100% of their products)
Companies with less than 50% import ratios	12	(of which seven were exporting almost 100% of their products)
Companies with almost 100% domestic procurement	11	(of which four were exporting almost 100% of their products)
Unknown	3	

Note: The above includes six companies manufacturing sweaters and one manufacturing socks.

As a general trend, the higher the export ratios of the garment products produced, the higher the import ratio of the materials used. Note that among the six sweater manufacturers, only one was procuring almost all its materials domestically. The degree of dependence on imports of materials was much higher in the sweater manufacturers than the general garment manufacturing companies.

The materials produced in Thailand are limited mostly to fabrics of mixed cotton and polyester and mixed polyester and rayon and 100% cotton products. Further, almost no thick fabrics suitable for cold regions are being produced. Therefore, while it is only natural that companies rely on overseas suppliers for materials not produced domestically, there are technical problems between domestic textile production and garment production.

Many persons in the companies surveyed stated that there would be problems with materials if they switched to exports of products. Among these, the technically related problems relate to the variety and quality of the fabrics and can be summarized as follows:

- In the case of companies set up for the purpose of exports, orders from customers change rapidly and domestic producers cannot supply the types of materials required.
- In particular, the largest production count of fabrics in Thailand is 40 counts, irregardless of the types of fabrics. It is becoming difficult to produce export oriented garments using these. Further, while domestic producers are making some cotton yarn of 50 counts, at the present time the amount of production is extremely limited.
- Thai materials suffer from defects in the weave such as uneven weaves compared with South Korean and Japanese materials. Recently, considerable improvement has been made, but there are still many defects.
- A critical defect of the textile materials of Thailand is the outdatedness of the dyeing technology. Exports of woven fabrics with low unit prices are increasing, but imports of dyed fabrics and dyed yarn with high unit prices are increasing.
- Many of the Thai textile producing companies will not agree to a deal unless the lots are of a certain size, but recently lot sizes of garments for the export market have been becoming smaller as a general trend, so production is becoming out-of-touch with the actual situation on the international market.
- Putting together the above, recently the life cycle of garment products has become shorter and a greater variety of types, colors, and patterns of materials has become necessary, but the materials supplied by Thailand are mass produced items of limited variety and thus the gap in the corporate strategies of the supply side and the user side, including strategies on technical adaptivity, is growing.
- However, Thai fabric, irregardless of the state of the dyeing, is presently usable for medium class garment products on the international market, as both the supply side and the garment producing side will admit.

In this way, the problems in materials summarized above are mostly related to relatively high qualities and fashion products. For the medium class garments, for which there is great demand in the international market, Thai materials may be considered to presently have sufficient market competitiveness, but this is an area which other countries could relatively easily catch up in, so it would be desirable to have a revolution in thinking on the part of the Thai material suppliers at an early date.

Aside from basic materials, there are problems in the supply of secondary materials essential for garment production such as buttons, hooks, zippers, cores, and paste.

In general, the domestic supply system for secondary parts such as buttons, hooks, linings, cores, and pocket fabrics is underdeveloped and garment makers basically rely on imports. In particular, there are almost no domestic means of supply of core fabrics due to the extremely short history of their use.

Regarding other accessories and parts too, with the exception of zippers, domestic producers of accessories and parts will sometimes accept orders for production, even for export, if the production lots are large enough, but when the lots are small in size or special specifications are called for, companies have to import almost without exception. The rate of self supply of the paste used for garment production is estimated to be relatively high, but the companies presently rely entirely on imports for adhesives, which have recently come into use in Thailand as well, and for the time being this situation is expected to continue.

3-2. Procurement of Machinery and Its Parts

The production facilities used for garment production in Thailand basically come from abroad. Much of the reportedly over 200,000 industrial sewing machines in Thailand at the end of 1988 are of Japanese make. Next most numerous are products from West Germany. Products are also beginning to appear from Taiwan and South Korea. In particular, there has recently been a noticeable increase in used machinery from Taiwan and Hong Kong.

Knitting machines, of which there were 43,982 in 1986, increased in number to 50,106 at the end of 1988 ("Ajia no Seni", vol. 1, no. 4, edited by Osaka Seni Kenkyusho). The same trends were shown in countries of origin as with sewing machines.

Among the companies surveyed, about half of the companies which were asked about the existence of plans for expansion of their facilities has fairly large scale plans of some sort or another, these companies tending to concentrate among the medium and large sized companies. Therefore, key production facilities will probably continue to be imported for the time being.

Regarding the acquisition of key facilities through imports, none of the companies seemed to feel there were any particular problems. However, the frequent complaint was raised that port procedures, including customs clearance of imports, took too much time.

The general channel for purchases of facilities was through general trading companies or sales agents of the manufacturers, but direct transactions were made with the manufacturers in many cases and, further, cases have been seen of transferral of used machinery from overseas, affiliated factories. In each case, however, there are no after sales service centers in Thailand, making response to emergencies difficult. Inherently speaking, there are only a few engineers with specialized knowledge of equipment in the Thai industrial world and, further, the factories find there are difficulties in securing the personnel for maintenance and safety. With the new installation of facilities continuing today, the problem of the shortage of engineers becomes even more serious. In particular, automatic machines and multifunctional machines are beginning to be introduced along with facilities provided with NC functions, so the engineers specialized in equipment have to have even more advanced knowledge about machinery. This is making the situation even more serious.

Further, there is no parts industry, so parts have to be sent away for from abroad in almost all cases. This situation also makes the problem bigger during emergencies. For the time being, it would be effective for the industry to make some arrangement enabling joint purchases of parts, consumables, jigs, attachments, etc. by groups of companies and joint management. In particular, even in Japan, attachments are mostly produced by factories of the cottage industry level. They are varied in type and inexpensive in price, so individual Thai companies would not have an easy time importing small amounts of unit items. Almost none of these factories have set distribution channels.

Note that almost all sewing machine needles, a consumable part, are imports, though needles can be freely purchased from the domestic market. The needles come in various types and no problems have yet occurred in their procurement.

4. Marketing

4-1. Product Planning and Development

The results of the survey on the state of product planning in the Thai garment industry, as shown in Table II-5-4, were that the industry basically depends on its customers for such planning.

Of the five companies which were producing products based both on their customer's plans and their own plans, one was formulating its own plans only for the domestic market and one was formulating its own plans for markets other than Japan. Further, there were companies which improved upon their customer's plans and then called the result their own.

Among the five companies which were producing all the products based on their own plans, two were export oriented and one each was a foreign capital joint venture and a Thai capital company. Of these, one had specialized foreign designers permanently stationed in Europe. The others were all oriented toward the domestic market. One of these specialized in various types of uniforms for the domestic market.

Only four companies, including the afore-mentioned two export-oriented joint venture companies, gave clear answers as to the number of specialized personnel they had in charge of their own product development. In the others, the owner himself or else some of the patterners took on that task.

Therefore, in view of this situation, it is judged that the Thai garment industry has yet to train native Thai experts who are able to plan original products on their own.

On the other hand, in the process of this survey, almost all the companies expressed eagerness to promote exports through original designs. In actuality, however, the situation is not one in which new Thai designs would be accepted in foreign markets on a commercial basis.

The reason is that fashion trends, including shape, colors, feel, and function, have recently become very diverse and volatile. In the face of this feature of the international market, the key to entry into the export markets lies in how accurately market trends are grasped and products are planned which match the market needs.

The Thai people, it was often stated, have both an artistic nature and a sensitivity toward things considerably higher than the people of other countries due to Thailand's unique culture.

Therefore, if there were just some arrangement by which persons interested in product planning could be able to quickly and accurately forecast the changes in the

desires of people of different cultures, it would be possible for Thailand to bring original planning into the international market through its own efforts.

Looking at the future from this viewpoint, it is judged that the potential suitability of the Thai people to product planning is relatively high.

4-2. Channels for Exporting

Probably because the firms we interviewed are of a larger size, most of them export their products directly to their buyers.

Table II-4-1, the result of a survey by the Thailand Development Research Institute Foundation (TDRI), supports this fact.

Table II-4-1 show the result of the survey of 27 firms. Only 18% of the total number of firms export through trading firms and only 7% have developed their export markets through their foreign partners. In contrast, more than 50% of the firms surveyed have developed foreign markets by themselves or through their sub-contracting firms in foreign countries. The firms which have developed markets on their own have done so through contacts with buyers they established by participating in trade fairs sponsored by various trade missions.

Table II-4-1. Export Marketing Channels of Thai Garment Firms Surveyed

	Percent a/
Single channel	36
Multiple channels	64
Sub-contracting	50
Foreign partner marketing	7
Trading companies	18
Own marketing effort	61
Others (e.g., sales agents)	32

Source: An Analysis of Foreign Barriers to Thailand Exports, TDRI. 1987.4.

4-3. Comparison of International Competitiveness

4-3-1. International Competitiveness

Fig. II-4-1 shows the results of the evaluation of international competitiveness, using the Revealed Comparative Advantage Indices (RCA) developed by Prof. B. Balassa.

$$RCA=(E_i/E_h) / (W_i/W)$$

Here E_i represents country h 's exports of a commodity i (SITC 84, SITC 65). E_h represents the world exports by the country h . W_i represents the total exports of commodity i and W represents the total world exports. When RCA exceeds 1, it indicates that the export ratio of commodity i by country h exceeds the world export ratio of commodity i .

Accordingly, while the competitiveness of the garment industry (SITC84) in South Korea and Taiwan has been declining almost consistently since the middle of the 1970s, the industries in China, Thailand, Malaysia and Indonesia have been witnessing upward growth.

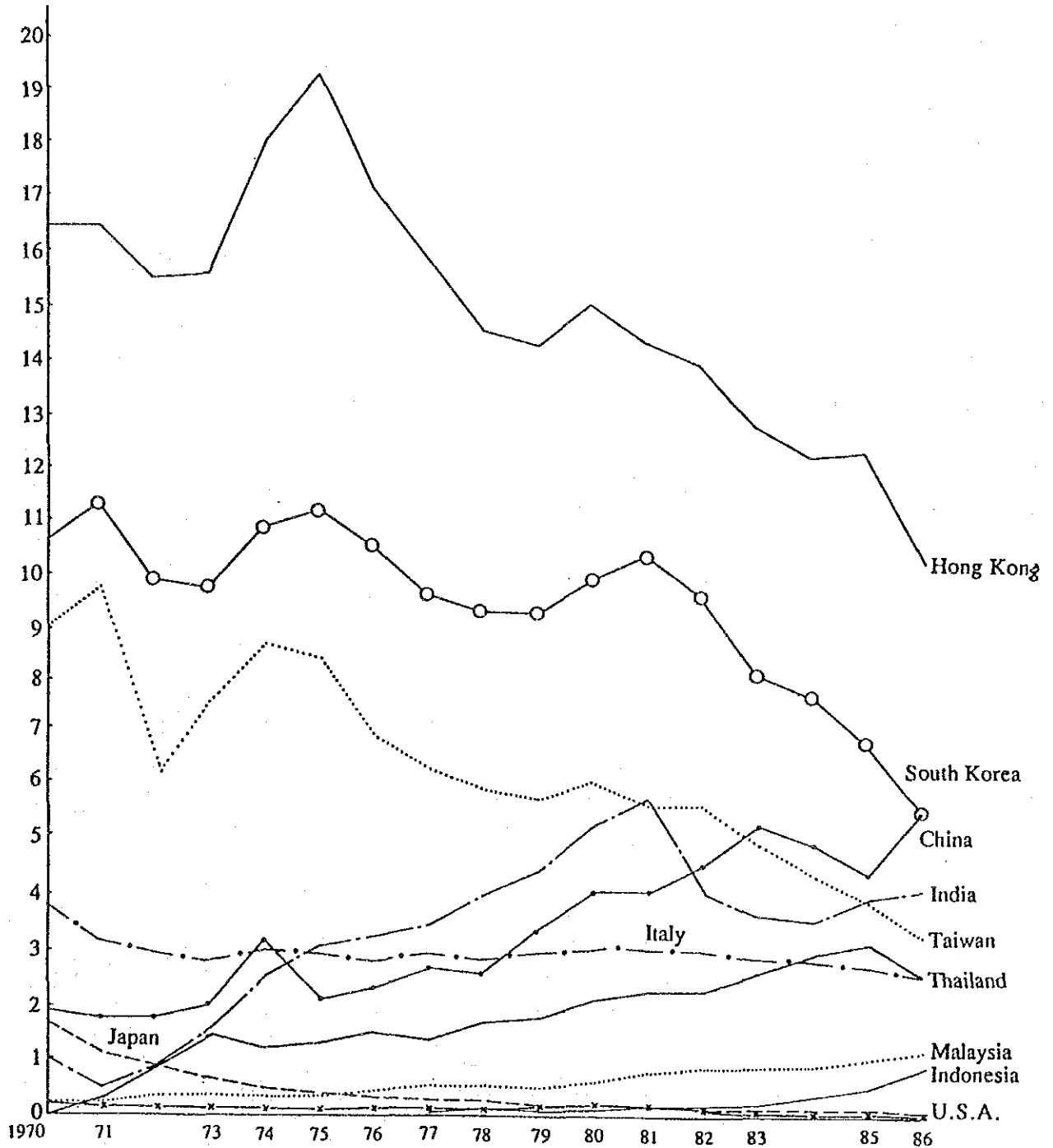
On the other hand, while the textile industry (SITC 65) in Thailand has been maintaining its upward trend, that industries in South Korea and Hong Kong have been declining.

4-3-2. Cost Factors

A majority of the firms surveyed in Thailand showed that the raw materials cost accounted for 60-70% of the total cost of the products shipped and the labor cost accounted for 20-25%. Most of the firms surveyed pointed out that while the factor which has the greatest comparative advantage in Thailand is the labor cost, the factor which is comparatively disadvantageous is the cost of the raw materials (including the cost of procuring raw materials).

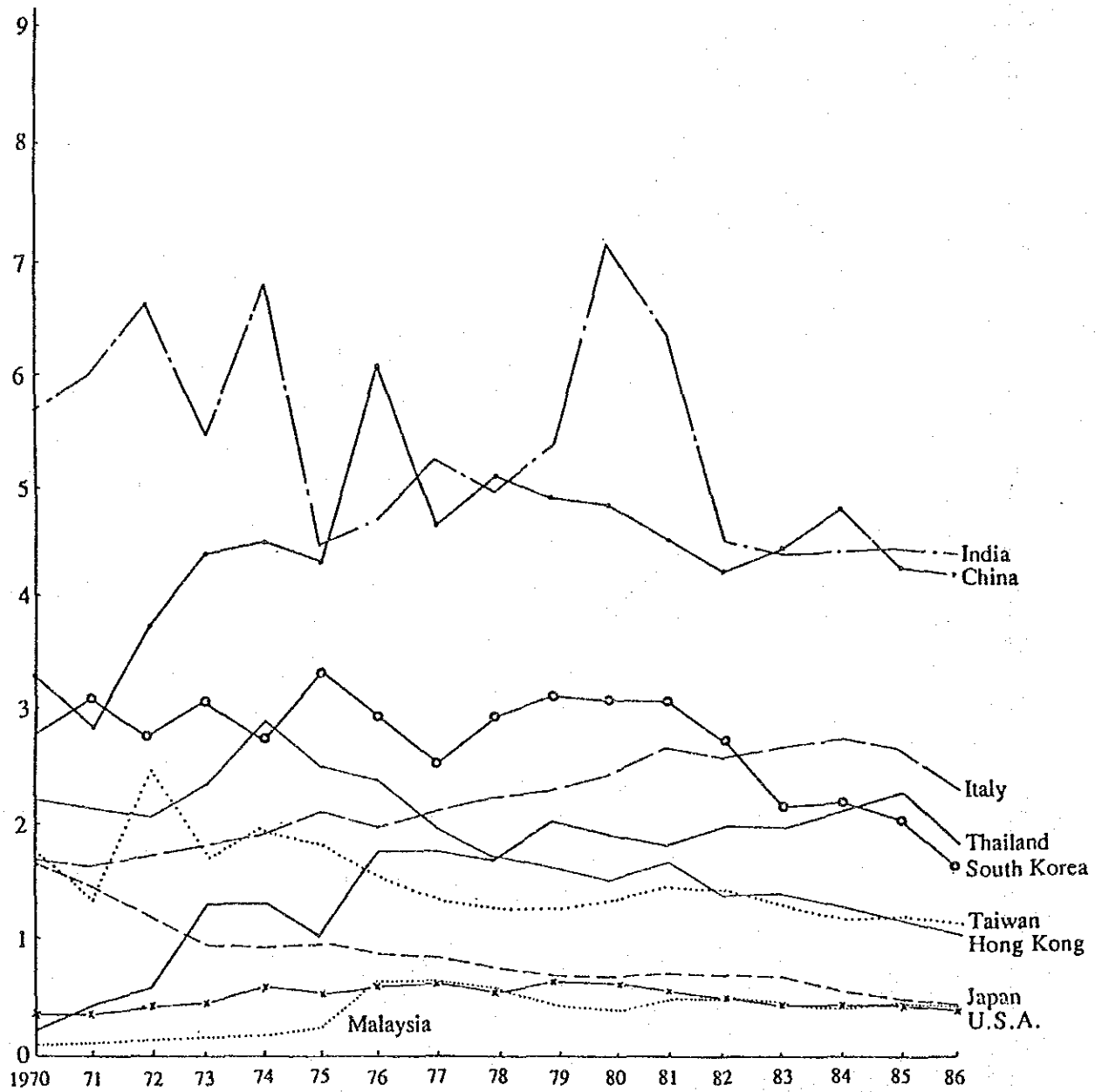
In the cost of procuring raw materials, one of the most important factors is the "tax refund" on imported raw materials.

Fig. II-4-1. (a) Comparison of RCA (SITC 84)



Source: OECD Foreign Trade by Commodities 1982 - 1986

Fig. II-4-1. (b) Comparison of RCA (SITC 65)



Source: OECD Foreign Trade by Commodities 1982 - 1986 (US\$)

(1) The objective of the "tax refund" has been to enhance price competitiveness by refunding the tariff on imported raw materials used in exported products. However, it cannot be denied that this "tax refund" system has acted as a barrier to strengthening international competitiveness in the following ways. [1] If a firm exports all of its products, it needs only to submit a bank guarantee when it imports raw materials. But many ordinary exporting firms are required to pay cash for tariffs and business taxes when they import raw materials. When the market rate of interest is 13% and the period of time required for a refund is six months, the interest burden will be 6.5%. [2] Tariffs and business taxes will be imposed on raw materials which have not been used for export products within one year after the materials were imported. [3] The additional cost incurred in processing necessary office procedures.

Accordingly, under the circumstances, the exporting firms cannot help but count 10-15% of CIF price into the cost of procuring the raw materials.

(2) Personnel expenses in Thailand, as shown in the labor costs of the spinning and fabric weaving industries (Table II-4-2), are said to be one-fifth of those in South Korea due to changes in the exchange rates against the dollar in recent years.

If labor productivity were taken into account, however, garment firms affiliated to foreign capital were of the opinion that the real wage level in Thailand would be around 40% of that in South Korea.

4-4. Problems and Countermeasures

(1) Export garments are presently only rarely produced based on the plans of Thai companies. While having their own designs and brands would bring the firms in Thailand a higher added value, it would also bring a greater risk. There would also be two conditions necessary for the development of design in Thailand. One condition would be the abundant availability of raw material and the other would be highly developed skills in the area of sewing techniques. Under the current circumstances, it would be more beneficial for them to strengthen their abilities to absorb the specifications and designs fitting to the export markets and which are demanded by the buyers of their products. In the long term, however, it would be desirable for the companies to reach a level where they can produce products based on their own plans.

Table II-4-2. Labor Cost Comparison, 1980 - 1987
(Unit: US\$ / hour)

	Spring 1980	Spring 1984	Spring 1987	Change 1987/1980 (%)
Switzerland	9.65	8.65	15.70	62.69
Netherlands	11.68	9.80	13.75	17.72
Sweden	10.43	7.91	13.69	31.26
Belgium	11.82	8.84	13.66	15.57
Denmark	9.12	7.97	13.46	47.59
West Germany	10.16	7.54	12.98	27.76
Norway	9.62	9.66	12.87	33.78
Italy	9.12	6.35	12.67	38.93
Austria	6.42	6.76	12.59	96.11
Japan	4.35	6.28	11.99	175.63
Finland	5.62	6.05	10.70	90.39
France	7.91	6.07	9.99	26.30
Canada	6.25	8.50	9.85	57.60
USA	6.37	8.60	9.24	45.05
Ustralia	-	7.85	7.83	-
UK	5.75	5.46	7.09	23.30
Irish Republic	5.13	4.20	6.70	30.60
Spain	4.90	3.87	4.78	-2.45
Syria	0.96	3.12	4.29	346.88
Greece	3.49	4.30	4.00	14.61
Tunisia	1.13	1.21	2.56	126.55
Venezuela	-	3.27	2.35	-
Taiwan	1.26	1.64	2.09	65.87
Brazil(Sao Paulo)	1.57	1.63	2.07	31.85
Uruguay	0.89	-	1.97	121.35
Hong Kong	1.91	1.65	1.93	1.05
Brazil (South)	1.27	1.00	1.90	49.61
Portugal	1.68	1.28	1.83	8.93
South Korea	0.78	1.89	1.77	126.92
Colombia	-	2.81	1.66	-
Argentina	3.33	2.23	1.60	-51.95
Peru	-	-	1.40	-
Turkey	0.95	1.19	1.28	34.74
Egypt	0.39	0.90	1.19	205.13
Brazil (North)	1.14	0.93	0.90	-21.05
Mexico	3.10	2.62	0.83	-73.23
South Africa	-	1.64	0.82	-
Morocco	0.85	-	0.74	-12.94
India	0.60	0.71	0.65	8.33
Kenya	-	0.53	0.62	-
Thailand	0.33	0.56	0.58	75.76
Philippines	-	-	0.57	-
Nigeria	-	2.13	0.48	-
Pakistan	0.34	0.49	0.37	8.82
Sri Lanka	-	0.28	0.31	-
Ethiopia	-	0.27	0.29	-
China	-	0.26	0.23	-
Indonesia	-	0.23	0.20	-

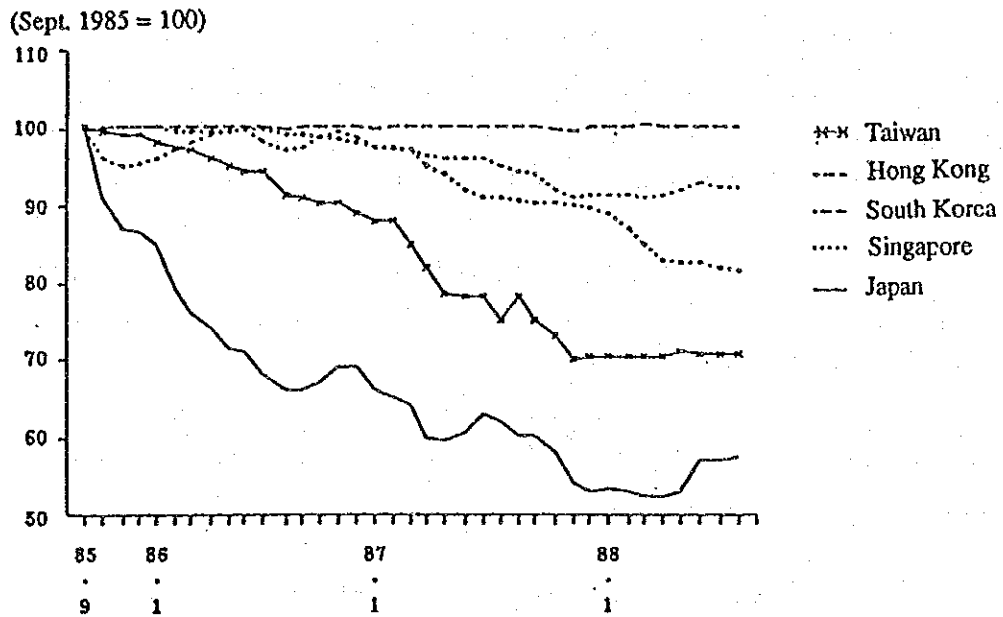
Source: World Textile Trade and Production Trends (FAO)

Further, augmentation of the training course as part of the functions of the TID would be effective both for the public and private sectors.

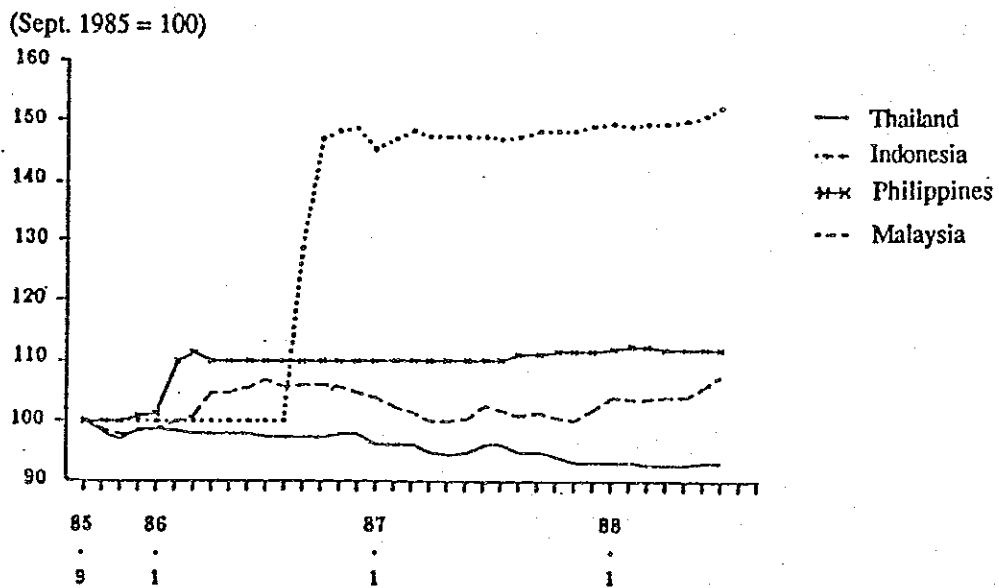
(2) Judging from TSI and RCA indices, the international competitiveness of the garment industry in Thailand has been steadily strengthening. However, we can guess that at present the increase of exports is led by the expansion of production capacity for standard products using TC and TR as raw material. In light of this, price competition is very important in strengthening international competitiveness. The devaluation in November 1984 and the subsequent additional depreciation of the Thai baht, coupled with the appreciating tendency of the Taiwanese dollar and the South Korean won which has continued since September 1985 (Fig. II-4-2), seems to have greatly contributed to export expansion in recent years. When the foreign exchange rates of the competing nations stabilize, however, it will become ever more urgent for Thailand to make efforts to reduce the production costs of garments.

(3) The "tax refund" system has been contributing to the enhancement of price competitiveness. However, when the system is applied in reality, the interest burden, the tariff on material not utilized for exports and the imposition of business tax have resulted in an addition to the costs of the garment exporting firms which must rely on imported raw materials. Therefore, it is necessary to speed up the process of tax refunds.

**Fig. II-4-2. (a) Fluctuations of Asian NIEs Currencies
Against the \$US Using the Index Method**



**Fig. II-4-2. (b) Fluctuations of ASEAN Currencies
Against the \$US Using the Index Method**



Source: Ministry of Finance

5. Corporate Operations

5-1. Process of Development of Companies

The garment manufacturers of Thailand began tackling exports in the early 1970s. Their main customers were the U.S. and the EC. Soon after that, a bilateral agreement with the U.S. (1975) and a multilateral one with the EC (1976) resulted in restrictions being placed on the quantity of some garment products exported from Thailand to these regions. The restrictions, however, were more easygoing than those set by the U.S. and Western Europe on Japan and the NIEs. Therefore, it may be said, Thai garment export manufacturers have been able to expand their production capacities stably and further have been able to increase their export volumes stably.

The reason for the growth of Thai garment manufacturers were, in addition to the increase in exports, the expansion of the domestic market for readymade garments. Up until the early 1970s, the majority of garments in Thailand was order-made. Readymade garments began making their way into Thailand with the popularity of jeans among students in early 1970s. Since then, readymade T-shirts, pants, and women's wear have spread. Sewing companies set up mass production systems and upgraded themselves to garment manufacturers around that time.

This growth of the garment manufacturers had an effect also in the method of sales of fabric by the Sanpeng textile wholesalers. Before that, they used to sell almost all their fabric by piece at their stores, but today they reportedly wholesale over 70% of their fabric to garment manufacturers.

The dates of establishment of the 37 garment manufacturers visited during the current survey are arranged in Table II-5-1. The majority of the manufacturers were established in the 1970s on. This was the period when production of readymade garments was launched.

Table II-5-1. Date of Establishment of Manufacturers Visited

Year of establishment	No. visited
Before 1969	4
1970 to 1979	16
1980 on	13
Unknown	4
Total	37

5-2. State of Corporate Management

5-2-1. Equity Composition

The equity composition of the 37 manufacturers surveyed may be summarized as shown in Table II-5-2. So far as one views these manufacturers, it will be seen that Thailand's sewn garment manufacturers are mostly local capital firms, with few being joint ventures with foreign capital.

Table II-5-2. Summary of Equity Composition of Companies Visited

	Local capital 100%	Joint venture with foreign capital	Unknown
Sewn garment manufacturers	21	3	5
Sweater manufacturers	3	1	2
Other manufacturers	-	2	-
Total	24	6	7

There are considered to be two main motivations behind a foreign company's investment in a sewn garment manufacturer: One is investment by a buyer considering the low labor costs and exchange merits and desiring to secure a base of supply of products. The other is investment by a foreign sewing company desiring to shift production centers to Thailand in search of price competitiveness. In the former case, the buyers would work on the basis of procurement prices adjusted to the product rank and in the event these are not met, would want to maintain enough freedom to obtain products from other manufacturers or countries, so not that much investment may be expected, it is believed. In the latter case, some Japanese, South Korean, and Taiwanese manufacturers are seen as desiring to shift their production centers to Thailand due to the rising personnel costs in their own countries and the upward evaluation of their currencies.

At the present time, there are six Japanese-affiliated garment manufacturers operating in Thailand: Thai Itokin, Thai Wacoal, Thai Fujibo Garment, Kikuya, Thai Hamilton, and Thai Kaneda. Thai Fujibo Garment increased its facilities by 50 sewing machines in 1988 and is producing blouses for export to Japan with a 100 sewing machine system. Kikuya also increased its facilities by 50 sewing machines in 1988 and current is producing for Japanese affiliated department stores and Japan with a 100

machine setup. Thai Kaneda, which started operation in 1989, produces with a 50 sewing machine setup, while Thai Hamilton produces with a 120 machine setup.

Among the export garment manufacturers in Thailand, there are many seen which have over 500 sewing machines and emphasize exports to the U.S. and Western Europe. The Japanese affiliated manufacturers, on the other hand, are generally small in scale, with the exception of Thai Wacoal, which primarily sells to the Thai domestic market and has 1,500 sewing machines.

A look at the activities of the Japanese affiliated manufacturers shows that their reasons for investment included promotion of local consumption, replacing exports from Japan to Thailand, and promotion of exports to Japan, shifting the source of supply of products from the Asian NIEs. In both cases, there has not been that much growth in investment by Japan in Thai's garment production field.

5-2-2. Production System

Most of the production by Thai's export garment manufacturers is production on order based on product plans and designs of the customers.

Almost all of the manufacturers visited were operating on the basis of production on order, as shown in Table II-5-3. Only three out of the 37 manufacturers were engaged in anticipatory production and these manufacturers were producing for the domestic market alone.

Table II-5-3. Modes of Production of Companies Visited

	Order production	Order/ anticipatory production	Anticipatory production	Unknown
Sewn garment manufacturers				
Export companies	20	-	-	2
Nonexport companies	2	2	1	-
Unknown	-	-	-	2
Sweater manufacturers				
Export companies	6	-	-	-
Other manufacturers				
Export companies	2	-	-	-
Total	30	2	1	4

Note: Export companies include manufacturers producing products both for export and the domestic market.

Table II-5-4 shows whether the manufacturers visited were dependent on their customers for product specifications and designs or were developing them on their own. In so far as one views these, most of the garment manufacturers in Thailand are being supplied with product specifications and designs from their buyers and producing based on the same. The buyers look for manufacturers with low processing costs the world over. The garment exporting manufacturers of Thailand seem to fit the bill.

Table II-5-4. State of Product Planning and Design of Companies Visited

	Customer planning	Customer's own planning	Own planning	Unknown
Sewn garment manufacturers				
Export companies	16	3	2	1
Nonexport companies	2	-	3	-
Unknown	-	-	-	2
Sweater manufacturers				
Export companies	4	2	-	-
Total	22	5	5	3

In general, when exporting general mass produced sewn goods, one must become well acquainted with the tastes of the targeted market in order to plan and design one's own products. Some manufacturers talk of the difficulties in planning products based on the ever changing preferences of the market.

To raise the certainty of orders for products one planned on one's own and thus secure a stable amount of orders, it is necessary to maintain a constant grasp of the preferences of the market and set up one's self to flow with the same. This requires time and money and entails a certain amount of risk in the investment.