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

8-1. Setting of Export Targets

According to UN Yearbook of International Trade Statistics (SITC 84, in terms of the U.S. dollar), garment exports in the world grew at an annual average rate of 6.3 percent between 1980 and 1986. During the same period, garment exports from Thailand increased at an annual average rate of 18.3 percent, almost three times the global growth rate.

Whether garment exports from Thailand can maintain such a high growth rate in the coming decade will be decided by the following factors.

The negative factors include the following facts.

[1] The United States and the EC are assuming a firm stance in dealing with the garment exporting nations of Asia over the future allotment of quantitative export quotas based on the MFA.

[2] Supported by the dollar's depreciation, garment production in the United States in 1986 and 1987 was recovering from the slump of recent years.

[3] It is not clear whether the growth of garment exports from Thailand to the Middle East and other developing countries, which greatly contributed to the expansion of the country's garment exports in the 1980s, can maintain the pace of the '80s in the future. The size of markets in the Middle East and other developing nations and the more severe competition expected from other garment exporting countries must be taken into consideration.

As a positive factor, it can be pointed out that the Japanese domestic market for garment imports has expanded due to the yen's appreciation. But it seems proper to expect that the entry of Thai garments into the Japanese market will not come up to the level of scale and growth of exports to Japan from South Korea, Hong Kong and Taiwan.

All things considered, it will be appropriate to fix the target of Thai garment exports for 1996 at $4,177 million (in 1986 prices) calculated on the basis of the annual average growth rate of 18.3 percent in 1980-86. If the annual average growth rate of global garment exports for 1987-96 were the same 6.3 percent as in 1980-86, Thailand's share in the world garment exports in 1996 would be 3.1 percent.

Garment exports from Hong Kong in 1986 amounted to $8,398 million, those from South Korea $5,490 million and Taiwan $4,259 million. Thailand's 1996 target will be close to Taiwan's 1986 exports.

For the Thai garment industry to attain this target, the first necessity is that by 1996 the industry should reach the size of exports and level of production capacity and technology which Taiwan and South Korea exhibited in 1986. Secondly, the industry by then should have the ability to cope with the problems currently faced by the garment industries of Taiwan, South Korea and Hong Kong. This will also be necessary for export strategy after the target year.

It will be important for the export strategy of Thailand that efforts be made to improve productivity through the reinforcement of production facilities, workers' skills and technological ability and production technology. It is also crucial to respond to the market requirements of diversification, individualization and shorter terms of delivery while expanding the sales routes of standard products.

As for production facilities, Thailand lags far behind Taiwan and South Korea in the ratio of workers per sewing machine and the introduction of automatic sewing machines.

The ratio of workers per sewing machine stands at 1.18 in Taiwan and 1.0 in South Korea as of 1986, while it is estimated at 2.86 in Thailand as of 1985.

As for the introduction of automatic sewing machines, the ratio of automation (in shirts) in Taiwan and South Korea stands at around 20 percent as of 1987. Thailand has only partially introduced them. For the improvement of quality, Thailand's industry will first have to introduce automatic pocket welting machines and automatic thread cutting machines.

As for production technology, it can be pointed out that the industry is short of foremen and other medium-standing leaders at job sites.

In reality, the quantitative expansion of production stated above should be decided on by every garment producing firm on the basis of their respective corporate strength and expected rate of return. More important will be changes in the production system to meet market requirements and the need to reform the way of thinking of workers and managers.

8-2. Requirements for Achievement of Targets

Taiwan and South Korea began promoting garment exports in the 1960s, about a decade earlier than Thailand. Amid the worldwide changes in demand, including an expansion of demand for products of the multi-variety and small-lot production type and the restraints on quantitative expansion under the MFA, it is in a position to have to hasten such measures as further promotion of multi-variety and small-lot production, shortening of delivery terms, improvement of quality and an increase in value added. For Thailand to achieve the target mentioned above, it will be necessary to establish a production system aimed at the improvement of productivity and quality under the conditions of the global demand structure.

(1) Changes in the Production System

Garment exports from Thailand are currently featured by exports of standard articles of the mass production type, a situation which makes the most of the country's low labor costs. This appears to have resulted from the adoption of the production system in Hong Kong and Taiwan. The bundle system (a sewing system conveying each production lot bundled with strings), which is most suitable for such mass production, is widely in use. This system naturally increases the work in process and the period from the start of work to the finish of the first product takes as many days as the number of workers on a line. Thus it is inefficient for multi-variety and small-lot production. The latest survey found the productivity of plants adopting the bundle system as follows.

[1] Productivity of plants producing few varieties in large lots for the United States: About a half the rate of Japan.

[2] Productivity of plants producing a medium number of varieties in medium sized lots for Europe: About a third the rate of Japan.

[3] Productivity of plants producing many varieties in small lots for Japan: About a fifth of the rate of Japan.

To cope with the need for multi-variety, small-lot production in a shorter cycle, it will be necessary to change the system into a synchronized system (a system conveying the work in process synchronously by standardizing the time required for each process of a production line) or U.P.S. (a unit production system as opposed to the lot production system). Unlike the bundle system, however, any new system will require that there be no difference in productive efficiency between individual workers that would have the result of impairing productivity. Establishment of well-balanced lines and mutual assistance between workers will be necessary. The efficiency-oriented wage system will not agree with the new production system.

(2) Improvement of Quality

The principles of quality improvement give more importance to the practice of quality control which prevents individual workers from producing defective articles than to the inspection system which removes defective articles.

Quality control in Thailand is mainly composed of final product inspection on the basis of a certain inspection standard. This makes the scale of the final product inspection process bigger so that it becomes a cost raising factor. It will be necessary to move toward quality control in each process which is the responsibility of the workers themselves.

Classified by receiving regions of Thai garments, the quality level of articles of the few-variety and large-lot production type for the United States is price-oriented as shown in Fig. II-8-1.

The quality level of medium-number-of-variety and medium-sized-lot products for Europe is higher than that for the United States as shown in the radar chart of Fig. II-8-2.

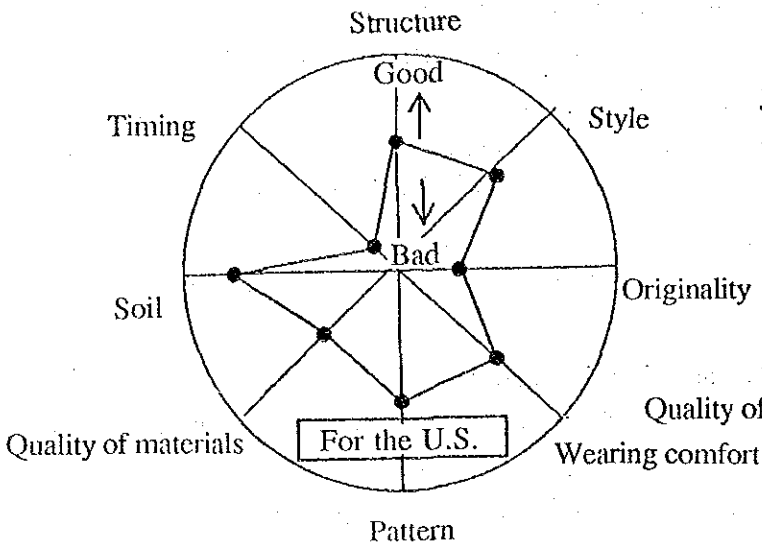


Fig. II-8-1 Radar Chart of Quality for the U.S.

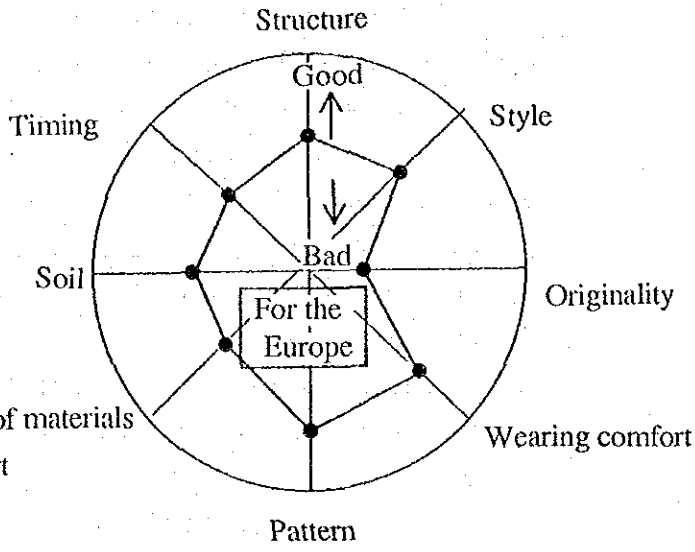


Fig. II-8-2 Radar Chart of Quality for Europe

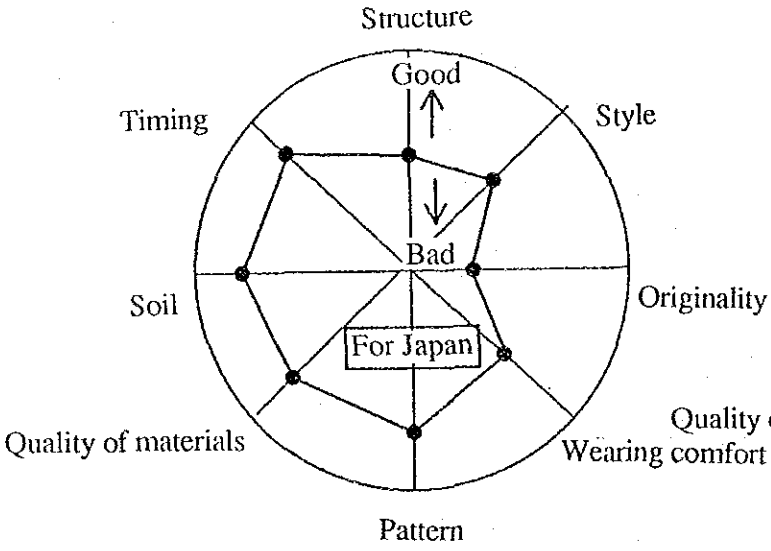


Fig. II-8-3 Radar Chart of Quality for Japan

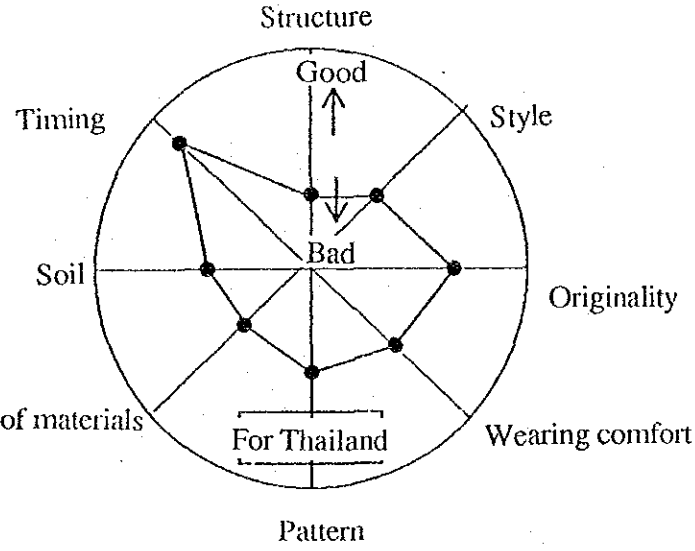
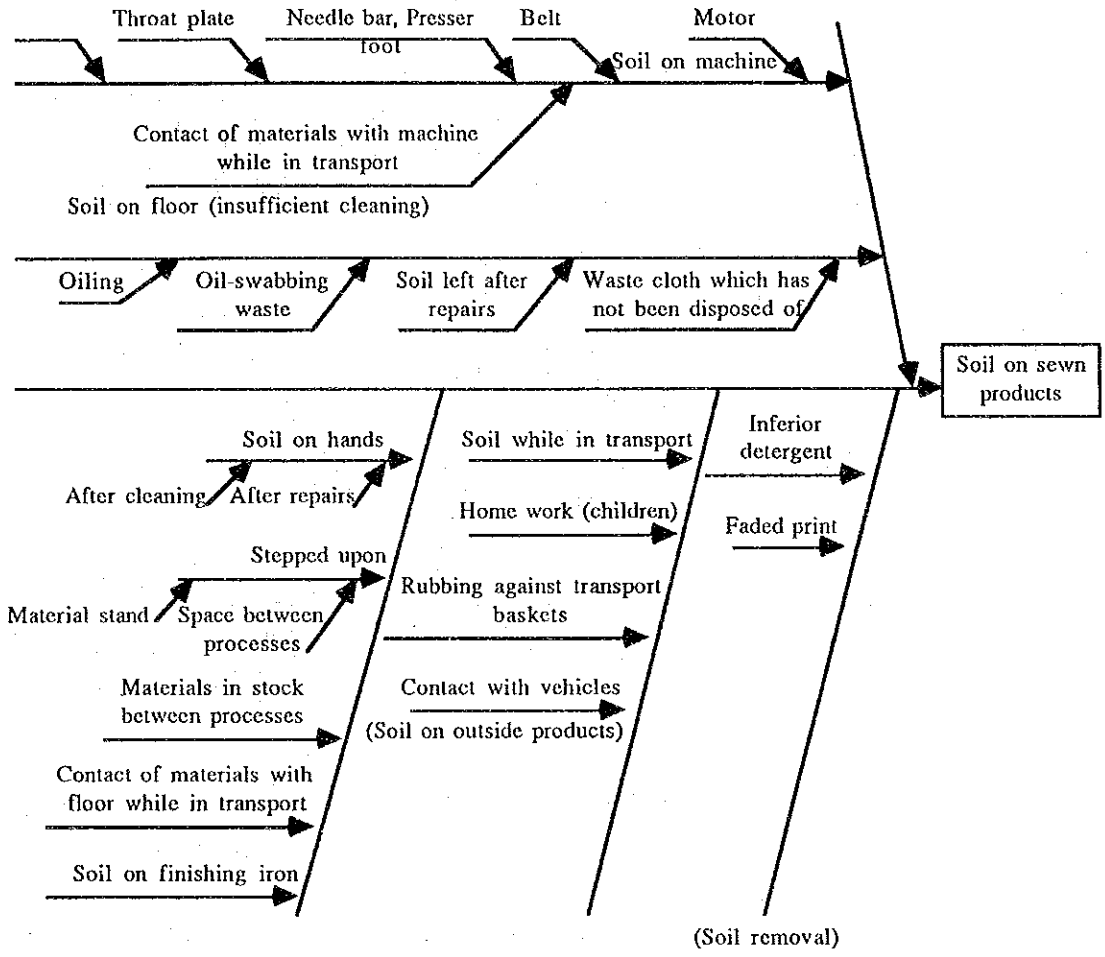


Fig. II-8-4 Radar Chart of Quality for Thailand

As an example of quality control aimed at preventing sewn products from becoming soiled, an analysis of a Japanese firm is shown for reference in Fig. II-8-5.

Fig. II-8-5. Analysis of Causes of Soil on Sewn Products



On the basis of the above analysis, the firm has taken the following measures.

<Concrete Measures Against Soil>

Measures	Causes	Contents	Results
Stands	Contact with floor	Made 70cm high and 60cm square to keep materials from touching floor.	In demonstration
Belt covers	Soil by oil	Belt covers were installed	Effective in practice
Cleaning	Rubbing against floor	Floor cleaning (twice in the morning and midday)	
	Soil by oil	Machine cleaning	Effective
Strict practice of hand-washing	Soil on hands	Hand-washing before the start of work	Effective in practice
Job-site	Soil by oil	Adjustment in arrangement of sewing machines	Effective in practice
	Rubbing with floor		
Control of outside products	Soil on outside products	Strengthened control of outside products	In practice
Inspection		Reinforcement of inspection section	In practice
Finishing irons	Soil of stains	Thoroughness of soil prevention	In practice
	Soil of scorch	Installation of temperature regulators	Under consideration

(3) Changes in the Wage System

The wage systems at sewing mills in Thailand are generally efficiency-oriented. When a mill raises the standard rate of output for a certain process, the productivity will improve. However, unless other mills raise their rates of output to the same extent, workers will move to other mills where the work is easier. This means that the improvement of productivity is difficult as long as the current production system is maintained. Moreover, finished products will be more likely to have defects if the norm is raised. In line with the changes in the production system mentioned earlier, a fixed wage system or a fixed wage plus piece-rate system must be introduced.

(4) Measures to Cope with Multi-variety Production and Shorter Delivery Terms

The growth of Thai garment exports has resulted from increased sales of mass-produced standard articles to cheaper end markets. Close to 20 firms have factories equipped with 1,000 sewing machines each, a scale unparalleled in the industrially advanced nations. A simultaneous switchover of all the large-scale factories to the new

production system stated above would be neither easy nor wise. Without a doubt, the markets for standard articles will never disappear but continue to exist, playing a basic role in the expansion of exports. This field of exports, however, is exposed to severe competition from the new garment exporting countries which are trying to catch up with Thailand. In addition, it must deal with the restraints of quotas under the MFA.

Appropriate measures for the immediate future, therefore, will be: [1] for the mass-producing factories to improve competitiveness in the standard article markets through the promotion of quality improvement and the addition of higher value on products, both utilizing the existing garment production lines, and [2] for the medium-sized firms which are able to change over quickly or new enterprises, which are in an advantageous position to enter markets for multi-variety and small-lot products requiring shorter terms of delivery, such as the Japanese market, to switch over to the new production control system from the existing one.

9. Policies and Regulations

9-1. Outline of Textile Industry Policy Changes

Policies relating to the textile industry in the early 1950s were directed at creating a self-supply system for cotton products through state capital.

With the change of government in 1958 the direction of industrial policy was changes. This saw a shift from the existing policy of promoting industry based on state-run enterprises to import substitution through private capital including capital from overseas.

Having changed over to a policy of using the private sector to lead the development of industry, in addition to enacting investment promotion acts, in 1960 the government also established the Board of Investment (BOI) as an organization for regulating and promoting industrial investment. Regulations governing the purchase of land by foreign nationals and the remittance of profits overseas were relaxed, and import tariffs on cotton products were raised by a substantial margin. It is with these measures that the development of the textile industry started in earnest.

As a result, during the seven-year period from 1960 through to 1966 41 projects related to spinning and weaving (21 of these were Japanese capital joint ventures) received assistance from the BOI and commenced operations. The number of pieces of textile equipment had increased dramatically by 1966. There were 246,000 spindles (roughly five times the number in 1955) and 16,000 weaving looms (roughly nine times the 1955 level).

This increase in equipment saw a shift away from the existing pattern of products within the textile industry which, mainly consisted of cotton yarn, cotton cloth and knitted cotton, to a more diversified pattern which included yarn, cloth and knitted fabric with incorporated synthetics. This increased the industry's capacity to meet export demand.

However, because this very rapid increase in textile equipment took place on the assumption that it would be used for supplying the domestic market there was heightened apprehension that a surplus in supply would lead to confusion in the market. As a result, in 1965 the BOI's investment incentives affecting the textile industry were discontinued.

In 1967 the Toray Nylon Thai Co. commenced production of nylon long fiber and then later in 1971 the Teijin Polyester (Thailand) Co. launched its production of polyester fiber. This start of full-scale production of synthetic fiber was accompanied by a need to strengthen the processing sector relating to this production. As a result, the BOI re-instituted its investment incentives relating to the textile industry in 1968. (During this

year the BOI granted approval for 17 new companies to enter the industry. By 1970 the number of spindles had risen to 373,000 and the number of weaving looms to 31,000.)

At round the time of this change in policy, cloth made form P/C began to be exported, and Japanese companies competed with local Thai companies to enter this product sector. Partly due to this change in circumstances, when the Thai government enacted the Investment Promotion Act 1972 it took the opportunity to change direction by adopting a policy aimed at turning the textile industry from an import substitution industry into an export oriented industry in line with the objectives of the Act.

In 1973 the BOI implemented a plan for the large-scale expansion of the textile industry by granting permission for a further 30 companies to enter the industry, for an additional 740,000 spindles and 25,000 weaving looms, and for the expansion of cloth exports to 350 million square yards. (In 1975 there were 1,094,000 spindles and 53,800 weaving looms.)

However, the worldwide recession following the oil crises of 1973 and the cessation of border trade on the termination of the Vietnam War led to an extreme surplus in production in the Thai textile industry, thus causing the industry to fall into a serious slump with regard to exports.

In 1975 the government imposed a ban on the introduction of any additional textile equipment with the exception of equipment used exclusively for exports. Seven of the 30 companies which had been issued licenses by the BOI put a halt to their plans, and during the three-year period from 1975 through to 1977 six Japanese companies pulled out after unsuccessful attempts to ride out the slump.

Since 1978 the recovery of the world economy and the resumption of border business has seen a second boom in the industry as exports of apparel and cloth made from artificial fiber have jumped rapidly.

In 1982, and then again in 1984, the government devalued the baht (from 20 baht/$ to 23 baht/$, and then to 27 baht/$) in a bid to promote exports.

The effect of this was a dramatic increase in the export of Thai textile products in the 1980s aided by a competitive edge brought about by low labor costs. In 1985 textile products took over the number one spot for the country's exports classified according to commodity. During this period a change took place so that textiles which had up until that time comprised the bulk of exports were replaced by apparel.

However, this boom in exports was accompanied by an increase in the import of raw cotton, for which Thailand had a low level of self-supply, and also of various other types of materials which could not be met by domestic supply. As a result, in 1987 the BOI and the Ministry of industry lifted the ban and began accepting applications for permission for new investment and expansion in a bid to raise the self-supply ratio for

raw materials and increase exports. The removal of these restrictions on expansion resulted in a 85% increase in the number of spindles and a 12% increase in the number of weaving looms. Thai government sources do not deny that the granting of permission to increase equipment in May 1987 might pose a danger of a surplus of production in the spinning sector. While being aware of the fact that not all plans for which approval has been given could be fully implemented (it is thought that no more than a maximum of 50% would be implemented), close attention is being paid to the course of events. As for the cloth manufacturing sector, the government still foresees a shortage of equipment.

9-2. Present Textile Industry Policies and Problems

9-2-1. Policy Drafting Organization: TIDC

The Industrial Policy Committee (IPC) is the organization which examines and discusses all industrial policies. The Committee is chaired by the Minister of Industry, and its offices are situated within the Ministry of Industry's Industrial Economics and Planning Division (IEPD). It is a policy consultation body controlled by the Ministry of Industry.

However, the textile industry is treated differently from other industries, and in 1977 the Textile Industry Development Committee (TIDC) was established. The committee deals exclusively with matters concerning the textile industry. The committee is headed by the Minister of Industry, and its director is the director of the Ministry's Department of Industrial Promotion. The IEPD and the Textile Industry Division of the DIP are in charge of its operations, and as in the case of the IPC it is a policy consultation body which is controlled by the Ministry of Industry.

Committee members from outside the Ministry include the Minister of Finance, Minister of Commerce, Minister of Agriculture, Minister of Foreign Affairs, and government-related organizations such as the BOI, Central Bank and the National Economic and Social Development Board. Non-government members include representatives from the various industry groups representing the textile, artificial fiber, cloth and garment sectors.

The TIDC has the authority and duty to: 1) consider and propose to the government detailed policies for the various government ministries and governmental organizations related to the promotion of the textile industry; 2) study and consider problems with which the industry is confronted and to present solutions to those problems to the government; and 3) establish sub-committees to which specific duties and authority are transferred.

The decision to lift the restrictions on spinning and weaving equipment in May of 1987 was made by the TIDC, and the task of accepting and reviewing applications for additional equipment was handled by one of its sub-committees.

Although the BOI takes part in considering policies as part of its role as a member of the TIDC, in the Ministry of Industry's view its basic function is to approve companies which are eligible to receive BOI incentives and also to approve incentive measures to be applied to those companies. However, there is no denying that, with its role of deciding which industries may receive investment incentives, the reality of the situation is such that the BOI is in charge of areas closely related to basic policy. In view of this situation, it is

impossible to dispel the impression that the extent of the Ministry of Industry's responsibility in regard to deciding industrial policy is somewhat unclear.

9-2-2. Control of Equipment

While constantly monitoring the supply and demand situation the TIDC and the Ministry of Industry are in charge of control of equipment in the spinning and cloth manufacturing sectors.

In 1987 approval was granted to companies both eligible for BOI incentives (controlled by the BOI) and not eligible (controlled by the Ministry of Industry) for a large-scale increase of equipment in spinning and weaving sectors. This resulted in close to a 50% increase of the existing capacity of the spinning sector. This increase has presented the problem of how to balance the equipment capacity of the weaving sector with that of the spinning sector.

If the one million spindles for which approval was given are in operation, there would be a yarn surplus of roughly 160,000 tons in 1990 even if all the newly approved 8,000 weaving looms were also in operation. The report states that an additional 29,000 weaving looms are required if this surplus is to be exported or consumed by the domestic market.

Furthermore, the recent increase in equipment occurred in order to increase production of standard items and it is not related to the diversification of material supply. We have partly attributed the shortage in domestic materials, especially in areas outside standard items, and the lack of variety in materials to the lack of a link between the upstream and downstream stages of production which the government authorities regard as a problem. Under the circumstances, it is inconceivable that the recent increase in equipment will help solve this problem. That is to say, there remains the problem of how to correct the qualitative gap in supply and demand which exists between the spinning and cloth sector and the garment sector.

There is also the problem of how to expand the dye processing sector which up until now has noticeably lagged behind the cloth sector.

One problem concerning policies for regulating equipment which cannot be overlooked is the possible danger that certain large companies which have strong political influence might be able to make use of the regulation aiming at creating an oligopoly. At the present time, the synthetic raw material sector is clearly controlled by two companies. In the spinning sector as well, there is the danger that the several large companies which possess more than half the total number of spindles may increase the extent of their control.

9-2-3. Modernization of Equipment

The equipment found in the spinning and weaving sectors today is generally old, and moreover, these sectors are slow to introduce modern equipment such as open end machines and shuttleless looms. This is casting a shadow on the industry's attempts to raise its level of international competitiveness.

9-2-4. BOI Investment Promotion

Starting on 24 December 1986, before the Ministry of Industry lifted its ban on new and additional equipment in May 1987, and running through to 26 May 1987, and then again from 31 August 1987 through to 12 July 1988, the Board of Investment accepted applications for new and additional equipment related to spinning, cloth and knitted materials. (However, this applied only to 100% use for export.) It has stopped accepting applications since 13 July 1988.

In other words, although the "spinning industry" and the "weaving industry" are among those on the list eligible for incentives, these have been suspended temporarily since 13 July 1988. Similarly, incentives once applied to "garment manufacture for export" have remained suspended since 13 February 1985.

Companies are subject to Ministry of Industry regulations governing the expansion of equipment related to spinning and weaving even when they do not expect BOI incentives. As for garment manufacturing companies, because the Ministry does not impose any regulations concerning equipment they are free to expand their equipment regardless of whether it is to be used for producing goods for export or for the domestic market as long as they do not receive BOI incentives.

As stated above, at the present time BOI incentives covering the spinning, weaving and export garment industries have been suspended. Items which are subject to exemption (as of the end of December 1988) are "woolen or linen yarn" in the spinning sector (in cases where investment exceeds 50 million baht), "taffeta" manufactured in the weaving sector (subject to the same conditions as above), and "dress suits for export" in the garment sector (in cases where investment exceeds 20 million baht and 100% of production is exported). (Promotion of "taffeta" has recently been suspended because permission was already given to 10 companies.)

The dyeing and printing sectors are also eligible for incentives. However, it is not practical to locate in remote promotion zones as required, and it is feared that the required

investment level is too high as these incentives are subject to an investment value of more than 50 million baht. A flexible approach to the size of the investment would be desirable.

The BOI intends to review policies concerning the development of supporting industries. It is thought that this will involve flexible polcies such as granting incentives regardless of a company's lcoation. It is hoped that this change in policy will help expand the dyeing and finishing sector.

Because the BOI's investment promotion has been directed exclusively at new investment for companies it is questionable as to whether it has played, or is playing, an adequate role in converting the textile industry - an industry which has been developed as an import substitution industry - to an export industry. An adequate explanation regarding this point was not obtained from the BOI subject to further study.

9-2-5. Policies Concerning Duties

(1) Duties Affecting Machinery and Parts

The Nakano Report points out that in expanding exports of textile products in the future it will, in particular, be necessary to aim at the Japanese market, and that the modernization of equipment will be important in order to achieve this. Nevertheless, the report goes on to point out that border taxes comprising of a 30% customs tariff and a 7.54% business tax makes the procurement price for machinery and equipment 40% more expensive than the international price, thus placing a substantial obstacle in the way of renewing equipment. The same applies for machine parts.

With the exception of specific companies which receive incentives from the BOI, generally no exemptions or refunds for import duties levied on machinery and their parts are granted. Viewed from this perspective, it cannot be denied that this has a negative effect on the export of textile products.

If this problem is simply taken as being one which involves selecting either the textile industry or the machinery and parts industry to receive preferential measures aimed at fostering that industry, it will be easy to reach a conclusion by gauging and comparing the policy effect (at the present time this mainly comprise of financial revenue) brought about by protecting the machinery industry through customs tariffs and the negative effect felt by the textile industry.

However, in regard to policies concerning customs tariffs it is necessary to examine the system of taxation and the system of customs duties from a broad perspective. This is because of the need to take into account the relationship between the importance which has been attached for a long time to policies concerning tariffs as

financial policies in Thailand. Caution is required in discussing the issue only from the narrow perspective of its relation to the textile industry.

Just for reference, the current tariff rates for textile machinery and parts in Thailand as well as in some other Asian countries are shown in Table II-9-1. Of course, there is practically no theoretical or analytical value in making a simple comparison between the tax rates provided in the Table. It is only by measuring and comparing the actual effect of such protective tariffs and taxes that it is possible to provide a basis for some argument or other. (Thai government authorities are currently studying lowering the tariff rates for industrial machinery.)

(2) Duties Affecting Dyes

A similar problem also exists in regard to dyes for use in textiles which are subject to a 30% customs tariff, a 20% surcharge, and a 2% business tax, bringing the total for border taxes to 52%.

Some dyes are produced domestically, and viewed in this light, these tariffs can be seen as a measure to protect domestic production. However, many factories have to use imported dyes due to the poor quality of domestically made dyes. The reality of the situation is such that protection of domestic production does not work.

There is a refund or rebate system which is applied to dyes as well, so that, in theory, the negative effect which import tariffs on dyes have on the export of textile products is countered. This is because refundment of customs duties can be obtained for dyes which were used for fabrics which were made into garments for export if an export certificate is obtained from the customer who ordered the dyeing.

However, even if the dye was, for example, one which was used for fabrics used in garments which were ultimately exported, in an overwhelming proportion of cases it was not possible to obtain an export certificate due to the fact that orders for dyes were coming from the distribution market. In other words, in practice there are many kinds of obstacles so that in reality the refund system for duties hardly functions.

Even though the problems outlined above concerning tariffs and the tax refund system for dyes do exist, it is necessary to look at the issue from a broader viewpoint as has already been mentioned above.

Again, just for reference, Table II-9-1 shows the current rates for tariffs applying to dyes in Thailand and in some other Asian countries.

(3) Duties Affecting Materials for Textiles

In cases where it is not possible for the export garment sector to procure materials which are suitable in terms of specifications, quality, and price from the domestic market, it naturally follows that imported materials have to be used. Of course, because refunds are made on customs tariffs and business taxes levied on imported materials used in the manufacture of exported items, the competitiveness of garments for export is not hindered by these duties levied on materials.

Nevertheless, import tariffs worth roughly 98% of the CIF price are levied on imported materials (cloth). This consists of an 80% customs tariff and a 17.9% business tax (effective basis). In the case of knitted fabric, import tariffs have a combined value of 120% of the CIF price.

Even if the procedure for receiving a refund on duties and the amount of waiting time for the refund were to be reduced substantially, the whole process would still take a considerable amount of time. Supposing that import duties are valued at 100% of the CIF price and bank interest rates are set at 13% per annum, if it takes six months to receive a refund after paying the duties the cost of interest rates incurred during that six-month period amounts to 6.5% of the CIF price. Viewed in this light, it can be said that the high duties levied on materials obstruct the export competitiveness of garments to a certain extent.

Even if the growth of the Thai textile industry has to a large extent been due to protective tariffs, there is a need to make a re-examination of policies of tariffs from an overall perspective which involves basic policies for fostering the textile industry.

A question that arises here is the "negative effect" which industrial protection policies have and the accumulation of the same. A problem lies with how to effectively strengthen competitiveness within a protected environment.

The current tax rates for customs tariffs and other duties which apply to textile materials in Thailand and other Asian countries are provided in Table II-9-2. As with Table II-9-1, there is virtually no theoretical or analytical meaning in making a simple comparison of the tax rates.

9-2-6. Fostering Man Power

In the textile sector, there is a shortage of staff, particularly in production management. There is also a shortage of process management staff as well as a shortage in designers in the garment sector.

According to the chairman of the Federation of Textile Associations, although the industry has been asking the government to establish more technical education at the tertiary level, very little progress has been made in this area.

9-2-7. The Role of The Textile Industry Division (TID)

The Textile Industry Division (TID) is affiliated to the Ministry of Industry and the Department of Industrial Promotion. As well as being concerned with the administration of the textile industry, it performs a wide range of activities aimed at assisting the industry. These include research and development, testing and inspection, education and training, and an information service.

However, there is a qualitative and quantitative insufficiency in the equipment and funds which are available to cope with the tasks facing the textile industry at the present time. Compared with the wide range of its activities, the number of staff employed by the division is not very large.

In particular, with regard to its inspection service it faces many difficulties in meeting demand due to factors such as the outdated testing equipment which it possesses. With the cost of a testing machine at somewhere around 23 million baht, it is not possible to purchase one using funds from the ordinary budget. A look at the machinery and equipment currently in use in factories reveals a noticeable number of obsolete machines. Accordingly, in many areas it is not possible keep up with the new technology which is essential today. Some areas are left out due to a lack of equipment such as computer graphics and research into automated machines.

Also, there is a notable lack of information. There is an especially severe shortage of information on Japan, a country with a very high demand.

As for its inadequate budget, although the division has earned a small amount from its testing fees, after this is paid to the government it is not refunded at a later time. Consequently, the TID is a long way from being able to appropriate its operating income for such things as the renewal of plant and equipment and research and development.

9-2-8. Problems Relating to Raw Cotton

At present, the self-supply ratio for raw cotton is only 10%. Competition with other crops and problems relating to distribution such as constraints in the financial capacity and storage capacity of ginners and spinners lies behind this lack of growth in raw cotton production despite a huge domestic demand. Defects in the quality of domestically produced cotton is also one problem faced by spinners and cloth manufacturers.

From 1983 until 1987 Thailand recorded an adverse balance of trade for cotton yarn. No accurate verification has been made to say whether the fact that the inferior terms of trade for standard Thai cotton yarn in comparison to those produced in India, Pakistan and China is a significant factor behind this imbalance. However, it can be assumed that one of the factors behind this lack of competitiveness in terms of price is the dependence on imports for raw materials (raw cotton).

It goes without saying that efforts aimed at the effective utilization of domestic resources would lead to a higher added value for the overall economy. However, in order to do this it would be necessary to provide certain incentives to cotton producers in order to promote production, and it would also be necessary to guarantee a supply of raw cotton which is internationally competitive for the textile industry in terms of both quality and price. At the same time, it would also be necessary to improve technology related to raw cotton cultivation and to engage in research and development (for improving strains, etc).

9-2-9. Control of Unfair Trade Practices

Despite the provision of a clause (Section 22.(5)) in the Trade Association Act. B.E. 2509 which prohibits acts which restrict competition, at the present time there is no unfair trading control law similar to that of an anti-trust law. Accordingly, even though it may be suspected that unfair trading practices take place within the textile raw material sector where there is an oligopolic situation, there is nothing which can be legally done about this.

(Note) For example, in the case of spindles and weaving looms, with a 30% tariff, a 16% standard profit provisions and a 5% business duty, the actual rate of the business duty is:

(100+30) x (100+16) x 5/100 x 100 = 7.54%

Table II-9-1. Current Import Tariffs of Textile Dyes and Textile Machineries in the Asian Countries (%)

Items	Thailand	Korea	Taiwan	China	Malaysia	Ind'sia	Philip.
(1) Dye Stuffs	(*1) (32.04)	(32.04)	(32.05)	(32.05)	(32.04)	(32.04)	(32.05)
	(*2) 30/1.5	20	15	25	Nil	(*6) 5	10
(2) Spinning	(84.45)	(84.45)	(84.36)	(84.36)	(84.45)	(84.45)	(84.36)
Machinery	30/5	20	10	(*5)30/20	Nil	5	10
(3) Weaving	(84.46)	(84.46)	(84.37)	(84.37)	(84.46)	(84.46)	(84.37)
Machinery	30/5	15	(*3)10	20	Nil	10	10
(4) Knitting	(84.47)	(84.47)	(84.37)	(84.37)	(84.47)	(84.47)	(84.37)
Machinery	30/5	20	10	20	Nil	5	10
(5) Parts of	(84.48)	(84.48)	(84.38)	(84.38)	(84.48)	(84.48)	(84.38)
(2), (3), (4)	30/5	20	(*4) 15	9-40	Nil	5	10
(6) Dyeing, Printing	(84.51)	(84.51)	(84.40)	(84.40)	(84.51)	(84.51)	(84.40)
and Finishing	30/5	15/20	10	15	Nil	(*7) 30	10
Machinery				Parts:5		Parts:20	
(7) Industrial	(84.52)	(84.52)	(84.41)	(84.41)	(84.52)	(84.52)	(84.41)
Sewing	35/9	20	20	30	Nil	10	50
Machinery				Parts:5/20		Parts:20	

(*1) Tariff Code Nos. in parentheses: H.S. for Thai., Korea, Malaysia, Indonesia, BTN for Taiwan, China, Philippines
(*2) Tariff/Business Tax (% of the total of Duty-paid plus Standard Profit)
(*3) "Shuttle-less" 15%
(*4) "Casings for plastic bobbins" 25%
(*5) Cotton Spinning 30%, Others 20%
(*6) 10% VAT is levied
(*7) Bleaching, Dyeing, Finishing machines

Source: Tariff Books of each country, 1988/89

Table II-9-2. Current Import Tariffs of Textiles/Apparels in the Asian Countries (%)

(*1) Textile Items	Thailand		Korea	Malaysia			(*3) Ind'sia
	(Tariff)	(B'ness Tax)	(Tariff)	(Tariff)	(Surtax)	(Sales Tax)	(Tariff)
(1) Staple Fibres	30	(*2) 1.5	20	0/2/5	0	0	0-15
(2) Cotton Yarns	30	5	20	15	5	0	15/20
(3) Filament Yarns	30	5	20	0/2/15	0/5	0	5-30
(4) Staple Fibre Yarns	40	5	20	0	5	0	20/30
(5) Cotton Fabrics	80	9	20	30	0/5	10	30-60
(6) Man-made Fabrics	80	9	20	30	0/5	10	50/60
(7) Knitted Fabrics	100	9	20	25-40	0/5	10	40-60
(8) Apparels, Fabrics	100	9	30	25-40	5	10	40-60
(9) Apparels, Knitted	100	9	30	25-40	0/5	10	40-60

(*1) H.S. Codes: (1) Staple Fibres (55.03-07), (2) Cotton Yarns (52.05), (3) Filament Yarns (54.02-03), (4) Staple Fibre Yarns (55.09-10), (5) Cotton Fabrics (52.08-12) (6) Man-made Fabrics (54.07-08, 55.12-16), (7) Knitted Fabrics (60.01-02), (8) Apparels, Fabric (61.01-17), (9) Apparels, Knitted (62.01-17)
(*2) Tariff/Business Tax (% of the total of Duty-paid plus Standard Profit)
(*3) 10% of VAT is levied

Source: Tariff Books of each country, 1988/89

9-3. Measures

9-3-1. Basic Policies

As illustrated by comments made by the chairman of the Federation of Textile Associations, there are those within the industry who are of the opinion that decision making should be left up to private companies and that the government should completely abolish both regulations and incentives.

The government, after making clear which system its policies for the textile industry are based on - (1) the perfect free competition system of Taiwan and Hong Kong; (2) the system of cooperation between government and the private sector as found in Japan and South Korea; or (3) the totally controlled system found in China, - could come up with a long-term vision for the textile industry. This may perhaps serve as a response to the critical opinions found within the industry.

As the Thai people are originally a people who respect freedom and who dislike control or intervention, there is a strong inclination towards making the textile industry a perfect free competition industry. However, from the viewpoint of ensuring job stabilization, export earnings and a contribution to national income, the textile industry is one of the country's main strategic industries, and it would be difficult for the government to allow it to be free from policies. A step-by-step easing of restrictions could be said to be practical.

It is clear from all kinds of analyses that in terms of its export potential the Thai textile industry compares favorably with Hong Kong, Taiwan, South Korea, and China, countries which are ahead of it at the moment. While policies which place an emphasis on maintaining and also strengthening international competitiveness are desirable, effective policies have to be devised with the understanding and cooperation of those involved in the industry.

Recorded in the supplement for reference in considering a "vision" for the textile industry is Japan's "New Textile Vision" (a draft of a report put out by the Textile Industry Council and the Industry Structure Council). Similarly provided for reference is South Korea's "Textile Industry Modernization Plan for 1984".

9-3-2. Equipment Controls

The addition of some 26,000 weaving looms should be considered in order to balance the equipment capacity of the weaving sector with the increased capacity of the spinning sector as a result of approvals issued for increasing equipment in 1987.

When looking at the problem of poor linkage between the materials sector and the garment sector, policies regulating equipment must contain measures which will help diversify the types of materials for the garment sector, that is to say, increase the supply of products which are not standard products, such as high grade materials and special materials. Also, from the perspective of strengthening competitiveness by rationalizing production and raising productivity, the policies should contain measures which are linked to the modernization of equipment.

9-3-3. Modernization of Equipment

Consideration should be given to the introduction of a special or accelerated depreciation (applicable to specific industries and specific equipment) for exporting companies.

Also, research needs to be made into a publicly operated equipment installment system and leasing.

Recorded as reference material in the supplement is information on the equipment installment system and the lease system which are part of the promotion of modernization of small and medium-scale enterprises in Japan.

In order to promote investment for modernizing textile machinery it should be worth considering the implementation, for a fixed period of time, of measures which provide special exemptions from import tariffs for specific types of machinery.

9-3-4. BOI Policies

The establishment of a dyeing industrial estate within Zone 1 of the BOI Investment Promotion Zones and other measures need to be considered for promoting the dyeing and finishing sectors, which pose the danger of becoming bottlenecks in the development of the textile industry in the near future.

9-3-5. Import Tariffs

As has been mentioned earlier, the problem of lowering tariffs imposed on textile machinery, dyes, and materials should not be discussed simply in the context of its relation to the textile industry. A review needs to be undertaken which focuses equal attention on the importance of fostering the export textile industry and financial structure, and also the tax and duty system.

In Thailand revenues from duties account for 19.8% of all tax revenue (1987), and revenues from duties on capital goods accounted for 9.3% of all tax revenues, and 47% of revenues derived from duties. Revenue from corporate and personal income taxes, on the other hand, comprised 18.2% of all tax revenues, lower than that for duty revenues.

Of course, given this kind of apparent tax structure, and viewing the seemingly high tariff rates mentioned previously in this context, it is hard to come up with a basis for judging whether or not Thai tariff rates are in fact high. An investigation of Thai tariffs must be undertaken by measuring the policy effect such as the effective protective rate of duties or the tax burden borne by imports.

However, it is extremely difficult to make an effective and complete investigation of this kind given the amount of time and human resources allocated to this survey. It would be only proper to leave this examination of duties up to an independent survey.

Nevertheless, as has been mentioned earlier, in regard to import tariffs for textile machinery, measures for providing special exemptions for a fixed period of time should be required in order to promote the modernization of equipment.

9-3-6. Import Tariff Refund System

As for refunds or rebates on import tariffs placed on dyes, certain adjustments to the way in which the system is operated and a relaxation of conditions should be required in order to make the system function.

9-3-7. Fostering the Dyeing Industry

Environmental regulations are part and parcel of the times we live in today. However, in a relatively small-scale industry such as the dyeing industry it is difficult for individual companies to deal with the problems concerning water for industrial use and waste water on their own. The establishment of a dyeing industrial estate to deal with these problems together is therefore considered necessary.

It is suggested that a separate feasibility study be made in regard to this dyeing industrial estate.

9-3-8. Fostering Man Power

Long-term measures covering a 5-10 year period need to be established which include school education based on long-term estimates for the number of production process management experts, technicians, and designers.

9-3-9. The Function of the TID

In relation to the function of the TID, a sort of equipment capacity which the TID should have in place is mentioned in detail in section I-2-7; 7), 8) and 9).

9-3-10. Control of Unfair Trade Practices

It is necessary to protect the right of choice of purchasers in regard to buying. In order to do this, a system concerned with fair trading under which purchasers make declarations could be established. Even where there is an oligopoly, the system ensures that the principle of competition will be allowed to work. In the future there will probably be demands for substantive regulations dealing with unfair trading practices and monopolies.

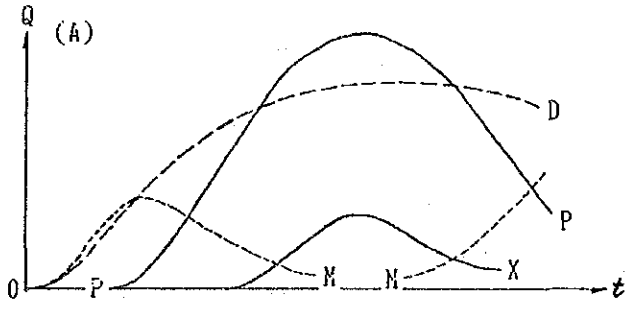
9-4. A Comparison of the Development Phases of Textile Industries — A Study for Government Consideration —

The following is a comparison between the process of the development of the Thai textile industry and its present development phase, and that of Japan and other Asian nations. This analysis has been undertaken wishing to provide the Thai government with some kind of policy implication as a basis for examining policies concerning the export industrialization of the textile industry. (Fig.II-9-1/4)

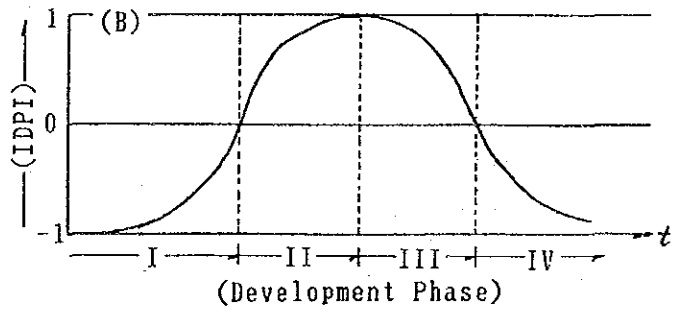
The analysis is based on Dr. Kaname Akamatsu's "Theory of Catching-up Product Cycle" (Note 1). Dr. Akamatsu's theory explains the process of developing countries catching up to advanced countries by following the development pattern of starting from import substitution of standard products to reach a stage of full-scale export.

The concept of the catching-up product cycle is explained by the following figure.

(A) A Concept of Product Cycle



(B) A Concept of IDPI



In the figure there is a curve representing an increase in imports of Commodity i which is not domestically produced in Country j. As a result of the imports (M), domestic demand (D) is generated.

When import volume reaches a level where it is profitable to start domestic production, domestic production (P) is commenced. At this stage policies for protecting and fostering domestic production are put in place and technology transfer and direct

investment from abroad becomes necessary. As domestic production increases imports gradually decrease. This process is import substitution.

When domestic production increases further and exceeds domestic demand the surplus is exported. Export is then gradually expanded.

However, it is difficult for Country j to continue to maintain a high degree of international competitiveness for commodity i. When another developing country with a greater degree of advantage enters the market it is inevitable that Country j's domestic production of Commodity i will start to decline. In due course, domestic production falls below the level of domestic demand and this is accompanied by the recommencement of imports of Commodity i.

Viewed in this way, the development phase of "i" industry of "j" country can be represented by the Trade Specialization Index (TSI), that is:

$$\sum_{t=1}^{n} \frac{Xij - Mij}{Xij + Mij}$$

Xij and Mij are Country j's exports and imports of Commodity i.

This has provisionally been called the "Industrial Development Phase Index" (IDPI).The values of the IDPI range between +1 and -1. The range of Phase I is -1/0, Phase II 0/+1, Phase III +1/0, and Phase IV 0/-1. This is illustrated in Figure (B) above.

In other words, during Phase I there is a shift from domestic demand being totally dependent on imports (IDPI= -1) to import substitution and an increase in exports. In Phase II following a equilibrium between imports and exports (IDPI = zero), exports start to exceed imports and the index rapidly rises. Imports then practically disappear and the index rises to a point near +1. However, when imports are recommenced in Phase III the index falls back down to zero, and during Phase IV it falls down towards -1.

On the basis of the Product Cycle Theory it is possible to anticipate the development process for a specific industry in a certain country during the stage when imports are declining and exports are increasing.

This concept of the IDPI is of course extremely broad. Moreover, when focusing on a specific product sector it is not a completely infallible means of measuring the phase of development reached and true capability because it does not take into account policies to control imports, the particular circumstances surrounding the product in question, and the scale of production or exports. Nevertheless, an analysis derived from the IDPI also reflects international competitiveness, and there is the advantage of using the same index and concept to identify both the development phases and international competitiveness of the industry under analysis.

In addition, it is relatively easy to obtain related long-range international statistics, and it is to a certain extent an effective means of comparing the development phases of

industries as it is possible to compare long-term trends relating to certain countries and products.

This method has been applied to measure the development phases of industries in specific countries by others as well (Note 2).

Figures II-9-1 through II-9-4 show the results of measurements taken on the basis of this concept. (For measurement values of the IDPI, refer to Table II-9-3 and Table II-9-4.)

Data has been obtained from OECD trade statistics. A study was made of SITC-65 (yarn and cloth) and SITC-84 (apparel).

However, it should be pointed out here that because the OECD statistics are derived from the export and import statistics of OECD member countries, in cases where these are used for Thai trade it is unavoidable that the statistics are slightly disparate and distorted from the actual situation as these do not include trade with non-OECD countries. It is, however, possible to obtain data concerning Taiwan and China from these OECD statistics.

Fig. II-9-1 shows the development of SITC-65 (textiles) in 10 countries. In addition to Japan and Thailand, Hong Kong, Taiwan, South Korea, Indonesia, the Philippines, Malaysia, China, and India are included.

A look at Figure II-9-1 shows that Hong Kong has already entered Phase IV and is experiencing a decline. Although Japan and Malaysia have entered Phase III, they are still retaining their competitiveness.

Thailand rapidly made ground during the 1970s, and in 1980 or so overtook Taiwan and South Korea whose growth had begun to level off, and ranked behind India and China in terms of its latitude of development. Indonesia has shown a rapid rise since 1982 and is fast catching up to Thailand.

The positions of the ten countries are plotted in Fig. II-9-3. Each country's IDPI as of 1986 is shown on X axis and the scale of their exports on the Y axis.

While this shows that the phase of development reached by Thailand's textile industry is almost the same level as that of Taiwan, Korea and China, its exports stand at between one-fourth to one-fifth the levels of those countries, suggesting a chance for a big volume-wise stride by Thai textile industry.

Malaysia's textile industry has entered Phase III even though the scale of its exports continues to be small. It is to be hoped that this is not a sign that the country's textile industry will be relatively short-lived. This will depend on to what extent it can improve its competitiveness through developing technology, turning to higher grade and more distinctive products, and by streamlining production.

Fig. II-9-2 and II-9-4 show the development phases reached by the same ten countries in regard to apparel.

Six of the ten (Japan, Thailand, Indonesia, and Malaysia are excluded) have been fully developed since 1970 and have maintained an overwhelmingly high level of competitiveness. However, judging from the data, it would seem that for Taiwan and South Korea their period of prosperity is just about over.

Looking at India, in comparison with the competitiveness of its textiles, in terms of quantity apparel is experiencing a noticeable stagnancy. This can be attributed to its delay in investment and production of goods with a high added value. In 1977 the Philippines' IDPI reached 0.96. It has almost reached its peak in terms of development phase, but the scale of its exports is similar to that of India.

Thailand and Indonesia overtook the leading group in 1980 and 1984 respectively. Malaysia has also reached a fairly high level.

Thailand, Indonesia, and Malaysia maintain an extremely high level of competitiveness at the present time. Although it remains to be seen how they will fare in the expansion of garment exports in the future, their success will depend on how they change over to the manufacture of products with a higher added value and manage to take over some of the market share presently held by Hong Kong, Korea and Taiwan. As in the case of textiles, there is a big possibility for the Thai garment industry to expand its exports.

Japan has already entered Phase III and the volume of its exports is naturally decreasing. A further increase in the index, though a slight one, which has been seen since 1982 reflects a higher grade of quality and a move to more distinctive products.

The cause and effect relationship of this sort of rise and decline between Japan and other Asian countries cannot be grasped from this analysis. However, looking at it from the perspective of price competitiveness, it could be said Japan's decline has been prompted by the rise in competitiveness of the Asian NIEs and ASEAN countries.

It is estimated that the IDPIs of Hong Kong, Korea, and Taiwan will, in the end, all follow the same sort of pattern experienced by Japan, in sequence with the growth of Thailand and other ASEAN countries.

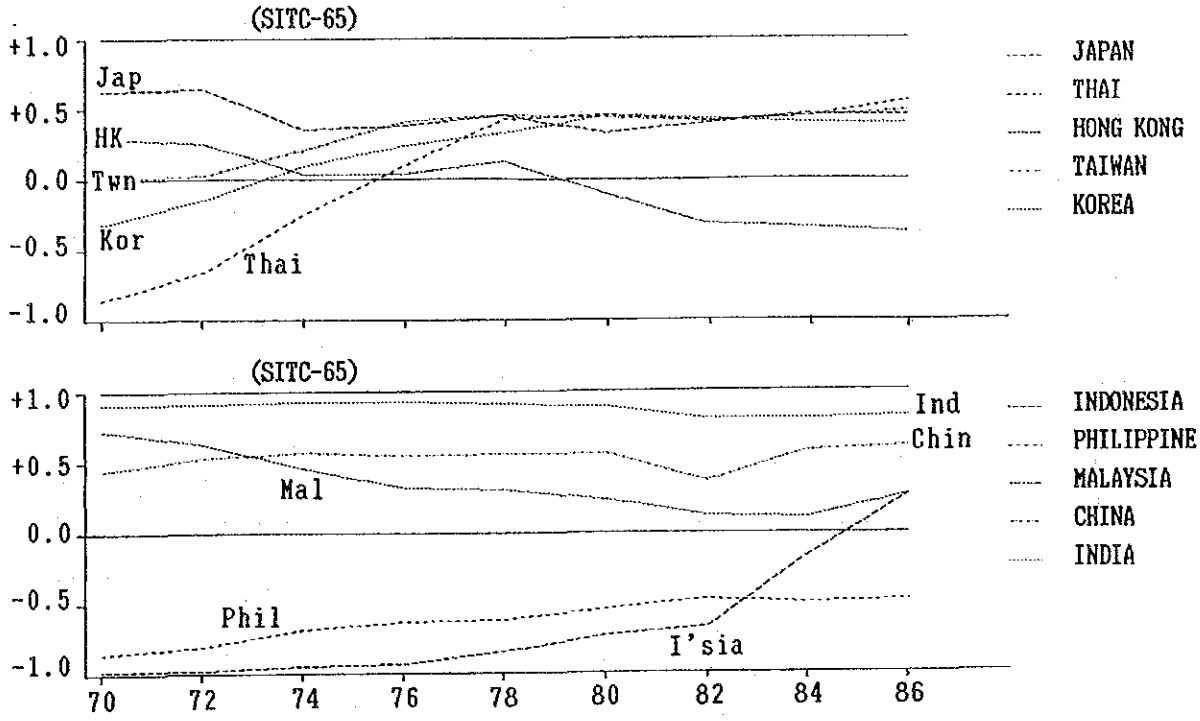
(Notes)

1. From p. 150, "The New World Economic Order and Japan", by Kiyoshi Kojima, Nihon Keizai Shimbunsha, 1975;

2. IDC "Survey Report on Basic Economic Facilities" (Thailand, Indonesia, Malaysia, and Burma), 1960;

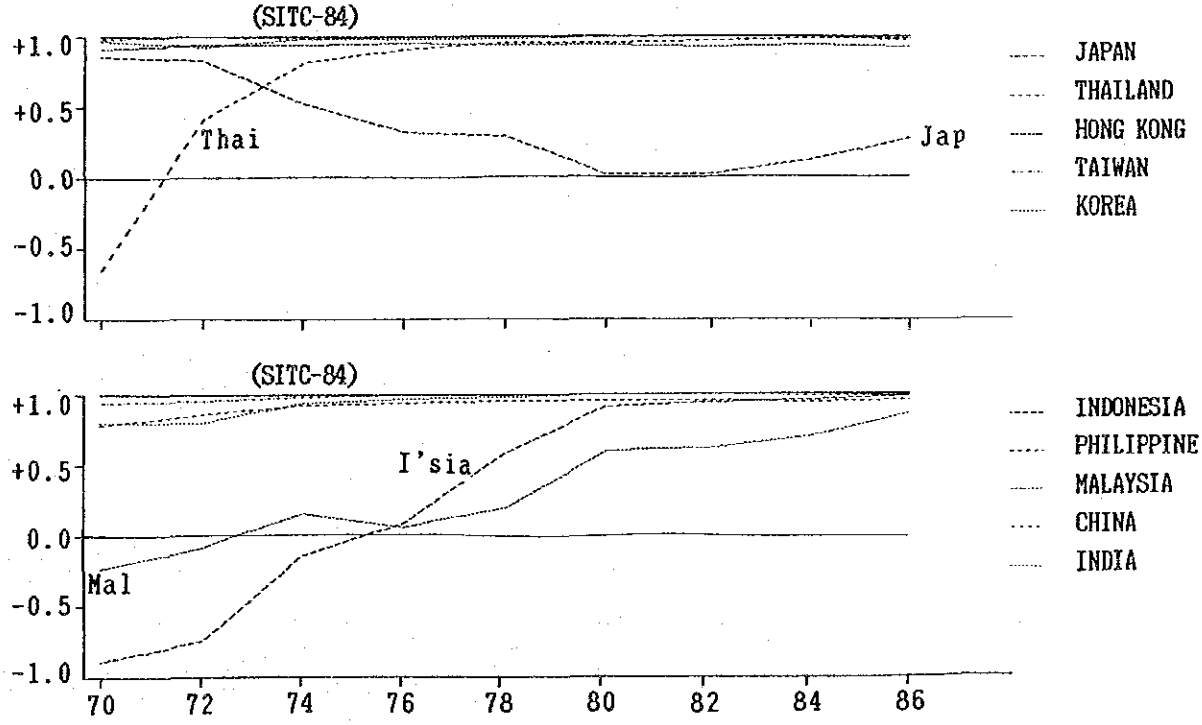
Nobuyuki Kasai, "International Competitiveness and Price Factors in The South Korean Textile Industry", Sekai Keizai Hyoron, April 1983.

Fig.II-9-1 Development Trend 1970-86: TEXTILE INDUSTRIES (SITC-65)



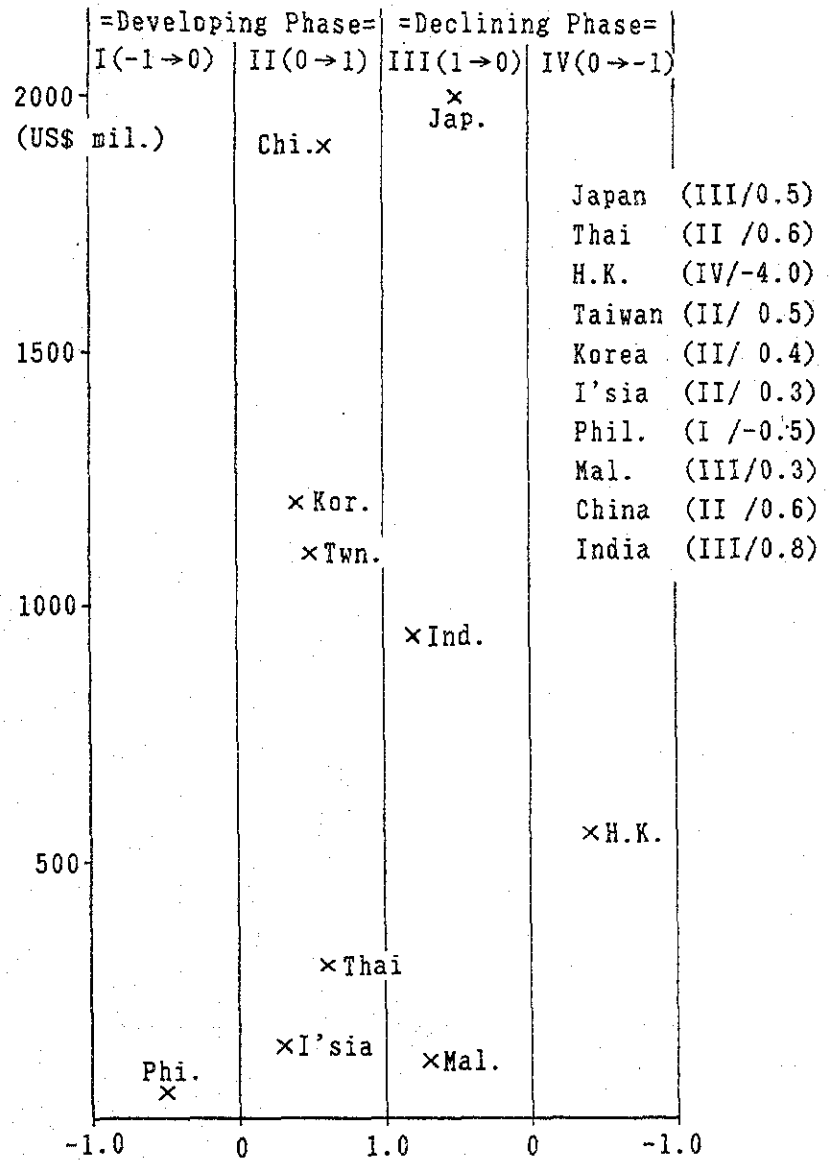
(Source) OECD: Foreign Trade by Commodities, 1982, 1986

Fig.II-9-2 Development Trend 1970-86: APPAREL INDUSTRIES (SITC-84)



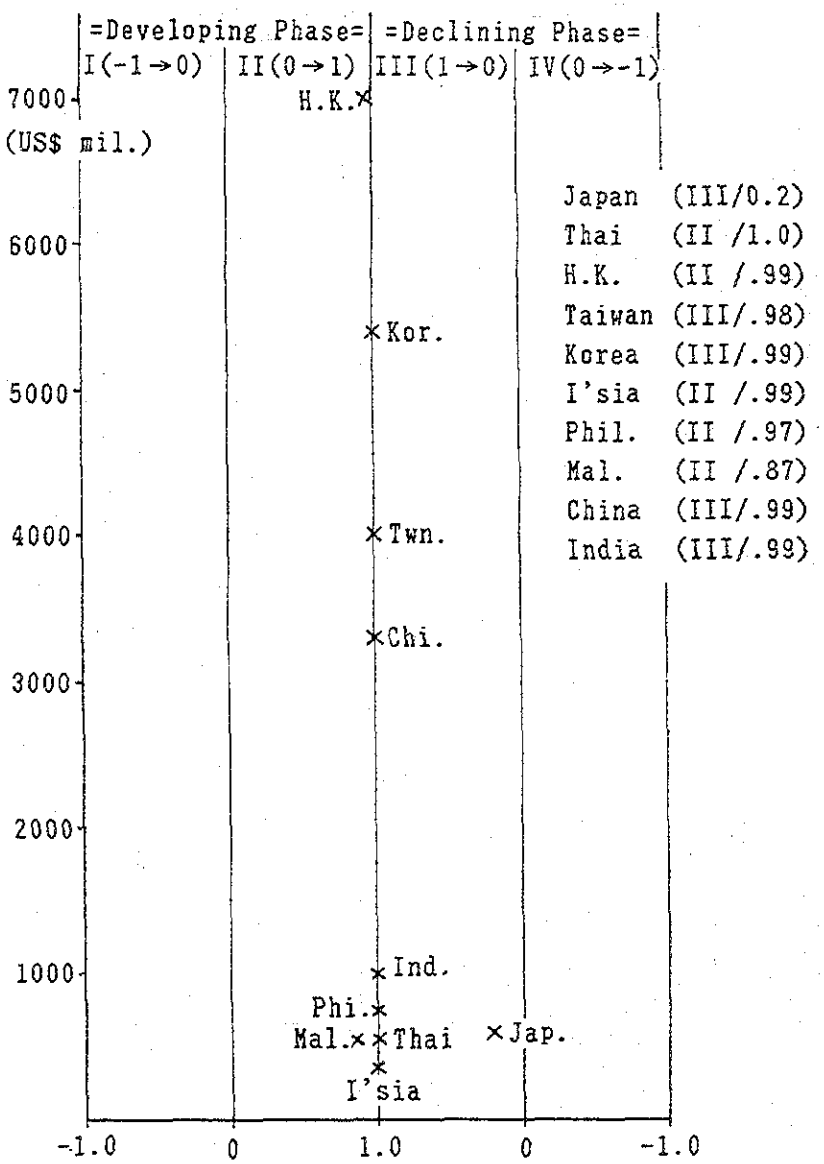
(Source) OECD: Foregin Trade by Commodities, 1982, 1986

Fig.II-9-3 Development Phase and Scale of Export (1986)
TEXTILE INDUSTRIES (SITC-65)



(Source) OECD: Foreign Trade by Commodities, 1986

Fig.II-9-4 Development Phase and Scale of Export (1986)
APPAREL INDUSTRIES (SITC-84)



(Source) OECD: Foreign Trade by Commodities, 1986

Table II-9-3 Development Indices(*): TEXTILE INDUSTRY (SITC-65)

	1970	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86
Japan	.64	.67	.65	.50	.36	.30	.39	.46	.47	.40	.34	.34	.40	.45	.47	.47	.47
Thailand	-.85	-.74	-.65	-.41	-.23	-.10	.10	.26	.43	.47	.47	.45	.42	.41	.45	.50	.56
Hong Kong	.31	.29	.27	.14	.05	.02	.05	.10	.13	.06	-.09	-.27	-.31	-.33	-.34	-.36	-.37
Taiwan	.01	.02	.03	.09	.22	.34	.42	.44	.46	.47	.45	.43	.42	.43	.45	.48	.49
Korea	-.31	-.23	-.13	.01	.10	.16	.25	.28	.34	.40	.46	.46	.44	.42	.41	.41	.41
Indonesia	-.96	-.96	-.96	-.95	-.94	-.94	-.92	-.89	-.84	-.77	-.72	-.70	-.67	-.49	-.16	.11	.26
Philippines	-.85	-.84	-.79	-.75	-.68	-.64	-.62	-.62	-.61	-.60	-.53	-.49	-.47	-.48	-.49	-.47	-.48
Malaysia	.74	.67	.64	.53	.46	.39	.32	.29	.30	.32	.24	.17	.12	.10	.10	.17	.27
China	.45	.50	.53	.61	.58	.59	.55	.57	.56	.58	.56	.44	.37	.43	.58	.59	.60
India	.92	.91	.92	.92	.94	.94	.94	.94	.92	.90	.89	.86	.81	.79	.80	.81	.82

(*) 3 years moving averages

(Source) OECD: Foreign Trade by Commodities, 1982, 1986

Table II-9-4 Development Indices(*): APPAREL INDUSTRY (SITC-84)

	1970	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86
Japan	.86	.86	.84	.72	.54	.38	.33	.32	.30	.14	.04	-.02	.03	.05	.14	.25	.29
Thialand	-.65	.20	.42	.58	.82	.91	.92	.94	.96	.97	.97	.97	.98	.98	.99	.99	.99
Hong Kong	.92	.94	.95	.95	.95	.96	.97	.95	.95	.95	.95	.95	.94	.94	.95	.95	.94
Taiwan	.99	.99	1.00	.99	.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	.99	.98
Korea	.98	.91	.94	.98	.99	.99	.99	.99	.99	.99	1.00	1.00	1.00	1.00	1.00	1.00	.99
Indonesia	-.88	-.79	-.74	-.40	-.13	.06	.09	.30	.59	.82	.92	.94	.95	.96	.97	.98	.99
Philippines	.79	.85	.87	.90	.93	.94	.95	.96	.96	.97	.97	.97	.97	.97	.95	.96	.97
Malaysia	-.22	-.23	-.08	.03	.17	.29	.06	.16	.21	.56	.61	.63	.62	.64	.70	.86	.87
China	.95	.95	.96	.98	.99	.99	1.00	1.00	1.00	.99	1.00	.99	1.00	1.00	.99	.99	.99
India	.80	.80	.80	.83	.95	.98	.98	.99	.99	1.00	1.00	1.00	1.00	1.00	1.00	.99	.99

(*) 3 years moving averages

(Source) OECD: Foreign Trade by Commodities, 1982, 1986

PART-III
WOODEN FURNITURE INDUSTRY

PART-III. WOODEN FURNITURE INDUSTRY

1. General Situation of the Thai Furniture Industry

1-1. Position of the Furniture Industry in Thai Manufacturing

The amount of added value (at 1972 prices) of the Thai furniture industry in 1985 totaled 550 million baht. or a mere 0.7% of the whole manufacturing industry. According to NESDB statistics, wooden furniture accounted for 97% of the added value and metal furniture the remaining 3%.

The employment absorption power, as seen from the results of an industrial census in 1985, showed that out of the total 9,584 manufacturing firms employing 10 or more people, furniture-related industries accounted for 159 or 1.7%. Of the total number of manufacturing employees - 1,316,122 - the furniture-related industries accounted for 11,309 or 0.9%.

It was in the 1970s that the Thai furniture industry began to develop into an export industry. Factors responsible for this were: [1] that parawood had begun to be commercially used as furniture material 10 years before; [2] that BOI designated rubber wood products as one of the industries entitled to investment promotion; and [3] that the Thai government in 1977 took measures to ban exports of logs. The number of furniture factories registered at the Ministry of Industry in 1987 had sharply risen to 1,270 from 243 in 1975.

1-2. Structure of the Industry

Classification by size or the number of employees of furniture factories as of 1985 on the basis of Ministry of Industry statistics showed that cottage industries employing nine or less people accounted for 60% and small industries employing 10 to 49 amounted to 35%. Thus, the cottage and small industries accounted for a combined 95% of the total furniture factories and medium and large enterprises accounted for only 5%. (Table III-1-1.) Export-oriented firms have many employees, however, with more than a few of them employing more than 200 people.

As for the location, more than 50% of the factories are concentrated in Bangkok, with the capital and the central region accounting for a combined 65% share, followed by the northeast region (13%) and the north and south regions (over 9% each). (Table III-1-2.) While Bangkok has many large-scale factories of an export-oriented type, the north region centering around Chiang Mai has industries using teak and rosewood as raw

materials. The south region centering around Hatyai and the east region around Rayong have industries using parawood.

Table III-1-1. Number of Registered Factories Classified by Industries and Size of Work Force, 1985

Classification by size	Cottage industries	Small industries			Medium industries			Large industries		
Size	-9	10-19	20-29	30-49	50-99	100-149	150-199	200-299	300-	Total
Factory	695	280	68	51	39	3	6	5	4	1,151
%	60.4		34.7			4.2		0.3		100.0

Source: Industrial Works Department, Ministry of Industry

Table III-1-2. Regional Distribution of Furniture Factories, 1985

	Cottage industries employing 9 or less people	Small industries 10 - 49 people	Medium industries 50 - 199 people	Large industries 200 or more people	Total	Percentage (%)
Bangkok	385	204	25	2	616	53.5
Central region	71	43	13	1	128	11.1
South region	82	21	1	4	108	9.4
North region	37	65	6	1	109	9.5
Northeast region	90	57	2	0	149	12.9
East region	30	9	1	1	41	3.6
Total	695	399	48	9	1,151	100.0

Source: Industrial Works Department, Ministry of Industry

Although it is very difficult to gain a view of the industrial structure using only the production value, some estimate that about 30 major firms account for 50% of Thailand's total furniture production. The 10 biggest furniture exporting firms in 1985 accounted for 41% of the whole value of furniture exports, showing a high degree of industrial concentration.

Table III-1-3 shows annual sales for the three years of 1985-87 of 8 firms whose financial statements were available out of the 22 firms selected for the latest on-the-spot survey.

Table III-1-3. Annual Sales of Furniture Firms

(Unit: 1,000 baht)

Firm name	1985	1986	1987
Acme Industries	44,843	70,313	126,388
D.K. Industry	52,435	42,076	64,114
Durospan	-	21,369	194,215
Fancywood Industries	85,015	-	-
Sangthana Furniture	-	-	40,413
Siam Parawood	-	25,729	33,346
Surina Industries	-	4,590	26,202
Sun Furniture	-	122,418	194,508

Remarks: D.K. Industry is a related company of H.D.K. Industry.
Siam Parawood is a related company of Siam Wood.
Source: Commercial Registration Department, Ministry of Commerce

In 1987, there were three firms with annual sales topping 100 million baht, proving the existence of large-scale enterprises.

A classification by size of the wooden furniture enterprises in Thailand in accordance with the definition by the Ministry of Industry is possible but cannot necessarily be said to reflect the current situation. Because the latest survey aims at nurturing its target into an export industry, classification may be made by capital and business relations. The result shows four groups: (1) joint ventures with foreign firms engaged mainly in exports (2) firms engaged in production on assignment from foreign firms (3) exporting firms having no relation with foreign firms and (4) local firms selling their products in local markets. Through the latest survey, however, we found that a classification by degree of processing or method of production may be nearer to the reality than a classification by capital, number of employees or the above-mentioned business relations. This classification method divided the furniture manufacturers into the following three groups:

(1) Manufacturers mass-producing furniture of low processing degree
(2) Manufacturers mass-producing furniture of high processing degree
(3) Manufacturers with a high dependence on processing by handwork.

Table III-1-4 shows a comprehensive classification based mainly on the method stated above, using the definition of the Ministry of Industry as reference and adding capital and business relations as factors.

Table III-1-4. Scale of Enterprise by Number of Employees and Fixed Assets

	Number of employees	Fixed assets
Cottage enterprises	9 or less	Less than 1 million baht
Small enterprises	10-49	1 million to 10 million baht
Medium enterprises	50-199	10 million to 50 million baht
Big enterprises	200 or more	More than 50 million baht

Source: Ministry of Industry

A large gap in the size of enterprises exists among manufacturers producing furniture of low processing degree. Some are big firms like Durospan Co. having super-large factories of the type seen in Taiwan and without parallel in Japan and with sales of more than 100 million baht a year. Others are small firms capitalized at around 5 million baht and employing about 200 workers. The United States is the chief overseas market of their products. It is believed that buyers do not demand products of extremely high quality for exports to the United States and such exports are therefore mostly low-priced products with their quality corresponding to the demanded price.

Manufacturers mass-producing furniture of high processing degree include firms such as Sun Furniture and Fancywood Industries, the leaders in the Thai furniture industry. Despite the difference in the size of capital or the number of employees, they put out products of high quality through efficient production methods. With the experience of five to 10 years in exports, all of them have fairly strong international competitiveness already.

Manufacturers which are highly dependent on processing by handwork do not have much experience in exports. They are typical of the Thai furniture manufacturers, selling their products mainly in the domestic market, and they have the most factories in the industry. Among the enterprises that we visited during the latest survey, the firms belonging to this group, compared to the other two groups, were extremely small-sized in terms of capital, the number of employees and the amount of exports as well as the floorage of factories. Furniture makers in Chiang Mai selling their products to foreign tourists also belong to this group.

1-3. Profile of Main Companies

Santi Forestry Group

This group began with the sawmilling and veneer slicing operations of the founder of the group, Mr. Santi, in the early 1970s. In later years, the group invested in kiln drying facilities and established furniture, construction material, and flooring factories. By the early 1980s, the group was characterized by use of teak as its main materials and by its completely independent procurement of raw materials, production, design, sales, and exports. It constitutes the top furniture group in Thailand both in terms of sales and exports. The group is currently comprised of six companies, the dates of establishment and activities of which are shown below:

1960 Santi Vayakonvichtr starts timber trading
1970 Longsan Veneer Co. established
1972 Santi Forestry Co. established
1978 Sanfoco Pte. Ltd. (Singapore) established
1980 Sun Furniture Co. established
1985 Ame Marketing Co. established
1987 Sun Paratech Co. established

Santi Forestry Co.

This company imports logs from Burma, processes them into lumber, and then reexports the lumber or else uses it for the furniture of Sun Furniture. The factories were integrated at Bangsai in 1979 and a modern band-sawmill with a daily production capacity for one shift of 80 cubic meters was installed. The kiln drying facilities can dry about 580 cubic meters per charge.

Sun Furniture Co.

This company began production in Bangsai in 1980 and has now grown to become one of the largest export manufacturers of teak furniture in Thailand. In addition to furniture, it produces parquet floorings, laminated and finger jointed panels, and teak decks.

Longsan Veneer Co.

This company was initially established in 1970 as a joint venture with MTC of Italy, but was fully acquired by the group in 1982. Its main materials are teak and Pradoo, but it also imports and uses Rosewood, Oak, Ash, Maple, and Mahogany.

Sun Paratech Co.

This company was established in 1987 and has acquired a large land site (80 rai) in southern Thailand. It engages in lumbering of parawood, processing, and production of furniture and comprises four factories for processing, plywood, particle board, and flooring. It principally uses parawood.

In addition to these companies, the group includes Ame Marketing Co., Ltd., which handles domestic marketing, and Sanfoco Pte., Ltd., which handles timber trade.

A breakdown of the employees of the group is as follows:

Executives	16
Administration	42
Engineers	6
Supervisors	36
Skilled laborers	305
Semiskilled laborers	390
Total	795 (as of July 1987)

The Table III-1-5 shows the export destinations. The ratios of exports for furniture are high for the U.S. and Canada, for sawn teak lumber the U.S. and Europe, and for veneer Scandinavia. The export products of the group are primarily high grade furniture with high added values, as typified by high class teak furniture.

Table III-1-5. Main Export Destinations (1987)

	Sawn Teak lumber	Furniture/floorings	Veneers
U.S./Canada	25%	65%	20%
Scandinavia	10	7	45
Netherlands/W.Germany /France/Italy	15	5	15
U.K.	15	3	15
Japan/S. Korea	15	5	5
Australia/Southeast Asia	10	15	-
Middle East	6	-	-
Others	4	-	-
Total	100	100	100

Source: Santi Forestry Group

The furniture division, Sun Furniture, exports 98 percent of its production and sells only the remaining 2 percent domestically. The minimum order for exports is 20 feet 1 container. Tables, chairs, and beds are exported knocked down and cabinets as finished products. The export price is FOB US$30,000 for 20 feet and US$60,000 for 40 feet. The U.S. accounts for 80 percent of the exports, Japan for 10 percent, and the U.K. for 10 percent. The retail price in the U.S. is 2.5 to 3 times the export price. The company is trying to market its products primarily in the high class furniture outlets of the U.S.

The company is rare in Thailand in that it has established its own original designs. Up to 95 percent of its designs are original. It has contracts with European designers and concentrates on Scandinavian designs.

Ninety-nine percent of the imported materials of Sun Furniture is teak, imported from Burma and Indonesia. The group as a whole takes care of procurement of materials. Special note should be taken of the fact that a group company negotiated with the Burmese government the right to harvest 250,000 rai of teakwood in 1988 and 500,000 rai in 1989.

Another feature of the group is that it makes use of the strengths of the group for its production system, procurement of materials, and entry into new fields (production of parawood furniture) and leads the top furniture manufacturers of Thailand.

1-4. Exports

It was in the latter half of the 1970s that Thailand's furniture exports got well under way. The exports rapidly expanded after exceeding imports for the first time in 1974. The value of exports surpassed the 100 million baht mark in 1977, topped 1 billion baht in 1984 and rose to over 3 billion baht in 1987. These figures show how rapidly the exports increased in such a short period of time.

Main export products in the 1980s consist of three items; chairs (tariff schedule item number 940101), wooden furniture (number 940302) and other furniture (number 940303). In recent years, shares of individual items have sharply changed. In 1981, other furniture (accounting for 39% of the whole furniture exports) and wooden furniture (31%) accounted for a combined 70% of the exports. In 1987, wooden furniture (34%) and chairs (31%) added up to more than 60% of the exports. The rapid increase in exports of wooden furniture and chairs was responsible for a 1.9 times year-to-year gain in the furniture exports in 1987 adding up to 3,295 million baht. Exports of wooden furniture in that year posted a 1.98 times gain to 1,160 million baht and those of chairs recorded a 2.13 times rise to 1,010 million baht. (Table III-1-6.)

Table III-1-6. Furniture Exports by Category

(Unit: 1,000 baht)

	1981	1982	1983	1984	1985	1986	1987
94101 Chairs & Other Seats	91,698	100,063	116,556	139,823	181,685	475,728	1,010,953
94102 Parts of Chairs & Seats	5,342	18,736	7,601	15,076	8,132	8,928	258,127
940302 Other Furniture of Wood	218,637	250,653	321,147	332,579	472,039	563,905	1,116,143
940303 Other Furniture & Parts of Other Materials	272,482	297,423	399,471	358,496	441,134	520,723	712,951
940309 Parts of Other Furniture	114,757	122,649	128,087	164,796	202,458	158,975	197,134
Total	702,914	789,524	972,862	1,010,770	1,305,448	1,728,259	3,295,308

Source: Customs Department

Because trade statistics show no detailed breakdown of wooden furniture, it is hard to grasp the export situation of parawood furniture, one of the main products. But IFCT has conducted a survey on the parawood furniture industry, allowing us to describe below the export trend of the product on the basis of the IFCT figures.

The ratio of wooden furniture to the total furniture exports fell to 70% in 1986 from 76% in 1977, while that of rattan furniture rose from 21% to 28% in the same period. A Ministry of Industry survey showed exports of parawood furniture in 1984 amounted to 215 million baht, accounting for about one third of wooden furniture exports in the year.

A classification by countries of destination of wooden furniture exports in 1987 showed the United States accounted for 52.6% of the total, followed by Japan (14.6%), Hong Kong (9.7%), Singapore (7.2%) and Canada (1.6%). These countries thus absorbed 85.7% of the exports. (Table III-1-7.)

Main countries of destination have changed during the past decade. In 1978, Japan (24%) and the United States (10%) were the main importers, while in 1983 the order changed to the United States (20%), Japan (19%), Singapore (19%) and Hong Kong (9%).

A factor responsible for the United States ranking as the number one destination of exports in recent years is the fact that Thailand has taken over part of the export business from Taiwan, which had held a large share in the U.S. furniture market. The U.S. withdrawal of preferential duties and a shortage of raw materials have forced Taiwan to reduce its furniture exports to the United States. Exports to Singapore are comparatively large because, like other manufactured goods, furniture is often re-exported from the island nation through transshipment in the port of Singapore.

A comparison between exports to Japan and those to the United States shows that the majority of exports to the United States, aimed mainly at mail order businesses and volume-selling stores, are low to medium in quality and prices, while exports to Japan are required to be of higher quality.

The annual quantity of exports is estimated at around 2,150 containers, of which knocked-down (KD) parts account for 1,530 containers and finished products 620 containers. Thus, the ratio of KD parts is high.

Table III-1-7. Furniture Exports by Country of Destination and Items

(Unit: 1,000 baht)

	1986						1987					
	Chairs & other seats	Parts of chairs & seats	Other furniture of wood	Other furniture & parts of other materials	Parts of other furniture	Total	Chairs & otehr seats	Parts of chairs & seats	Other furniture of wood	Other furniture & parts of other materials	Parts of other furniture	Total
U.S.A.	194,767	8,928	235,218	32,672	5,418	477,003	367,080	23,780	586,617	55,330	21,325	1,054,132
Japan	12,165	85,359	70,754	12,143	143,248	323,669	64,699	209,246	162,917	69,808	144,792	651,462
France	79,341	13	11,928	207,449	660	299,391	166,610	378	27,930	203,050	281	398,249
Singapore	18,738	54	78,663	14,312	1,665	113,432	29,894	1,090	80,668	20,657	3,992	136,301
Hong Kong	33,263	604	82,334	5,913	176	122,290	83,500	35	108,053	7,461	976	200,025
West Germany	16,467	1	3,983	53,506	483	74,440	40,298		8,921	94,560	94	143,873
Belgium	11,853	168	5,086	60,163	18	77,288	34,362	728	8,671	63,713		107,474
U.K.	22,617	11	13,545	24,433	823	614,429	56,964	2,398	23,080	43,485	547	126,474
Total	475,728	8,928	563,905	520,723	158,975	1,728,259	1,010,953	258,127	1,116,143	712,951	197,134	3,295,308

Source: Customs Department

1-5. Raw Materials

Thailand was formerly a forest kingdom with teakwood as its main export product. Since the 1960s, however, the forest area has been sharply reduced due to population growth and expansion of farmland. The ratio of forest area of the entire country plummeted to 29% in 1986 from 53% in 1961.

Changes in domestic wood consumption are shown in Table III-1-8, which indicates the self-sufficiency rate for wood at 78% in 1987. On the other hand, changes in wood exports and imports for the period of 1976 to 1987 show; [1] that Thailand has become a wood importing country since 1978, and [2] the unfavorable balance of the wood trade has been expanding.

Thai imports of logs and lumber in 1987 amounted to 740,000 cubic meters in volume and 3.6 billion baht in value. (Table III-1-9.)

Turning to individual material wood, production of teakwood has declined year after year due to a sharp reduction of the forest area in the north of the country where it is produced. The volume of its production in 1987 dwindled to 38,000 cubic meters, a mere 12.7% of the past peak of 299,000 cubic meters in 1971. The balance of teakwood trade has been adverse since 1982, with the volume of imports in 1987 reaching 43,000 cubic meters against the domestic production of 38,000 cubic meters. Teakwood is currently imported from Burma.

As for parawood, recently used mainly as raw material for furniture, NESDB issued a report in 1988 and we will explain it on the basis of the report.

The use of parawood as furniture material was made possible by the Japanese who commercialized it in the 1970s by developing special know-how including a chemical treatment against mold and weevils and the improvement of manufacturing processes. While it has the merits of being considerably whitish and fine-grained as well as easy to finish, it is also prone to damage from mold and weevils due to its high content of water, starch and sugar. The moisture content is required to be no more than 12% for use in products other than furniture and about 7% for furniture. Usually used as raw materials are rubber trees from which latex has been gathered for over 20 years. Sixty to 64 rubber trees can be planted per rai.

According to the NESDB report, statistics estimate the rubber tree planted area in Thailand at 10,730,000 rai, of which 9,650,000 rai is distributed in 17 prefectures in the south and the remaining 1,080,000 rai in the prefectures of Chon Buri, Rayong, Chanthaburi and Trat in the east. Industrial circles say demand for parawood produced in the east is stronger than that for the product from the south and the former is considerably higher priced. According to the interview with the Thai Furniture Industry Association,

Table III-1-8. Changes in Domestic Consumption of Logs and Sawn Timber

(Unit: 1,000 m^3)

Year	Timber production	Imports	Exports	Domestic consumption	Self-sufficiency rate
1981	1,798.6	575.6	7.8	2,366.4	76.0%
1982	1,769.4	488.5	1.5	2,256.4	78.4%
1983	1,819.7	630.4	1.7	2,448.4	74.3%
1984	2,031.7	581.5	6.7	2,606.5	77.9%
1985	1,882.6	418.2	11.2	2,289.6	82.2%
1986	2,014.7	348.7	29.2	2,334.2	86.3%
1987	2,149.0	736.5	138.2	2,747.3	78.2%

Source: Forestry Statistics of Thailand 1987, Royal Forest Department

Table III-1-9. Exports and Imports of Logs and Sawn Timber

(Unit: Volume in m^3, Value in baht)

	Exports		Imports		
	Volume	Value	Volume	Value	Value
1976	146,298	1,075,870,960	145,043	140,326,546	935,544,414
1977	82,399	800,244,024	320,815	512,713,777	287,530,247
1978	33,477	321,887,603	515,017	889,615,497	-567,727,894
1979	7,654	125,768,955	1,033,110	1,935,837,948	-1,810,068,993
1980	1,549	7,726,898	434,351	1,126,007,800	-1,118,280,902
1981	7,797	70,424,440	575,576	1,772,741,363	-1,702,316,925
1982	1,464	8,409,966	488,452	1,693,065,123	-1,684,655,157
1983	1,669	4,228,449	630,375	2,285,732,736	-2,281,504,287
1984	6,696	20,975,117	581,490	2,269,113,946	-2,248,138,829
1985	11,237	281,447,230	418,240	2,144,402,065	-1,862,954,835
1986	29,228	563,886,857	348,651	1,956,713,150	-1,392,826,293
1987	138,167	716,876,673	736,546	3,631,831,180	-2,914,954,507

Srouce: Forestry Statistics of Thailand 1987, Royal Forest Department

rubber trees planted in the south are traded at 3,000-4,000 baht per rai against 30,000 baht in the east. The sharp price rise in the east is attributed to the following factors: (1) parawood produced in the east is better in color, grain and other quality than the product in the south, (2) more furniture factories are located in the east, and (3) the Japanese buyers prefer parawood produced in the east.

About 45 cubic meters of rubber wood can be obtained from a rai of rubber plantation, of which 2.87 cubic meters is used for piles, 21.09 cubic meters for firewood and 20.64 cubic meters for processed wood.

Factories related to parawood are as follows:

(1) Saw mills ——349 across the nation.

(2) Treatment and processing mills ——46
- ——18 in the east
- ——20 in the south
- ——18 in the center

(3) Furniture factories ——38
- ——10 in the east
- ——12 in the south
- ——16 in the center

(4) Other factories
- Toothpick factories ——3
- Ice cream stick factories ——2
- Wooden sandal and shoe heel factories ——4
- Brush handle factories ——2
- Picture frame factories ——3
- Toy factories ——2

The above-stated 38 furniture factories need an annual rubber wood supply of 278,975 cubic meters. Among the firms we visited for the survey, there were some which have rubber plantations and lumber mills of their own and are assured of a stable parawood supply. Most of the companies, however, said their problems were (1) a difficulty in obtaining parawood in the rainy season and (2) an annual 10-20% rise in parawood material prices.

One problem with parawood may be that it is not only utilized for making furniture but it is also exported as processed rubber wood, recently in sharply increasing volume. Exports of processed rubber wood in 1987 posted a gain of 35 times in volume and 41 times in value at 58,820 cubic meters and 186.6 million baht from 1,696 cubic meters and 4.56 million baht in 1984. The government currently levies a 3% export tax on processed rubber wood exports. But it may have to take some additional restraining measures on processed rubber wood exports if it wants to promote the furniture industry in the future.

Failure of a stable raw material supply in the rainy season is attributed to the facts that trees planted in deep jungles cannot be felled in the rainy season and there are problems with preservation before carrying the trees into plants for drying and chemical treatment. Also, transportation of raw material costs higher than otherwise because furniture factories and exporters are concentrated in Bangkok while most lumber mills are located in the south.

Thailand has built up an excellent know-how on the production and processing technology of parawood. But there is a considerable gap between firms in this regard.

It is a fact that the Japanese firms which pioneered the field have excellent know-how and put out products of fairly good quality, while the quality of products varies widely among local firms. Together with an effective utilization of gum wood, it will be necessary in the future to put out products of higher added value through the diffusion of processing technology.

2. Production Activities and Technology

The Thai wooden furniture industry has been doing well these past few years due in part to strong furniture exports. Factories are being expanded or newly set up one after the other. Numerous cases of lumber or plywood makers starting production of furniture have also been seen. Therefore, the Thai statistical authorities have not been able to obtain an accurate grasp of the number of factories in operation. In the current survey, visits were made to 25 factories engaged in the production of wooden furniture. These may be broken down as follows:

1,000 or more employees:	2
500 to 999 employees:	7
100 to 499 employees:	8
99 or less:	5
Unknown	3

Not counting the employees in the three companies where figures could not be obtained, the factories employed 8,355 workers - an average of about 380 workers - making them comparable in the number of workers to large sized factories in Japan.

Note that of the three companies with unknown numbers of workers, two had over 1,000 workers and the other had about 100.

The state of exports of products by these 25 factories was as follows:

Factories exporting almost 100% of products:	16
50% or more	2
Less than 50%	5
Unknown	2

All of the factories surveyed, including those with unknown export ratios, were exporting in some way or another. None of the companies were producing all the products for domestic consumption.

The export destinations were varied. There were five companies with export ratios of over 50% which were exporting large amounts to Japan (of which four were exporting almost 100% of their production there) and eight companies which were exporting large amounts to the U.S. (of which three were exporting almost 100% there).

2-1. State of Facilities

(1) Current State of Main Facilities

A basic characteristic of use of machinery in production in Thailand, for material drying, cutting, planing, boring, polishing, assembling, painting, product drying, and

other rest of the means of production of furniture, is to use a general use machine like a specialized machine fixed to one job. Therefore, with the exception of some of the large corporations, most production is by general use machines. Further, these general use machines are very old and create difficulties in securing a certain level of product quality in terms of efficiency and precision with the skill of general workers.

These mostly general use production facilities are partially produced in Thailand, but the majority is imported from Taiwan, F.R. Germany, Italy, Japan, and the like and includes used units. Recently, use has been made of large numbers of used machines from Taiwan. These account for 80% of all facilities in Thailand. Behind this is the fact that Taiwanese furniture producing companies which previously produced furniture mainly for the U.S. have moved adeptly in response to the recent sharp changes in the exchange rates and begun transferring their means of productions, indeed their whole factories, to Thailand and other nearby countries.

There is basically no difference in special facilities between wooden furniture production and other manufacturing industries in regard to the types of general facilities operated. There are some differences, however, with the advanced furniture producing nations in regard to the following facilities unique to wooden furniture.

1) Drying facilities

The wooden furniture industry differs from industries producing products of metal or nonmetallic materials other than wood in that it uses living materials to produce durable products. Therefore, to prevent deformation or cracking of the wood due to long term changes in characteristics, it is necessary to apply at least a certain degree of drying for different species of wood and production areas. This is the most important treatment process in the production of wooden furniture.

Natural drying after cutting down or sawing the trees damages the properties of the wood the least, but requires that the materials by left standing for half a year or a year, so the general practice recently has been to dry them artificially.

In this regard, of the 25 companies visited, just 12, or about half, had drying facilities. Only three companies were deliberating drying their wood naturally. The other 10 companies were purchasing materials dried by some means or another or else were totally oblivious as to the state of drying. Even among those companies which were purchasing dried materials, almost all were not interested much in the state of drying. No companies were seen as inspecting the moisture content upon their purchases. One company was observed to be using

natural drying, but commissioning out lumber for export furniture for artificial drying.

Almost all the companies owning artificial drying facilities were large sized companies. Small and medium sized companies only had them in exceptional cases. The artificial drying facilities were in general of the steam heating type. The electric heating type was not observed. The vacuum drying type and the hot press type, effective for wide lumber and prevalent in Japan, were installed only in exceptional cases.

2) Dust catching facilities

Dust catching facilities were installed in almost all the factories, it was confirmed. However, the number of dust catchers, their deployment, and their ducting were not suited to the number of work machines in many of the factories, resulting in a noticeable insufficiency of dust catching capacity.

The fine dust produced in such large quantities in woodworking processes not only has an undesirable effect on human health, but also adheres to the products and has a strong effect on the product quality. Further, piles of dust and the large amounts of dust floating in the air represent fire hazards.

3) Painting booths

A noticeable number of the companies visited had in sufficient painting facilities in their processes. One factory was even doing the painting work right out in the open. The painting process is a finishing process and in the sense of securing a qualit y finish of the product and fire prevention, flush type painting booths separate from other processes are necessary. The method of finishing and the quality of the finish are said to be problems in the Thai furniture industry. Despite this, the Thais are somewhat vague in their thinking regarding the necessity of painting booths.

4) Product drying facilities

The small and medium sized companies use the natural drying method to dry their products after painting. Even some of the large sized corporations rely on natural drying to dry their products. Of course, it is desirable to quickly complete the final drying so as to prevent adherence of dust in the air and it is desirable to do the same in independent rooms or areas provided with electrical drying facilities. In this regard too, there is still much room for study in Thai furniture producing factories. Further, even factories with product drying facilities sometimes depend on manual labor for moving the products inside and outside of

the drying rooms, so there is much room for hanger systems or other labor-saving measures. This is a matter requiring full study by mass production type factories.

(2) State of modernization of facilities

Some of the large sized corporations already engaged in mass exports of products have begun introducing the latest, high productivity, specialized work machines. Some of these factories were observed to have installed a number of the latest Japanese made NC routers and NC boring machines, but the vast majority of the companies suffer from a critical shortage of information on new equipment and cannot keep up with advances made in machinery when replacing their work machines. Overall, signs are just now beginning to appear of the introduction of automatic work machines and labor saving equipment at this stage. Further, the factories use only the basic software of the machinery manufacturers for the programs of the NC machines beginning to be introduced and have not yet reached the stage of creating their own software based on their own products and manufacturing concepts.

(3) State of maintenance and safety

There were many improper points in the maintenance of the work machines, both in the large and small factories. In particular, there was little interest in the polishing of drills, cutters, and other wood-working cutting tools. Some factories were even observed to be using notched cutting tools. Among the factories surveyed, only one out of 25 was polishing its cutting tools on a daily basis. Overall, this is feared to have an effect on work quality.

Regarding the machinery and facilities themselves, there were noticeably companies which left misalignment of the boring drills alone, having an effect on the work precision. In general, many factories were unconcerned about the centering of rotary machines. In addition, there were many facilities observed lacking protective covers for rotary parts and moving parts such as cutting tools and belts, resulting in problems in work safety.

2-2. Technical Level and Quality

(1) Product planning and basic design

The Thai furniture manufacturing companies are exporting in some form or another or else are seen as strongly desiring to turn to exports. The state of product planning and basic design among these, as far as seen through the companies surveyed

(four unknown), is as given below. There is a strong tendency for production based on the plans and designs of the customers:

Companies relying on customers for most product planning and basic design	13 companies
Companies performing product planning and basic design mostly by themselves	5 companies
Companies performing product planning and basic design through their customers for exports and by themselves for domestic sales	1 company
Companies performing product planning and basic design irregularly by themselves	2 companies

It is believed that there are still few companies in the Thai furniture manufacturing industry having the ability to plan and develop products themselves, as shown later. This is due to the fact that due to the properties of wooden furniture, in addition to the inherent functions of furniture, there are differences in the designs, sizes, colors, and uses of furniture in the Japanese, U.S., European, Scandinavian, and other markets, planning and design are not possible without a sufficient grasp of the properties of the markets due to differences in the lifestyle and habits in the furniture markets, and such market information has not reached the industry much at all.

(2) Production design

Designs based on one's own plans and plans from customers are normally brought in the form of samples or drawings. The following may be said about the numbers and quality of the production designers who receive them:

a) Only 12 companies had specialized designers in the field of production design - not even half of the companies surveyed. Further, there were only about one to three designers per company.

b) There is only a thin strata of designers able to handle production design in the industry as a whole. While they are able to handle a certain degree of design modifications, in level they do not go beyond the scope of making mere dimensional modifications on the drawings.

c) The absolute number of designers able to handle production design in the industry as a whole is too small.

d) Judging from the factory inspections and from the design exhibitions etc. of specialized industrial schools and industrial universities sponsored during the

survey period, knowledge on drafting methods of design drawings was not widespread. Either the basic premises on drafting were not known or else there was no uniformity.

e) In a noticeable number of companies, the managers lacked an awareness of the necessity of production design and production based on drawings.

f) The companies were not able to adjust dimensions when converting foot-inch dimensions given on drawings supplied by customers to the metric system, causing a decline in the quality upon assembly.

g) Samples brought in by customers are in many cases disassembled and then measured in dimensions and drawings drafted based on the same, but this is merely transfer of dimensions and no consideration is being paid to the manufacturing tolerance, the deformation of the material, strength, productivity, etc.

h) There is insufficient knowledge about the fitting position of stiffeners, the position of engagement holes (dowels), size, depth, and other basic design features of structural strength. Further, in many cases such design information is not converted into drawings, resulting in variations in the joint portions and cutaway portions of members and the fitting condition of stiffeners.

i) In particular, there was a noticeable weakness in design capabilities relating to assembly strength and adhesion strength and a shortage of knowledge about work precision, deformation projections, etc. These cannot be judged from the outer appearance of the product even after a product is finished and require judgement based on technology and experience.

(3) Production

1) Production technology

Among the Thai furniture manufacturing factories, most of those producing primarily export furniture were relatively large in size. Of these factories, those producing furniture for the U.S. had sufficient space for work and installed large numbers of specialized machine tools, unlike the case of Japan, for creation of a mass production system. However, the history of furniture production in Thailand is still short, so there is a strong tendency to rely on the capabilities of machines so as to make up for insufficient knowledge and technology in manufacturing. Therefore, there are a large number of types of machine tools installed.

A problem arising from this state of affairs is the shortage of engineers capable of handling the machinery and equipment. The shortage of engineers

knowledgable about operation and adjustment of machines to meet with the objectives of the work and the maintenance of machinery is worsening. Similarly, the shortage of skilled workers able to correctly set the work efficiency of each equipment and the suitable amount of cutting and to select the cutting tools and other tools and judge their condition is becoming a problem.

The importance of drying of materials is generally recognized, but as mentioned earlier there are many companies without drying facilities and there are many gaps in drying knowledge in practice. The drying treatment itself is one of the most difficult techniques even in the advanced industrialized countries. In the case of artificial drying, the product quality changes delicately depending on the control of the temperature, pressure, and humidity at the time.

A look at the drying facilities shows that most are of the steam drying type, but judging from the temperature and pressure during the drying treatment, in actuality what is being performed is warm water drying. Further, the factories do not understand the suitable degrees of moisture content and drying methods for each material. Therefore, almost none of the factories are performing the temperature control, humidity adjustment, etc., such as the raising of the temperature inside the drying rooms and the maintenance of those temperatures, which requires adjustment with each type of material, based on correct knowledge. Many factories are also not keeping records of the treatment.

In the case of materials destined for export, the climatic conditions at the production areas of the materials and the usage areas of the furniture differ considerably in many cases, resulting in problems in the areas of use in very many instances. Therefore, the best method would be to survey and obtain a good grasp of the climatic conditions of the export destinations and then control the drying conditions in accordance with the same.

Cases were seen where the methods of stacking in the storage of naturally dried materials and artificially dried materials were unsuitable, resulting in problems of warping in some cases. It is important that the beams placed between the dried boards be placed in the same positions from top to bottom to prevent deformation of the boards during storage.

Similarly, in the case of natural drying, there were no factories at all placing covers over the topmost part of the stacks to shut out direct sunlight, resulting is large warping in the boards at the topmost portion.

These problems have a large effect on the yield of the materials.

In selecting members, it is desirable to make the selection envisioning the state of the surface of the finished product, but not much attention is paid to the

existence of knots and cracks or mismatching of the grain. The standards of acceptance of the nature of the surface of the finished product differ considerably according to the preferences of the market exported to, so workers supplying the members to the manufacturing processes have to be able to make instantaneous decisions in the selection of the portions to serve as the surface and the position of cutting.

As mentioned earlier, almost no attention is given to the state of maintenance of tools (cutting tools) used for cutting, planing, boring, etc. In particular, the state of polishing of cutting tools is very important in that it is directly linked to the product quality and thus suitable decisions must be made as to the polishing cycles. However, even the same cutting tools will differ in the degree of wear due to the type of materials cut, the depth of cut, and the speed, so it is difficult to decide on a polishing cycle according to the amount of time used or the amount of work performed. Therefore, the method of having the machine operators carefully watch the work conditions of the materials and send the tools out for polishing whenever there is even a slight change in the work conditions should be thoroughgoingly promoted.

Further, the dimensions of cutting tools change after polishing, so it is necessary to measure the degree of wear each time, record it, and mount the cutting tool in the machine in accordance with the recorded cutting tool dimensions and to correct for the working error on the required working dimensions. The greatest care is required in this regard in the coming introduction of automated and labor saving facilities.

The polishing of cutting tools is generaly commissioned to outside specialists. These specialists can handle all types of cutting tool materials usually in use.

One thing noticeable about the use of these cutting tools is that heavy duty working is performed in the circular sawing, planing, and boring processes. In particular, the cutting is performed at excess cutting tool feed speeds and rotating speeds. This is due to the fact that suitable work standarsd are not set for the members. The factories probably are trying to raise the work efficiency at this process, but this results in increased roughness of the work and sometimes residual cutting tool marks or cracks, having a detrimental effect on product quality. This results in an increased load on the following processes. This heavy duty working presents problems in safety as well due to the fact that wood is a material which easily cracks. In particular, an excess rotational speed and feed in a

rotary machine can be dangerous to workers in causing cracking of the material and flying pieces.

An important matter in the working which has a large effect on the strength is the fact, often seen in chair making factories, that the wooden dowels of the joint portions of members were smaller than the dowel holes in diameter and further no spiral grooves were cut in the surfaces of the dowels. This factor critically weakens the bonding strength. This is judged to be a result of the fact that the principle has not spread of making the wooden dowels of dried and compressed materials which easily expand upon absorption of the moisture in adhesive agents and cutting spiral grooves which allow the adhesive agents to easily pass over the entire surface of the dowels.

The finishing process is an important one which determines how the product is judged aesthetically. Therefore, the quality of the finish is a major element determining if a product will be accepted in a market. The polishing process is one which determines the major portion of the quality of the finish as a prior stage of the painting process, i.e., the final finishing process. The direction of the final polishing is determined with respect to the type of wood used and the direction of the grain, but no uniformity was observed among workers in the factories surveyed. Up until the final polishing, it is necessary to change the numbers of the sandpaper used for the polishing in accordance with the roughness of the surface of the members and the state of scratches, but this was also not seen as being performed. Further, the state of wear of the sandpaper on the belt sanders was terrible.

The painting directly governs the quality of finish, but the directions of application and the frequency of application of paint by sprayers were varied. Control of the amount of spray will probably be necessary. Looking at the surface conditions of the finished furniture, numerous painting spots and unevenness of luster can be seen. This is due to improper machine finishing of the surfaces and further to differences in the mixture ratios of paint and solvents (thinners) and inappropriate numbers of applications (thickness) and directions of application. At the present time, Thai factories do not have mature enough painting techniques required for dealing with all these points.

Note that there were factories with extreme shortages of water for flushing out the sprayed paint in painting booths.

2) Production control

Production control itself, in its wide sense, is subdivided into various control elements from the product planning to shipment of products and further to after sales service, but the method of production control for the production of wooden furniture in principle is no different from the production control for general mass production type machined products. Points noted through the factory inspections relating to production control, in particular manufacturing actions, may be summarized as below:

a) The production lines tend strongly to make use of general use machine tools as specialized machines, so there are a larger number of work processes compared with Japanese furniture factories. However, the greater the number of work processes, the more care is required, resulting in considerable waste in the flow of work members and in some cases even crossing of flows. Further, something tended to be seen in factories with large production spaces, there is often unnecessarily long distances between processes, resulting in deliberate creation of work for moving the members.

b) Processes are set contradictory to the principle of work order. For example, boring is performed after grinding of the surface of a member; NC routers and other high productivity, specialized machines for machining members with complicated shapes or curved portions and which should be set as far to the end of the production line as possible are set at the middle of the lines; and full use is not being made of the high productivity of the precious specialized machines.

c) A look at the flow of the machining lines shows that there are large amounts of raw materials, members, and semifinished products stacked up throughout the factories, remarkably hindering work efficiency in many cases. Further, it is believed that the number of parts in processing is not accurately being grasped.

d) Export-oriented furniture differs in structure and finishing methods depending on the characteristics of the target markets. For example, in the case of box type furniture, almost all such furniture destined for Japan is hollow core in construction. Cold presses are required for producing hollow core panels. Furniture for the U.S., however, is of solid core construction, so such presses are not required. Therefore, the machinery required for the production lines should naturally differ. Highly efficient production is not possible without dividing the production lines.

In the survey, cases were seen where products for export to both Japan and the U.S. were being produced on the same lines. However, it is difficult in practice to set production lines for each product, so in such cases at the very least the lines should be set in accordance with the general product constructions of the export markets.

Judging from the above-mentioned state of affairs and the matters learned from the companies, Thailand has had only short experience in the production of furniture of the mass production type and there are almost no control engineers in the industry who can handle production control, which comes from both theory and experience, in particular practical combination of process settings.

Of the 25 companies surveyed, seven had specialized production control staff, but all of these were limited to factories engaged in large scale production. In all cases, however, due to the shortness of the time period for building up experience in mass production, there was an unfamiliarity with practical application even if basic knowledge of production control techniques was learned to some extent. The reason for this is believed to be that there is almost no idea of standardization covering a company's own products and facilities and almost no preparation of standardization materials which would serve as the basis for production control, such as standardized processes for each product type, work procedures, machining procedures, standard schedules, standards for machining technology for setting such machining methods for each individual means of machining, methods of operation of equipment, methods of selection of tools, maintenance standards, maintenance procedures, etc.

Further, it seems that the basic knowledge on production control itself comes from school education covering general production methods for a one-course product in many cases.

Therefore, many factories suffer from problems of different control staff setting different production processes, machining procedures, etc.

On the other hand, factories engaged in small or medium scale production and with little experience in producing furniture stated that the managers themselves visited the large factories and copied the control methods or that they scouted experienced personnel, even from other industries, to handle the control. This speaks eloquently of the situation.

3) Quality

The biggest elements in judging quality, related to the furniture manufacturing technology, are considered to be the performance, strength, and beauty. The following may be said in general from the results of the survey:

In performance, some chairs, tables, and other legged products suffer from lack of levelness of the legs, resulting in tottering. This is seen particularly often in products destined for the U.S. Some tables suffer from uneven surfaces, particularly remnants of the joint portions of parawood. Many chests, sideboards, and other box-type furniture suffer from looseness of the drawers, poor fit of the doors, misalignment of mounting of the fittings, etc. In all cases, while there were no problems in the product planning by the customers, there was some doubt as to the size of some of the furniture produced for export by companies using their own plans. Research is necessary in the future on sizes suitable for the lifestyles in the intended export markets.

In regard to strength, a large problem existed in the loss of strength due to lack of assembly precision. In particular, there is a tendency for laziness in the method of joining strength members in that they cannot be seen from the outside. Seen were poor sizes and positions of dowels and dowel holes, assembly clearances between members, poor mounting methods of hinges and other metal fittings, etc. Research on adhesives and methods of adhesion is also a task for the future.

Regarding beauty, unevenness of painting, unevenness of luster, differences in color, etc. are largely due to the skill of the painting workers. In addition, there is a noticeable tendency toward differences in the pattern of grain and colors of fabrics upon assembly of materials due to the differences in the sense of methods of combination. Further, metal fittings attached to the surfaces of the furniture are often misaligned. Some markets will tolerate some scratches, black spots and scratch marks due to latex of the rubberwood, etc. and it is desirable to finish the products to meet with the market characteristics. These are due in large part to the individual characters of the workers and are areas requiring the ability to discern beauty and minute differences in color. The problem is less that of quality itself than of the variation in quality of the same products.

4) Quality control

In the factories surveyed, only nine had staff specializing in quality control. As expected, the larger the size of the factories, the more factories which had such staff. There were from one to six such staff members, depending on the overall number of employees, but in general most had double duties such as

design or process control and their actual duties could be said to have been within the area of simple inspections. Therefore, when a problem arises, the factories are not in a position to find the root of the problem and devise countermeasures to resolve it.

The state of the quality control as seen from the survey was as follows:

a) Regarding the materials, almost none of the companies performed inspections of the dimensions upon purchases of lumber products.

b) Similarly, most companies did not bother with having the other party check the moisture content or performing an inspection when purchasing logs or lumber products. Further, most of the small and medium sized companies did not have moisture testers.

c) As mentioned earlier, 12 companies had drying facilities, but none of the companies was performing drying tailored to the type of the lumber and the producing areas and usage areas of the final products. In general, the steam drying method was used and the temperature inside the drying chamber was kept at 50 to 70°C for about one week in most cases. Some companies dried the lumber for 10 to 15 days, but these were rare. The target values of the moisture content after treatment also vary, as shown below:

Target values of moisture content	
5%	1 company
7 to 10%	6 companies (mostly 8%)
10% or more	3 companies (mostly 12%)
Unknown	2 companies

The time allowed for natural drying was about six months in companies with knowledge about drying.

d) Aside from the drying, the companies had basically no standards serving as measures for checking quality. Therefore, they did not understand the significance of quality throughout the processing, assembly, and finishing processes and were unclear as to the quality demanded for the products itself and the allowable range of quality.

e) The factories did not know of methods for making the quality of the products meet with the demanded specifications. The idea was strong of trying to produce everything at the same level.

f) Regarding the final inspection of products, in the case of products destined for Japan, the customer side performed full inspection of the products in the overwhelming majority of cases, while for products destined elsewhere, the customers performed sampling inspections. Among the

companies surveyed, only one was perfoming repeated load tests on its products for Japan on its own.

2-3. Product Costs

Regarding the ex-factory price of furniture products, responses were obtained from 10 of the companies surveyed (almost all primarily producing for export), but the prices of raw materials such as teak and rubberwood varied tremendously and were not a sufficient basis for accurate analysis.

Insofar as the interviews went, there are differences depending on the species of wood used and the grade of the products, but the materials costs account for 40 to 60% of the ex-factory price, for an average of a little over 50%, it is believed. The ratio of materials costs in furniture for Japan is believed to be about 5% lower than that for furniture for the U.S., but the ratio of personnel expenses is correspondingly higher.

Even in Japan, the ratio of materials costs is about 40%, so the price of materials in the Thai furniture industry is not by any means cheap, it will be understood. Looking at this another way, the degree of processing (added value) of the products themselves is still low and there is still ample room for raising the degree of processing and thus the price of the products.

The ratio of personnel costs to the ex-factory price is a wide range of distribution of 15 to 40%, varying according to the production items and the state of facilities, but the average value is estimated at about 30%.

A look at the state of wages shows almost all general workers being paid on a daily basis, though some companies were seen as using the monthly wage system for skilled workers etc. Further, use was made of the piece rate system for carving craftsmen in many cases.

In the case of the daily wage system, the standard minimum line was 61 bahts/day in the suburbs of Bangkok and 73 bahts/day in Bangkok, but some places in Bangkok were paying 70 bahts/day and 100 bahts/day (175 bahts/day including overtime).

In the case of the monthly wage system, the average income seems to be 2000 to 3000 bahts/month (3000 to 4000 bahts/month including overtime).

In the case of piece rates as paid to carving craftsmen, the maximum level received was reported as 200 to 300 bahts/day.

In general, most companies make two to four hours of overtime obligatory, paying a premium of 1.5 times the daily rate. Note that the minimum daily wage in Bangkok is about three times the 1600 rupia level of Jakarta (Indonesia) and about 1/10th that of Japan.

Note that one of the companies surveyed had standards for estimation for each customer.

2-4. Development of Human Resources

The majority of the companies surveyed strongly complained of the fact that the supply of engineers and other key personnel has not kept up with the progress and expansion of Thailand's industrialization program and of the difficulties in securing the manpower for expansion of business. This is due not only to the fact that people do not enter the furniture manufacturing industry from the vocational schools and technical colleges etc., but also to the fact that there is fierce scouting of superior personnel in the industrial world as a whole and the furniture industry is feeling the effects of this.

The basic source of supply of human resources is the schools, but it did not seem that the private sector was expecting much from the current school education system. The opinion was that due to the short history of furniture production in Thailand, there were no full-scale courses in woodworking and there were no people in the educational world able to understand the practice and provide practical education. Further, there were those such as the Thai Furniture Industry Association calling for, in the long term perspective, the broadening of the base of manpower supporting the industry by going forward with down to earth measures such as establishment of courses on woodworking technology in the local middle schools and higher schools.

Practical training could be provided in the companies, but the fact is that the companies themselves do not have any system for in-house training of employees. The frequent response was that in-house training was through on-the-job training, but this could not be expected to give systematic, integrated training. Almost none of the companies have the work standards, quality standards, and other in-house standards required for training. This is probably one reason why there has been no progress in in-house training and the comment was made that no training methods were known.

Further, as a practical problem, there is the situation on the company side that the production lines cannot be stopped for training purposes. In regard to this, there were many calls for an arrangement allowing practical training somewhere separate from production in the large corporations etc.

The seminars held by public organizations are well regarded by the private companies for what they offer, but the prevalent opinion was that they lean too much to theory and strong calls were made for more specific, practical methods to be taught.

The training expected from the government organizations preferably should cover the practitioner level in the companies, but the private sector is dissatisfied with the

outdatedness of the government's policies toward technology and its industrial policies with respect to the increasingly rapid acquisition of technology and technical innovations in the private sector. With the exception of some seminars, there are many doubts as to the government led training and reeducation of personnel as they stand now. For example, in actuality, most of the large or medium sized companies have facilities superior to those of the FIDC and thus it is questionable if the technical training provided with the current FIDC facilities would be effective.

However, the private companies as well understand that there are limits to their competitiveness with other countries with just a continued expansion of the volume of production and look forward to the presentation and execution by the country of some radical measures to enable them to raise the technical level of the industry at an early date and acquire international competitiveness. From this viewpoint, much can be expected from such realistic measures as the establishment and promotion by a public organization of a system for the supply of skilled workers to the furniture industry and positive assistance to the reeducation and training of medium level engineers through renovation of the functions and facilities of the FIDC.

2-5. Problems and Countermeasures

(1) Promotion of replacement and modernization of processing facilities

The Thai furniture industry is currently in the middle of a process of quantitative expansion and has yet to finish the conversion of work from human hands to machinery where possible. Elimination of the waste in work and materials, upgrading of the degree of processing (added value), and manufacture of quality products meeting the market needs will be the way to smashing the old form of production based on cheap labor and establishing true international competitiveness.

Some of the large sized corporations have already begun introducing automated, specialized machines. Unless everyone including the medium sized companies introduce such modernized facilities for this purpose, the industry will find it difficult to expand its export market. Industrial organizations must take the lead and work to collect information on trends in development of facilities and start full-scale research on CAD. Further, it would be desirable to conduct research on the linkage from CAD to CAM in parallel.

(2) Promotion of spread of drying facilities and establishment of drying technology

The quality of the drying of furniture materials is an important element determining the product quality. In the case of exports, the climates of the producing areas and the areas of usage often differ tremendously and it is important that the control technology for

the drying temperature, drying period, and moisture content take this into account. It would be very difficult for individual companies to survey and decide on details of the the artificial drying methods, so a government organization should research it or provide guidance to the industry based on materials in specialized research organizations inside and outside of Thailand. Further, it will be necessary, for companies without drying facilities, which are mostly small and medium sized companies, to promote action by low interest fund assistance or joint utilization of drying facilities.

(3) Strengthening of individual guidance on production and quality in accordance with characteristics of export market

Wooden furniture fundamentally differs in function, beauty, and perceived value depending on the lifestyle in the market using the same. Depending on which market the company is targeting for export, the targeted quality, the plans of equipment, and the process settings differ, so the quickest way to upgrading quality to match productivity would be to obtain direct guidance from specialists from the targeted markets. The same applies to the FIDC, which is in a position to promote, guide, and manage the industry. It will be important for it to obtain a firm grasp of the situation in different countries before acting and, as means for this, to receive experts from the markets periodically to obtain direct guidance.

The same thing may be said for product planning and design, so in the long run, it will be necessary to collect information on different markets and further give consideration to promotion of designers etc. so as to obtain a firm grasp on and understand the design characteristics of the different markets.

The condition for this would be close ties with the DEP.

(4) Converstion to production based on drawings

Regarding the product design, which follows product planning, there is a lack of design capability and knowledge of draftsmanship among designers as a whole. For example, they are unfamiliar with aspects of design such as properties of materials, assembly strength, bonding strength, projected deformation, and allowable error and drafting knowhow such as accurate drafting, indication of dimensions, determination of the order of processing, indication of instructions and information to workers, etc. Due to the fact that insufficient consideration is given to these or that they are not incorporated into the drawings, the reliability and importance of drawings at the production stage are being lost. In particular, the most important things in design at the present time are the promotion and strengthening of design capabilities in regards to product strength and the training of the processing personnel to strictly observe the information on the drawings.

To raise quality, raise productivity, and acquire export competitiveness, preparation of correct drawings and production observing the same are important. Toward this end, augmentation of organizations for providing guidance in specialized design is urgent.

(5) Strengthening of functions of FIDC

International trends in wooden furniture have been changing with each year and a higher degree of processing technology and skill have come to be demanded. Further, rapid progress has been made in production facilities and control methods for this.

Therefore, policies for promoting the development of people with the new knowledge and technology for furniture production through school education and thus increasing the human resources for supporting the industry will be necessary in the future. On the other hand, it is more important to reeducate the medium level engineers and skilled workers now handling furniture production and to quickly give the expanding furniture industry practical export adaptability.

A possible place for this would be, considering the past administrative organizations and their roles, the FIDC. Strengthening and development of its current functions would seem a realistic approach.

Before strengthening the function of reeducation, it would be necessary to have the staff providing the guidance to the private sector specialize in areas of guidance and to receive experts from abroad in each of those areas to train the guidance staff. Further, as the method of guidance by the staff, it would be realistic to provide training to trainees from the private sector and at the same time train on the job.

The guidance would cover, in content, production design, drafting, and other design techniques, production processes, schedule planning, and other aspects of planning and control technology, drying technology, processing technology and assembly technology, including bonding methods, for legged furniture and box type furniture, tool handling methods, polishing, paints, paint adjuvants, painting methods, and other finishing methods, quality and quality control technology, etc.

To implement this education and training, practice in everything from design to completion of products would be necessary in addition to classroom study, but the processing facilities currently owned by the FIDC are beginning to become noticeably outdated, with some of it even being unusable, so there is a need for some replacement of facilities.

Table III-2-1 shows the processing facilities currently owned by the FIDC. Facilities marked with an asterisk are those judged by the current survey as requiring replacement.

The facilities judged as requiring replacement and the new processing facilities required for practical training in the latest furniture production methods, and the specifications for the same, were studied. The results are shown in Table III-2-2.

To overcome the present weak points of Thai furniture products, due to the limitations in the number of companies and individuals which could be trained at the FIDC, it would be effective for foreign engineers and FIDC personnel to provide frequent seminars and roving guidance of factories. In particular, there is a need to quickly spread, through such activities, the points to watch in design, relating to the properties of the wood materials, and the technology for finishing furniture.

Other important functions desired of the FIDC would be augmented testing of products and expanded services.

Companies only naturally have responsibility over the basic quality of their furniture, but the companies are only able to improve their production facilities and the abilities of their personnel. In general, they do not have the leeway to concern themselves with testing facilities as well. Further, it is not easy to secure the personnel required for performing tests correctly and it is not easy on the corporate level to make the test results official.

In particular, it is difficult to provide the test facilities and to secure the test personnel for tests on the strength of members, assembly strength, repeated strength, etc. Further, tests on the properties of materials are similarly difficult for private companies. In regard to this point too, the FIDC should augment its testing facilities and testing personnel as the agency in charge so as to be able to perform correct testing and issue official test findings in accordance with requests from the private sector, make judgements on whether products meet customer specifications or the standards and specifications of the market of the export destination, and otherwise contribute to the improvement of the basic quality of furniture.

Note that it is recommended that such commissioned testing be provided on a fee basis under the basic principle of the beneficiaries bearing the burden of payment. This is a desirable arrangement for the industry.

At the present time, the FIDC has the testing facilities shown in Table III-2-3, but the survey could not judge whether the precision and capabilities of the testing equipment were being maintained. Even if all the testing facilities functioned correctly, they would not be sufficient for the afore-said testing services and introduction of equipment as shown in Table III-2-4 would be required.

In the case of the Thai furniture industry, development of technology for utilization of rubberwood will be essential due to the characteristics of the resources of Thailand. Rubberwood poses difficulties in the chemical processing of the logs. There are

many aspects of the treatment timing and treatment technology which require development. The same applies to the elimination of black spots and scratch marks, the bleaching out of discoloration caused by molds, etc.

These problems and development goals are themes of development technology which have to be tackled from the standpoint of having the persons engaged in the production of the furniture process the products with a firm grasp of the physical and chemical characteristics of the materials. Therefore, both the public and private sectors must deal with them.

In this regard, individual companies are not in a position to equip themselves with research facilities and research personnel. The fastest way to solve the problem would be for the FIDC to take the lead in research and development under the cooperation of industrial organizations. It is necessary to formulate a plan for fast implementation of this.

Note that the research personnel would have to include chemists, biologists, and other experts in academic fields other than the engineering field, so it will be important to promote ties with foreign research organizations and to seek the dispatch of researchers to Thailand.

Whatever the case, it would be advantageous in the activities and functions of the FIDC to build a cooperative relationship with the wooden furniture industry through the provision of technical guidance and training to the industry with regard to practical resolution of problems in production technology, research and development, and the development of human resources with advanced, specialized technical knowhow and skills, all of which general education institutions and the private sector find difficult to cope with on their own.

Table III-2-1. Existing Processing Equipment at FIDC

1. Super Universal Scroll Saw
2. Router
3. Single Spindle Moulder
4. Wood Copying Lathe
5. Band Saw
6. Universal Radial Saw
7. Straight Line Rip Saw (*)
8. Auto Level-Planing Double Side Planer (*)
9. High Speed Tilted Saw (Circular Saw) (*)
10. Four Spindle Single and Tenoner (*)
11. Hollow Chisel Mortisor (Hydraulic) (*)
12. Dowel Machine
13. Dowel Chamfering Machine
14. Table Press
15. Assembling Machine for Chair
16. Body Press
17. Bench Drill
18. Drilling Head
19. Conner Locking Machine (*)
20. Auto Dovetailing Machine (*)
21. Auto Single Surface Planer (*)
22. Hand Feed Planer
23. Elevating Spindle Type Cross Cut Circular Saw Bench
24. Exhaust Fan
25. Spark Detector
26. Panel Saw
27. Cold Flash Press
28. High Frequency Heater (*)
29. Oil-Hydraulic Press of Wood Working
30. Boring Machine (*)
31. Wide Belt Sander (*)
32. Double Head Polley Sander
33. Spindle Sander
34. Universal Belt Sander
35. Disk-Belt Sander
36. Belt Sander Line
37. Universal Dust Collector
38. Ventuli Booth
39. Automatic Bandsaw Sharpener
40. Universal Grinding Machine
41. Knife Grinder and Lapper
42. Universal Tool Grinder
43. Automatic Circular Saw Sharpener
44. Bench Type Electric Grinder
45. Upset Flash Buttwelder
46. Bag Filter Collector
47. Dust Collector
48. Dry Kiln Control
49. Combination Boiler (*)
50. Baby Compresser
51. Portable Jig Saw

(*) indicates equipment requiring replacement.

Table III-2-2. Processing Equipment Requiring Replacement or Augmentation at FIDC

Equipment	Specifications	
Straight line rip saw	Max. saw dia.	255-355mm
	Spindle revolution	4,000/5,000rpm
	Feed speed	15-30m/min. (Step less)
	Distance from saw to column	510mm
	Mix thickness of work	80mm
	Distance among pressure rolls	170mm
	Table area	1,600mmx1,000mm
	Overall height, width, depth	1,450mmx1,490mmx1,775mm
	Motors for saw	5.5KW (380V, 50Hz, 3ø)
	for feed	1.5KW (380V, 50Hz, 3ø)
Auto level-planing double side planer	Max. stock width	300mm
	Max. stock thickness	100mm
	Cutter head, round type	3 knives
	Cutting circle	108mm
	Cutter head speed	5,000rpm
High speed tilted saw type	Max. circular saw dia.	405mm
	Hole dia. of circular saw	25.4mm
	Max. Thickness of workpiece	135mm
Four spindle single and tenoner	Max. tenon length	100mm
	Max. tenon width	330mm
	Max. stock width	76mm
	Max. diam. of circular saw	300mm
	Hole diam. of circular saw	25.4mm
Hollow chisel mortisor (Hydaulic)	Chisel size	6-24mm
	Max. effective thickness & width	170mmx150mm
	Drill chuck (No.3 Morse taper)	16mm
	Vertical taravel of chisel	125mm
Conner locking machine	Max. effective with	450mm
	Max. effective thickness	120mm
	Max. effective depth of fret	38mm
	Fret pitch	5.75mm
	Spindle speed	2,850rpm
Auto doverailing machine	Max. effective thickness	10-25mm
	Max. effective width	210mm
	Number of bit	8pcs
	Spindle speed	10,000rpm
	Pitch of bits	25mm
Auto single surface planer	Thickness range	6-320mm
	Cutter spindle speed	4,500rpm
	Cutter spindle	127ø with 3 knives
	Feeding speed	4-22m/min (stepless)
	Max. planing width	450mm
High-frequecy heater	High frequecy output	3KW (380V, 50Hz, 3ø)
	Total input	7KVA (380V, 50Hz, 3ø)
	Frequency (approx. 1)	6.7MHz
	Dimensions	800mmx750mmx1,720mm

Boring machine	Width of work	640mm
	Length of work	1,350mm
	Thickness of work	45mm
	Drill head	21 spindles of 30P
	Motor	1.5KW (380V, 50Hz, 3ø)
Wide belt sander	Max. working width of stock	1,270mm
	Max. working thickness of stock	200mm
	Feed speed, infinitely variable by inverter control	5-30m/min
	Width and length of abrasive belt	1,310mmx2,615mm
Double head polley sander	Spindle diameter	25.4mm
	Spindle speed	1,000/1,660rpm
	Motor	400W
	Table area	750mmx750mm
	Table height (adjustable)	680-720mm
KT combination boiler	Fire tube, water tube boiler	
	Dia. of shell	750mmx1,650mm
	Max. working pressure	10Kg/cm^2
	Surface area	8.0m
	Evaporation	rated 280Kg/H
Solid woodbend machine	Material & size	Pararubber wood 25-50 mm thickness 50-75 mm width 1500 mm length (max.)
	Bending angle	Single, as smaller as possible
Finger jointing equipment	Micro-computer controlled length-cut system Handling stock 15-50mm thick, 30-220mm wide and 200-2,000mm long. With finger sharper, automatic feeder, finger joint, assembler, cutter grinder.	
N.C.Router	*Router machine with 4 Spindle heads:*	
	Router head :	5KW(2P) 2 Spindle heads
	Router/Molder heads:	2 Spindle heads: 5KW (2/4P)
	Voltage	380V, 3-phese, 50Hz.,
	Table area	1,300mmx2,000mm
	Stroke	1,300Xmm, 2,000Ymm, 250 (Z Axis)mm
Electrostatic spray set	Kind of paint	General paint (Metalic, Waterbse, Conductive)
	Max. pattern width	330-390mm
Ultraviolet drying machine	Input voltage	AC220V, 1 phase
	Feed speed	1.5-5m/min
	Effective irradiation width	200mm
	Lamp	HI-20(N), 2,000Wx1pc
Copy turning lathe	Max. length for machining	800mm
	Max. diameter for machining	70mm
	Follow rest	3 follow rest sizes

Multiple spindle boring	Max. effective length	250-2,000m
	Effective width	100-600mm
	Pitch between spindles	30 or 32mm
	Horizontal spindle	20 Spindles in a row, at both ends
	Vertical spindle	5 rows, 20 spindle per row
Six spindle moulder (4-side moulder)	Max. size to be processed	180Wx180mmH
	Min. size to be processed	18Wx12Hx500mmL
	Dia. of cutter head	120mm
	No. of cutting kinves	4pcs.
Electric dry kiln	Forced-air-circulation Internal fan type	
	Capacity	1.11m3
	Max. piling up dimensions	2,000Lx1,200Wx1,200mmH
Top side grinder for tipped saw blade with TCT knife grinding machine	Max. effective diameter of saw	405mm-16"
	Max. effective diameter of cutter	305mm-12"
	Max. effective shank of bit	0-13mmø
	Max. size of knife to be ground	120mm
	Size of diamond wheel	150mmø
Spray booth	Water wash spray booth Main body dimensions (WxDxH) 4,000Wx2,000 (Water tank 1,500)Dx2,565mmH	

Table III-2-3. Existing Testing Equipment at FIDC

1. Cobinet Testing M/C
2. Chair Repeat Testing M/C
3. Strength Testing M/C For Furniture
4. Cross-Cut Tester
5. U-F Scratch Tester
6. Direct Reading Balance
7. Universal Wood Testing M/C
8. Tepm Humidity Control Chamber
9. Safety Oven

Table III-2-4. Additional Testing Equipment Required

Equipment	Specifications	
Equipment for temperature and humidity control room	Room No. 1 (condition test) Text condition Test period Room No. 2 (condition control) Test condition Test period	3m(W) x 5m(D) x 4m(H) 25°C, 65% RH (Constant) 7 days 2m(W) x 3m(D) x 4m(H) 15-60°C, 30-95% RH (Adjustable) 3 days
Elastic loop dynamo meter (Load calibrator)	Max. cap. Min. cap.	150Kg 15kg
Straine gauge (Load cell) with recorder	With Load cell, Dynamic straib amplifier, 3 Channel recorder, Displacement transducer	
Sponge compression tester (Foam hardness check test machine)	Capacity	8Kg
Surface gauge Profilemeter (Roughness meter) with recorder	Traversing length Straightness accuracy	1-30mm 0.5micron/30mm
Rockwell hardness tester	Minor load Major load Vertical gap Horizontal reach	10Kg 60,100,150Kg 200mm 135mm
Computer aid design (CAD)	1set	
Weather meter	Light source Temperature Humidity	6KW water-cooled xeanon long-life arc lamp Room temp. +15~60°C 30~60%RH (at 40°C)
Wood cutting torque and speed measuring machine	For wood cutting experiment, ie. Minimum piece size	Pararubberwood, monkey pot, etc. 30mm(W)x10mm(T)x200mm(L)
Universal testing machine (Tensile and compressive testing machine with recorder)	Load range Effective distance between frames Crosshead stroke	1,000Kgf 420mm 1,100mm
Precision gas detector (Free formaldehide meter)	With Absorber Detection tube Disposal type 1,000 pcs	
Gross meter	Measuring surface Incident angle	14x45mm Light emitter (0-85°C) Light-receiving element (0-85°C)
Profile projector (Universal projector)	Screen dia.	350mm
Vibration testing machine	Max. loading weight Direction of vibration Vibration table	150Kg Vericall 1,000Wmmx1,000Dmm
Caster tester	Size Running speed Installation	Approx. 900Wmmx900Dmmx900Hmm Approx. 800m/min Approx. 1m
Scratch hardness tester (Fabric flex tester)	Load max.	50gf

Taber abrasion tester	Revolution	60± 2rpm
	Load	250g, 500g, 1,000g
Equipment for chemical laboratoy	Kind of analysis	Wood preservative substances, lacquer, paint, stain and bleaching agents Adhesive and free formaldehide
Joinery tester	Size	Approx. 1,600Wmmx1,250Dmmx2,250Hm
	Open and close speed	10±1/min
	Open angle	70° ± 5°
	Door for test	900Wmmx2,000Hmm
Cabinet door closs and open tester	Size (Frame)	1,200Wmmx1,000Dmmx1,500Hmm
	Stroke	400mm
	Repeat speed	20 times/min
Bed tester	Size	Approx. 2,500Wmmx1,700Dmmx1,500Hmm
	Stroke	200mm
	Repeat speed	160 ± 10 times/min
Flamability furniture test instruments (Cabinet and equipments for flamability test)	Test specimin	300mmx300mmx70mm
	Heating part	Burner (Automatic sliding method)
	Control pannel	
	Heating time determination	0-99min. 99sec.
	Remains of flame time determination	0-999.9sec.
	Remains of soot time determination	0-999.9sec.
	Size	
	Control panel	52Wcmx25Dcmx50Hcm
	Test part	75Wmmx83Dmmx94Hcm
Autoclave	Usable inner size	400øx650mm (82 L)
Dyeing abrasion tester (Fabric rubbing meter)	Number of test specimim	6 pcs.
	Size of test specimim	30Wmmx220Imm
Micrometer	Range	0-25mm 25-50mm 50-75mm 75-100mm
Fatigue and static load chair test machine	Size (base)	1,500Wmmx1,500Dmm
	Repeat speed	1-20 times/min

3.Supporting Industries

3-1. Raw Materials

The following trends were observed in the large sized corporations and the small and medium sized companies with regard to the ability to procure logs, lumber, and other furniture materials:

Large sized corporations: Many companies were engaged in direct transactions with primary domestic suppliers, sometimes foreign suppliers, based on two- to five-year contracts. Further, many companies had integrated supply systems, covering forestry and lumbering, in-house or in their affiliated group.

At the present time, they have no problems in obtaining materials and the quality of the materials obtained is good.

Small and medium sized companies: These do not have any specific, strong sources of supply. They primarily rely on transactions with a few lumber companies. The lots purchased are small, so there is the headache that purchases cannot be made at the best timing. Usually, the companies have to make reservations at the lumber mills, but even with reservations, they are often made to wait, interfering with their production schedules. It is difficult for them to obtain good quality materials.

The materials generally used for furniture are as follows:

(1) Plywood

The raw materials for plywood are mostly imported from Sarawak, Brunei, and Indonesia. Recently, materials from Africa have begun to be imported as well. Rubberwood and lauwan are mostly used for production of plywood. Imports of plywood are also increasing, with the principle countries of origin being Indonesia and Malaysia. Indonesian plywood is of the lauwan type and is cheap in price, while the Malaysian plywood is like that of Thailand of the rubberwood type and includes many joints. Regarding the domestic species of wood in use, permission must be obtained from the Royal Forestry Department for each species used. Companies producing plywood therefore are not in a position to freely select the materials they use in accordance with market conditions. Teak logs are mostly imported from Burma, which products better quality teak than Thailand.

In price competitiveness, domestic plywood is about US$3 cheaper than imports, but production has fallen in the past two years. At the present time, there are no problems in acquiring plywood.

As to size, plywood of 3' x 6' is being produced as well, but the standard size is 4' x 8' in thicknesses of 3.5, 4, 6, 10, 15, and 20 mm. It comes in grades A and B, which are respectively differentiated for interior and exterior use.

(2) Particleboard

There are two to three companies producing particleboard in Thailand and the volume of production is rising. At the present time, the companies are obligated by the government to export, so much of the production is of thick board and only a little of thin board.

The particleboard is produced in the size of 4' x 8' and thicknesses of 2.5, 3, 3.2, 4, 4.8, 6, 10, 12, 16, and 19 mm. The companies do not produce the 15 and 20 mm thicknesses in demand in Japan.

Manufacturers of export furniture use Malaysian particleboard, which is cheaper in price than Thai board. The prices have been rising each year and run at about 280 bahts/board for boards of 4' x 8' x 4 mm laminated with teak materials - coming close to the price in Japan. The companies rely on imports from Japan for the laminate paper, but not many companies have machinery for applying the laminates. The particleboard is produced by the hot press method. The cold press method is not used. The strength of the products is sufficient and the error in thickness is held within $\pm$0.3 mm.

(3) Parawood

The demand for parawood has been growing rapidly, so there is a slight shortage of supplies. Prices have risen 20% from last year. Therefore, the main materials for Thai parawood, rubber tree logs, are scrambled after in the rainy season.

The parawood lumber used most for furniture is produced in a standard size of 1 m x 10 cm, with 1.3 m sizes being produced on special order. There are two ranks of quality, class A and class B, but in both cases there are large errors in the size of the boards.

The prices run at 250 to 300 bahts/cf for class A and 170 to 200 bahts/cf for class B.

The area of rubberwood plantations rose from 10.70 million rai in 1986 to an estimated 11.00 million rai in 1988, it is reliably thought. Of this, 90% is distributed in the local regions of southern Thailand and 10% in the northeast.

According to the Thai Furniture Industry Association, the current amount of rubberwood being used, including that for boxes for fruit and fish and shellfish, is about 20% (about 300,000 rai) of the annual supply capacity, so there are considered to be no apprehensions on supply for the time being. It is true that use of rubberwood for furniture

materials is soaring, bolstered by the rapid increase in production of wooden furniture for export, but the government is encouraging aforestation with the aim of ensuring supplies of rubber tree sap in rubber plantations after harvesting all rubber trees from which sap can no longer be obtained, said to be about 25 years. This will as a result contribut to the stabilization of the supply of rubberwood to the furniture industry.

The incentives for aforestation of rubber trees are provided to the plantations in the form of provision of seedlings, fertilizers, chemicals, wages, and other support in kind or cash equivalent to 5000 bahts/rai - with no obligation of repayment. At the present time, 312,500 rai is being aforested a year, but the average rate of implementation is about 90%. Recently, there has been rapid progress in aforestation of rubber tree forests in the northeast, where the wood is of superior color, high in wood fiber density, and hard. Note that exports of rubber tree logs are banned. Sixty to 64 rubber trees are planted per rai, and transaction price for rubber trees stands at 3,000-4,000 baht per rai in the south and 30,000 baht in the northeast. The price of rubberwood has rapidly risen in the past two or three years. The price for chemically treated lumber for general use soared to 130-150 baht/cf in 1988 from 37 baht/cf in 1984.

(4) Teakwood

Starting January 1989, domestic harvesting of teak trees was banned and the industry was forced to rely on imports for its supplies. Prices have been continuing to rise, and both the public and private sectors have apprehensions over future projections of supply.

The main countries of origin are Burma, from which logs and lumber are imported, and Indonesia, from which lumber is imported. Recently, lumber has begun to appear from Laos. The large corporations have obtained permits from the Burmese government for lumbering operations along the Burmese border and are engaged in direct lumbering operations in some cases. The price of the lumber was 130 to 150 bahts/m^3 in 1983, but soared to about 1000 bahts/m^3 by 1988.

(5) Other furniture materials

Quince trees are widely distributed in Thailand, but almost all the wood is presently being imported from Burma and Laos. Opinions are divided on projections of supply, but in general it is considered that supplies are sufficient for the next five to 10 years. The prices have soared from 3500 bahts/m^3 in 1986 to 12,000 bahts/m^3 in 1988.

Eucalyptus wood is primarily used for particleboard, but trees of about 10 years' age have recently begun to be used directly for furniture as well. Further, some private companies are beginning aforestation. Eucalyptus, however, absorbs large amounts of

moisture and thus have a large effect on other plants. Also, it gives off a strong smell when used for furniture. Therefore, it is judged that large-scale aforestation would be difficult.

There are sufficient resources of acacia wood and no aforestation is underway. The yield is poor and therefore the wood is only used for limited applications.

Oak, walnut, etc. are being imported from the U.S. and coming into use. The yield of oak is poor and the real cost is about the same as that of teak.

In addition, use is being made of tibony, mayan, mahogany, etc. Further, dorian, mango, papaya, coconut, palm, and other such trees have been mentioned as subjects for study for future use.

3-2. Secondary Materials

The secondary material most in demand in the furniture industry is furniture fittings such as metal fittings. Thailand has about 20 to 30 companies, including cottage industries, engaged in the production of furniture fittings, but none of the companies are engaged in integrated production of all varieties. Further, there are no foreign capital affiliated companies. There are about 10 importers.

As to the items produced, Thailand can manufacture fairly much everything, but too much investment is required for the molds and dies and the processing facilities, so it cannot manufacture good quality items.

This is due to a tendency to stress price over quality and the strong desire on the part of the producers to manufacture cheap articles. With the exception of imitations, there is no originality in designs and therefore domestic makes have a difficult time competing with imports.

At the present time, large amounts of standard screws, bolts, nuts, nails, etc. are being used for export furniture with almost no problems. Thailand cannot make console hinges, handles, rails, etc. with good functionability and has to use imports for its export furniture.

The countries of origin for the furniture fittings are West Germany for the hinges and rails and Italy and Australia for the handles, with some Danish makes also being imported. Recently, Taiwanese fittings have also begun to be imported in large quantities.

The domestic sales price is about 1.75 times that of Thai products in the case of Taiwanese fittings and about 2.5 times it in the case of European fittings. An import duty of 40% is levyed on the CIF price of metal products and 85% on plastic products. Note that complaints were heard that duties were also assessed on samples.

There is no problem with domestic procurement in Thailand of adhesives and solvents, but the adhesives and solvents used are mostly made in Japan. Recently, products of foreign capital affiliates have begun appearing. However, the adhesives used for outdoor furniture basically are imported from West Germany and Norway. The paints used are mostly Thai paints, but imports are used for outdoor furniture.

In addition, laminate sheets are imported from Australia and Israel, cork from Portugal, and fabric for export furniture from Denmark etc.

3-3. Processing Facilities and Parts

Thailand has four to five companies which produce woodworking machinery, but these are all small in scale and account for only a small percentage of the machinery supplied to the domestic furniture industry. However, the companies are able to produce at prices about half that of the Taiwanese makes and therefore some are exporting to Laos, Burma, Malaysia, etc. The mode of production is production on order, with the companies manufacturing work machines developed by themselves using their own standards and specifications. Therefore, it will still require considerable time before these companies contribute to procurement of parts by the furniture industry, which uses mostly imported facilities.

Cutters, saws, and other tools are produced in Thailand, but are limited in type and often do not meet international specifications, so the industry relies on imports in practice. Further, domestically made tools are easily worn or deformed and improvement of the quality is being sought.

Sandpaper is not being produced, so Thailand relies on imports for its supplies.

4. Marketing

4-1. Product Planning and Development

4-1-1. Summary

Among the companies visited for this survey, there were very few which had their own planning and development capabilities. Only three companies were engaged in aesthetic and industrial design on their own (these being manufacturers primarily engaged in exports). Twelve companies manufactured completely on the basis of designs specified by the customers. The failure to nurture one's own planning and development capabilities is deeply related to the short history of Thai's modern furniture industry and the fact that exports have begun to soar only just recently. The tendency is for most furniture manufacturers to operate on the basis of the policy of expanding exports through production based on product planning and designs from their customers. There are differences in design tastes in each market and it is essential to obtain a firm grasp of the features of the U.S., Japanese, and other key export destinations, but at the present time companies gather very little information on global markets. Independent planning and development would therefore seem to be a medium and long term task. The problem is rather in the industrial design of the products rather than product development - there is an insufficient knowledge of drafting among industrial designers. If Thai's furniture exports are to shift in the future from value added products to medium class products and maintain their export competitiveness, production based on accurate drawings will be important.

4-1-2. Market-Oriented Planning

The market characteristics of the U.S. and France, the markets surveyed, reveal the preferred dirction of planning and development of Thai furniture. The problems may be summarized as follows:

(1) The United States

The U.S. market is large and open. Demand for wooden furniture extends from high class to low class items. Thai furniture is evaluated as suitable in quality and price and is well received among demanders. The Thai furniture sold in the U.S. is produced on an OEM basis and independently by Thai companies. No particular problems were mentioned with regard to the products themselves.

On the other hand, the U.S. importers and manufacturers which agreed to the interviews all commented on a lack of Thai marketing. U.S. businessmen have a strong interest in Thai products and seek to obtain information through catalogs etc. and contacts with industrial organizations etc. In marketing, it is necessary to promote sales through a close exchange of information with all sectors of the market and simultaneously to gather information on the market characteristics (preferences of demanders and products and designs sought after by businesses) and strive to put that information to good use in developing new products and improving designs.

(2) France

France differs from the U.S. in that it is a relatively limited market. There is a demand for Thai products, but in general they are treated as low class items and are not regarded well. While there is that demand for low class, inexpensive products, demanders are shifting toward moderate and high class items in their preferences. In France's case, design and finish are judged by tough standards. Quality, more than price, is the criteria for selection by demanders.

Marketing for France requires different measures from that for the U.S. As was commented in the interviews, it is necessary to give serious consideration to joint ventures or technical tieups and strive to improve design, quality, and finish.

4-2. Export Channels, Brands, Markets

All of the 22 firms we visited for the survey are exporting their products. Fourteen of them are exporting 100% of their products, four more than 50% and two less than 50%. Data was not available for two of the companies.

For your information, the table below shows the value of exports by the 10 largest furniture manufacturers and exporters in Thailand. The ratio of exports by major exporting firms to the total exports is high.

Table III-4-1. Ten Biggest Export Furniture Manufacturers

(Unit: Baht)

	1984	1985 (Jan. - Nov.)
1. Siam Tani Furniture Co., Ltd.	84,306,988	93,156,033
2. Kowsupamonkol Export Co., Ltd.	61,420,394	72,110,935
3. Hawai Thai Export Co., Ltd.	50,657,908	67,839,723
4. Sun Furniture Co.	58,823,212	60,627,400
5. Siam Wood Furniture Co.	35,023,119	47,432,248
6. Thai Parawood Co., Ltd.	30,744,903	43,657,319
7. Panang Thai Rattan Ltd. Part	31,387,763	39,734,170
8. 912200299	24,420,182	37,369,645
9. Siam Household Products	31,206,757	36,284,595,
10. Fancy Wood Industries Co., Ltd.	35,220,498	35,101,542

Source: Export Business Guide (in Thai)

The table below shows a comparison of monthly volumes of exports of the firms we visited during the latest survey.

Table III-4-2. Monthly Export Volume of the Firms

Name of firms	Ratio of exports	Volume of exports	Destination
Fancy Wood Industries	100%	40 ft x 70 units	Japan 70%; U.S. 25%
Task Co.	100%	" x 8 ~ 10 units	Japan 100%
Siam Wood	100%	" x 13 units	Japan 100%
Acme Industries	100%	" x 60 units	U.S. 50%; Japan 30%; Europe 20%
Siam Maison	60%	" x 15 units	U.S. 70%; Japan 20%
Sang Thana Furniture	100%	" x 12 units	U.S. 50%; Japan 40%
Pongsin Furniture	15%	20 ft x 3 units	U.S. 50%; Japan 50%
Thai Bamboo & Wood Products	100%	40 ft x 25 units	U.S. 75%; Japan 10%
Chiangmai Sudaluk Co.	95%	20 ft x 20 units	Europe 50%; U.S. 20%

The difference between firms is large, with some exporting more than 60 units a month of 40-foot containers and others only three units. They also can be divided into two groups with one group of firms exporting mainly to Japan and the other mainly to the United States. Five of the firms with an export ratio of more than 50% also have a high ratio of exports to Japan, while eight others also have high ratios of exports to the United States.

As for the method of exporting, many firms are directly exporting by themselves. In exports of parawood furniture to the United States, some consultant firms are engaged in technological guidance, product planning, and marketing. About 20 manufacturers deliver their products to one trading firm. Exports to the United States are mainly for mail order businesses. Among firms engaged in direct exports, many deliver their products to the same receivers.

The marketing activities of small and medium furniture manufacturers in Chiang Mai are limited since their products are mainly intended for foreign tourists visiting there. Among the small manufacturers dependent on indirect exports through trading firms, some are searching for opportunities to directly export by themselves. They may have to be assisted in the future to achieve their aim.

When comparing exports to Japan and the U.S., products destined for the U.S. are mostly aimed at mail order sales and mass merchandisers. Items of low to moderate quality and price form the mainstream of products. As opposed to this, exports to Japan are required to have a higher level of quality compared with those to the U.S.

4-3. Comparison of Price Competitiveness

Unit export prices of the four main products for the past decade have risen on the average, although they have varied widely from year to year. Unit prices for chairs doubled from 130 baht in 1977 to 260 baht in 1987, while prices for wooden furniture soared from 269 baht to 743 baht during that decade. Wooden furniture prices in 1980 bottomed out at 82 baht, in 1982 rose to 343 baht and posted a sharp climb during the period from 1983 to 1987. (Fig. III-4-1.)

A comparison of fluctuations in unit export prices for the main countries of destination since 1980 produces distinctive features. While unit export prices to Singapore and Canada have stayed high, those to the United States, Japan and Hong Kong remained low until 1987, when they rose sharply. Unit export prices to Japan in the 1980-83 period moved between 20 baht and 88 baht, with KD parts believed to account for the majority of exports. Unit export prices on the average in 1987 climbed to 743 baht from 82 baht in 1980. Classified by country of destination, unit export prices to Japan rose 40 times from 20 baht to 841 baht. Likewise, those to Singapore climbed from 455 baht to 3,403 baht, those to Canada from 1,156 baht to 1,764 baht, those to Hong Kong from 176 baht to 780 baht and those to the United States from 278 baht to 570 baht. (Fig. III-4-2.)

Fig. III-4-1. Export Prices (per unit) of Main Items of Products (1977-1987)

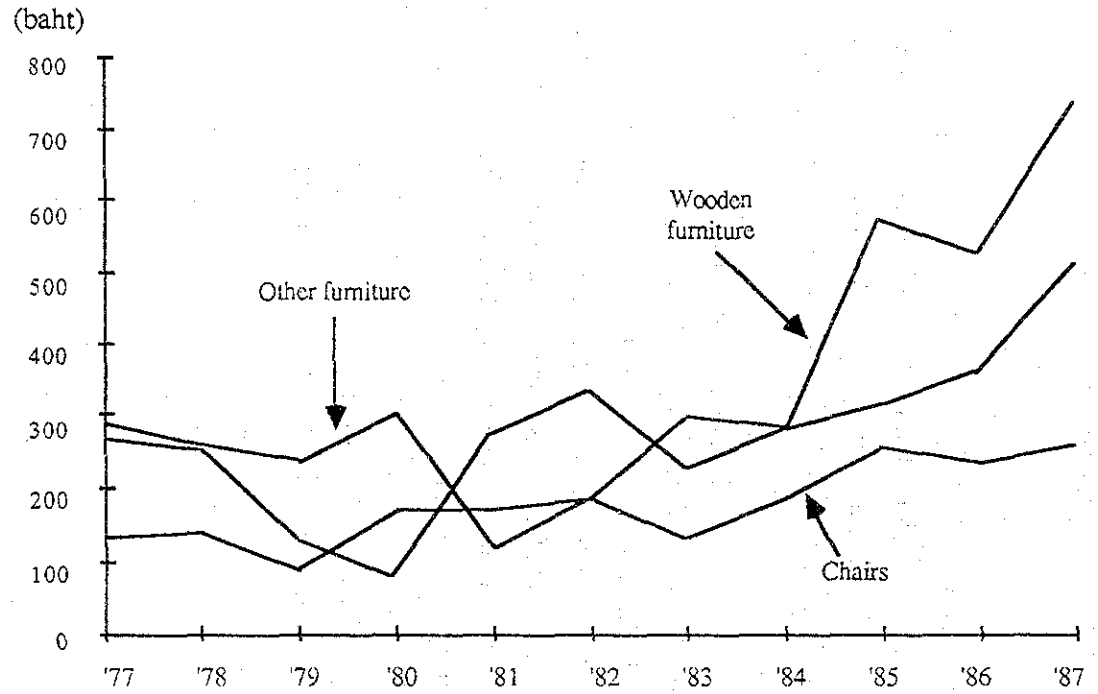
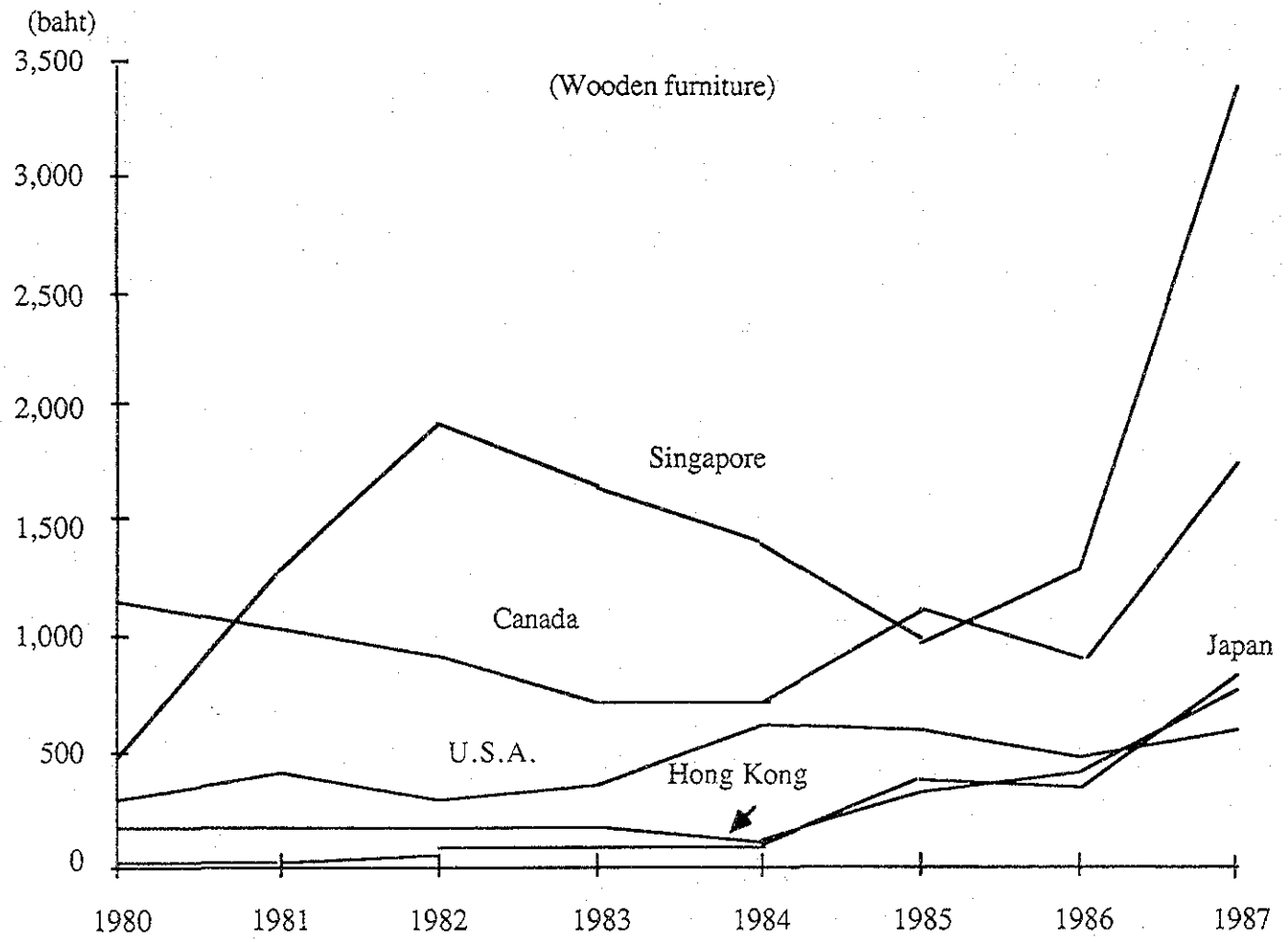


Fig. III-4-2. Changes in Unit Export Prices to Main Countries of Destination (1980-1987)



4-4. Problems and Countermeasures

Marketing of exports in general is mostly dependent on agents or buyers. As a result, there were very few firms among those we visited that had brochures of their products, and it was the same situation for export price lists. We cannot help but say their collection of information on marketing is very weak except for some major firms. The importance of knowing what kinds of products are selling well abroad or how their own products are sold overseas is not well recognized. It will be essential for their marketing strategy to grasp the characteristics and current trends of major overseas markets including the United States and Japan. They may require assistance from the government in the future for successful participation in overseas furniture fairs or for inspection of furniture factories abroad.

Taiwan and South Korea, both of which started in the industry earlier, have had a long 10 years or more experience in exports and thus abundant export expertise. Thailand, on the other hand, only entered the world furniture market just recently and must overcome many problems.

Comparing Taiwan and Thailand, Taiwan is in a superior position in that (1) it has had long experience with exports and has already established a large presence in the U.S., Japanese, and other key markets, (2) it has advantages in the presence of woodworking machinery manufacturers and supporting industries and in terms of technology, and (3) it is closer to the important U.S. and Japanese markets and thus has the advantage over Thailand in transport costs. On the other hand, Thailand is in better position to (1) expand production through price competitiveness, a result of its lower wages, and in (2) the exchange rates as compared with the Taiwan dollar. Thailand's superior positions do not mean bright prospects for the future, however, in view of the rise in domestic wages projected for the future and the lack at the present time of any promising wood resources other than parawood. Once its superior positions are eroded, companies with investments in Thailand and indigenous Thai companies may well move elsewhere in search of new production bases. For Thailand's furniture industry to survive, it will find it critical to raise the degree of technology intensiveness of its products and strive to raise the grade and distinctiveness of its products so as to gradually establish itself in the high and moderate class sectors of the export market.

Toward this end, in marketing, it will be necessary for more information on marketing to be gathered, not only through efforts of private companies, but also through international exchanges by industrial organizations and greater suport from the government sector. Specifically, much closer cooperation among the Department of

Export Promotion (DEP) of the Ministry of Commerce, the FIDC of the Ministry of Industry, and the Thai Furniture Industry Association will be sought.