THE KINGDOM OF THAILAND

REPORT ON FURNITURE INDUSTRY DEVELOPMENT AND PROGRAMING

NOVEMBER 1975

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

The Government of Japan, at the request of the Government of Thailand, decided to undertake a survey for the preparation of concrete plans for the development of furniture industry in Thailand.

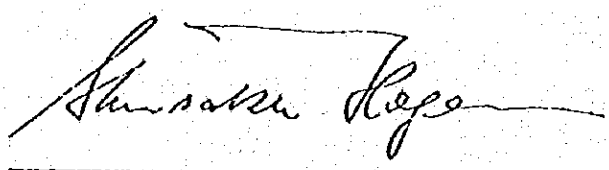
The Government of Japan entrusted its implementation to the Japan International Cooperation Agency. The Agency organized a survey team consisting of seven experts headed by Mr. Hisao Saito (Head of International Trading Division, Kosuga & Co. Ltd.) and dispatched the survey team to Thailand for twenty days from March 11th to 30th 1975.

The survey team was accompanied by the Head of Furniture Section of Industrial Service Institute (ISI), during the survey covering five major provinces (Bangkok, Chiangmai, Lanpang, Phare and Haadyai). The survey team visited private enterprises, studied the activities of local administrative organs and assistances from UNIDO, while making discussions and arrangements with the ISI of the Ministry of Industry.

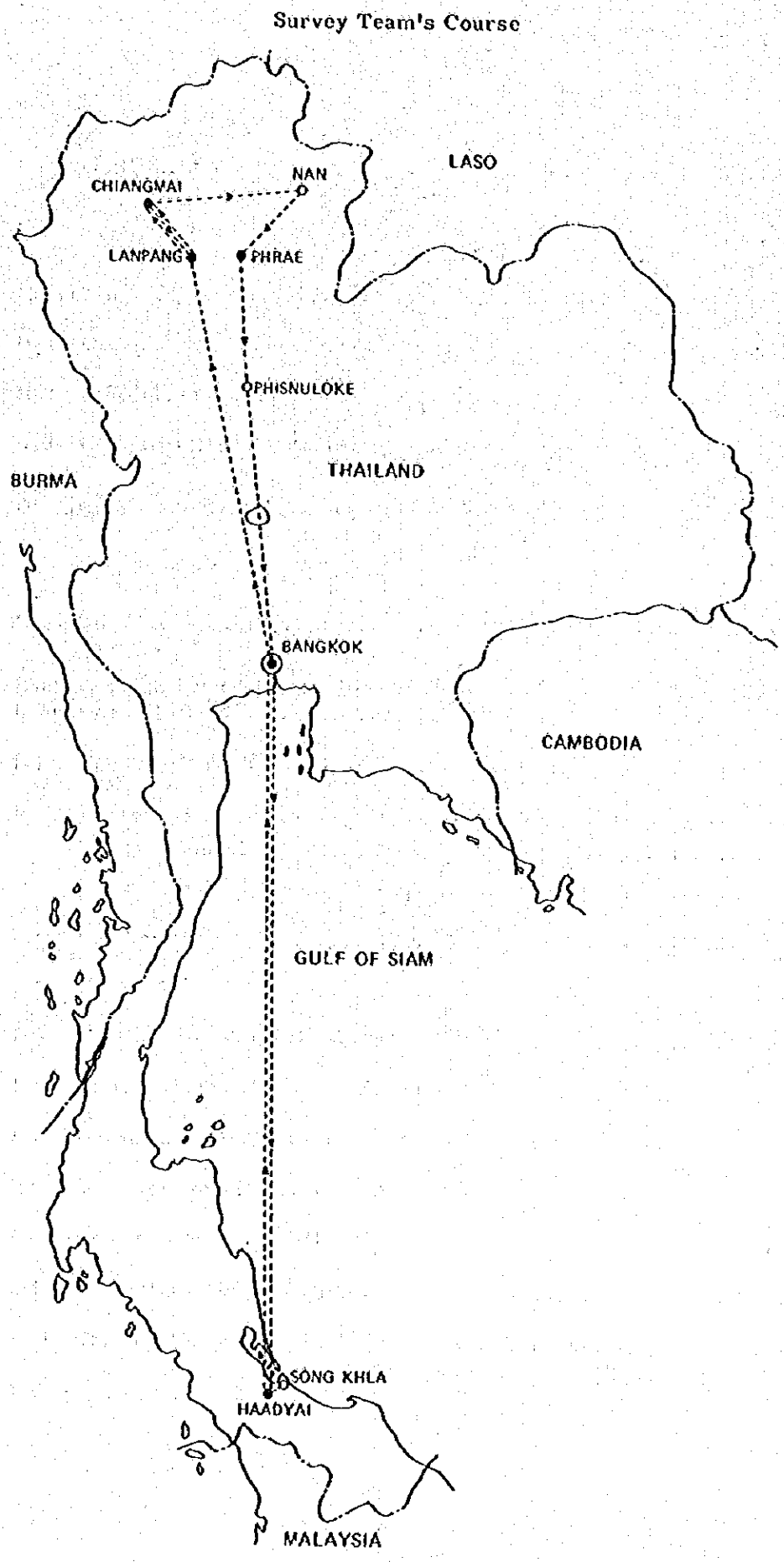
After the return to Japan, the survey team studied the results of the field survey in details and prepared a report. It will be our greatest pleasure if this report contributes to the development of furniture industry in Thailand and to the friendship between Thailand and Japan.

Finally, we would like to express our deep gratitude to the Government of Thailand and Thai Authority Concerned, the Japanese Embassy in Bangkok, the Bangkok Center of Japan External Trade Organization.

November, 1975



SHINSAKU HOGEN
President
Japan International Cooperation Agency


Survey Team's Course
LASO
CHIANGMAI
NAN
LANPANG
PHRAE
PHISNULOKE
BURMA
THAILAND
BANGKOK
CAMBODIA
GULF OF SIAM
SONG KHLA
HAADYAI
MALAYSIA

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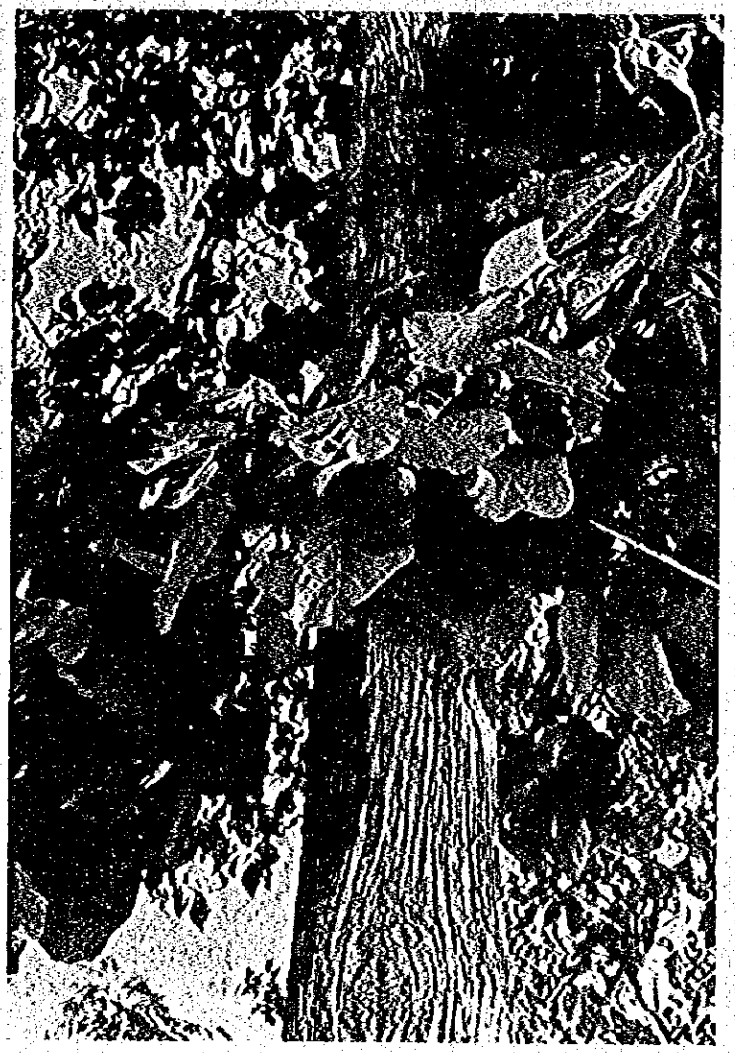
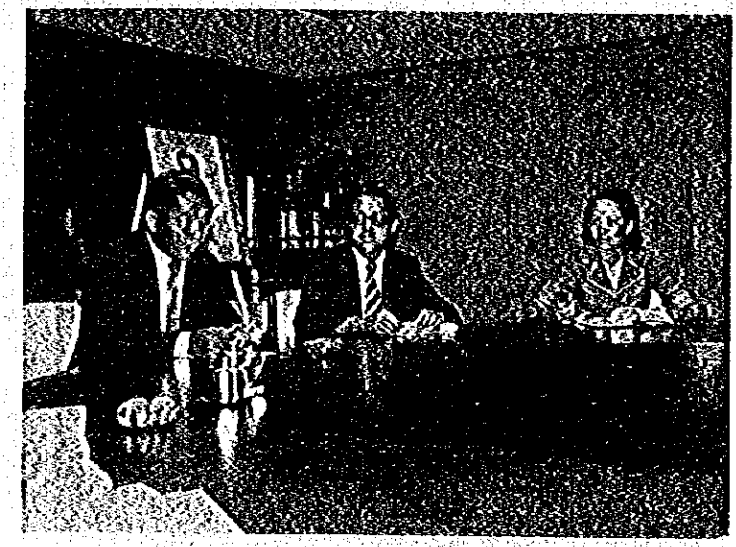


Teak

Row of teaks in Chiangmai



Discussion at Department of Industrial Promotion

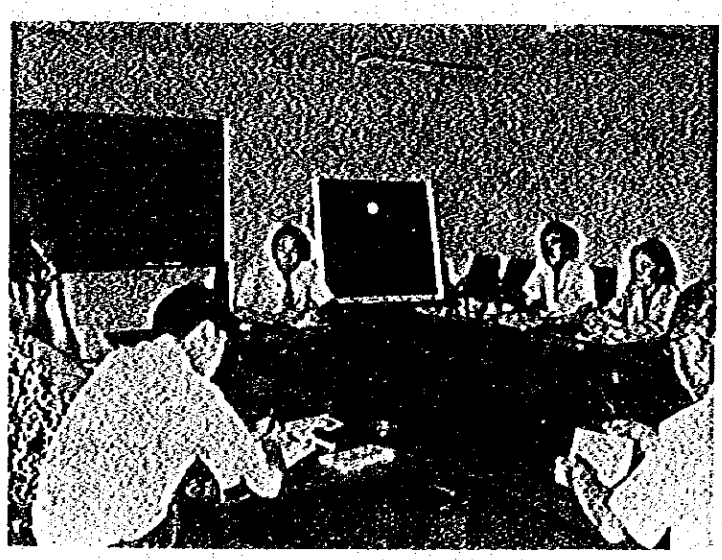
Director General
Mr. Vimor
Mr. Vandi
Mr. Nuanwan

Discussion at Industrial Service Institute

Head
Mrs. Nuanwan
(Furniture)

Chief
Mr. Art

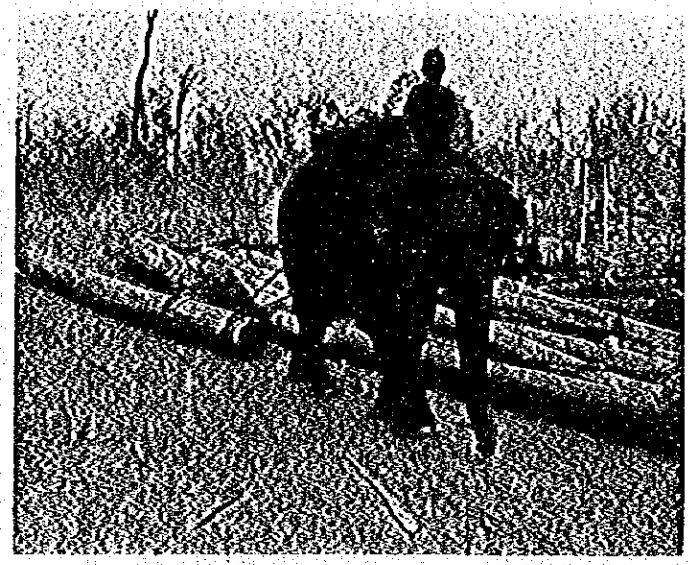
Head
Mrs. Orrasa
(Packing)



Discussion at ISI Northern Branch

Chief
Mr. Phiphat

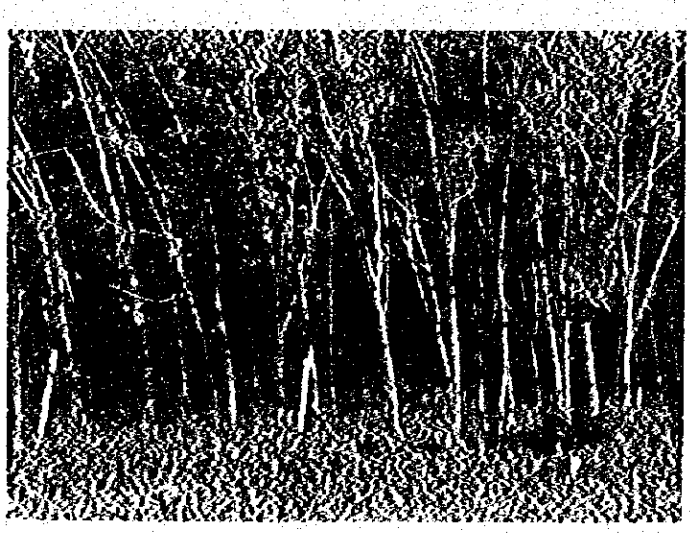
Head
Mr. Dehtkrai
Mrs. Nuanwan



Timber Yard of Muang Songe Branch Office of the Forestry Bureau

Employees of Muang Songe A Branch Office of the Forestry Bureau

Chief
Mrs. Nuanwan



Plantation of Yang Para (rubber tree) in southern district

Chapter 1. Outline of Survey

I. CIRCUMSTANCES AND PURPOSE OF SURVEY TEAM

The Survey Team for programing of Thai Furniture Industry Development was organized in response to the request from the Thai Government and the request made at the Sixth Japan Thailand Joint Trading Committee.

The team was organized and sent to Thailand by Japan International Cooperation Agency with the members recommended by the Ministry of International Trade and Industry.

The purpose of the survey team's inspection was to study various problems related to the development of furniture industry (field of manufacturing techniques and field of designing) and to obtain basic data for programing. The survey team visited more than forty governmental agencies and enterprises in five provinces (Bangkok Province, Chiangmai Province, Lanpang Province, Phrae Province and Haadyai Province) for twenty days between March 11th and March 30th, 1975.

II. PROGRESS OF SURVEY

II-1 Organization of Survey Team

Leader	Hisao Saito	Head of International Trading Division, Kosuga & Co., Ltd. - Manager
Member	Keisuke Nakamura	Director of Japan Interior Designer's Association - Design
"	Tsunetaro Aoki	Head of Engineering Division, Kosuga & Co., Ltd. - Mannufacturing Technique
"	Tsuneyoshi Shiraishi	President of Marusan Shoji Co., Ltd. - Line Control
"	Yukio Takenaka	President of Takenaka Co., Ltd. - Material Control
"	Eiichi Hayashi	Assistant Chief of Design Promotion Section, Export Inspection & Design Division, Ministry of International Trade Industry - Quality Control

Member	Hideo Yasuki	Technical Cooperation Division, Mining and Industrial Development Cooperation Department, Japan International Cooperation Agency - Planning and Coordination

II-2 Schedule of Survey Team

Day	Date	Trip and Visit	Place of stay
1st	March 11 (Tue.)	Tokyo ... Bangkok	Bangkok
2nd	March 12 (Wed.)	(1) JICA Overseas Bangkok Office	
		(2) Japanese Embassy at Bangkok	
		(3) Japan External Trade Organization (JETRO) at Bangkok	
		(4) Industrial Service Institute	Bangkok
3rd	March 13 (Thur.)	(1) Visit of Mr. Tanabe of UNIDO	
		(2) Chada Furniture & Construction Co., Ltd.	
		(3) Boonchai Engineering Ltd. Parter-ship	
		(4) Deccon Co., Ltd.	Bangkok
4th	March 14 (Fri.)	(1) Raja Co., Ltd.	
		(2) Siam Wood Products Co., Ltd.	
		(3) Sweet Home Co., Ltd.	Bangkok
5th	March 15 (Sat.)	(1) Thai Wood Works Co., Ltd.	
		(2) (M & Developer Co., Ltd.)	
		(3) Thai Steel Products Co., Ltd.	
		(4) (Thailand Paints & Chemical Co., Ltd.	Bangkok
6th	March 16 (Sun.)	Market research, meeting etc.	Bangkok
7th	March 17 (Mon.)	(1) Department of Industrial Promotion	
		(2) Hawaii Furniture & Construction Co., Ltd.	
		(3) Silom Shanghai Furniture Ltd. Part.	Bangkok
8th	March 18 (Tue.)	Bangkok - Chiangmai	
		(1) S. V. Furniture	
		(2) Photchana Silp Furniture	
		(3) Mingchen	
		(4) Vichit Silp	Chiangmai
9th	March 19 (Wed.)	(1) Chiangmai Handicraft Co., Ltd.	
		(2) Unbrella Village	

Day	Date	Trip and Visit	Place of stay
9th (Cont'd)	March 19 (Wed.)	(3) I.S.I. Northern Branch	
		(4) Chiangmai Sangalok	
		(5) Chiangmai Carving	
		(6) Chiangmai Art	Chiangmai
10th	March 20 (Thur.)	Chiangmai - Lanpang - Chiangmai	
		(1) Stump Parquet Limited Partnership	
		(2) F.I.O. Bond Wood Factory	
		(3) Surin Furniture	
		(4) Lampang Vanachai	
		(5) Konmoung Furniture	
		(6) Suwanasri	
		(7) Biwlee Registered Ordinary Partnership	Chiangwai
11th	March 21 (Fri.)	Chiangmai - Muang Phrae	Muang Phrae
12th	March 22 (Sat.)	(1) Forestry Training School, Director	
		(2) (Sathorn Furnishing Co., Ltd.)	
		(3) Nariman Teak Industry Co., Ltd.	
		(4) North Thailand Product Factory	
		(5) Forestry Training School	
		(6) Silapa Sardkarn Chang Factory	
		(7) Phrae Priwan	
		(8) Denchai Parquet Factory Co., Ltd.	
		(9) Furniture Shop district in Hua Dung	Muang Phrae
13th	March 23 (Sun.)	Inspection of Timber Yard of A Branch of the Forestry Bureau in Muang Songe	
		Muang Phrae - Bangkok	Bangkok
14th	March 24 (Mon.)	Bangkok - Haadyai	
		(1) Haadyai United Timber Mill	
		(2) Khoaphra Saw Mill	
		(3) Rataphum Saw Mill	Hat Yai
15th	March 25 (Tue.)	(1) Ra Cha Industry	
		(2) Meng Lee	
		(3) Kitcheren	
		(4) Siam Wood (It could not be visited.)	Hat Yai
16th	March 26 (Wed.)	(1) Mr. Mori Factory Owner of Siam Wood) came	
		Haadyai - Bangkok	
		(2) Party by Director of D.I.P.	Bangkok

Day	Date	Trip and Visit	Place of stay
17th	March 27 (Thur.)	(1) Market research and meeting, report	
		(2) JICA Overseas Bangkok Office	
		(3) Japanese Embassy at Bangkok	
		(4) JETRO	
		(5) Party by Survey Team	Bangkok
18th	March 28 (Fri.)	I.S.I. meeting, report	Bangkok
19th	March 29 (Sat.)	(1) Translation of report	
		(2) Presentation of report to Overseas Bangkok Office of JICA.	
		(3) Preparation for return	Bangkok
20th	March 30 (Sun.)	Bangkok - Tokyo	

II-3 Classification of Enterprises Visited by Survey Team

1. Bangkok Area

Furniture (including steel furniture, carving furniture)	8
Spindle	1
Paint	1
Wooden Machine	1
etc. (rough cutting workshop)	1
Total:	12

2. Chiangmai Area

Furniture (including carving furniture)	7
Lacquer Wares	1
Silk Textile	1
Ceramic	1
Total:	10

3. Lanpang Area

Furniture	3
Flooring Parquet (W/saw mill)	3
Wooden Wares (whole saler)	1
Total:	7

4. Phare Area

Furniture (carving furniture)	1
Saw Mill	1

Parquet (W/saw mill)	1
Wood Wares	2
Furniture Store (street) (W/factory)	1
Department of Forestry, Lumber Yard	1
etc. (looked out furniture factory)	1
Total:	8

5. Hat Yai Area

Furniture (including show case)	2
Saw Mill	3
Motor Car Body	1
Total:	6

III. DISCUSSIONS WITH THAI GOVERNMENTAL AGENCIES AND OFFICIALS CONCERNED

The survey team made discussions with the Thai administrative agencies and numerous officials concerned during the survey Thailand's basic policies on the development of wooden furniture industry were as listed below.

- Establishment of industry.
- Improvement of machines and tools and acquisition of operating techniques.
- Improvement of operational efficiency.
- Development and use of new materials.
- Development to export-oriented industry.

The team pointed out problems not only to the staff of furniture factories, but also to governmental officials concerned, including the officials who accompanied the team. The team indicated concrete solutions as far as the time permits.

Chapter 2. The Text

I. BACKGROUND AND PRESENT CONDITION OF WOOD FURNITURE INDUSTRY IN THAILAND

I-1 General

Located in the tropical zone, Thailand is blessed with rich forest resources since forests (about 250, 000 km^2) occupy almost a half of its national land. Various kinds of tropical trees exist in these forests. The major trees include Teak, Yang, Teng-Rang, Krabak, Daeng, Takien, Plung, Maka, Hieng, Pradu, Tabek, Saya, Yang and Pradu etc. are used for furniture in addition to teak. A considerable number of species which are grouped as miscellaneous trees can be used for furniture.

Since Thailand is richly endowed with timber for furniture, small woodwork and other products, timber has been used for various products from the ancient times. Especially, wooden furniture industry is among older industries. Its history can be traced to the 19th century. At those times, a chair wasn't used to ordinary households. There was hardly any demand for living room furniture and bedroom furniture since the use of such furniture was not customary. Therefore, furniture was manufactured for palaces and relatively high-class families. High society people wanted carved furniture or pearl-decorated furniture. They were used as a symbol of the prestige of the high society itself.

Thailand began to make active contacts with the West Europe around in 1930. Modern furniture production began, but it depended heavily on labors. Subsequently, the furniture industry continued to develop gradually. However, the manufacturing system has remained almost unchanged. The present condition in mechanization and labor-saving efforts is still primary. In the field of furniture designing, traditional carving design is mostly adopted. Although it is beautiful, it does not allow efficient mass production.

In the 1960s, the furniture makers in the Bangkok area began to promote mechanization and the products moved from carved furniture to uncarved furniture. As a result, furniture of high quality has become available in the market and the demand for furniture has increased.

The production increased further in the 1970s. A special growth was made in 1973. This can probably be explained by large contracts with Japanese and other foreign buyers. The Thai Government is giving strong encouragement to furniture manufacturers. In 1972, the export-oriented wooden furniture industry was included in the industries under the Government's industry development plan.

I-2 Forest

In Thailand, forest occupy about one half of the national land. According to the data obtained from the Department of Forestry, the area of virgin forest is 115,300 km^2 in the north, 77,620 km^2 in the northeast, 12,610 km^2 in the east, 20,511 km^2 in the west and 27,301 km^2 in the south. In other words, forest are rather concentrated in the north and the northeast. It should be noted that there is a marked difference in tree species between the north and the south. Teak is produced in the north, while Yang is produced in the south. In Thailand, all the trees are owned by the Government.

I-2-1 Annual Fall of Various Trees

In Thailand, the felling regulations for teak tend to become more and more strict every year. The annual fall during the past several years is shown in the following table.

(The names of miscellaneous differ locally. Their identification should be confirmed with samples.)

Table 1. Transition in Annual Fall of Trees, Excluding Teak and Yang

(Unit: 1,000 m³)

Classification		(Year) 1965	1966	1967	1968	1969	1970	1971	1972
Thai name	Academic name								
Teng-Rang	Shorea Spp.	200	189	193	213	191	165.9	137.2	115.1
Krabak	Anisoptera glabra	111	142	174	166	159	187.8	152.6	142.2
Daeng	Xylia Kerrii	74	79	93	105	105	87.4	99.3	65.2
Takien	Hopea odorata	106	83	91	99	81	82.8	101.1	107.1
Pluang	Dipt. tuberculatus	78	81	89	98	80	46.5	50.5	37.0
Maka	Afzelia Xylocarpa	49	44	54	65	59	50.1	56.6	41.6
Hieng	Dipt. obusifolius	36	44	50	58	57	53.5	46.2	41.3
Pradu	Pterocarpus macrocarpus	30	31	43	46	48	44.8	42.1	40.4
Tabek	Lagerstroemia Spp.	30	28	50	52	45	36.9	59.0	56.4
Saya	Shorea Spp.	26	26	34	44	42	43.7	51.9	81.9
etc.	–	569	610	751	842	789	605.0	521.0	511.0
Total		1,309	1,357	1,622	1,788	1,656	1,404.4	1,317.5	1,239.2

Source: Department of Forestry

Table 2. Transition in Total Annual Fall (Unit: 1,000 m^3)

Classification	(Year) 1965	1966	1967	1968	1969	1970	1971	1972
Teak	256.6	151.2	182.0	263.5	296.4	233.9	298.8	177.9
Yang	540.2	534.8	525.4	524.7	488.1	447.4	598.4	738.8
etc.	1,309.0	1,357.0	1,622.0	1,788.0	1,656.0	1,404.0	1,317.5	1,239.2
Total	2,105.8	2,043.0	2,329.4	2,576.2	2,440.5	2,085.7	2,214.7	2,155.9

Source: Department of Forestry

I-2-2 Standards for Teak Logs

It is said that teak logs must be at least 2.13 m round at 1.3 m high from the ground. According to the explanation of the staff at the teak timber distribution center of a Branch Office of the Forestry Bureau in Maug Songe, teak logs are ranked into the following five grades. In other words, they are graded as A, B, C, D, X.

Grade A .... 4 m long log with the circumference exceeding 2.13 m at the center

Grade B .... 4 m long log with the circumference exceeding 1.70 m at the center

Grade C .... 4 m long log with the circumference exceeding 1.30 m at the center

Grade D .... 4 m long log with the circumference below 1.30 m at the center

Grade X .... 4 m long log with the circumference below 0.80 m at the center

If a log satisfying the dimensional requirements of Grade A is curved, it is cut at the center to obtain two 2 m long logs. In this case, they are ranked as Grade D. Logs satisfying the dimensional requirements of Grade A will also be ranked as Grade D if they have corrosion at the center, holes or a large crack.

Teak logs of Grades A and B are used for sliced veneer while those of Grades C and D are used for furniture.

The current timber stock at this distribution center is approximately 16,000 logs. The total shipment was 150,000 logs (70 million Baht ..... 1 billion and 50 million yen) last year. However, most of the logs in stock were marked as C or D. Some Grade B logs were found, but no Grade A log was found.

I-3 Lumber Mills

Currently, approximately 500 lumber mills exist in Thailand. More than two hundred lumber mills are in the central area, around Bangkok. Table 4 shows the distribution of lumber mills. Their scale is small. Most of the mills have only out-dated equipments.

Table 3. Number of Lumber Mills in Various Districts

District / Lumber mills	North	Northeast	South	Middle	BANGKOK	Total
Number of lumber mills	75	85	109	144	87	500
Percentage (%)	15	17	22	29	17	100

Source: Timber Trends, FAO Rome 1972

Strict felling restrictions have been enforced because of the excessive felling of teak timber during the recent years. As a result, the teak production has been decreasing. Therefore, it is natural that the operating rate of teak lumber mills has been dropping.

I-4 Plywood Factories

A teak and Yang sliced veneer overlay plywood factory was constructed in Bangkok in 1957. There are six overlay plywood factories at present. The three larger factories account for 90% of the plywood market in Thailand, but the other three factories are small. The government-managed Thai Plywood Factory is the largest in Thailand. It is followed by Bangkok Plywood Co., Ltd. and the Hero Plywood Co., Ltd. However, the production of Thai Plywood Factory exceeds the total production of the other two factories.

Yang timber is the main material for the plywood production in Thailand. Fancy teak plywood (20%), fancy Yang plywood (75%) and fancy plywood of other trees (5%) are manufactured. The plywood production of the latter two factories was 2 million sheets in 1973. The total production of the three largest factories was 4.8 - 5 million sheets.

I-5 Particle Board and Hard Board Factories

Particle boards for furniture are manufactured by three factories, including the government-managed Sriraja Shaving Board Factory. A wet-type hard board factory is in Thai Plywood Factory, while a dry-type factory is in Sriraja Shaving Board Factory. The production of these materials has been increasing slowly.

I-6 Distribution of Furniture Factories

Furniture factories are densely distributed in and around Bangkok. However, many factories have become a major local industry. If factories are tentatively classified into large, medium-sized and small factories, factories of the first two groups exist mainly in the cities and those of the last group exist in the country.

Table 5 shows the numberof furniture factories and the number of employees in cities and the country. A large number of employees does not necessarily mean the use of many good equipments since the Thai industry depends highly on labors. A furniture factory must be founded with a permission of the Ministry of Industry. All the factories having at least two h. p wood-working machines must be registered, but smaller factories do not have to be registered. Therefore, the number of house-hold industry type furniture factories is not clear. However, a considerable number of such factories is expected to exist throughout the country.

Table 4. Number of Furniture Factories and Employees in Cities and Country

(As of March, 1974)

Ranking by number of employees (in person)	Cities		Country		Thailand	
	Number of enterprises	Number of employees (in person)	Number of enterprises	Number of employees (in person)	Number of enterprises	Number of employees (in person)
Less than 10	211	2,516	304	2,417	515	4,933
11 – 20	155	3,059	85	1,152	240	4,211
21 – 50	164	6,905	57	1,835	221	8,740
51 – 100	39	3,174	8	488	47	3,662
More than 100	9	1,584	3	412	12	1,996
Total	578	17,238	457	6,304	1,025	23,542

Sources: (1) Factory Control Division, Ministry of Industry
(2) Labor Department, Ministry of Industry
(3) Board of Investment, Office of the Prime Minister
(4) Survey Finding conducted during March–April 1974

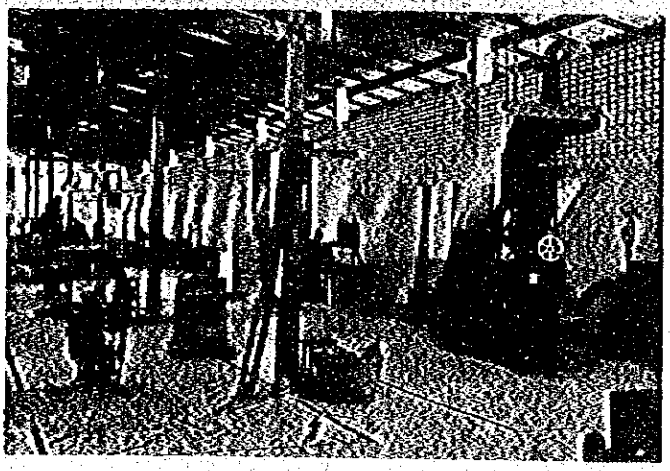
I-7 Local Characteristics and Common Trends

The survey team requested to cover as many factories as possible and left the selection of factories entirely to ISI. The team visited mainly the wood furniture factories in the middle district (Bangkok Area), the northern district (Chiangmai Area, Lanpang Area, Pnrae Area) and the southern district (Hatyai Area). The team also surveyed the related industries and the local industries (wood-working).

Lumber mills, furniture industry, wood-working industry etc. seem to coexist in every district. Local characteristics are given below.

Bangkok Area

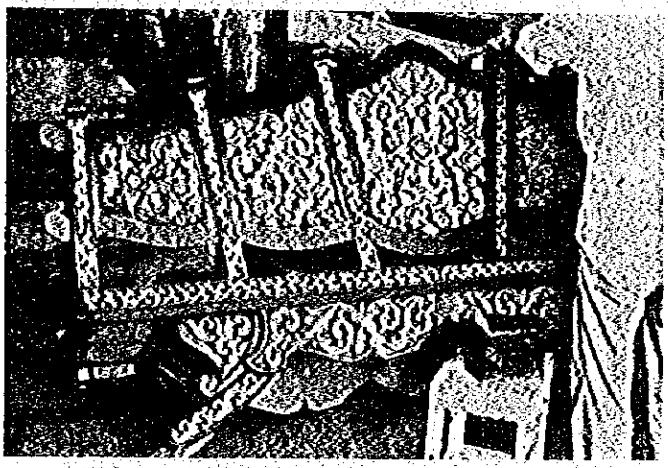
This area has those large lumber mills and furniture factories which are well-equipped. There is a large dowel turnery factory, but it was now closed.



Furniture factory (A part of wood-working machine shop)
(Deccon Co., Ltd.)

Chiangmai Area

The furniture factories in this area are small. Many factories produce carved furniture sold for souvenir. This area has one large factory of turnery, such as salad bowls and small bowls.



An example of carved furniture in Chiangmai
(Mengchen)

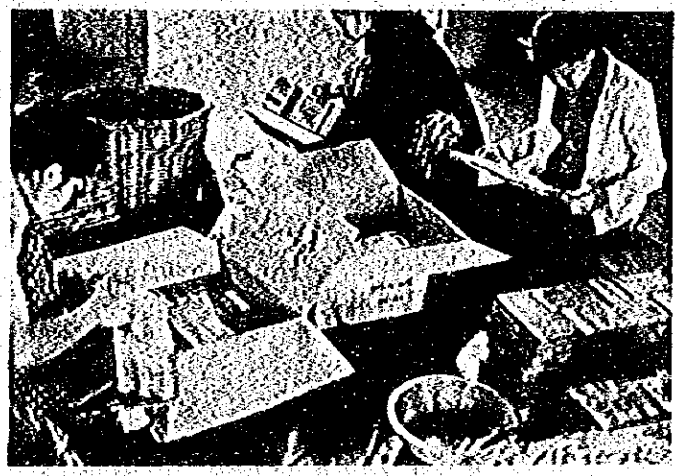
Lanpang Area

Most of the factories in this area produce flooring, mosaics and packets which was thought to develop in second products manufacture from lumber mills. Their furniture production is very small.

However, this area has a furniture factory under the direct control of the Ministry of Agriculture and Forestry.

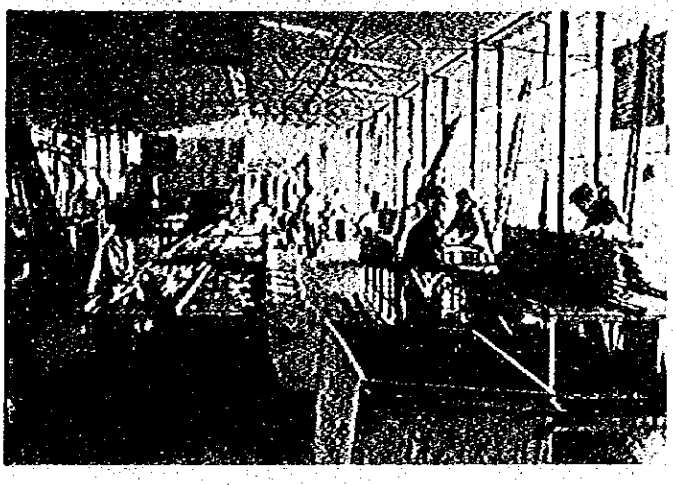
LANPANG

Lumber mill in flooring, mosaic and packet factory.
Wood edge and wood residue are used.
(Stump Parquet Limited Partnership)



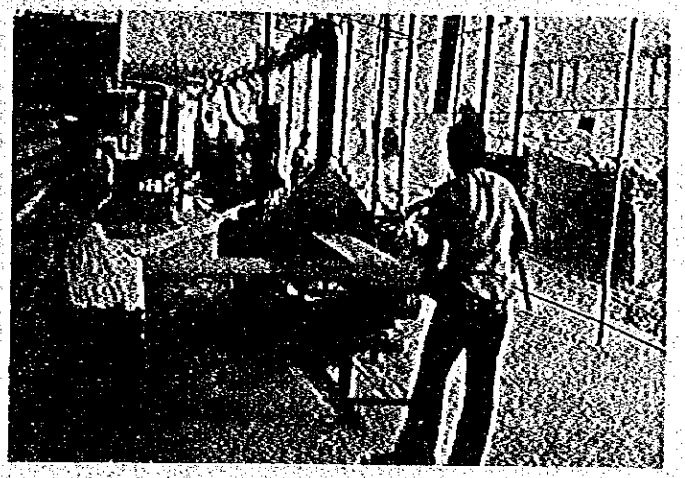
LANPANG

Inspection of mosaic packet
Unacceptable pieces are replaced
(Same as above)



LANPANG

Furniture factory
Gluing (Edge joint)
(F. I. O. Bond Wood Factory)



LANPANG

Furniture factory
Laminated wood is cut.
(Same as above)

(Note) At this plant, slender teak logs, branches or defective logs are cut into regular sized square bars. They are bonded to make boards for furniture. The problem is that logs with considerably serious defects are bonded. This decreases their commodity value. Their price is said to be the same as products of ordinary timber. It is recommended to select materials more strictly and improve designing.

Phrae Area

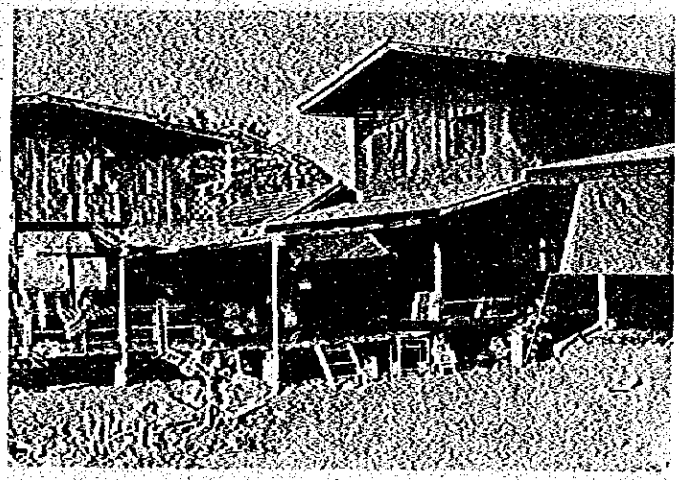
This area can be regarded as the distribution center of turnery and small woodwork, such as salad bowls and small bowls. There are about 40 - 50 furniture retailers on Hua dung district in the suberbs of Phrae.

Phrae

After sanding, small bowls are painted.
They are painted by hand.
(Nariman Teak Industry)

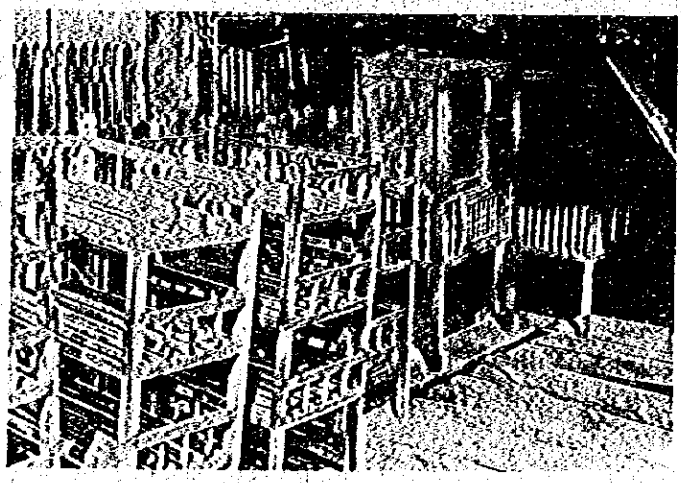
Phrae

Warehouse of small woodwork products
(North Thailand Product Factory)



HUA DUNG

Furniture shop district
About 40 - 50 furniture shops like them stand.
They paint furniture by hand here.



HUA DUNG

(Right)

Painted	150 Bahts
Ground coat alone	120 Bahts

(Left)

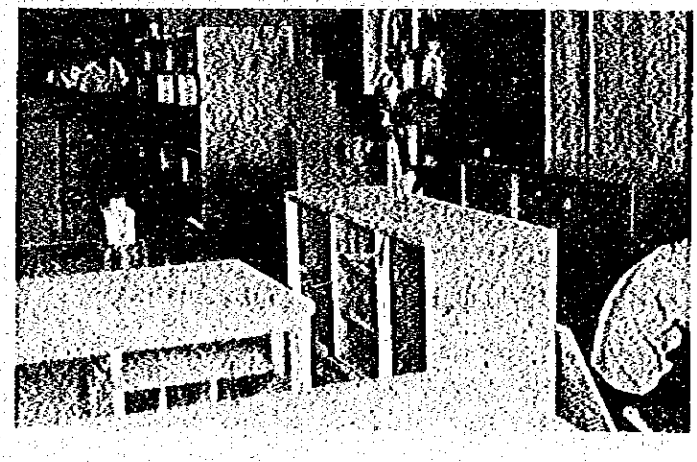
Ground coat alone	90 Bahts

Hat Yai Area

This area mainly has lumber mills for building materials. No special furniture factory was found. The existing furniture factories are small. However, there is one large factory of turning wood piece in Song Khra.

Hat Yai

Furniture assembly shop
Most of them are assembled with nails.
(Ra Cha Industry)



Hat Yai

Furniture painting shop
They are coated by hand.
(Same as above)

The survey team studied local characteristics and was able to grasp the conditions and problems that are common to all the areas. Since they seem to indicate the current state of furniture industry in Thailand in view of the coverage of the present survey.

(a) Enterprise Type

The enterprises are of typical local industry. Their management is like that of the Japanese furniture industry before the turning point.

Although they satisfy the legal requirements of a company, they have a strong tendency of one-man business, both in capital and management.

(b) Enterprise scale

The concept of minor enterprises applies to furniture factories. All of them are ranked as small enterprises in terms of capital, employees and production.

(c) Enterprise characteristics

The characteristics in various aspects are summarized below.

Capital and management:

The separation of capital and management has not been realized. In this respect, the premodern character remains firmly.

Production system:

Hand work of house-hold industry type system is used. (This tendency is found even at relatively large factories.) Mass production is unknown.

Means of production:

The land is usually privately owned by a manager, and its area is relatively large. Labor forces are secured relatively easily.

No large single-purpose machine is used. Some machines of this type were found at large enterprises. However, they were often left unused since they require high-level operating techniques.

Techniques:

The level of techniques is low in the field of practical furniture. Even high-grade furniture involves various problems. Although high-grade materials are used, the value is products tends to be lowered by unsatisfactory techniques.

Productivity:

The productivity per employee is extremely low. This may be acceptable in view of low labor wages, but this problem should also be studied.

II-8 Development Program by Thai Government

Currently, various fostering measures are used to promote the production of wood furniture for export. The statement on the industrial policy given by the Ministry of Industry is summarized below.

(a) Those industries which use domestic raw materials are to be encouraged.

(b) Those industries whose products replace imports are to be encouraged.

(c) Those industries which have high international competitive ability in cost and quality are to be encouraged.

(d) Those industries which make maximum use of Thai labor forces are to be encouraged.

In compliance with this industrial policy, the Investment Committee takes the following assisting measures for the applicable industries.

(a) Exemption of import tax on machines to be used for plant construction and operation and exemption of transaction tax on these articles.

(b) Exemption of income tax for five years

(c) Permission of entry of foreign specialists or engineers to Thailand exceeding ordinary allotment.

(d) With exports, exemption or discount of export tax provided in the Duty Law.

(e) Exemption or discount of transaction tax on exports.

(f) Special benefits for individual industries to meet their needs.

Financial assistances are also being given to the wood working industry. The Small Industry Finance Office (SIFO) gives a loan below 1 million Bahts at the annual interest rate of 6% to small wood working enterprises.

Furthermore, Industrial Finance Corporation of Thailand (IFCT) was founded to provide various assistances independently of the Investment Committee.

(a) Assistance to stabilize and modernize the management of private enterprises.

(b) Encouragement for enterprises to participate in domestic and foreign private capitals.

With these purpose, IFCT gives a loan (within the limits of 36 million Bahts) at the annual interest rate of 10.5% (in case of domestic currency) or 9.5 (in case of foreign currencies).

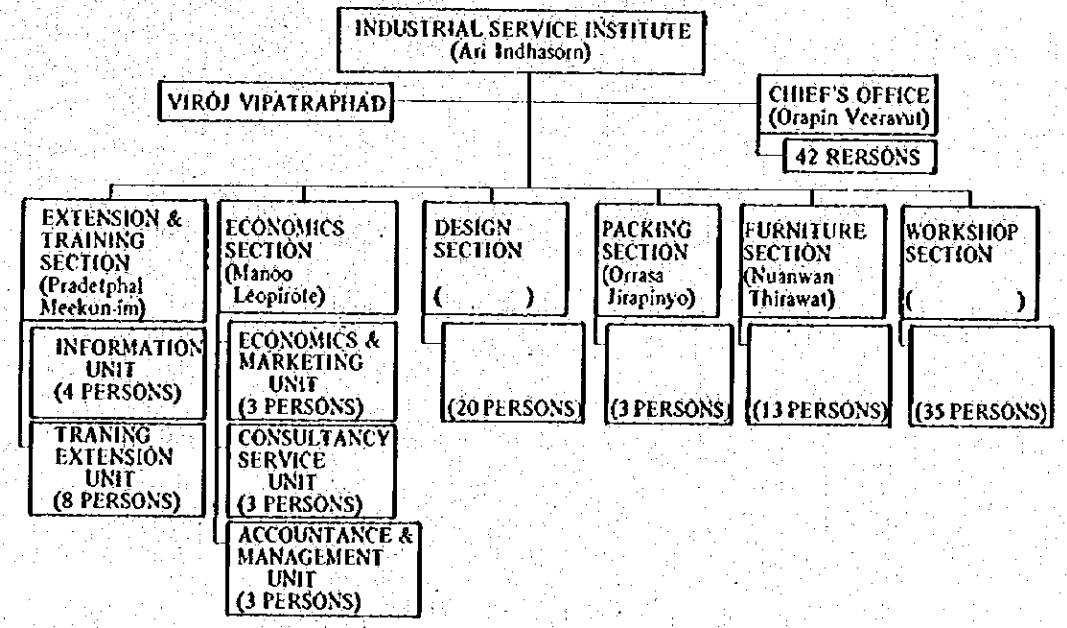
Special measures for encouraging the foundation of joint corporations are taken though with a condition that the ratio of registered capitals should be 51% (Thailand versus 49%).

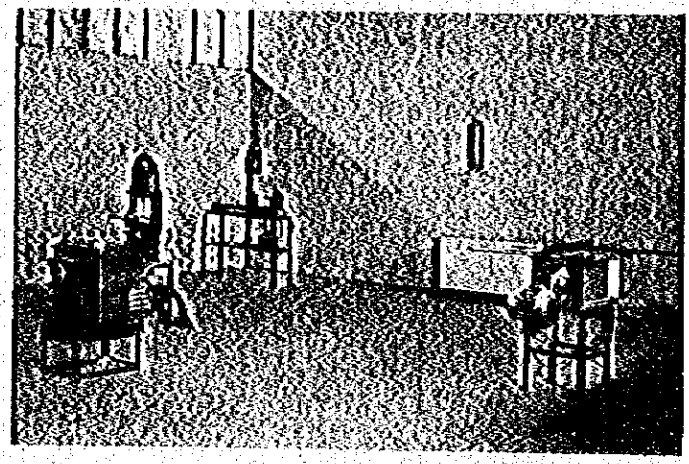
I-9 Assistances from UNIDO

Both engineers and machines are provided to Thailand by UNIDO. When one country applies for assistances with engineers or machines, its application is submitted to the headquarter through a UNIDO branch. The headquarter considers the application and either accepts or refuses it. When the application is accepted, a project is formed and the Budget Committee begins to work. After this process, engineers are dispatched and machines are provided. Actually, it seems to take 1.5 - 2 years until the actual provision of assistances.

Engineers are selected from UNIDO's list of registered engineers. Within the scope of the present survey, both ISI (Bangkok and Chiangmai) and private enterprises were under these assistances.

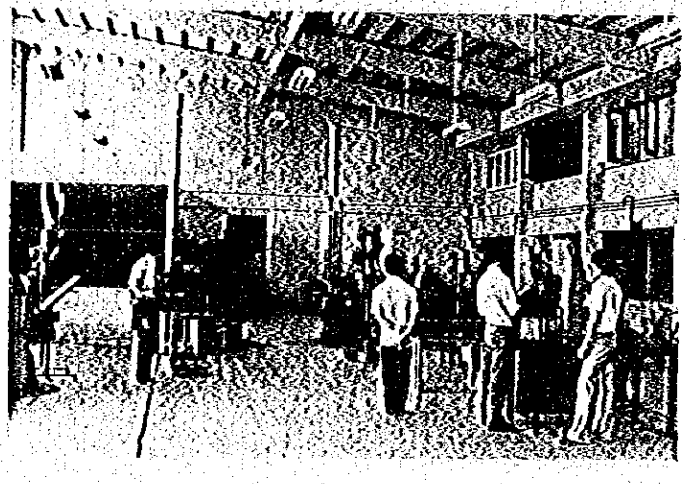
I-10 Organization of ISI (Bangkok)





Equipments at furniture section factory
Only a small number of small equipments were available.

Band saw	1
Automatic saw	1
Circular saw	1
Wood lathe	1
Dry booth	1



Equipments at metal section factory
Various equipments are available

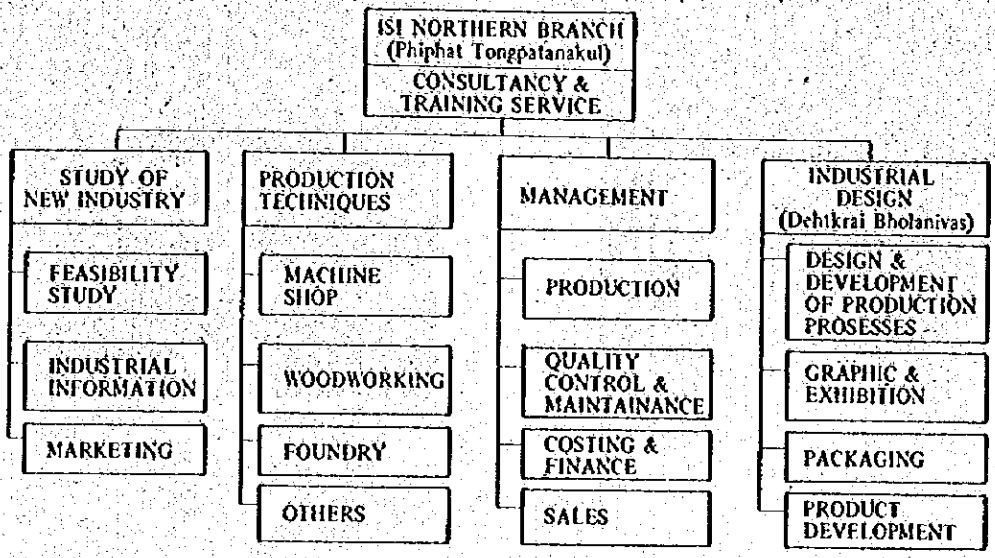
1-11 Organization of ISI-Northern Branch (Chiangmai)

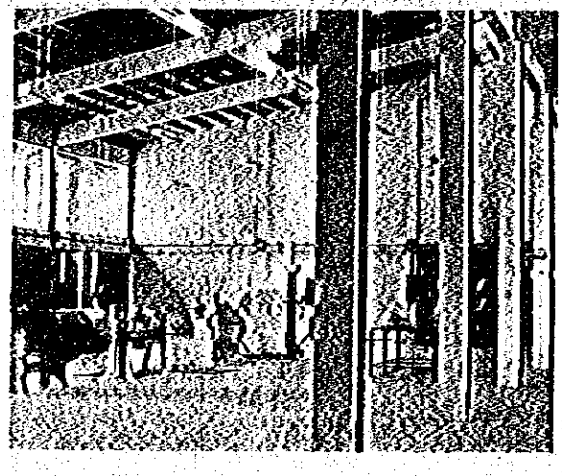
This branch was constructing factories of metal, shut metal, woodwork and pottery sections. The total budget for machines is about 100 million yen. The budge for machines in the woodwork section is estimated to be about 20 million yen, including those which have not arrived.

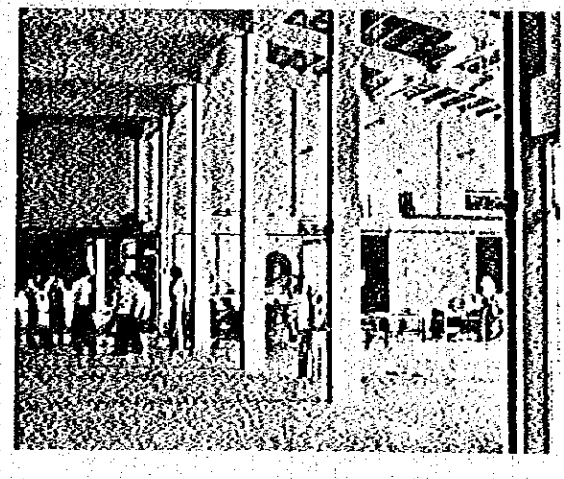
The equipments for the woodwork section are listed below.

26" Band Saw (EJCA)	1
Radial Saw (DEWALT)	1
Crosscut Saw (WADKIN)	1
Hand Planer (DOMINION)	1
Tenoner	1
Mortiser (SEDGWICK)	1
Belt Sander (DOMINION)	1

Disk Sander (WADKIN) 1
Wood Lathe (DOMINION) 1
Thickness Planer and Router ..... Not arrived
Band Saw Sharpener (VOLLMER) 1
Chipped Saw Sharpener (VOLLMER) 1
Knife Grinder (DOMINION) 1

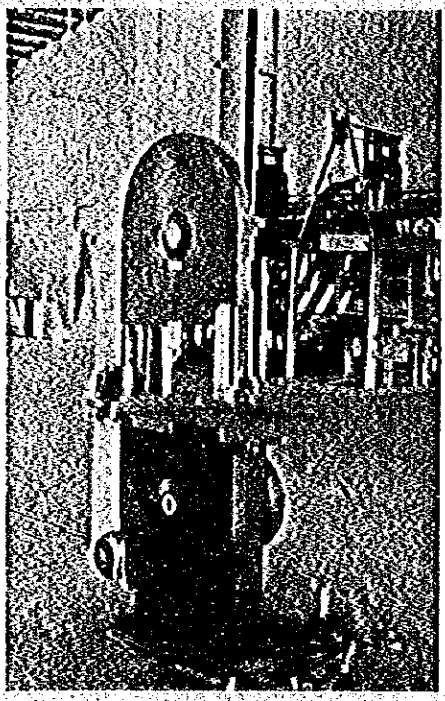




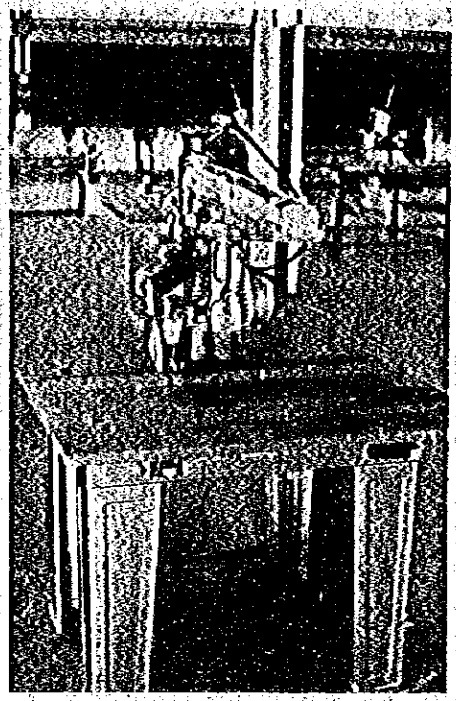


ISI NB Factory

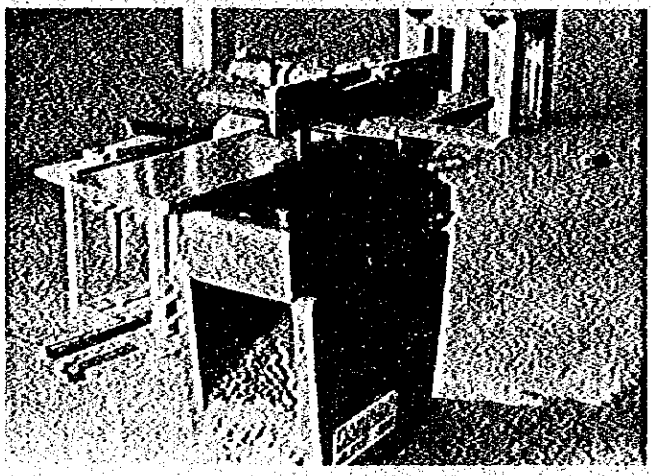
(Left) Shut Metal Section (Right) Woodwork Section



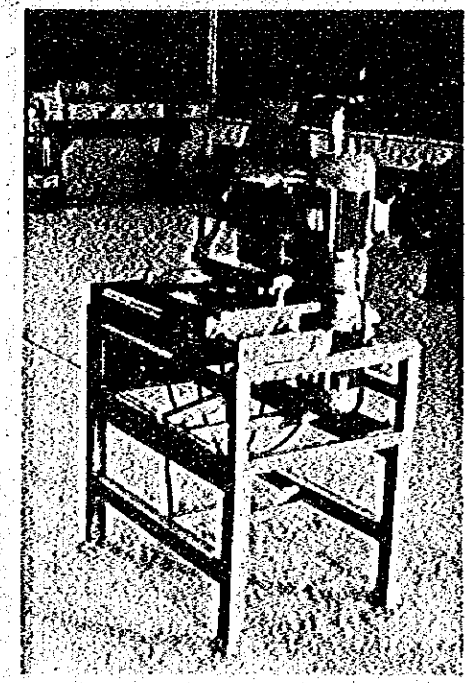
26" Band saw



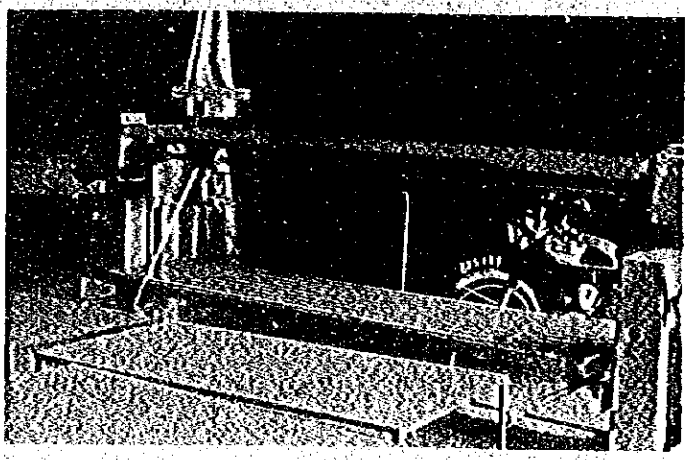
Radial saw



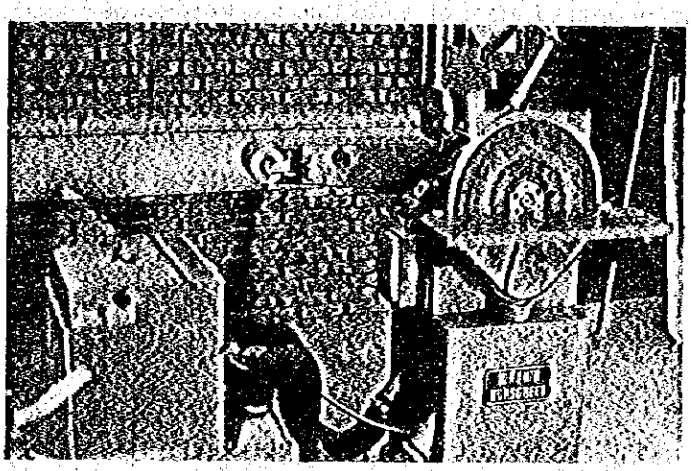
Hand planer



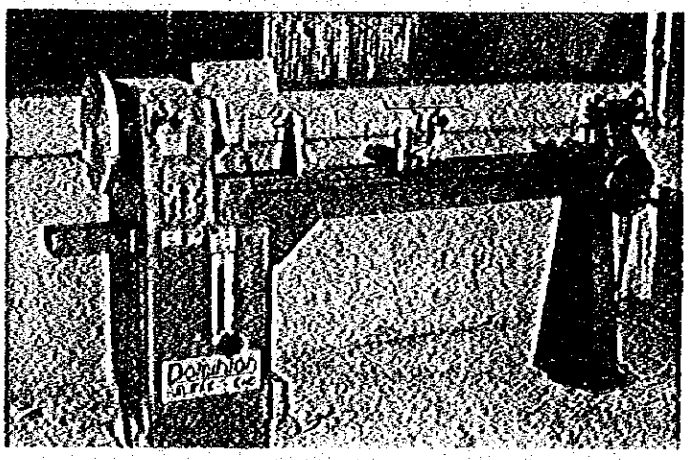
Tenoner



Belt sander



Disk sander



Wood lathe

All of these are general-purpose machines and need not be specially introduced here. They were listed here to show assistances from UNIDO. Timber and other testing equipments were found neither at ISI, nor at ISINB. Fundamental research and applied research will be necessary to take leadership in the industry.

II. PROBLEMS AND DEVELOPMENT PLAN FOR THAI FURNITURE INDUSTRY

II-1 Manufacturing Techniques and Line Control, etc.

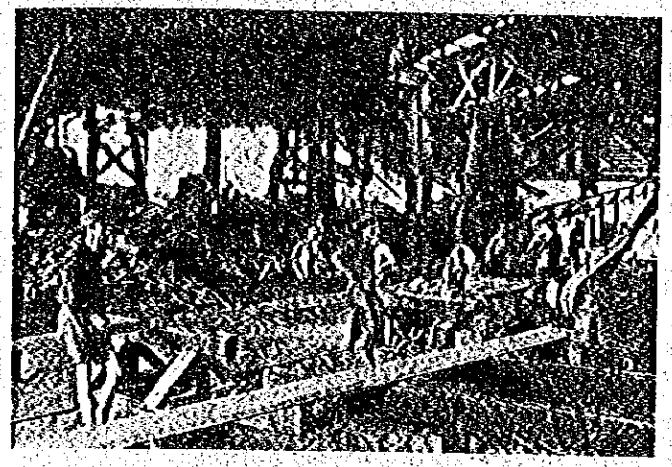
Considerably advanced techniques are used for hotel furniture or some special furniture. However, the level of manufacturing techniques is generally low. It is not sufficient to install many machines. Numerous knowhows and basic techniques are required for assembling furniture from natural materials. These problems and development measures are discussed below.

II-1-1 Sawing

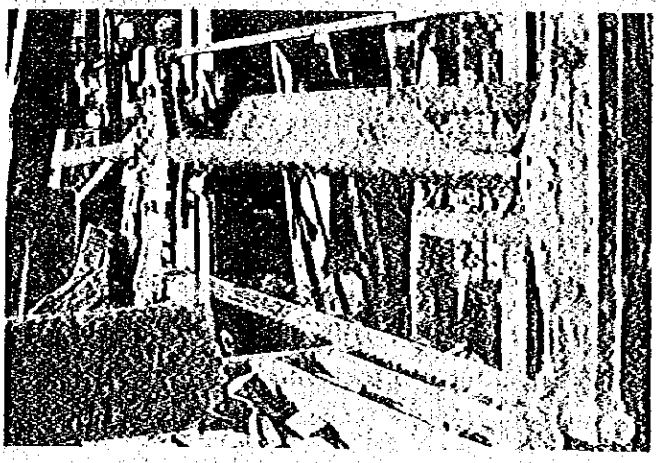
Horizontal frame saws or circular saws were used for headsawing and vertical gang saw were used for medium thickness sawing and reawing at all of the mills visited by the survey team. Since the thickness of a saw blade is about BWG 13, the saw blade is about 2.5 mm thickness and the tooth width is about 4.5 mm. Let's assume the use of band saws instead. Since the thickness of on ordinary band saw blade is BWG 19, the thickness of the saw blade and the tooth width will be about 1.05 mm and 2.3 mm, respectively. A difference of about 10% will be made between the two in case of 30 mm thick boards. Therefore, the adoption of band saws should be encouraged in the future.

The use of circular saws also accounts for extremely poor dimensional accuracy. Band saws are superior in view of loss and additional work due to thickness irregularity. Attention should also be directed to poor surface accounted by low mechanical precision and lack of skills.

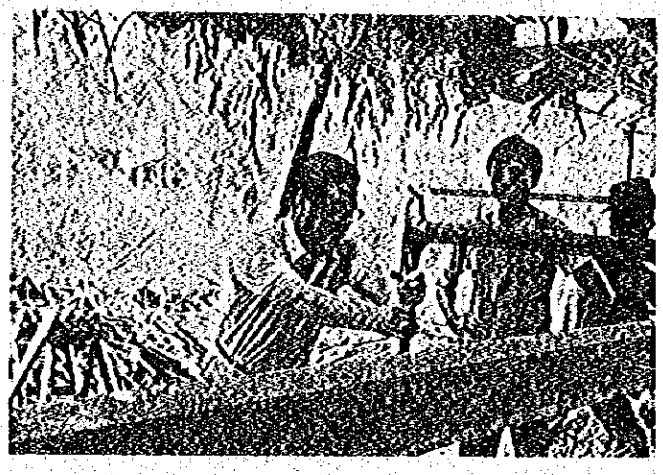
Efficiency should also be considered. For example, the feeding speed of a horizontal frame saw was only 25 cm/min. for headsawing of a log of 90 cm in the diameter. With a band saw, it would be 20 m/min. minimum. Furhter study and vesolution of these problems in lumbering are the first step for improvement of the export in the future.



Lumbering mill
Circular saw at the center



Horizontal frame saw



Teak timber is cut into small strips at a local furniture factory. Since no machine is available, it is cut by two workers facing each other. The yield rate is good because the saw blade is thin.

Equipments chiefly using a circular saw lower yield rate and efficiency because of their thick blade thickness. The excessive lack in thickness uniformity seems to be accounted also by problems related to feeding method. The basic purpose of lumbering techniques is to obtain the thickness that is required. A band saw with carriage should be used to meet this requirement. Naturally, the introduction of new machines requires large equipment cost.

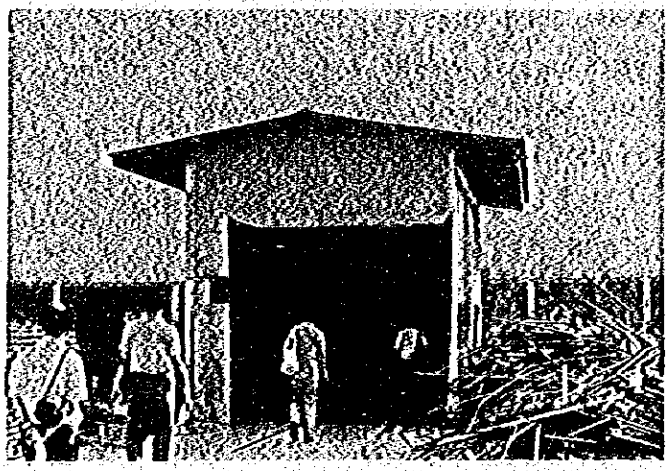
However, they will prove to be sufficiently worth their cost in view of the saving of timber resources, the realization of internationally acceptable quality and labor-saving effect by improved efficiency. However, operating techniques and blade maintenance and control techniques (repairing etc.) must be learned for the adoption of band saws.

Lumbered materials are usually laid directly on the earth. Sleepers should be used since earth and sand stick to timber surface or enter trachea and damage blades during machine working. Sawing of blocks into board of straight grain is recommended for furniture material rather than square sawing because of high yield rate.

Sticker piling system is recommended for the storage of lumber products since good ventilation helps natural drying and prevents discoloring by inhibiting the growth of blue-staining fungus.

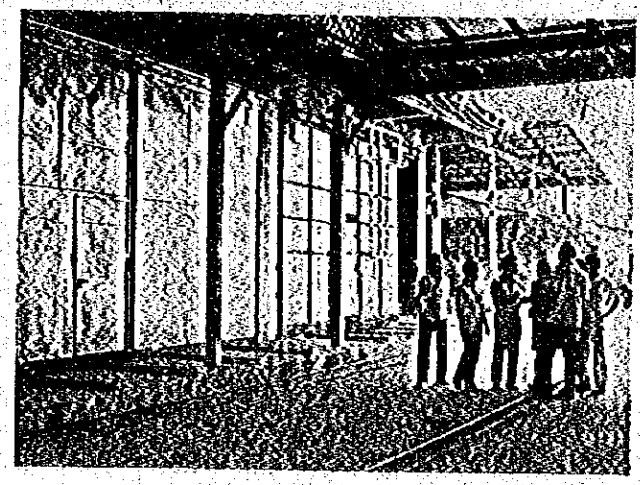
II-1-2 Drying

The use of a drying room was found at various places. However, the degree of difficulties related to drying depends on tree species. With teak, for example, water influence does not give large effect on its elongation and shrinkage. With new materials, an adequate drying schedule must be made for each tree species. Deformations and cracks due to inaccurate species identification are found. Various problems must be studied to make improvements. For example, the performance of a drying room itself must be checked, an optimum drying schedule must be established and the water content at finish must be checked.



Bangkok

This large furniture factory has only one drying room. There is only one drymatic high capacity timber seasoner in it.



Lanpang

Flooring factory
Timber drying room
Internal fan type
2,000 ft^3 x 2 rooms
1,000 ft^3 x 1 room

Strangely, the large furniture factories in Bangkok have only a small timber drying equipment. They should recognize that water control for wood furniture has larger importance than flooring.

Timber has large water content. If timber is used without drying, the water in it will evaporate gradually. Timber will become dry and shrink, resulting in so-called distortion. For this reason, timber must be dried at the beginning. The water contained in timber can be divided into free water and bound water. Timber does not shrink while free water evaporates. However, timber begins to shrink when free water evaporates completely and bound water begins to evaporate. In other words, shrinking begins when water content drops below fiber saturation point, namely 25～30% (28% on the average.) Timber expands or shrinks as it absorbs or discharge water around its fiber saturation point. The final water content of timber must be determined on the basis of equilibrium water content at a place where furniture is to be used.

Timber is usually dried either air or kiln. Timber drying has been done from ancient times. The old natural drying method was to leave timber in atmosphere for a long period. However, natural drying requires a long period, fixes large capital, often causes damages, such as surface cracking, discoloring, corrosion and does not give an optimum water content. Natural drying has been replaced by kiln drying because of these disadvantages. Currently, natural drying process is used as a preparatory step for kiln drying. Kiln drying not only saves drying time and allows quick capital turnover, but also allows to regulate temperature and relative humidity in a drying room for preventing cracking and other damages. It also allows to obtain an optimum water content.

In this sense, drying rooms were used more widely in other woodwork industries (flooring, turnery parts) than in the furniture industry. However, efforts should be made to study good kiln drying schedules and correct method for checking water content. Inadequate drying must be avoided since it will bring about undesirable effects.

The importance of adequate kiln drying must be taught to the furniture industry in the future. Widely used teak undergoes little deformation due to water absorption and evaporation. Some new tree species are not expected to have such convenient properties. Therefore, it will be extremely important to obtain basic knowledge on drying and to establish drying techniques.

II-1-3 Machining (including saw-procedure)

Dimensional accuracy of machining must be improved to obtain products of uniformly high quality. Accurate saw-procedure and accurate machining are very important. The need for subsequent correction (for example, correction by plain after machining) must be eliminated.

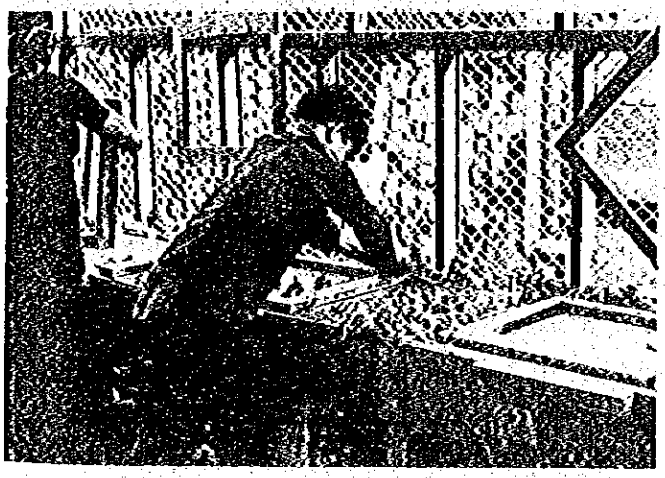
This requires not only machines of high precision, but also correct operation and maintenance of machines and tools and adoption of adequate techniques. There seems to be general lack in the recognition of these factors. The survey team frequently noticed rough or chipped timber surface etc. attributable to poor machine and blade maintenance.

The quality of machining determines the value of products or joint accuracy. The degree of fitting between a tenon and a mortise is important for assembling and gluing. No study has been made on these factors. At certain factory, most boards could not be glued because of difference in the thickness finish of flush core member.

Instruction on suitable wood-working machines at furniture factory.
(Mr. Shiraishi)
(The catalogues were brought from Japan.)

Instruction on dowel handle joint, structure and strength at a furniture factory. (Mr. Aoki)

Instruction on structural improvement of knockdown furniture at ISI. (Mr. Takenaka)



Defect caused by low machining accuracy is being corrected with plane.

Machining should not be a preparation for manual working. Advancement to mass production will be difficult if machining always requires subsequent correction by hand.

It is wrong to assume that precision can be improved and that mass production can be realized by purchasing many good single-purpose machines. Machines are maintained and adjusted not automatically, but

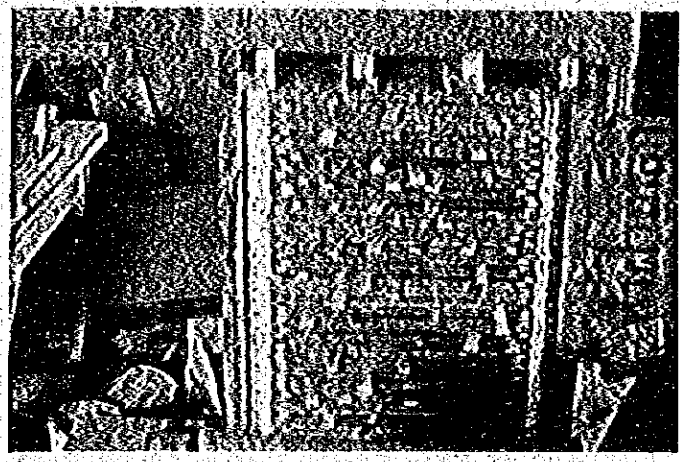
by men. The acquisition of this technique is a prerequisite for the improvement of precision and the advancement to mass production. The first step to these goals will be to maintain and manage machines, to watch for the wear or damages of parts and to maintain high performances.

It is also important to learn how to use machines correctly, to maintain and use jigs and tools rationally and to learn the best techniques for works. It is also important to learn correct blade grinding technique. Surface irregularity, interlocked grain etc. of products are caused by insufficient sharpness of blades.

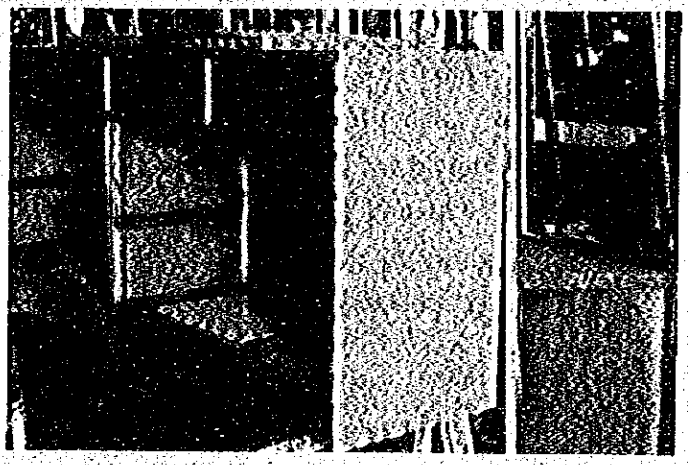
The system of the furniture industry in Thailand differs from that of Japan. Individual factories are not oriented to special products. Therefore, the system of using single-purpose machines should not be adopted. This is partly because furniture factories in Thailand are engaged in the fabrication of various products, including case and chair and table furniture. Therefore, it is recommended to introduce general-purpose machines and to improve working precision and save labor by acquiring basic techniques. Then, efforts should be made to increase production. It is highly important to eliminate the need for manual correction after machining. The value of products has been lowered by poor surface finish due to the dullness of blades. Since the degree of fitting has large effects, on strength, various techniques, especially in this field, should be mastered.

II-1-4 Gluing

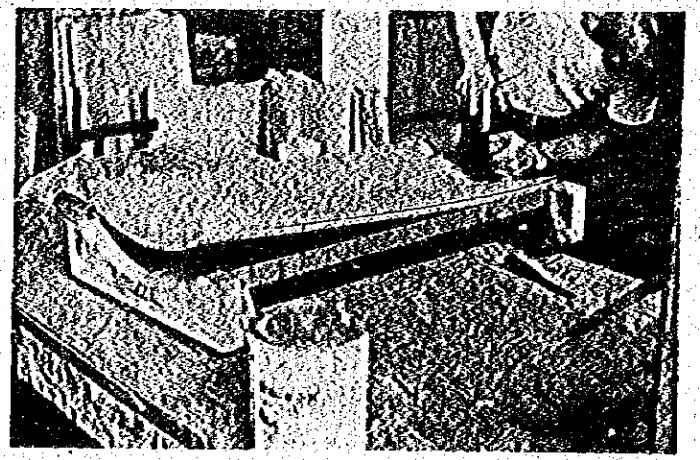
Various gluing methods are used for boards. Generally speaking, gluing is poor because of the lack of thickness uniformity of core material and the inadequacy of equipments. A press with large table area is suitable for gluing boards, while a press with large strokes is suitable for formed plywood. In other words, equipments must be chosen according to the types of gluing operations. Since most of these equipments are unavailable, no national gluing method is used. The general use of nails and putty has lowered the value of products. It is also a problem that the same gluing method is used for high-grade materials and low-grade materials.



Fancy melamine plywood is being glued to solid core material (lumber core).
A wooden press of wedge clamping type is used. Additional wedges are used where clamping is insufficient.



Fancy melamine plywood is glued after assembly. They are simply held with adhesive tape.



Gluing formed plywood
A simple gluing jig is used. It does not give uniform clamping.

Imported adhesives are mostly used in Thailand. They are either urea type, or vinyl acetate type or synthetic rubber type. The former two are used for gluing timber, while the latter is used for gluing fancy melamine plywood or home rubber. Urea type adhesives have thermosetting property, while vinyl acetate adhesives have thermoplastic property. Since the both types have unique advantages and disadvantages, selections should be based on purposes. In other words, correct use of adhesives and correct gluing methods must be studied to take advantage of the characteristics of individual adhesives and to cover their faults. Since adequate timber drying and surface smoothness are important for obtaining large gluing force and strength. In other words, the effects of drying and machining processes on subsequent processes should be fully understood.

Gluing always requires a press. In other words, certain pressing force must be applied to obtain higher gluing force. This is not given much importance in Thailand either due to the unavailability of equipments or to the lack of knowledge. Nails are used from outside even on fancy plywood and on assembled furniture. Since currently available adhesives are highly effective, they should be relied on more. Added value of furniture should be increased by stopping the use of nails. This will require the introduction of good gluing equipments.

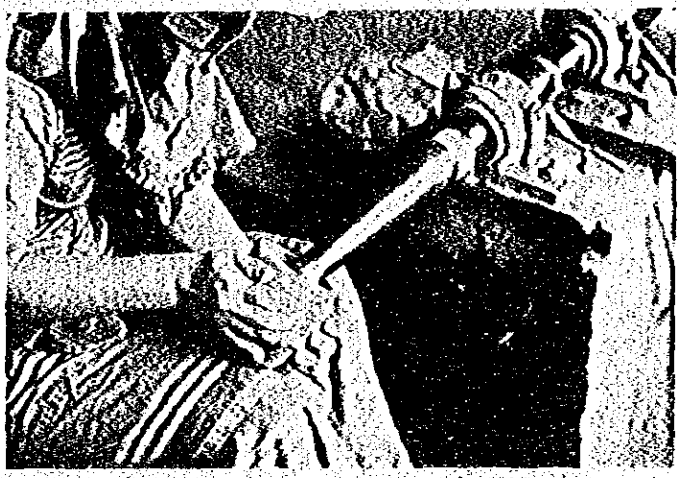
Additionally, techniques of gluing formed plywood should also be acquired. In principle, plane gluing and gluing formed plywood are identical. However, gluing jigs are used for the latter. Satisfactory gluing formed plywood requires such gluing jigs that can apply uniform clamping pressure.

Gluing methods (crossband, laminated wood or combination) must be selected according to purposes and shape of formed plywood.

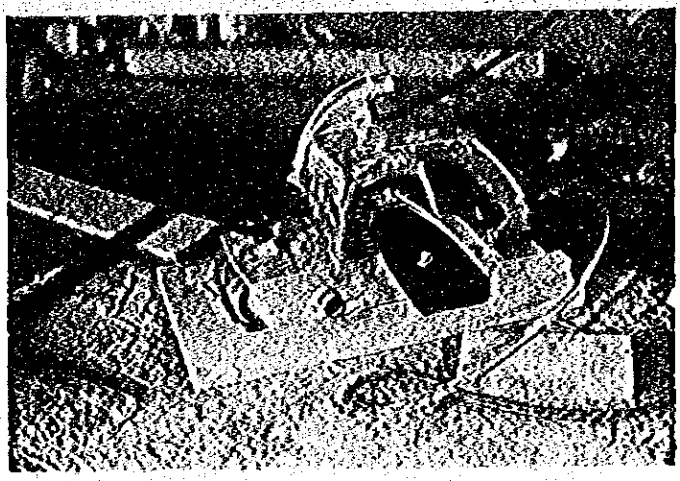
II-1-5 Sanding

Thailand imports most of auxiliary materials. Since abrasive papers are expensive and difficult to obtain and involve a difficult storage problem, machines should be used for sanding. Although furniture sanding has been unsatisfactory, salad bowls and small pots etc. have been sanded well.

Sanding of parts
Flat finish is not obtained since the beginning and the end are sanded more heavily.



Sanding of small pots
The environment is polluted heavily by wood dust.



Portable sander
An auxiliary plate is used for regulating sanding.

In case of making many furniture, assembling is begun after complete sanding of parts. It is inefficient to sand assembled products.

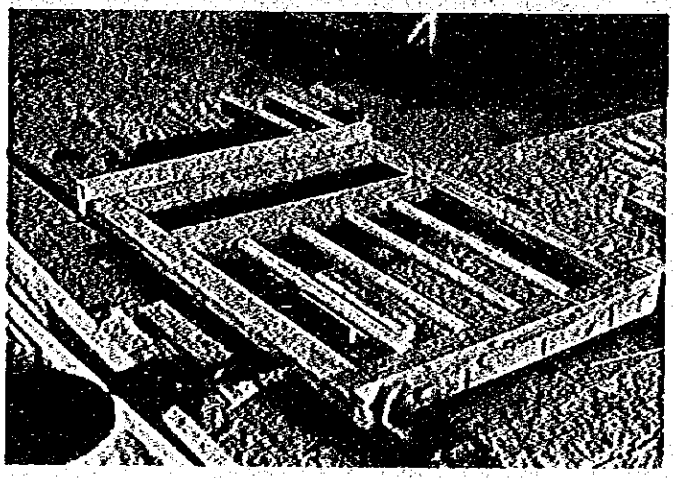
Machines should be used for sanding. It should be fully recognized that the efficiency of this process is very important for the efficiency of the whole process. Rather rough abrasive paper or cloth has been used probably because of the poor machining finish. Rough abrasives do not bring about good finish and lower the effect of painting. Efforts should be made to improve efficiency, to study the purposes of sanding and to learn correct finishing.

Sanding involves problems of dust public nuisance. Many sanding shops are heavily polluted with dust. It is urgent to install a dust collector or make improvements.

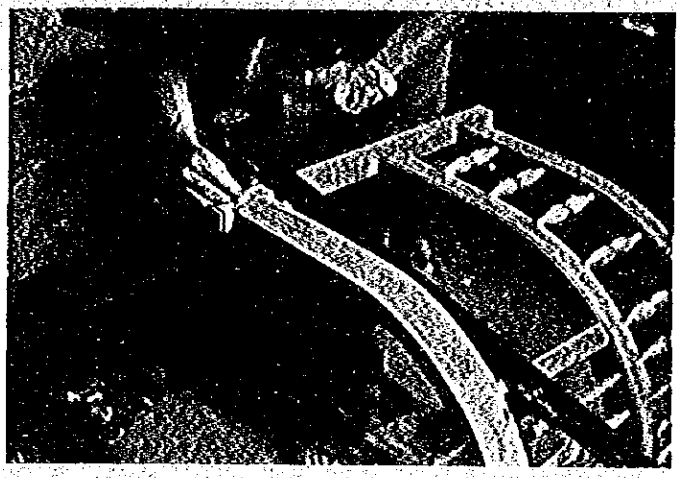
II-1-6 Assembling

Hardy any machinery is used for assembling. Since parts are assembled by hand, scratches, hit marks and other damages lower the value of products.

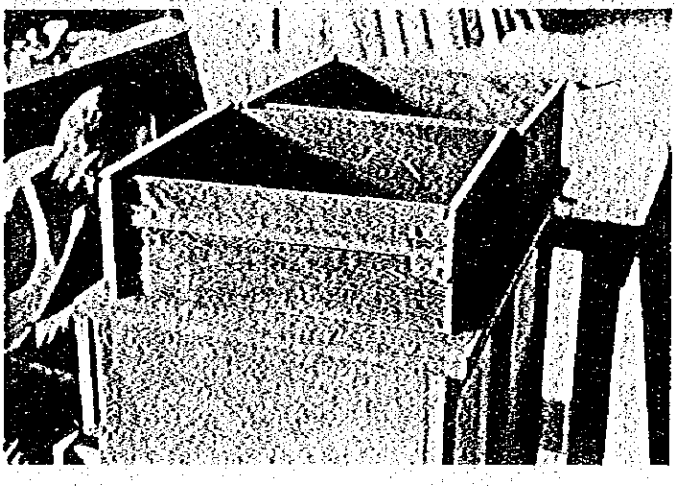
It is important to consider that the final value as commodity is determined also by various factors connected with parts assembly, including well-matched color tone and grain.



Sash clamp is used for assembling and gluing.
No nail is used.



Assembling of arm chair
Both parts are locked with a sash clamp and nailed.
The nail is driven from the top (outside) of the front leg.



Assembling of desk
Many nail holes are seen.

In case of plane gluing, larger bonding force can be obtained by giving clamping pressure to gluing surfaces. In case of assembly gluing, adhesive itself must be able to fill gap since parts are assembled by insertion. In other words, adhesive must be able to fill a gap between a tenon and mortise and have sufficient bonding strength at the same time. Gluing of inserted parts occasionally presents a problem of producing defects due to abrasion. This lowers bonding force. This is also related to machining accuracy, degree of engagement and condition of adhesive application. To obtain better results from gluing of assembled parts, these related factors and techniques must be learned further. It will be possible to do away with conventional nailing by sufficient training in this field.

Parts are usually assembled manually in Thailand. Assembly machines and, occasionally, assembling jigs and tools should also be used.

The efficiency of assembling work can be increased by learning techniques for correct and accurate assembling. Gluing of assembled parts is the most important process since it influences final strength. It is highly important to learn more knowledge and techniques.

II-1-7 Painting

Painting is done simply in a room within a factory or at a corner of a factory. Therefore, sanding and painting are often performed at the same place. Dust from machining machines flies to a painting shop. Neither a water-washing booth, nor a drying booth is found. Although an inefficient ventilating fan is installed at some factories, it is almost useless. Sprayers (used with a compressor) are not widely used. Painting work is done mostly by hand. Harms from organic solvents are naturally expected.

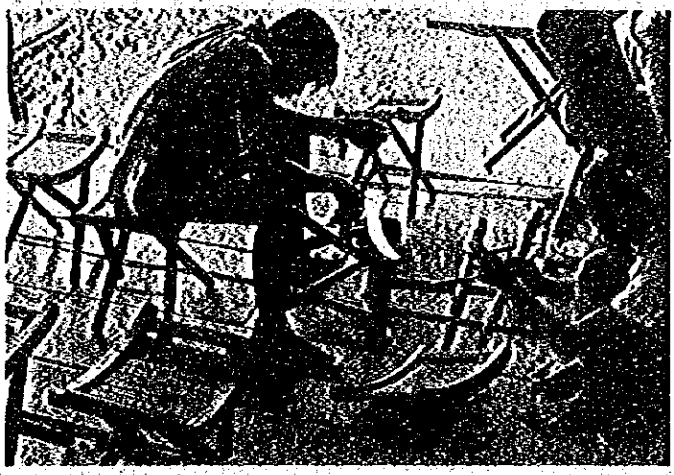
At certain factory, two colors were used on one product. However, one of the colors was painted by hand. Manual painting can be avoided even in this case by changing the sequence of processes or by using some other methods.

The major problems alone were summarized. The survey team felt that the situation should be improved urgently.

Painting can be considered as the final make-up for furniture. Painting is done to add beauty to materials and to protect materials. In this sence, current painting does not meet these purposes. It seems that neither painting techniques, not effects have been learned. They should be learned urgently to increase the value of products.

Painting shop
Furniture is painted mostly by hand.

Painting shop
Black paint is applied by hand.
He is working with a cigarette in one hand.



Common painting method
Painting with brush

Brushes are commonly used for painting. They should be replaced by sprayers. Although hand tools are used for polishing paint coat, especially of flat boards (such as table top), they should be replaced by machines.

Apart from the restricted availability of paint varieties, paints should be handled with more care. In other words, no fire should be used at a paint shop since solvents in paints are easily inflammable. No care is taken for the ventilation of a paint shop. Since the heavy inhalation of organic solvents is harmful, allowable limits should be set. This requires to improve painting equipments. It will be harmfly for workers to work in a solvent-filled room. In view of these problems, it is recommended to install a water booth and a drying booth and to construct a paint storage as soon as possible. At the same time, teaching and training on these matters must be given.

II-1-8 Line Control

The flow of parts and inspections etc. are left completely uncontrolled probably because field workers are in charge of field works. Nobody seems to care how parts are flowing, whether they have satisfactory precision, where any parts are in short, whether any parts are defective and when parts are to be assembled. No slip (such as operation slip and parts slip) was found. It seems that no final inspection is given. Everything seems to be left to workers.

The purpose of line control is to facilitate communication among various processes and to ensure smooth flow of the entire production line, beginning with the arrival of materials at a factory, and ending with the shipment as products. In other words, a thoroughly planned line control must be followed correctly for smoothly managing various operations.

A plan must be made for the production of commodities. It is important to decide the materials to be used, the quantity of products, time restrictions, the number of workers, and the machines and equipments to be used. To set these conditions, the systems of production must be considered at first.

System of production can be roughly classified into job-order production and stock production. Under the former system, materials, workers, machines and equipments must be planned according to given specifications and time restrictions. Therefore, job-order production tends to become production of larger varieties of products in small quantities. Under the latter system, a production plan can be made according to the availability of workers, machines and equipments. Therefore, stock production tends to become production of small varieties in large quantities.

Both under the job-order production system and the stock production system, the quantity for one lot must be determined on the basis of technical and economic consideration. The quantity per lot should be large from the view point of prime cost since the number of man hours will be increased by repeating setup and cleaning. On the other hand, work in process and stock will be increased by increasing the quantity per lot. This will be undesirable from the view point of capital turnover. Since conflicting factors always exist in production, unavoidable conditions must be given priority. When materials are ready and a schedule is made, an order for operation is given. At the field, detailed schedules are made, workers

are assigned to various duties, machines are arranged for, drawings are prepared and various slips are issued.

Additionally, education and training must be given in the field of standard working methods and operation analyses.

II-1-9 Quality Control

Manufacturers must understand the qualities requested by customers and make efforts to produce desired products at the lowest possible price in consideration of the level of skills and characteristics of their factories. For this purpose, quality standards should be set at first. In case of job-order production, qualities standards should be set in consideration of orderers and manufacturers. In case of stock production, the factors related to quality, price, market demand and technological standards should be considered.

The purpose of quality control is to enforce and observe the quality standards that have been set. Parts and products should be inspected periodically to check their conformity to pre-set quality standards. Efforts should be made to find mistakes as early as possible. When it is found that parts or products fail to meet the standards, its cause must be found and removed to prevent repeated mistakes. Quick and adequate measures should be taken to remove such causes.

Troubles are usually attributable to some defects in manufacturing techniques or to inadequate inspecting methods (sampling inspection etc.) or to inadequately high standards. Systematic quality control for all the sections of a company is essential for preventing repeated occurrence of defects and for improving technology. Fundamentally, results must be reflected on and studied. A new plan must be made immediately, whenever necessary. Manufacturers must be given education and training for such a system.

II-1-10 Material Control

Raw materials, parts, fixtures, consummable items and products are moving in various forms at factories. Most of materials are purchased from external sources. Purchased goods are inspected according to accompany's purchase regulations and stored in a warehouse or at other places. They are taking out at requests from the field. In other words,

adequate materials must be supplied to the field in an adequate quantity at an adequate time. It is also important to purchase materials complying with company standards at the lowest possible price. These operations are called as material control.

Material control staff must make sure to avoid the discontinuation of production due to the lack of materials and to avoid excessive funds and storage cost as well as quality deterioration during storage due to excessive purchase of materials. They should check the consumption of materials, the delivery date of materials suppliers and watch for changes in demand and supply relation. They should periodically check the conformity between stock on records and actual stock.

Education and training in this field are also important.

II-1-11 Conveyance Control

The survey team noticed that the manual method was used instead of machines at all the factories probably because of sufficient availability of labor forces. Passages should be kept safe by keeping shops orderly. Push carts should be used at least for sending parts to machining and for subsequent conveyance.

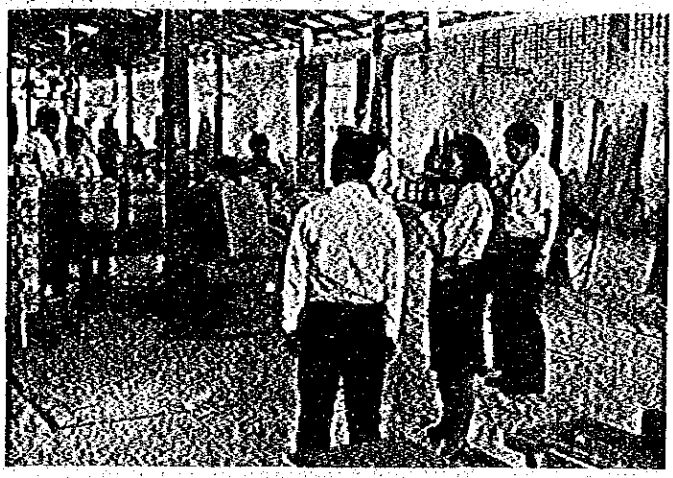
The time that is used for actually working is extremely short. Most of the remaining time is used for waiting and conveyance. Efficient conveyance will make a large contribution to production. Although conveyance within a factory is unavoidable for linking various processes, it is not directly related to working. Therefore, the time spent for conveyance should be shortened as far as possible.

Correct conveyance control can prevent waiting and accidents due to conveyance and facilitate smooth line control. It can prevent the discontinuation of production or waiting due to conveyance troubles. As a result, a production plan can be followed. Good conveyance control realizes the rationalization of labors and time and increase efficiency. It should be noted however that overall efficiency cannot be necessarily improved by increasing conveyance speed.

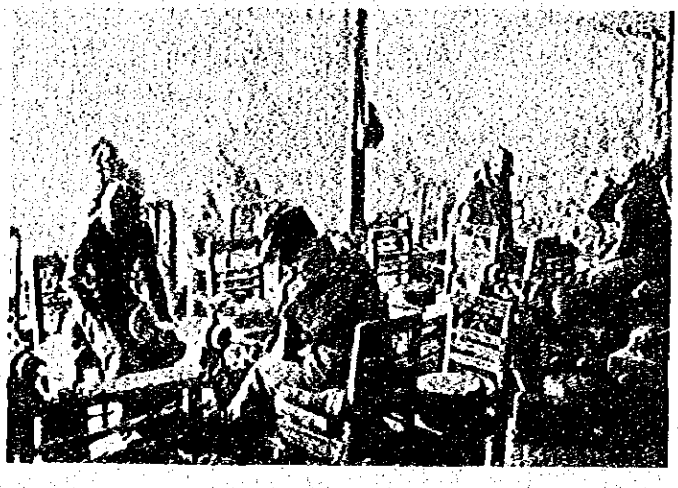
Conveyance cost can naturally be cut down by rationalizing conveyance, by adopting or improving machines or by changing routes. Conveyance control can be facilitated by securing safe passages. Education and training in this field will be important.

II-1-12 Safety and Hygiene Control

Most of the factories are without a dust collecting system. Employees are working in dusty environment. A dust collecting system should be installed as quickly as possible. Exposed movable parts are hardly covered. Belt parts in lumber mills are highly dangerous. Wood-working machines required a safety cover or a safety device at some parts. More consideration should be given to painting shops and sanding shops for small woodwork products.



Even this large factory has no dust collecting system. Passages are not safe since they are filled with sawdust. At this factory, a dust collector was attached to one molder alone.



Sanding of salad bowls and small bowls. Wood dust in air even decreases visibility.

Disasters are unfortunate for the injured and are not permissible from a humanitarian point of view. It is natural that all the efforts should be made to prevent disasters. Disasters also bring about economic losses.

Operations must be continued smoothly to maintain high productivity under good production control. However, disasters stop operations against the will of workers. Therefore, causes of disasters must be removed as far as possible. This can be done only by the cooperation of the management and workers. A system must be organized to ensure the prevension of disasters in each of the sections. The following efforts must be made.

(1) Machines, equipments and tools etc. to be used for production must be safe. (Use of a safety device etc.)

(2) Workers must learn and be trained to use machines, equipments and tools correctly and safely.

(3) Education on labor safety must be given. Shops must be kept neat and tidy.

Work environment has large effects on efficiency and often involves hygienic problems. In other words, workers are greatly influenced by room temperature, humidity, brightness, noise, vibrations, poisonous gas, dust etc. Poor environment will tire workers quickly and lower efficiency. Since poisonous gas and dust can cause occupational diseases, sufficient measures must be taken.

Therefore, safety and hygiene control must be learned well. The team is opinion on fundamental issues has been summarized. Guidance from an advanced country will be effection for these issues.

The basic spirit is to learn to make not product, but goods, to learn to distinguish between high-grade and low-grade materials, to remove shortcomings and to increase added value.

II-1-13 Circulation System

In Thailand, furniture is sold directly by makers in most cases. For this reason, it seems difficult for them to understand the system of export. The same applies to the export of parts. Factory shipment prices should not be determined on the basis of the market prices of a purchasing country. Prices of other competitive countries should also be considered. Joint enterprises with foreign capital occasionally seem to have troubles because of these problems. The management should study the circulation system in the world.

II-2 Design

II-2-1 General Condition

The current trends in the designs of wood furniture in Thailand can be classified into the following five types. Each of them discussed below.

(1) Traditional Thai furniture and traditional Chinese furniture

The traditional wood working technique of Thai furniture is based on the Chinese working technique for rare wood and use Thai decorations seen at palaces and temples. Furniture of this type is used mainly by high society people (including Chinese citizens). It has the following design characteristics.

(a) Thai style furniture

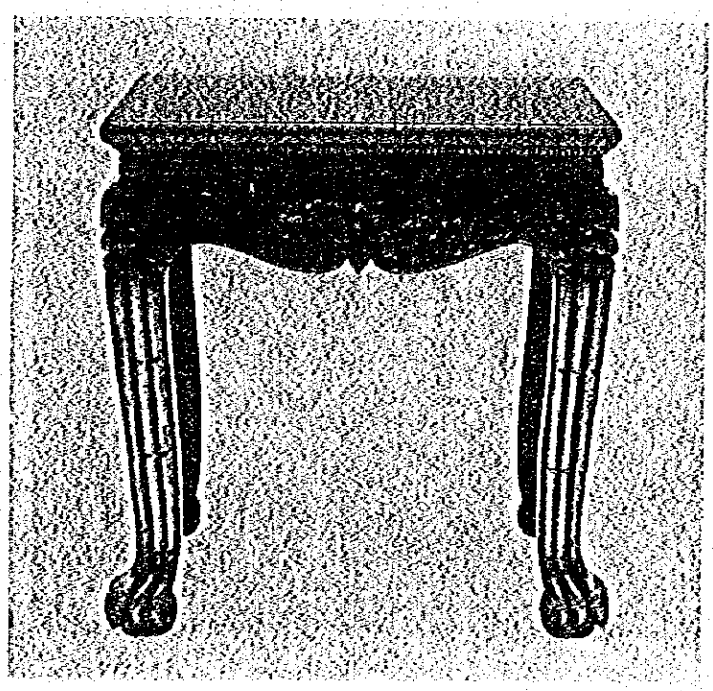
(Main material ... Teak)

Trapezoid doors, elephant chairs, Thai arabesque, lion head and other decorative carving.

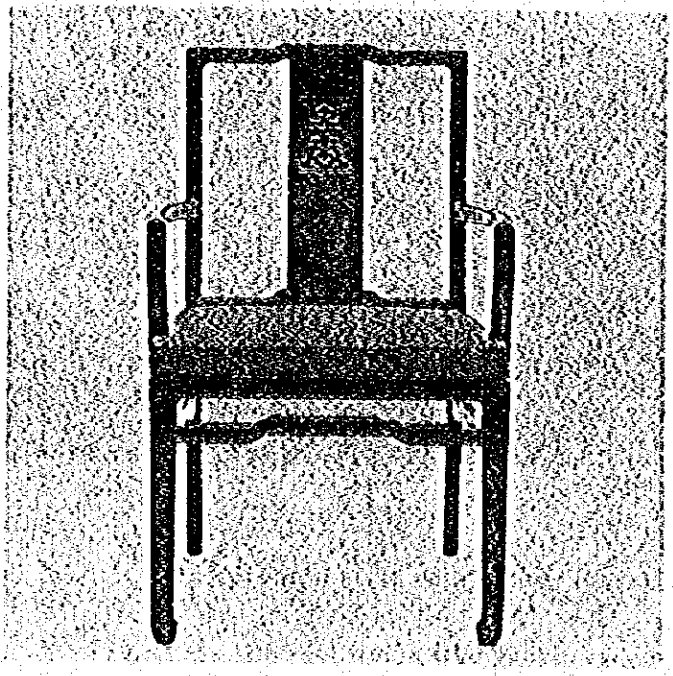
(b) Chinese style furniture

(Main material ... Chinese quince)

Open carving of thunder, 卍 pattern, arabesque, peach



Traditional Thai style furniture (Sweet Home)

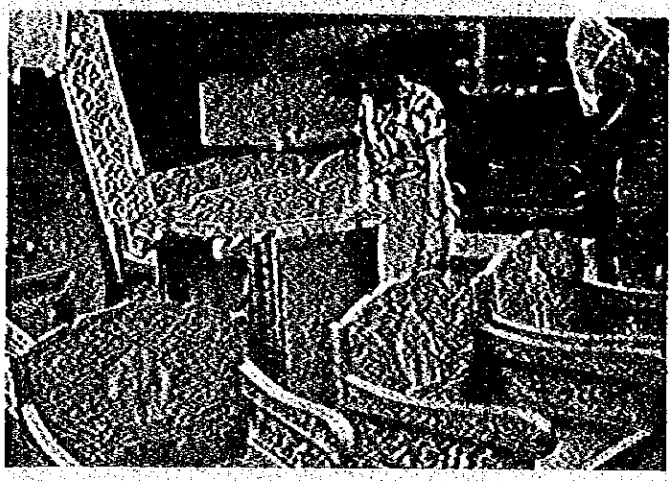


Traditional Chinese style furniture
(Sweet Home)

Typical manufactures of furniture of these types are Sweet Home (Bangkok), Vichit Silp Furniture (Chiangmai), Silapa Sardkarn Chang Factory (Phrae). Most of them are worked by hand, excepting the processes upto wood conversion. They are fabricated by numerous furniture craftsmen and wood carving technicians (including women and minors).

They lack freshness because of fixed design, but they seem to have deep-rooted demand.

No. 1
Wood carving
(Bangkok)

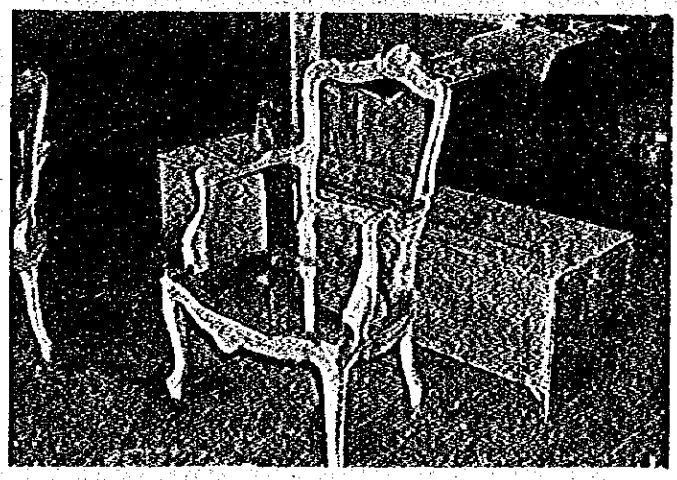


No. 2
Fabrication of carved furniture
(Chiangmai)

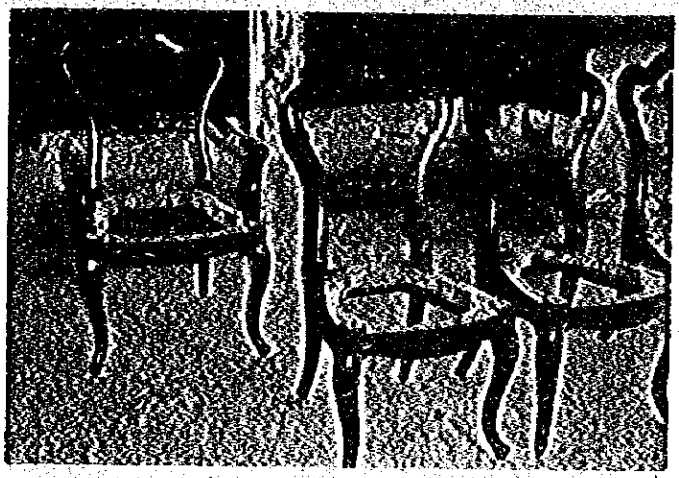
(2) European style reproduction furniture

Sweet Home (Bangkok) produces European style reproduction furniture. Since there are many wood carving technicians in Thailand, the level of reproduction techniques is high. Such products are used for Oriental Hotel and other top level rooms with European interior decoration.

Such technicians are becoming internationally precious since they are becoming scarce annually in Japan and European countries.



No. 1
Louise Quinze chair



No. 2
Electic type chair

(3) Furniture of modern design and traditional motifs

This trend is worth notice from the view point of design. This style seems to have very promissing future since it involves an essential cultural problem of tradition - succession - creation.

In the Japanese process of modernization, industrial rationalization preceded the succession of tradition. In Thailand, however, it seems possible to carry out modernization in the development of racial tradition. This will lead to the creation of original design.

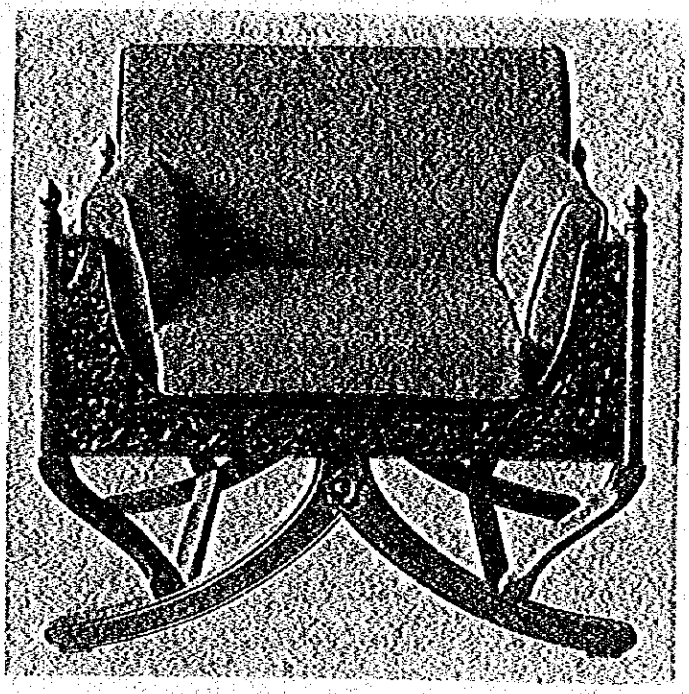
The following two trends are found as examples of such furniture.

(a) Furniture succeeding decorative trend

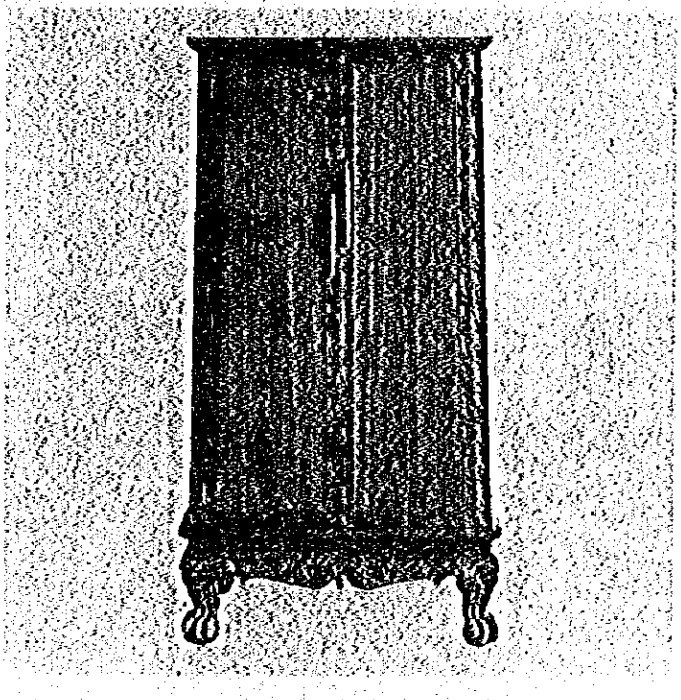
(Elephant chairs with decoration of Thai arabesque as accent.)

Furniture of modern design and traditional motif

(Decorative trend is succeeded.)



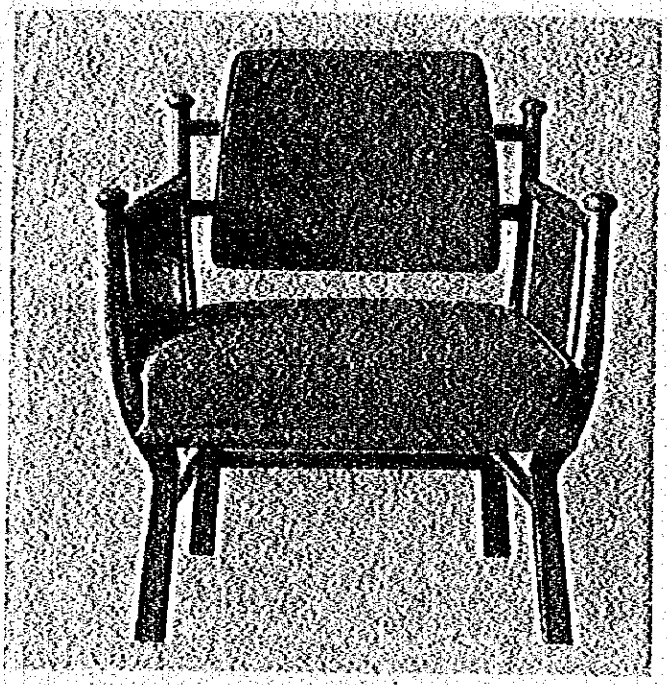
No. 1
Elephant chair
(Arm chair)



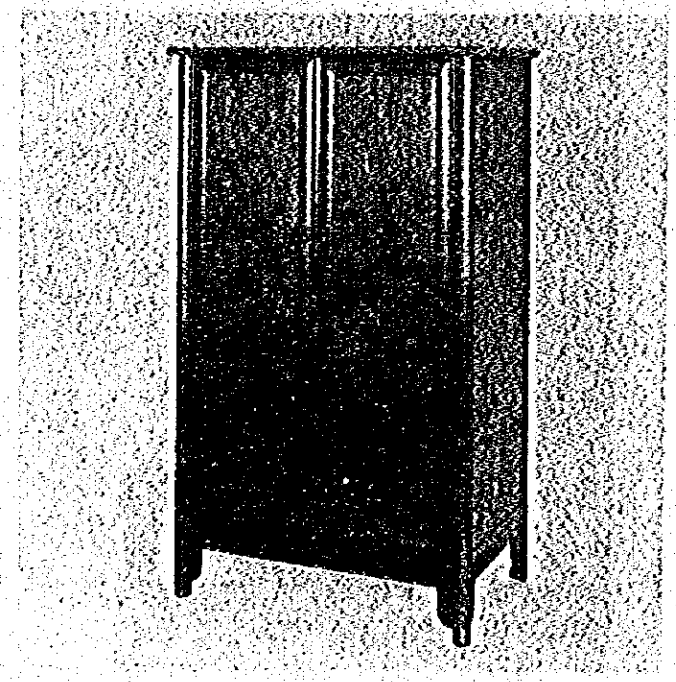
No. 1
Cabinet

(b) Mass production type furniture with traditional images in abstract form.

Furniture of modern design with traditional motif
(Abstract expression of traditional image)



No. 1
Arm chair
Design khun sala

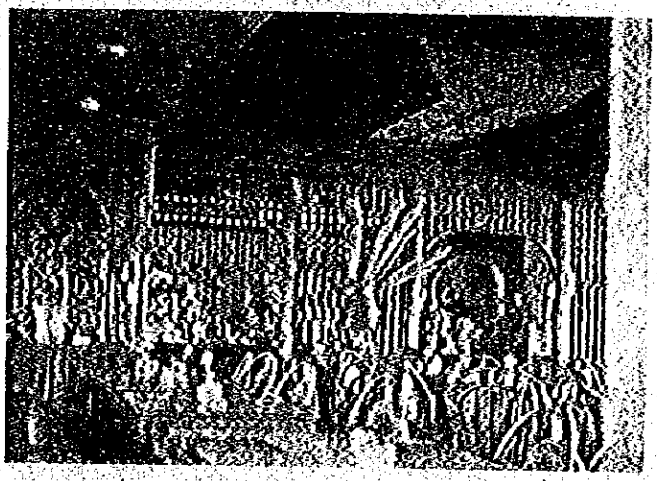


No. 2
Cabinet

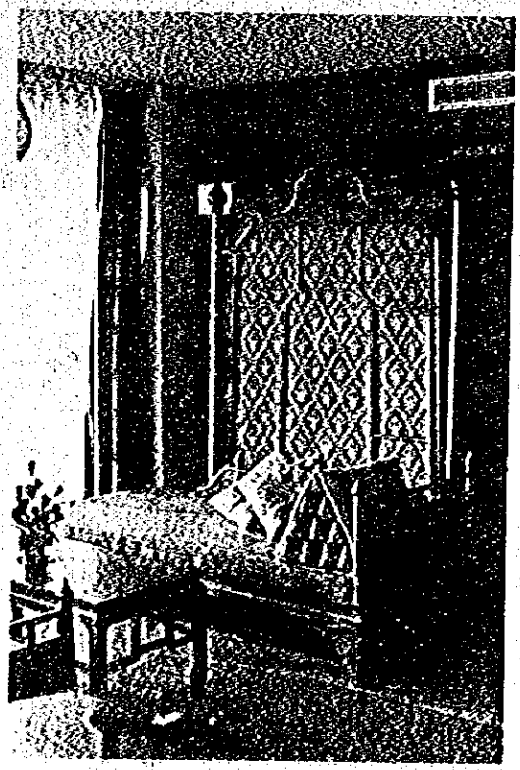
Furniture of these types is used at houses of new well-informed people or hotels for foreign tourists. It has certain originality differing from Western design. Since the demand for such furniture is still small, the system job-order production by manual works is mostly adopted.

In Thailand, the group of people with modern sense is expected to increase and tourist industry is also expected to develop in the future. With the development of interior decoration with Thai design, more productive design will be developed. Larger export will become possible if quality stability and transportation are improved.

Interior design of Thai atmosphere in a hotel.



No. 1
Chiangmai
Rincome Hotel



No. 2
Bangkok
Montien Hotel

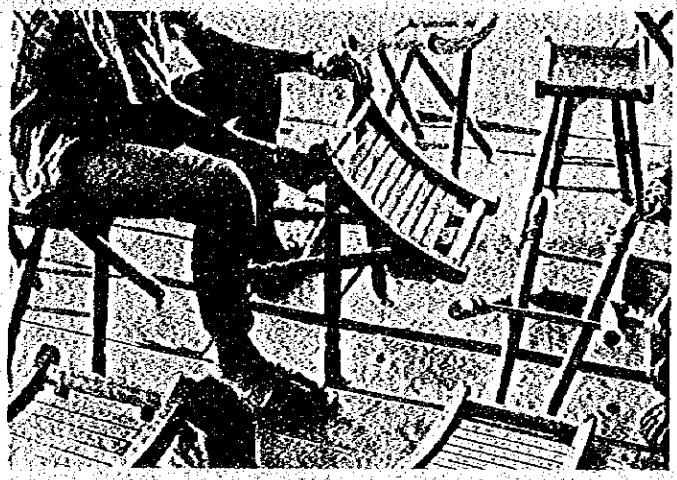
(4) Furniture for Daily Use

The furniture shop district at Hua Dung in the suburbs of Phrae was typical within the scope of the present survey. Since furniture of the same type was found at Hat Yai, it seems to be manufactured throughout the country. It seems to form the bottom of the furniture industry in Thailand.

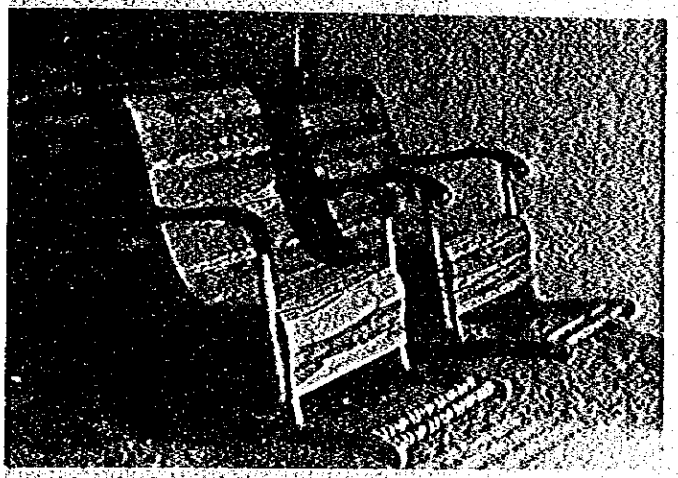
The style of such furniture slightly varies locally, but various materials, including teak and Yang Para, are used everywhere. Since most of such furniture is produced by home industry, both design and working techniques are poor. Improvements should be made even with price restrictions.

The division of work by product types has not been realized yet. As consumption increases, mass production factories equipped with machines will also advance into this field. New design will also be created. In any event, administrative efforts should be made to lead and organize these small enterprises and to improve the level of design and technology.

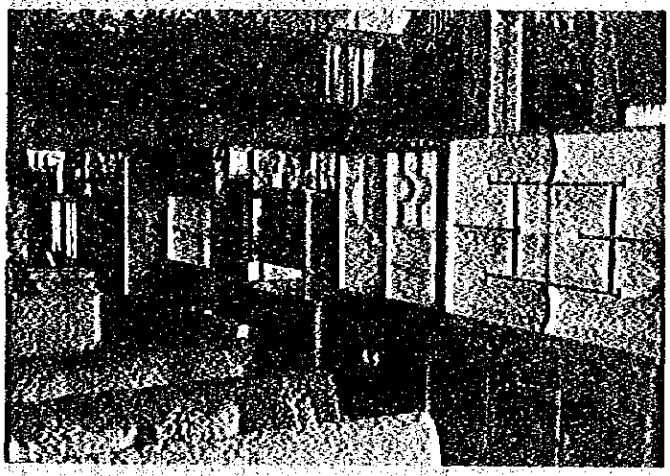
Furniture for Daily Use



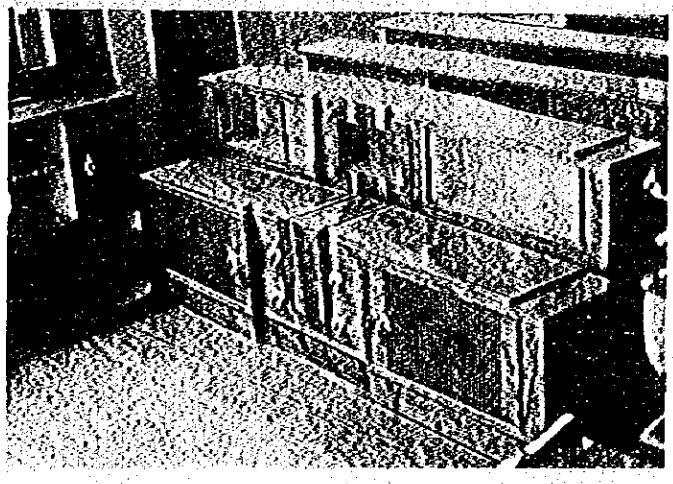
No. 1
Stool (folding type)



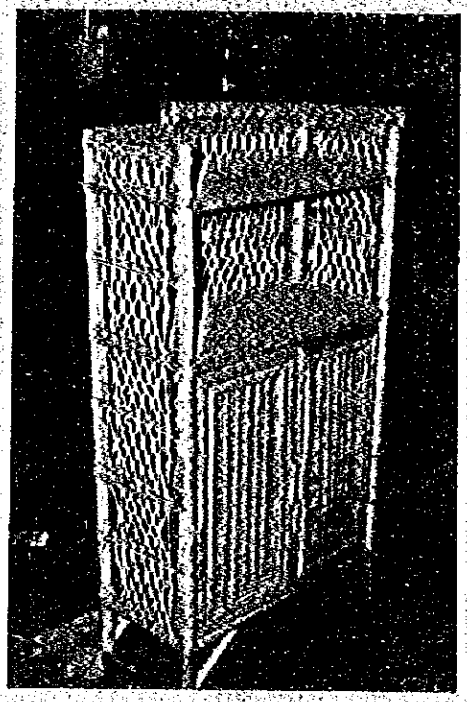
No. 2
Locking chair



No. 3
Display shelf



No. 4
Display shelf



No. 5
Bookshelf (Rattan)

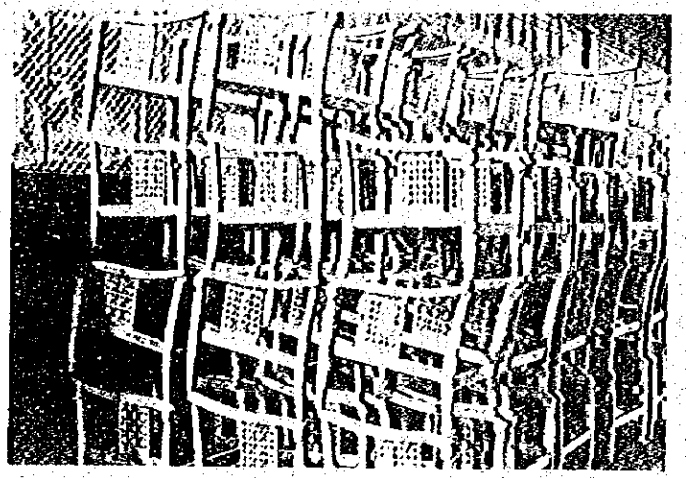
No. 6
Wardrobe and dressing table

(5) Mass production Furniture by Machines

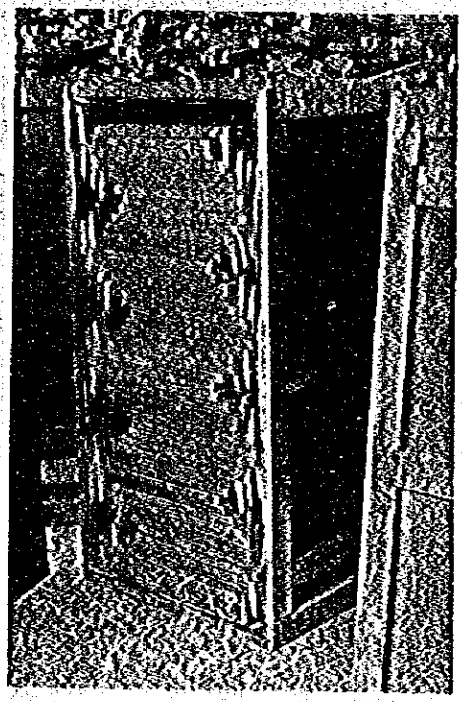
Mass production furniture factories are concentrated around Bangkok (in Raja, Deccon, Chada etc.). Many of them export their products. However, they have cut down production and were manufacturing furniture for the domestic market because of the international depression after Oil Shock.

The design of export furniture is usually specified by a purchasing country. Although teak is used, the products are sold at low cost in the market of a purchasing country.

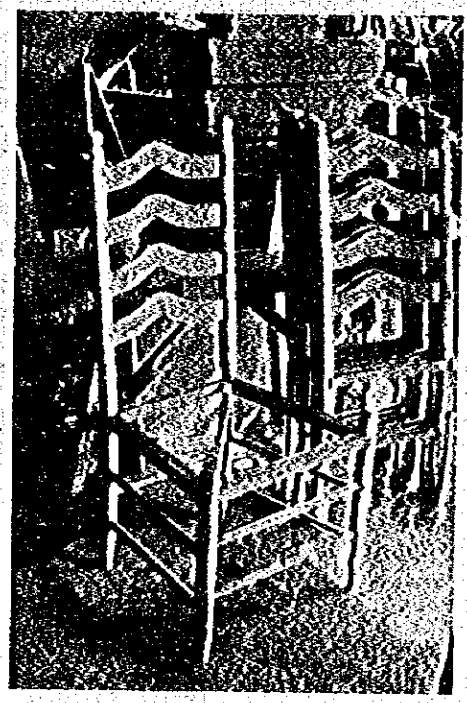
These mass production factories must base their production on domestic demand to stabilize their management. This requires the standardization of the structures and dimensions of domestically sold furniture. To improve the quality of products, the criteria of commodity evaluation in a purchasing country must be studied and efforts must be made to increase the value as commodity. Manufactures should also be ready to meet the diversification of design.



Mass production furniture by machines
No. 1
Arm chair



No. 2
Export package

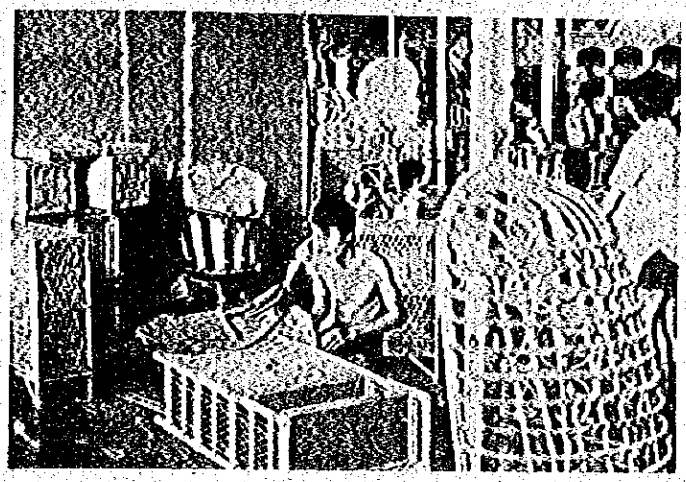


No. 3
Chair

The current state of wooden furniture industry has been summarized. Additionally, rattan furniture and metallic furniture are also manufactured.

Rattan produced near the boundary with Burma is used for making chairs and shelves. A considerable demand seems to exist in view of the display at furniture shops in Bangkok City. Their design is quite diversified, ranging from decorative furniture similar to Hongkong products to practical furniture.

Metallic furniture is produced by Thai Steel Product alone. Their design is identical with Japanese JIS productions. They have some quality problem, but their level is quite close to that of Japan. The production seems to be smooth.



Vatious rattan furniture
(The same shop is used for rattan furniture and wood works.)

The following measures are recommended for the development of design.

II-2-2 Establishment of Designing and Control Techniques Required for Modernization of Furniture Industry

The first step for the modernization of the furniture industry is to study developments in details. It is important to grasp the engineering techniques and skills and the capacity of machines available at a factory. It is also important to consider the characteristics of timber and other materials. Commodities must be developed with sufficient knowledge on these factors. Especially, assembling method is an important factor having a decisive effect on the possibility of mass production. Rational conditions must be used. The following problems must be improved at first.

(1) Establishement of Full Scale Drawing, Working Drawing, Part Drawing

In Thailand, furniture is manufactured by referring to a sample product or a simple sample boards. The selection of materials and local structures are often left to the judgement of craftmen at the field. A step toward mass production will be difficult if such a system is continued. Drawings should be used as the basis of works to follow commands from a higher level. In this sense, it is important to train workers to give commands on the basis of drawings and to read drawings. Reduced scale drawings, full scale drawings, working drawings and part drawings are often used. They have their own characteristics. For large box-type furniture, reduced scale drawings, partial full

scale drawings and reduced scale part drawings etc, are used. For chairs, full scale drawings, working drawings and part drawings are used. Full scale drawings must be read carefully since the length, width and thickness of parts often are not drawn exactly according to actual dimensions. Part drawings are necessary for checking parts, while working drawings are convenient and necessary for working and assembling. Training must be given to make these drawings and to work by these drawings.

(2) Designer Education of Knowledge on Materials and Structure

Designing should be based not only on style, but also on functions and strength. Mass production and labor saving system cannot be realized by reproducing conventional structures. In this sense, designers must be given education in the following fields.

(a) Human engineering

Furniture is used for accommodation, working, resting and for other purposes. Dimensions and angles of furniture are determined on the basis of human engineering. Therefore, it is not an overstatement to say that human engineering is the basis of designing.

(b) Materials

Perfect designing will be impossible without the knowledge on the physical properties of materials. For example, physical properties of timber differ among tree species. This applies also to synthetic resin materials. Designers must know these materials well to use various materials for adequate purposes.

(c) Structure

Members can be joined by various methods, including tenon, dowel, edge joint, board assembling. The strength of joints is the crucial problem. A strong structure cannot always be obtained by using strong members. A board without reverse warping can be fabricated by satisfying various technical requirements, such as symmetricity of materials and dimensions against the axial surface. Designers must be widely informed on these subjects.

(d) Gluing

Adhesives and their uses must be determined according to purposes and glued materials. Designers must learn various techniques for improving bonding force.

(e) Painting

Painting is the final make-up for furniture. Paints of various types are available and they differ from one another in physical properties. Naturally, adequate paints must be selected for each purpose. In other words, accommodating furniture and desk top do not require the same type of painting. Designers must acquire knowledge on such subjects as well as coloring methods and fixing methods. They should be able to instruct an adequate painting method for each purpose.

(f) Upholstered chair

Designers should acquire correct and wide knowledge on material of upholstered chair, methods of upholstered chair, cushion materials, available cloth varieties, color combinations etc. They should also learn various covering methods, including thin upholstering, thick upholstering etc.

Only a few examples were given here. However, designers must acquire sufficient knowledge on these subjects.

(3) Specifications and Cost Estimate

Specifications must naturally be prepared for the production of furniture. Knowledge on these subjects is essential for the preparation of specifications. However, specifications will allow to uniformalize products, to improve the standard of woodworking techniques, to adopt correct materials, trimming methods, structures and finishing methods, and to help the preparation of trimming tables, line tables and the calculation of standard operation time and accurate cost estimate. Designers should be trained to prepare satisfactory specifications to give instructions not expressed in drawings and to provide basic materials for cost estimate.

II-2-3 Establishment of Original Design Unique to Thailand

The developne nt of unique and original design is nothing but Thailand's national theme of succeeding, developing and creating Thai tradition. A fundamental study should be made on the role of designers in this sense. Some of the works described before indicate sprouting of such activities.

Therefore, the country should consciously promote the development of such design as a national policy. The freshness of Thailand's original design should be internationally advertised by using it for the interior decoration of hotels.

II-2-4 Market Research of Country of Destination

Export is promoted by manufacturing and shipping a large quantity of products and receiving no claim.

The U.S.A., Japan and other countries of destination have unique tradition, customs, and natural environment. They also have unique criteria for commodity evaluation. These factors should be studied well and efforts should be made to meet the demand of each country.