## 3. Comprehensive Program

### 3-1. Textile and Garment Industries

#### 3-1-1. Basic Strategy

As the basic strategy for the development and expansion of the textile and garment industries of Thailand, consideration may be given to the following framework of measures:

(1) The growth potential of the garment industry, which has been displaying rapid growth as an export industry, should be exploited to the fullest. Toward this end, it will be necessary to promote small and medium sized companies and subconstractors and take other measures to boost production capacity and also to push for stronger competitiveness through improvement in product quality and added value an improvement in productivity. Further, effort should be poured, in the medium and long term, into the development of human resources for design and product development and into raising the image of "Thai fashions" on the international market so as to enable a transition from the current stage where reliance is placed on the designs and brands of the buyers to a stage where companies can develop and export products based on their own designs and brands.

(2) In the past, the textile sector has achieved growth as an import substitution type industry. It should now establish and promote a policy of expanding and strengthening its ability to supply materials to the domestic export garment industry. Toward this end, it will be necessary to eliminate the factors inhibiting the expansion of the supply (production capacity) of garment materials throughout the upstream sector (textile materials and spinning) and the midstream sector (weaving, dyeing, etc.) In particular, it will be essential to ease or scrap restrictions on facilities and to reduce import duties for yarn and woven fabrics. This would make the "market mechanism" act, linked with the international market, in the supply of textile materials and would lead to the strengthening of the international competitiveness of the textile sector and in turn the expansion of exports.

(3) To enlarge the supply capacity of garment materials, an important task will be to modernize the facilities in the corresponding upstream and midstream sectors and raise the level of production technology. To realize this, it would be effect to give some institutional benefits, such as temporary abatement of import duties or low

interest financing, for the corresponding facilities and equipment. In particular, special measures will be needed in the dyeing, printing, finishing, and other sectors to lighten the burden of investment in water supply and wastewater facilities. Further, encouragement of investment by foreign companies with advanced technology and knowhow and promotion of the establishment of joint ventures with foreign companies or corporate tieups would, it is considered, also have large effects.

(4) To increase the supply of materials from the textile sector to the garment sector, in addition to the expansion of production capacity and improvement of technology mentioned above, the development of companies with so-called "converter functions" which link up the two sectors will be needed. To promote their appearance, it would be effective to spread knowledge about and promote awareness of these "converter functions" among related businesses in Thailand (in particular the textile trading companies) and to promote the investment of foreign companies having such functions or joint ventures with the same. Further, in relation to this, it will be essential to stimulate the exchange of information among the different sectors of the textile industry.

(5) Regarding the expansion of production capacity in the garment industry, it should be fully possible to promote the establishment of factories in the local regions and the development of small and medium sized companies to help alleviate the national problems of Thailand of overcrowding in Bangkok and the slow economic development of the local areas. However, to do this smoothly, the prerequisites would be that full consideration be given to the establishment of the infrastructure and development of human resources in the local areas and further that incentives be devised for corporate investment.

(6) The Ministry of Industry should formulate a "vision" for the textile industry in which it states its view of the Thai textile industry (including textiles and garments) five to 10 years hence through exchanges of opinion and deliberations with the related industries and should announce the same to establish a concensus among the related parties in the industries. This should be respected and made use of over a certain period of time as the basic direction along with policies should be drafted and acted on in the related sectors.

(7) The TID, which acts under the DIP, should focus on key issues of the present time, along the direction of the above-mentioned basic strategy, set roles for itself in the same, and use the most effective means available to complete its tasks. At that time, it should introduce the principle of the beneficiaries paying for services

and supplie services, for a fee, advantageous to private industry so as to breathe life back into the organization.

### 3-1-2. Comprehensive Program

Package of Measures [1]

Augmentation and Modernization of Garment Material Supply Sector

To increase domestic production of garment materials, it will be necessary to strengthen the production facilities for various materials in part of the upstream sector (for example, high count yarn) and the midstream sector in accordance with demand trends for garment materials. Toward this end, the required organizations and systems should be set up and promotional measures formulated and realized.

Program [1]

Augmentation and Modernization of Material Supply Sector

To speedily achieve an expansion in the capacity of supply of materials to the garment sector through part of the upstream sector and the midstream sector, the Ministry of Industry should establish the necessary systems and mobilize whatever it can for the same on a concentrated basis for a certain period of time.

As a first stage in this, it will be necessary to clarify the sections and officials in charge for the textile industry and establish a system of responsible agencies and to establish a system of deliberations with industrial organizations etc. which can be used by those at the working level at all times. These sections and officials in charge would take the lead and collect and analyze related information and draft and realize specific policies through deliberations with industrial organizations etc. Note that in regard to this point proposals would be made that an expert be engaged by the TIDC (Textile Industry Development Commission) as a "policy advisor" for two to three years and that one to two officials in charge of textile policy be sent overseas for training for a short period of time.

As specific measures for increasing production capacity, measures to promotion investment in the sectors leading to the supply of garment materials would be effective. As possible measures, consideration may be given to temporary lifting of restraints on facilities, application of BOI incentives, temporary reduction or waiver of import duties for related machinery and equipment, promotion of investment and establishment of joint ventures, etc.

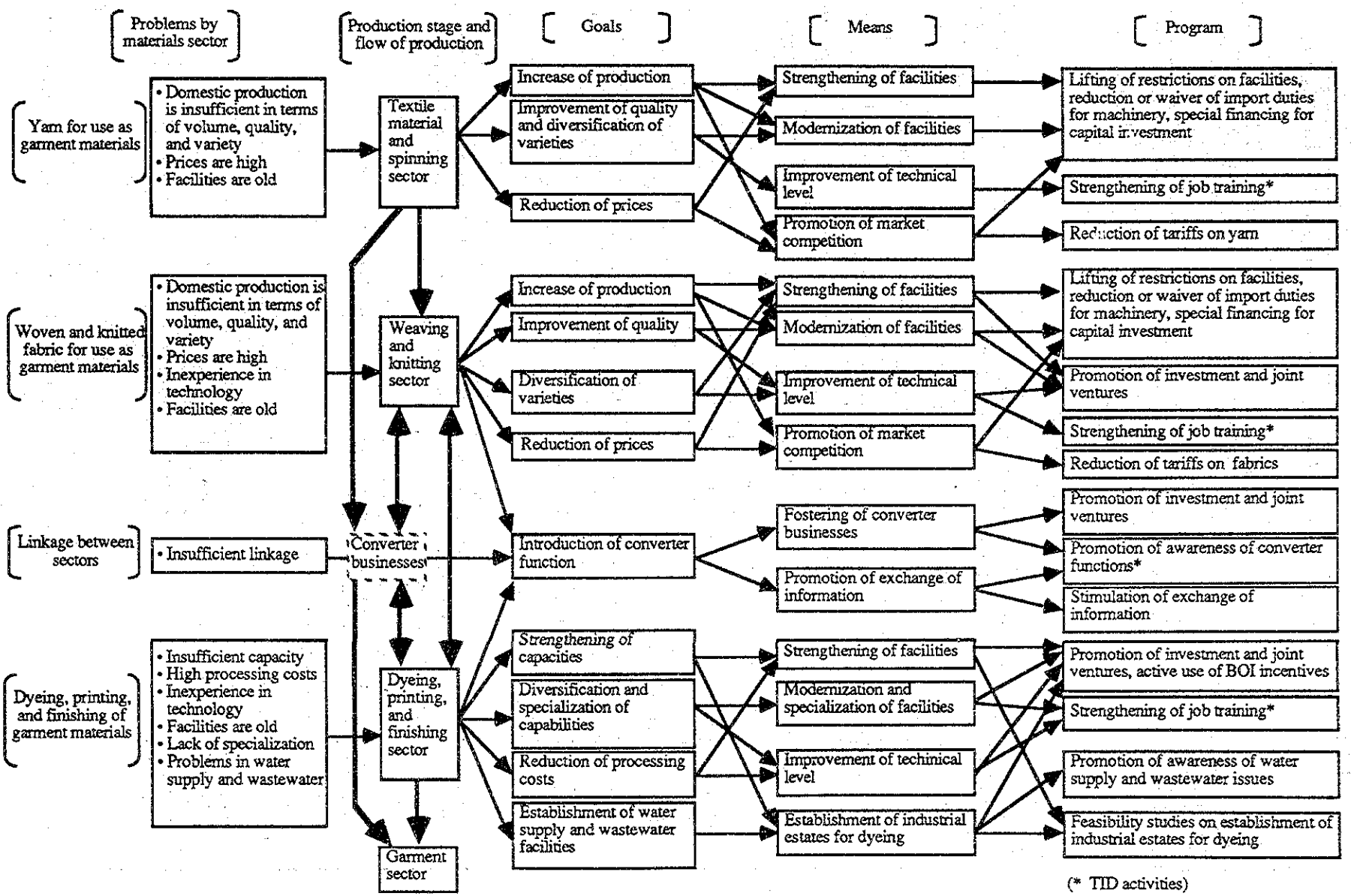
Further, in this field, modernization of the antiquidated and out-dated machinery and equipment are also urgent tasks. For this, easing or lifting of restraints on facilities, temporary abatement of import duties on machinery and equipment, and low interest funding through institutional financing would be effective.

In the midstream sector, particularly the dyeing, printing, and finishing sectors, the establishment of a proper environment for operations, in terms of water supply and wastewater, is another important task. In this regard, proposal would like to be made of inspections and improvement of industrial water supply and wastewater systems and simultaneously the early running of a feasibility study on the establishment of an industrial estate for the dyeing sector (for reference: Plan in Detail -1). Further, in the establishment of such an industrial estate for the dyeing industry, a string of incentives for enticing companies to locate their operations there (application of BOI incentives, low interest financing, abatement of taxes, etc.) would be considered effective. In relation to this, a campaign (for example, seminars, provision of information, etc.) for raising the awareness of water supply and wastewater problems would be significant.

In parallel with the expansion of the supply of materials, deepening and expanding the linkage between the upstream and midstream sectors and the garment sector are important. Toward this end, it will be necessary to promote the development of businesses with so-called "converter functions" For this, it would be effective to promote investment, joint ventures, and tieups and also the awareness of related domestic businesses of "converter functions" through seminars and provision of information.

In the implementation of this string of measures, it will be important to make active use of the functions of the TID to raise the level of technology and skills and strengthen information activities. This will be discussed later in relation to the enlargement and strengthening of the TID.

## Chart 10. Program for Augmentation and Modernization of Materials Sector



[Plan in Detail - 1]

## Plan for Water Supply and Effluent Facilities at Industrial Dyeing Estate

The industrial dyeing estate is aimed at small and medium sized dyeing factories, has as its object the supply of good quality dyed products to the textile and garment manufacturing industries, and gives consideration to the suppression to the minimum extent of the detrimental effects of effluent on the surrounding environment.

A summary is provided of an example of water supply and effluent treatment facilities of an industrial dyeing estate. Note that the study was performed envisioning an industrial dyeing estate comprised of 10 to 15 small and medium sized dyeing companies and a joint management organization.

[Water Supply Treatment Facilities]

- Amount of water treated for use by only manufacturing process: 5,000 $m^3$/day
- Treatment time: 20 hours/day (250 $m^3$/hour)
- Type of water (raw water) supplied: River water treated for industrial use
- Treatment system: The raw water contains Fe, Mn, and Ca and is high also in turbidity, so pretreatment will be performed before water softening treatment. Further, five 50 $m^3$/hour treatment systems will be set up in parallel and consideration given to backwashing. Note that recycling and reuse of processed water used in the dyeing processes is not being considered.
- Other considerations
  Raw water reservoir: Shall have a capacity enabling storage of over half a day's required water and further shall serve as a firefighting water reservoir
  Treated water reservoir: Shall serve both as a reservoir for treating dissolved metals and a reverse washing reservoir for the water softening reservoir. The amount of reverse washing water needed shall be that for reverse washing the treatment vats (10) 30 minutes once a day (624 $m^3$/hour). Further, the maximum amount of water used for the dyeing processes is assumed to be three times the ordinary amount of water (250 $m^3$/hour) and the capacity of the treated water reservoir shall be a capacity in excess of the amount of water required for both.
- Treatment facilities for industrial water supplies: (see Table 1)
- Concept of treatment facilities for industrial water supplies (see Fig. 1)
- Treated properties of industrial water supplies: (See Table 2)
- Required ground area: Approximately 2,100$m^2$ (70 x 30 m)

[Effluent Treatment Facilities]

- Basic thinking: The effluent from the dyeing processes will, after pretreatment of dyeing effluent including catalytic dyes and acidic catalytic dyes, be merged into the main treatment facilities, i.e., the general dyeing effluent system for overall treatment.
- Capacity of treatment of dyeing effluent: 5,000 $m^3$/day
  Pretreatment facilities: 1,000 $m^3$/day
  Main treatment facilities: 5,000 $m^3$/day
- Treatment time: 20 hours/day
- Other considerations: The main effluent treatment facilities shall use dome defizzers as defoaming apparatuses so as to raise the energy saving and biochemical treatment effects and shall use a DO automatic control system (inverter system) so as to reduce the power costs of the aeration blowers. Note that the dyes used, chemicals, and treated water will not be recycled and reclaimed.
- Dyeing effluent treatment facilities: (See Table 3)
- Concept of dyeing effluent treatment facilities: (See Fig. 2)
- Conditions for inflow of effluent into dyeing effluent treatment facilities: (See Table 4)
- Required ground area (not including office)
  Pretreatment: 200 $m^2$ (8 x 25 m)
  Main treatment: 7,200 $m^2$ (120 x 60 m)

[Permanent Staff]

| | |
|---|---|
| Engineer in chief: | 1 (serving in daytime) |
| Engineers (mechanical): | 2 (two shifts of one person each) |
| Engineers (electrical): | 2 (two shifts of one person each) |
| Office staff: | 1 (serving in daytime) |
| Supplementary workers: | 2 (serving in daytime) |

**[Plan - 1] Table 1. Industrial Water Supply Treatment Facility**

| | Unit | Quantity | Remarks |
|---|---|---|---|
| I-1- | Raw Water Reservoir | 1 | 3,000m3 |
| I-2 | NaCLO Tank | 5 | |
| I-3 | Fe Removal Tank | 5 | |
| I-4 | Water Softner | 5 | |
| I-5 | Regeneration Tank (NaCL) | 5 | |
| I-6 | Treated aWater Reservoir | 1 | 1,500m3 |

**[Plan - 1] Table 2. Treated Properties of Industrial Water Supply**

| | Raw water (inflow) | Treated (process) water |
|---|---|---|
| Temperature | < 35°C | < 35°C |
| Turbidity | 4.5 | -- |
| pH | 6.5 - 8.5 | 6.0 - 8.0 |
| Conductivity | 700 μs/cm | < 500 μs/cm |
| TDS | 500 mg/l | -- |
| M-alkalinity (as $CaCo_3$) | 350 mg/l | < 40 mg/l |
| Total hardness (as $CaCo_3$) | 130 mg/l | < 10 mg/l |
| $CL^-$ | 45 mg/l | < 45 mg/l |
| $SO_4^{2-}$ | 20 mg/l | < 20 mg/l |
| Fe | 0.5 mg/l | < 0.1 mg/l |
| Mn | 0.3 mg/l | <0.1 mg/l |

**[Plan - 1] Table 3. Dyeing Effluent Treatment Facilities**

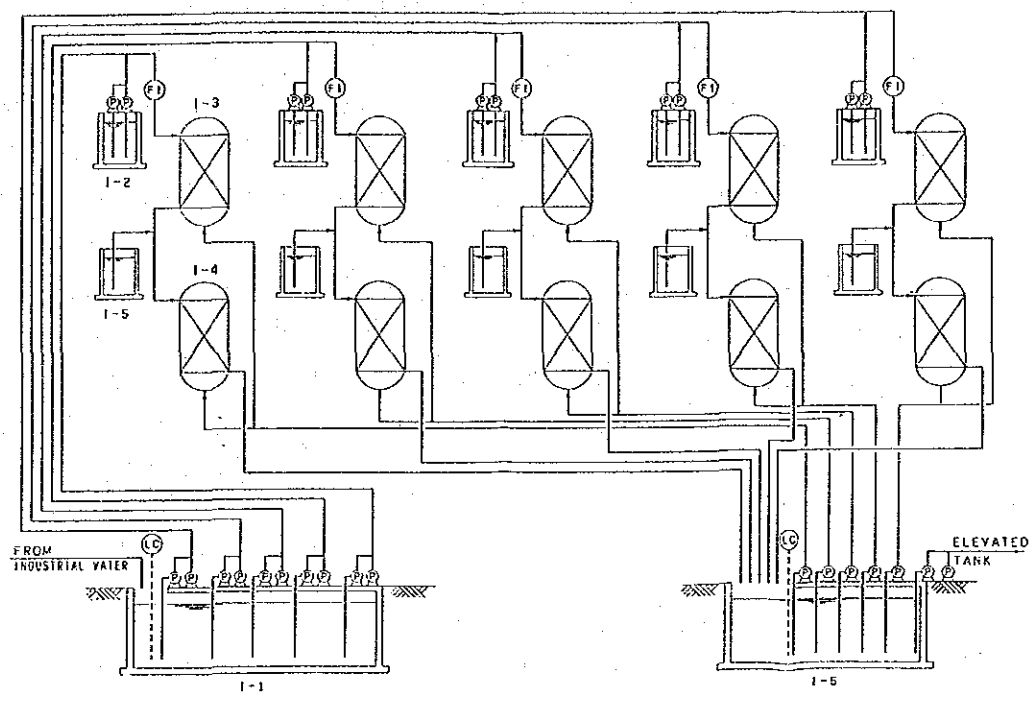
| | Unit | Quantity | Remarks |
|---|---|---|---|
| Dyeing effluent pretreatment facility for mordant and acidic mordant dyes | | | |
| B-1 | Pump Station Equipment | 1 | Pump 11 KW x 2 |
| B-2 | Raw Waster Water Tank | 1 | Pump 7.5KW x 2, Blower 22 KW |
| B-3 | Primary Reaciton Tank | 1 | Agitator 3.7 KW |
| B-4 | Secondary Reaaction Tank | 1 | Agitator 3.7 KW |
| B-5 | Coagulation Tank | 1 | Agitator 3.7 KW |
| B-6 | Coagulation & Settling Tank | 1 | Scraper 0.4 KW, Pump 1.5 kw |
| T-1 | Chemical Storage & Injection Facilities | 1 | Pump 0.2 KW |
| T-2 | — Ditto — | 1 | Pump 0.2 KW |
| T-3 | — Ditto — | 1 | Pump 0.2 KW |
| T-4 | — Ditto — | 1 | Pump 0.2 KW, Pump 0.4 KW |
| T-5 | — Ditto — | 1 | Pump 0.2 KW, Pump 0.4 KW |
| Main treatment facility | | | |
| B-7 | Pump Station equipment | 1 | Pump 30 KW x 2 |
| B-8 | Raw Waster Water Tank | 1 | Pump 15 KW x 2, Blower 37 KW x 2 |
| B-9 | Reduction Tank | 2 | Agitator 11 KW x 2 |
| B-10 | pH Neutralization Tank | 2 | Agitator 11 KW x 2 |
| B-11 | Aeration Tank | 4 | Blower 37 KW x 4 |
| B-12 | Sodimentation Tank | 2 | Scraper 1.5 KW x 2, Pump 3.7 KW x 2 |
| B-13 | Defoaming Pump Tank | 1 | Pump 3.7 KW |
| B-14 | Disinfection/Treated Water Tank | 1 | Pump 0.2 KW |
| B-15 | Cludge Thickened & Storage Tank | 1 | Pump 3.7 KW |
| | Control Panel | | |
| | Dehydrator Unit | | 7.5 KW |
| | Screen Unit | | 0.2 KW, 0.75 KW |
| | pH Meter, ORP Meter | | |
| | pH Controller Unit | | with inverter |
| | Another Equipment | | |

Note: T-4 and T-5 are to be used together.

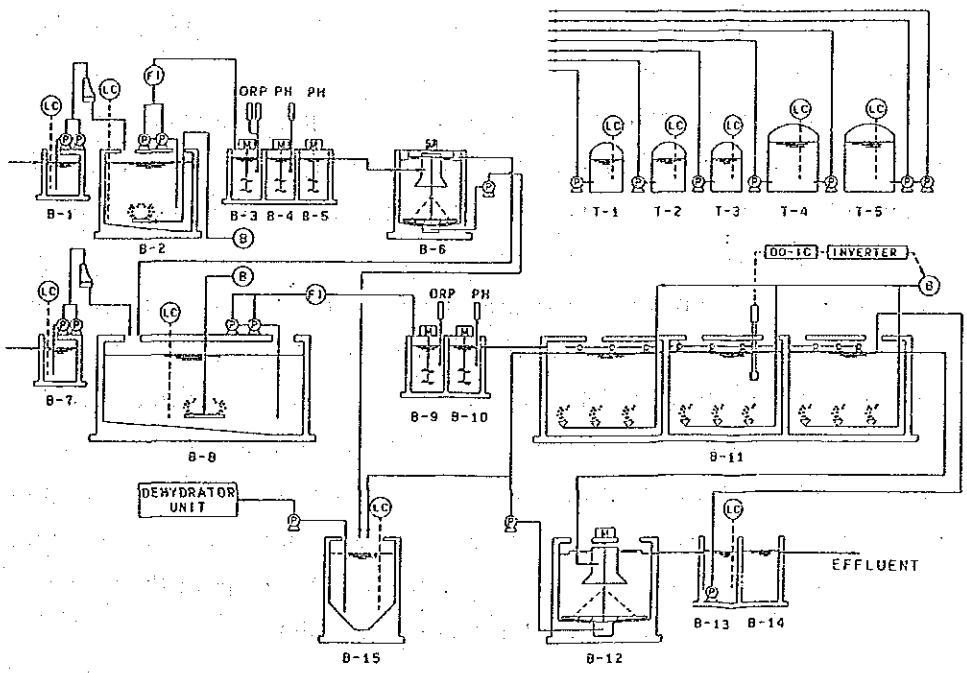
**[Plan - 1] Table 4. Properties of Effluent Flowing Into Dyeing Effluent Treatment Facilities (Conditions)**

| | Pretreatment facility | Main treatment facility |
|---|---|---|
| pH | 3.0 - 10.0 | 3.0 - 12.2 |
| BOD | 190 - 550 mg/l | 300 - 800 mg/l |
| COD | 150 - 400 mg/l | 300 - 800 mg/l |
| SS | 100 - 120 mg/l | 100 - 150 mg/l |
| n-Hexane | 10 - 35 mg/l | 10 - 25 mg/l |
| Heavy metal (as Zn) | 3 - 10 mg/l | < 1 mg/l |

[Plan - 1] Fig.1. Schematic Diagram of Industrial Water Treatment System




[Plan - 1] Fig. 2. Schematic Diagram of Waste Water Treatment System



Package of Measures [2]

Expansion of Production Capacity of Garments and Human Resource Development

To increase the overall production capacity of garments for export, greater investment should be promoted, including investment in the local regions and investment in development of small and medium sized companies and a subcontracting system. Toward this end, augmentation and mobilization of the functions of various related organizations will become necessary.

Also, to raise the production technology and skills in the garment sector and increase production capacity, the Ministry of Industry, the Department of Labor of the Ministry of Interior, the Ministry of Education, etc. should cooperate to augment vocational education, job training, etc., in the local areas as well, and develop human resources.

Program [2]

Expansion and Strengthening of Garment Industry

To increase the production capacity of export garments, small and medium sized companies in this field should be fostered and active use be made of the subcontracting system. Toward this end, incentives such as access to institutional financing (SIFO etc.) and abatement of import duties on sewing machines should be devised for small and medium sized companies and cottage industries. Further, establishment of a leasing system for sewing machines by an official organization (for example, by SIFO) for such companies deserves consideration.

For promotion of small and medium sized companies and subcontractors on a local level, it will be necessary to further beef up these incentives and press forward with development of human resources and establishment of the related infrastructure. Linkage with related organizations would also be important.

For the expansion of the production capacity of garments, training of engineers and skilled workers would of course be necessary. To do this, first of all, textile and garment courses in the vocational schools should be augmented. Even before that, it will be important to secure and train the required teachers and instructors.

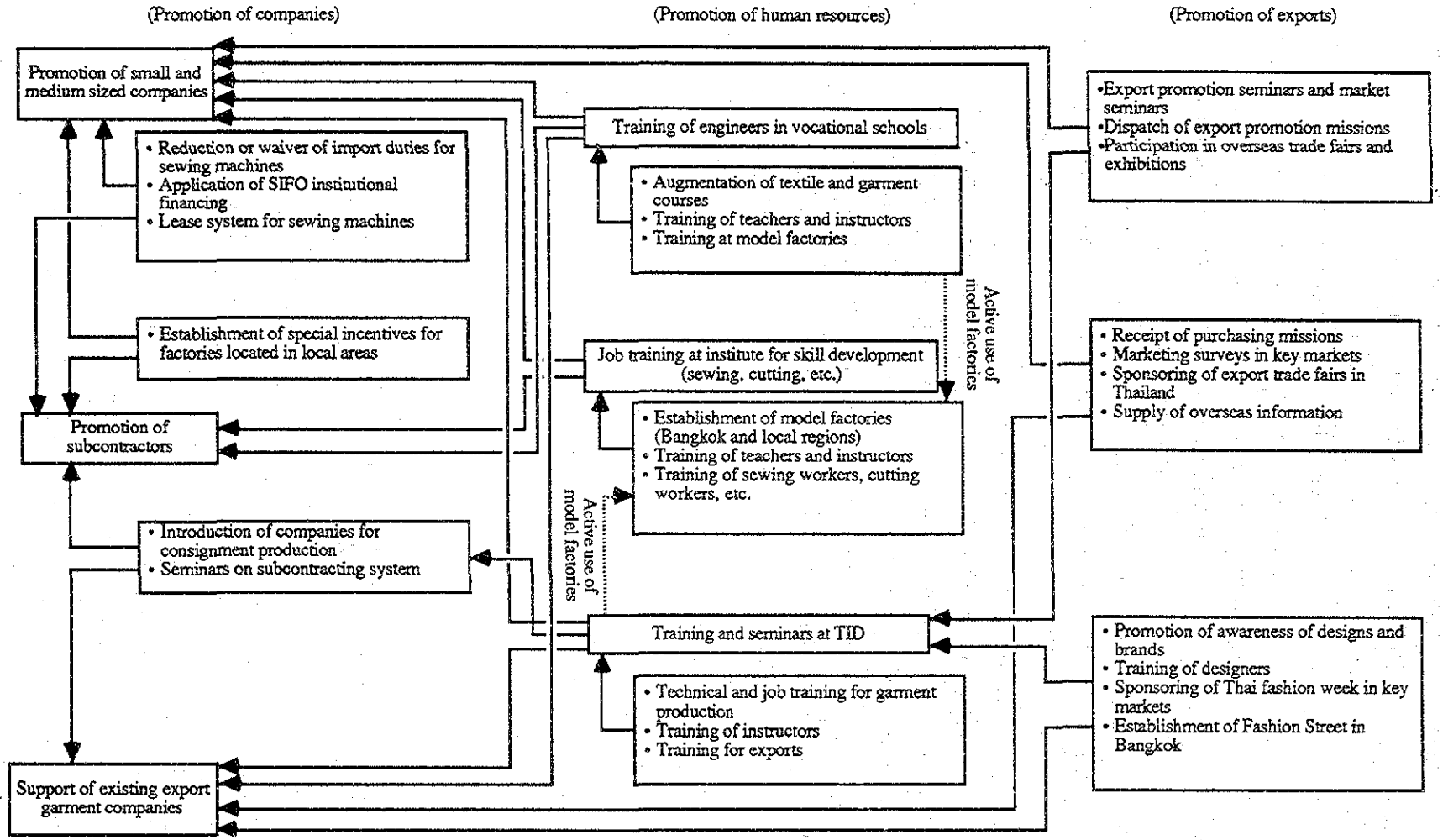
In the Thai garment industry, there is a striking unfamiliarity with production control and process control. Effort should be made to improve this situation in the education in vocational schools. Active use must also be made of the later-mentioned "model factories" of the Institute for Skill Development (ISD).

To make up for the shrotages of instructors for vocational training, cooperation will have to be obtained from the TID and private companies, in particular in the form of engagement of private sector experts.

To train skilled workers, particularly sewing workers and cutting workers, as fast as possible, proposal would like to be made of implementation of a "sewing worker training program" at the Institute for Skill Development. In this regard, it will be necessary to establish "model garment factories" at two locations for the time being, i.e., Bangkok and the local regions (for reference: Plan in Detail - 2). These model factories could be used for both training workers and for education and training by the TID and vocational schools in production control. Instructors would have to be secured and trained for this, which would require formation of a system of cooperation with private companies and use of private sector experts.

In addition, to improve technology and productivity, in particular in small and medium sized garment companies, proposal would like to be made of the engagement of experts by official organizations or industrial organizations so as to provide roving guidance on technology to companies desiring the same (guidance on production control, sewing technology, maintenance of equipment, etc.)

## Chart 11. Program for Expansion and Strengthening of Garment Industry



[Plan in Detail - 2]

**Proposed List of Equipment for Model Factories at the Institute for Skill Development**

To facilitate management, the model factory is planned for production of uniforms for government officials. The list of equipment and machinery is as follows.

<Machinery for garment production>

| Machinery for production control | Production control system | LEVEL3 | |
|---|---|---|---|
| Cloth inspector | | | 1 |
| Cloth analyser | | | 1 |
| Spreading table, machine | Spreading table | 1.8x15m | 2 |
| | Spreading machine | Automatic | 1 |
| Cutting machine | Cutting machine driven by electric Motor with straight cutter | 8 inch | 3 |
| | Bandknife cloth cutting machine | | 1 |
| Cloth-drills | | with heater | 1 |
| Fusing press | Rotary press | | 1 |
| Sewing machines for industrial use | 1-Needle Lock stitch machine | | 30 |
| | 1-Needle Lock stitch machine with Automatic thread trimmer | | 20 |
| | Overlock machine | | 10 |
| | Safety stitch machine | | 5 |
| | 1-Needle top & bottom feed lock stitch machine | | 5 |
| | Bartacking machine | | 5 |
| | Butonholing machine | | 3 |
| | 1-Needle double chain stitch machine | | 3 |
| | Button sewing machine | | 2 |
| | Edge control seamer | | 2 |
| | Serging machine | | 1 |
| | Eyelet stitch button holding machine | | 1 |
| | Blindstitch machine | | 1 |
| | Blindstitch machine | | 1 |
| | Needle feed lockstitch machine | | 1 |
| | Automatic lockstitch welting machine | | 1 |
| | Post-type machine for sleeve | | 1 |
| Iron | Steam iron | | 5 |
| | Electric iron | | 5 |
| Vacuum finishing board | | | 10 |
| Press in process | Mini-press | | 1 |
| Finishing press | Body press | | 1 |
| Carriage | Truck | | 10 |
| Warehouse | Rack | | 10 |

Note: to equip the machinery for sewing knitted goods, it would be preferable to arrange it according to "List of sewing machinery for knitted goods" in Plan in Detail - 6.

Package of Measures [3]

Augmentation and Strengthening of Training, Testing, and Information Functions of Government Organizations

The functions of the TID (Textile Industry Division) should be augmented and strengthened after the fields considered urgent and important have been focused on. Further, the principle of the beneficiaries paying for the services should be introduced and thus the organization revitalized in a form appropriate for industry needs. For the time being, the functions of retraining engineers and skilled workers, testing materials and products, and collection and dissemination of information in particular should be strengthened and put to good use.

Program [3]

Enlargement, Strengthening, and Use of TID

In the enlargement and strengthening of the TID, two things are important: to select those functions considered must necessary in view of the problems being faced now by the related industries and revitalization of the organization along with introduction of the principle of the beneficiaries paying for services. To devise effective means for these, it is proposed that an organizational expert experienced in this field be engaged for two to three years. The advice of this expert should be obtained while establishing and putting into practice the fee-basis system (for reference: Plan in Detail - 3).

Regarding the functions of the TID, it is proposed first that the technical guidance function for the textile sector (in particular the garment material production sector) be improved. Similarly, it would like to be proposed to establish and put to use a training function for garment production. Use of personal computers for the training in these two areas would be advantageous. To realize this, a prerequisite will be the equipping and augmentation of training functions, including the necessary materials and equipment. Also, it will be necessary to secure the instructors for this and to train further instructors for the future (for reference: Plan(s) in Detail - 4, 5, 6).

Regarding the testing and inspection functions, basically it will be necessary to ensure effective utilization through augmentation of those services and the introduction of the principle of the beneficiaries paying for them. However, regular inspections should be carried out by the companies themselves on their own responsibility, while the TID should shift its emphasis to special inspections and testing which the companies are unable to perform. For regular inspections, consideration may be given to introduction of an "open system" where TID equipment can be used by companies for a certain fee.

Whatever the case, augmentation of the testing and inspection functions and provision of the equipment for the same are necessary and training of inspectors is essential. To develop the human resources for high level testing and inspection, proposal would like to be made of overseas training of the relevant personnel and engagement of testing experts.

An important function which the TID should strengthen is the collection and supply of information. In regard to this, it will be necessary to train information staff and to strengthen the cooperative relationships with the DEP and industrial organizations so as to gather and analyze information more efficiently and also to disseminate the information to the related industries through publication of a textile information journal. This would help raise the technical level of textile related companies and their product development capabilities and further would, through stimulation of the flow of information among textile sectors, perform the role of assisting the expansion of linkage among the same.

The TID would be able to make use of the above training, inspection, and information functions to engage in various activities answering the needs of the industry. For example, it could sponsor seminars and work shops for the improvement of technology in dyeing and printing, seminars on converter functions, seminars on the significance of designs and brands, and seminars on water supply and wastewater in the dyeing sector. By introduction of the principle of the beneficiaries paying for these and other services, the TID could more readily lay acquire materials and information in accordance with user needs and improve its services.

Note that when introducing the principle of payment by beneficiaries, it would be desirable for the TID to fundamentally operate on a self-accounting basis. Several options are available, however, such as the establishment of a "users association" representing the users.

[Plan in Detail - 3]

## Draft Schedule of TID Enlargement Plan by Stage

| Common Sector | Textile Sector | Garment Sector |
|---|---|---|
| **First stage** | | |
| • Engagement of organizational experts<br>• Preparation of draft of enlargement plan<br>• Preparation of detailed proposal for introduction of principle of beneficiaries paying for services (fee-basis system) | • Consultation with related industrial organizations | • Consultation with related industrial organizations |
| • Dispatch of trainees overseas for training of testing and information staff | • Dispatch of trainees overseas for training of instructors (weaving, dyeing, finishing, etc.) | • Dispatch of trainees overseas for training of instructors (garment production control) |
| • Sponsoring of seminars on converter function | • Sponsoring of seminars and work shops on weaving, dyeing, finishing, etc.<br>• Sponsoring of seminars on water supply and wastewater in dyeing sector | • Sponsoring of seminars on export markets for garments (DEP)<br>• Sponsoring of seminars and work shops on production control for garments |
| (Formulation of textile industry "vision") | (Feasibility study of industrial estate for dyeing) | (Formulation of plan for promotion of small and medium sized companies and subcontractors and plan for personnel training) |
| **Second stage** | | |
| • Formulation of enlargement plan<br>• Start of fee-basis system (establishment of users association) | • Establishment of system of cooperation with related industrial organizations | • Establishment of system of cooperation with related industrial organizations |
| • Equipping of materials and equipment for testing and inspection<br>• Engagement of experts for above<br>• Start of fee-basis system for tesitng and inspection | • Promotion of private utilization of testing and inspection services<br>• Formulation of job training plan (including equipping of materials and equipment and engagement of experts) | • Promotion of private utilization of testing and inspection services<br>• Formulation of job training plans (including equipping of materials and equipment and engagement of experts) |
| • Strengthening of information collection and supply system (cooperation with DEP)<br>• Publication of information journal | • Collection and accumulation of technical information and promotion of use thereof | • Collection of technical and market information and promotion of active use thereof |
| | • Seminars and work shops on weaving, dyeing, finishing, etc. (same as first stage ) | • Sponsoring of seminars and work shops on export markets, production control, etc. for garments (same as first stage )<br>• Sponsoring of seminars on designs and brands (cooperation with DEP) |

[Plan in Detail - 3] (continued)

| Common Sector | Textile Sector | Garment Sector |
|---|---|---|
| **Third stage**<br>• Full-scale implementation of fee-basis system (testing and inspection, information, training, etc.) | • Equipping of training materials and equipment (looms, computers, etc.)<br>• Engagement of experts for training (weaving, dyeing, etc.)<br>• Start of job training<br>• Start of technical guidance and roving guidance to private companies | • Equipping of training materials and equipment (sewing machines, computers, etc.)<br>• Engagement of experts for training (garment production control)<br>• Start of job training<br>• Strengthening of training, seminars, etc. in local regions<br>• Start of technical guidance and roving guidance to private companies |
| **Fourth stage**<br>• Expansion of independent revenue sources<br>• Augmentation of service functions and expansion of services in local regions<br>• Replacement and strengthening of materials and equipment<br>• Securing of instructors<br>• Full-scale start of research and development activities etc. | | |

[Plan in Detail - 4]

## Proposed Equipment List for the Textile Sector of TID

| Machine Name | Ranking |
|---|---|
| * Draw Texturing Machine<br>No. 333 (24sp.) | B |
| * Stretch Breaking Machine for wool, silk or linen<br>OM SILVER REACTER Mdel TR-C5 | C |
| * Splicing Knotless Automatic Cone Winder<br>MINI No. 7 R-II (1sp.) | B |
| * Sizing System for filament yarn<br>• Waper: FILAWARPER 450SS<br>• Waper's Beam: FILAWARPER BEAM (6pcs)<br>• Sizer: FILAMASTER EXPERT (1set)<br>• Prebeam: FILAMASTER BEAM (25pcs)<br>• Beamer: FILA BEAMER (1set)<br>• Preparatory Tanks | A |
| * Air Jet Loom<br>• Air Guid System<br>• Profile Reed type | <br>B<br>B |
| * Water Jet Loom with Dobby 2 nozzle<br>ZW 302 | B |
| * Weaving Control Management System<br>• Computer Monitoring Network System<br>DLM II-D | C, A |
| * Color Pattern Design System for dyed yarn<br>• Computer Design Work Station GD 1000 (1set) | C |
| * Package Dyeing Machine for Laboratory<br>• High Pressure High Temperature<br>HUHT-250/1250 (1set) | B |
| * Package Dyeing Machine for Laboratory<br>• High Pressure High Temperature<br>HUHT-250/1000 (1set) | B |
| * Hank Dyeing Machine for Laboratory<br>• SOFT-COLOUR HANK DYEING MACHINE SC-S-8 | B |
| * Spray Hank Dyeing Machine for Laboratory<br>NEW-RARE-N-HB (1 cylinder) | B |
| * Polyester Fiber Dyeing Machine for Laboratory<br>• High temperature & High Pressure Dyeing Machine DYEPET SUPER | B |
| * Box Dyeing Machine for Laboratory | B |
| * Jet Dyeing Machine for Polyester fabric for Laboratory<br>• High Temperature & High Pressure Dyeing<br>Machine 300 LVPH-M | B |
| * Computer Color Matching System<br>AUCOLOUR 10A | C |
| * Scanning Microscope<br>JSM-T330A | C |
| * X-ray Diffractometer System<br>JDX-8000 | C |

Ranking Remarks
A: Equipment recommended to be purchased with aid funds from other countries
B: Equipment recommended to use a method of kease or display or dispose by maker
C: Equipment for training or research

[Plan in Detail - 5]

## Draft Concept for Strengthening of Garment Sector by TID

1. Objects
   (1) The object is to provide support to garment manufacturers so as to enable them to timely adapt their production systems to the diversification of consumer preferences in the key markets. In particular, the object is to support the establishment of a production system by garment manufacturers aiming at exports to the small lot, diverse item markets.
   (2) Another object is to support the establishment of a production system by manufacturers aiming at improved nonprice competitiveness.

2. Details of Activities
   (1) Guidance in methods of utilizationof CAD systems
   (2) Guidance in production control technology in accordance with production items and lot sizes
   (3) Dissemination of knowledge on the performance, applications, special features, etc. of various garment producing equipment
   (4) Guidance on the use of computers for production planning, production control, and other work
   (5) Guidance and training of technicians for maintenance of equipment

3. Method of Activities
   (1) Training
   Plans will be made for training of employees of the garment manufacturers of the foreman class up and that training given at the TID. The instructors for the training will be trained from among the TID personnel. Foreign experts should be invited there for that purpose. In the training, the following courses of the following contents will be established. Separate courses, further, will be established for sewn garments and knitted garments.
   a) CAD
      - Lectures on the types, features, and methods of introduction of CAD system etc.
      - On-site training in preparing patterns, grading, and marking by CAD systems

   b) Production control
   - Lectures on process design in accordance with production items and lot sizes, methods of selection of effective equipment, calculation of efficacy of capital investment, layout, process control, schedule planning, and progressive control
   - Lectures on techniques of quality control
   - Lectures on estimates, control of prime costs, etc.
   - Lectures on types, applications, performances, special features, etc. of garment producing equipment
   - Practice in production planning, production control, etc. using personal computers

   c) Maintenance of equipment
   - Lectures on types, applications, performances, special features, etc. of garment producing equipment
   - Lectures on maintenance control techniques for equipment
   - On-site training in maintenance of key production equipment

   (2) Sponsoring of seminars
   Seminars of one to two days' length will be held on specific themes. Consideration will be given to drawing the seminar lecturers from among knowledgeable persons in the Thai garment industry, educational organizations, and government organizations and experts from different countries.

4. Utilization of Existing Buildings
   Space for the following four applications will be secured in the existing buildings of the TID and the necessary equipment and materials will be installed in those spaces:
   (1) Practice area for CAD system
   (2) Practice area for personal computers
   (3) Practice area for maintenance and repair of equipment
   (4) Classroom for 20 to 30 persons

5. Necessary Equipment and Materials

(1) CAD system for sewn garments
- Computer work stations (two to three sets)
- Digitizer
- Plotter
- Application programs (pattern preparation, grading, marking)

(2) CAD system for knitted garments

(3) Personal computers
- Computers and peripherals (five sets)
- Production control and other application programs

(4) Repair and maintenance equipment
- Various tools
- Work tables
- Garment equipment for practice in maintenance

6. Invitaion of Foreign Experts

Foreign experts should be invited to train the TID instructors and give guidance in the preparation of a training curriculum. The foreign experts will witnes the starting stage of implementation of the training courses and will assist the TID instructors at that time. The nature of the guidance, the number of persons dispatched, and the periods dispatched will be as follows:

| Nature of guidance | No. of experts | Total term |
|---|---|---|
| Operation of CAD system for sewn garments | 1 | 1 month |
| Operation of CAD system for knitting | 1 | 1 month |
| Repair and maintenance techniques for equipment | 1 | 3 months |
| Techniques of production planning and production control and knowledge on garment producing equipment | 1 | 12 months |

Further, foreign experts should be invited for short terms as seminar lecturers upon need.

7. Receipt of Trainees

The TID staff who will serve as instructors will be sent to foreign countries as trainees and given the necessary knowledge and guidance on technology. A summary of the program for the trainees is given below:

| Nature of guidance | No. of trainees | Term |
|---|---|---|
| Techniques of utilization of CAD systems for sewn garments and knitting | 2 | 3 months |
| Repair and maintenance techniques for equipment and knowledge on garment producing equipment | 1 | 3 months |
| Production planning and production control techniques and knowledge on garment producing equipment | 2 | 6 months |

**[Plan in Detail - 6]**

## Proposed List of Equipment for Garment Production Training Section in TID

| Machine name | | | Unit |
|---|---|---|---|
| <Machinery for garment production> | | | |
| OA machinery | Personal computer | | 10 |
| Machinery for production control | Production control system LEVEL3 | | 1 |
| Machinery for apparel designing | POS, POS terminal | | 5 |
| <Machinery for apparel made of woven fabric> | | | |
| Machinery for designing | Apparel CAD (Computer aided design) | | 1set |
| Cloth inspector | | | 1 |
| Cloth analyser | | Stepless speed variator | 1 |
| Spreading table, machinery | Spreading table | 1.8m x 15m | 2 |
| | Spreading machine | automatic | 1 |
| Cutting machine | Cutting table | 1.8m x 3.6m | 2 |
| | Cutting machine driven by electric motor with straight cutter | 6 inch | 5 |
| | | 7 inch | 5 |
| | | 8 inch | 5 |
| | Bandknife | 1.8m x 1.6m | 1 |
| | Die-cutting press | | 1 |
| Cloth-drills | | with heater | 2 |
| Fusing press | Rotary press | | 1 |
| Sewing machine for industrial use | 1-needle lockstitch machine | | 30 |
| | Overlock machine | | 30 |
| | Safety stitch machine | | 30 |
| | Bartacking machine | | 10 |
| | Zigzag lockstitch machine | | 3 |
| | 2-needle double chainstitch machine | | 3 |
| | Buttonholing machine | | 3 |
| | Edge control machine | | 2 |
| | Serging machine | | 2 |
| | Eyelet stitch button holing machine | | 1 |
| | Blind stitch machine | | 1 |
| | Lockstitch machine with built-in trimming device | | 1 |
| | 2-needle lockstitcher with organized split needle bak | | 1 |
| | Needle feed lockstitch machine | | 1 |
| | Covering stitch machine | | 1 |
| | 1 needle bottom & variable top feed lockstitch machine | | 1 |
| | 1 needle top & button feed lockstitch machine | | 1 |
| | 1 needle double chainstitch post-bed type machine | | 1 |
| | 1 needle double chainstitch machine | | 1 |
| | Automatic lockstitch welting machine | | 1 |
| | Post-type machine for sleeves | | 1 |
| | 1 needle chainstitch basting machine | | 1 |
| | 1 needle lockstitch post-bed type basting machine | | 1 |
| | 4 needle covering stitch machine | | 1 |
| Iron | Steam | | 20 |
| | Electric | | 10 |
| Vacuum finishing board | | | 30 |
| Press in process | Mini press | | 3 |
| Collar turning device | | | 3 |

**[Plan in Detail - 6] (continued)**

| Machine name | | | Unit |
|---|---|---|---|
| Name cutting and creasing device | | | 3 |
| Finishing press | Sleeve press | | 1 |
| | Collar press | | 1 |
| | front press | | 1 |
| | shoulder press | | 1 |
| | general utility press | | 1 |
| Folding machine | | | 1 |
| Bagging machine | | | 1 |
| Truck | | | 10 |
| Special work table for pair sit-work system | | | 30 |
| Special work table for pair stand-work system | | | 30 |
| Hanger system for products warehouse | | | 1 |
| Rack for warehouse | | | 10 |
| <Machinery for sewing knitted goods> | | | |
| CAD for knitting | | | 1 |
| Knitting machinery | Horizontal Knitting machine | gauge | 1 |
| | Horizontal manual knitting machine | | 10 |
| | Circular knitting machine | gauge | 1 |
| | Vertical knitting machine | gauge | 1 |
| Knitted croth inspector | for knitted fabric | 1.8m width | 1 |
| | for sweaters | | 1 |
| | for cut & sewn products | | 1 |
| Linking machine | straight type | | 5 |
| | dial type | | 20 |
| Sewing machine for industrial use | 1 needle lockstitch machine | | 30 |
| | 1 needle lockstitch machine with automatic thread trimmer | | 30 |
| | 1 needle 3 thread overlock machine | | 20 |
| | 2 needle 4 thread overlock machine | | 20 |
| Knitted goods, finishing machinery | Iron | | 10 |
| | Vacuum finishing board | | 10 |
| | Sweater for knitted goods | | 3 |
| | Finisher for knitwear | | 1 |
| <Utilities> | | | |
| Electric power | | | 1 set |
| Power distribution | | | 1 set |
| Boiler | | | 1 |
| Steam distribution | | | 1 set |
| Vacuum | | | 1 |
| Duct work | | | 1 set |
| Compressor | | | 1 set |
| Compressed air distribution | | | 1 |
| Water supply | | | 1 set |
| Waste water | | | 1 set |
| Air conditioning | | | 1 set |
| Lighting | | | 1 set |

Package of Measures [4]

Promotion of Exports of Garments and Improvement of Added Value

A string of export promotion measures for increasing garment exports should be implemented and also the price competitiveness and nonprice competitiveness of the products should be raised through improvement of quality, development of design capabilities, establishment of good brand images, establishment of sales channels, and improvement of the overall image of "Thai fashions". Toward this end, the Ministry of Commerce (DEP) should take the lead and the Ministry of Industry (TID) should cooperate with it for support activities, particularly for small and medium sized companies.

Program [4]

Promotion of Exports of Garments and Improvement of Image

The export promotion activities of the DEP for garments should be energetically promoted so as to get small and medium sized garment manufacturers to enter into the export field and to improve the image of Thai fashions. Toward this end, it would be effective to combine the activities with the training and information functions of the TID and to cooperate in activities for the expansion of exports and improvement of added value.

Export promotion activities considered effective for the DEP for the time being would include sponsoring of export promotion seminars for primarily small and medium garment companies (in particular regarding overseas markets and export channels), participation in overseas trade fairs aimed at small and medium sized manufacturers, sponsoring of overseas exhibitions, and dispatch of export promotion missions. Further, an international exhibition could be sponsored in Thailand for garments and purchasing missions from abroad should be accorded warm receptions. As a means for improving the image of Thai fashions, it would also be effective to obtain the cooperation of the Thai jewelry, silk product, and other industries and hold a "Thai Fashion Week" in major cities around the world.

Other activities of the DEP considered effective include cooperation with the TID for promotion of designs and brands. For this, consideration may be given to, for example, hosting seminars on designs and brands to create awareness in the garment industry of the importance of designs and brands and the hosting of design contests etc. to promote designers. Further, the establishment of a "fashion street" in Bangkok would be effective in the medium and long term in boosting the international image of Thai

fashions. The collection and dissemination of design information are also thought to be important future activities of the DEP and TID.

Package of Measures [5]

Formulation of Image of Future of Textile Industry as a Whole

To create a common concensus in the industry over the future of Thailand's textile industry, opinions should be exchanged with related agencies, industrial organizations, etc. and an image of the Thai textile industry (including garments) five and 10 years hence should be created and widely publicized.

Program [5]

Textile Industry "Vision"

It is essential to formulate an image of the future state of the textile industry so as to draft policies for Thailand's textile and garment industries. Toward this end, a committee comprised of related government agencies, industry representatives, and economists, etc., should be established to formulate the vision, with and the government sections in charge of the textile industry serving as the secretariat.

The vision which is formulated should be publicized, used, through PR activities, for creating a common awareness among the related persons in the industry, and used as the basis for textile industry policies.

## Table 7. Comprehensive Program (Textiles and Garments) (1/5)

| Package of Measures | Program | Implementation Method and Schedule | | | | |
|---|---|---|---|---|---|---|
| | | Method | 1st stage | 2nd stage | 3rd stage | 4th stage/on |
| Augmentation and modernization of garment material supply sector<br><br>- To meet with increase of facilities in upstream sector, augmentation and strengthening of midsteam sector in direction of expansion of ability to supply garment materials through establishment of necessary organizations and institutions and formulation and implementation of promotion measures | [1] Augmentation and strengthening of materials supply sector | | | | | |
| | Promotion of investment in weaving and knitting sector | | | | | |
| | - Temporary lifting of restrictions on facilities | Lifting of restrictions | O | O | | |
| | - Revival of application of BOI incentives | Encouragement of investment | O | O | | |
| | - Promotion of investment and joint ventures | Promotion of investment | O | O | O | |
| | Establishment of environment for investment in dyeing, printing, and finishing sector | | | | | |
| | - Activities to promote awareness of pollution caused by factory wastewater | Seminars | O | O | | |
| | - Feasibility studies on creation of industrial estate for dyeing (joint water supply and wastewater system) | Feasibility studies | O | | | |
| | - In the establishment of an industrial estate, designation of that estate as eligible for BOI incentives | Encouragement of investment | | O | O | O |
| | - Similarly, promotion of relocation of existing dyeing companies into estate and measures for encouragement of relocation (low interest government financing, tax abatement measures etc.) | Same as above | | O | O | O |
| | - Similarly, promotion of new investment | Encouragement of investment | | O | O | O |
| | Promotion of modernization of facilities in material supply sector (spinning, weaving and knitting, and dyeing sectors) | | | | | |
| | - Lifting of restrictions on facilities for the case of introduction of facilities aimed at improvement of quality | Elimination of restrictions | O | O | O | O |
| | - Temporary reduction or waiver of import duties on imports of such related facilities | Abatement of tariffs | O | O | O | |
| | - Similarly, temporary implementation of special financing system for introduction of such facilities | Special promotion | O | O | O | |
| | Promotion of converter function | | | | | |
| | - Activities to promote awareness of converter functions | Seminars | O | O | | |
| | - Promotion of investment by foreign companies (in particular, consideration given in issuance of visas) | Promotion of investment | O | O | O | O |

## Comprehensive Program (Textiles and Garments) (2/5)

| Package of Measures | Program | Implementation Method and Schedule | | | | |
|---|---|---|---|---|---|---|
| | | Method | 1st stage | 2nd stage | 3rd stage | 4th stage/on |
| | Stationing of policy advisors in TIDC | | | | | |
| | - Engagement of policy advisors | Engagement of experts | ○ | | | |
| | - Training of policy officers in industrial policies | Overseas training | ○ | ○ | | |
| Expansion of production capacity of garments and development of human resources (Promotion of small and medium sized companies and personnel training) | [2] Expansion and strengthening of garment industry | | | | | |
| | Augmentation of textile and garment courses in public vocational schools (training of engineers) | | | | | |
| | - Training of teachers | Overseas training | | | | |
| - Strengthening of vocational training so as to expand production capacity in garment sector. Further, stimulation of industry and expansion of supporting industries through promotion of small and medium sized companies and subcontractors | - Practice in production control in model factories (mentioned below) | Practice at factories | ○ | ○ | ○ | |
| | | | | | ○ | ○ |
| | Training program for "sewing workers and cutting workers" at institute of skill develpment | | | | | |
| | - Establishment and operation of "model factories" (in Bangkok and local region, each with 100 or so sewing machines and dormitories) | Establishment of model factories | | | ○ | ○ |
| | - Training of teachers and instructors | Overseas training | ○ | ○ | ○ | |
| | Promotion of small and medium sized companies and subcontractors | | | | | |
| | - Creation of industrial estate for sewing near above-mentioned "model factory" (one in local region) and provision of incentives to attract companies there | Promotion of investment | | | ○ | ○ |
| | - Application of SIFO institutional financing | Institutional financing | | | | |
| | - Temporary abatement of import tariffs on facilities | Abatement of tariffs | | | ○ | ○ |
| | - Implementation of public leasing system for facilities | Leasing system | | | ○ | ○ |
| | | | | | ○ | ○ |
| | Strengthening of OJT at companies | Engagement of experts | | | ○ | ○ |

## Comprehensive Program (Textiles and Garments) (3/5)

| Package of Measures | Program | Implementation Method and Schedule | | | | |
|---|---|---|---|---|---|---|
| | | Method | 1st stage | 2nd stage | 3rd stage | 4th stage/on |
| Augmentation and strengthening of training, testing, and information functions of government organizations<br>- In particular, selective strengthening and use of existing functions of government organizations for retraining of engineers and skilled workers in fields considered urgent, testing and inspection, information supply, etc. | [3] Enlargement, strengthening and use of TID | | | | | |
| | Strengthening of teaching abilities of TID staffers (strengthening of teaching abilities in textile fields aimed at higher level engineers of companies) | | | | | |
| | - Technical training of TID staff | Engagement of experts<br>Overseas training | ○<br>○ | ○<br>○ | ○<br>○ | |
| | - Provision of facilities for above training | Provision of materials and equipment | | | ○ | ○ |
| | - Training in production control at "model factories" (above mentioned) | On-site training | | | ○ | ○ |
| | Establishment of teaching functions in garment production field | | | | | |
| | - Technical training of TID staff | Engagment of experts<br>Overseas training | ○<br>○ | ○<br>○ | ○<br>○ | |
| | - Provision of facilities for above training | Provision of materials and equipment | | | | |
| | Sponsoring of seminars and work shops | Engagement of lecturers<br>Sponsoring of seminars | ○<br>○ | ○<br>○ | | |
| | Roving guidance to companies | Engagement of experts | | | ○ | ○ |
| | Augmentation of testing and inspection functions (tests, analysis, and inspection of quality of materials, products, etc.)<br>- Augmentation of testing and inspection facilities | Provision of materials and equipment | | ○ | ○ | |
| | - Training of testing and inspection personnel | Engagement of experts<br>Overseas training | <br>○ | ○<br>○ | ○ | |
| | Opening of testing and inspection facilities to public on a fee basis (along with guidance on testing and inspection methods by TID) | Private use of facilities | | ○ | ○ | ○ |

## Comprehensive Program (Textiles and Garments) (4/5)

| Package of Measures | Program | Implementation Method and Schedule | | | | |
|---|---|---|---|---|---|---|
| | | Method | 1st stage | 2nd stage | 3rd stage | 4th stage/on |
| | Strengthening of information functions | | | | | |
| | - Training of information staff | Engagement of experts | O | | | |
| | | Overseas training | O | | | |
| | - Publication of textile information journal (fee basis) (publishing results of tests and analysis etc.) | Publication of information journal | | O | O | O |
| | - Creation of cooperative system with DEP, industrial organizations, etc. | Consultations with related organizations | O | | | |
| | Introduction of principle of beneficiaries paying for services | | | | | |
| | - Establishment of fee-basis service system | Introduction of fee-basis services | | O | O | O |
| | - Stationing of organizational advisors | Engagement of experts | O | O | O | |
| Promotion of exports of garments and improvement of added value | [4] Promotion of exports of garments and improvement of image | | | | | |
| | Export promotion activities of DEP | | | | | |
| | - Export promotion seminars and market seminars | Sponsoring of seminars | | | | |
| - Expansion of exports of garments and further increase of added value and nonprice competitiveness through development of design capabilities, establishment of brand images, establishment of sales channels, and further improvement of image of Thai fashions through the cooperation and support of the Ministry of Commerce (DEP) and the Ministry of Industry (TID) | - Dispatch of export promotion missions | Dispatch of missions | O | O | | |
| | - Receipt of purchasing missions | Receipt of missions | O | O | O | O |
| | - Marketing surveys of key markets | Market surveys | O | O | O | O |
| | - Participation in overseas trade fairs and exhibitions | Participation in trade fairs | O | O | O | O |
| | - Sponsoring of Thai fashion week in key markets | Sponsoring of events | O | O | O | O |
| | - Sponsoring of export trade fair in Thailand | Sponsoring of trade fairs | | O | O | O |
| | | | | O | O | O |
| | Promotion of designs and brands (through cooperation of DEP/TID) | | | | | |
| | - Promotion of awareness importance of designs and brands | Sponsoring of seminars | | | | |
| | - Training of designers | Overseas training | O | O | | |
| | - Collection and supply of design information | Information service | O | O | O | O |
| | - Sponsoring of design contest | Sponsoring of events | | O | O | O |
| | - Creation of "fashion street" | Establishment of forum | | O | O | O |
| | | | | O | O | |

## Comprehensive Program (Textiles and Garments) (5/5)

| Package of Measures | Program | Implementation Method and Schedule | | | | |
|---|---|---|---|---|---|---|
| | | Method | 1st stage | 2nd stage | 3rd stage | 4th stage/on |
| Formulation of desired future image of textile industry<br>- Formation of common perception in industry as to future of Thai textile industry | [5] Textile industry "Vision" | | | | | |
| | - Active use of policy advisors (mentioned earlier) | Active use of experts | ○ | ○ | | |
| | - Creation of forum for exchange of opinions among related persons | Establishment of forum | ○ | ○ | | |
| | - PR activities for "vision" | PR activities | | ○ | ○ | |

### 3-1-3. Examination of Priorities of Programs

The priorities of the programs in the textile and garment sectors were studied based on the standards of evaluation shown in Table 9.

The program for augmentation and strengthening of the materials supply sector of [1] includes numerous measures realizable by institutional means such as the lifting off restrictions on facilities, the application of BOI incentives, and the abatement of duties and therefore could be quickly realized through political judgement and action, it is believed. This is further judged to be highly urgent in view of the expansion of the upstream sector.

The augmentation of the dyeing, printing, and finishing sectors has as a prerequisite measures to deal with the problems of water supply and wastewater, so a feasibility study should be run as quickly as possible on the establishment of an industrial estate for the dyeing sector. The augmentation of these sectors is urgent and important for the growth of the Thai garment industry. IIf one considers the feasibility study and the ensuing construction and promotion of investment there by companies, at the very least the feasibility study should be commenced immediately.

Note that in planning the industrial estate for dyeing, there should be room for consideration of a larger scale estate including other industries with similar water supply and wastewater problems.

The program for promotion of converter functions must be run in parallel with the publicization among domestic distributors and related businesses and the transfer of soft technology (knowhow) from foreign businesse and must be run with a medium and long term perspective. It should be understood that there are no means available having immediate effect.

In realizing this array of programs, the engagement of a policy advisor having experience in textile industry policies for a one year period would be very effective. At the same time, it is urgent to establish a section in charge of drafting and realizing the future textile industry policies and train the staff to man it.

The augmentation and strengthening of the garment industry of [2] is a program developed after consideration of numerous factors such as global trade friction, changes in exchange rates, relocation of production centers, etc. plus the rapid rise in garment exports from Thailand, the existence of a surplus labor force in the local regions of Thailand, and the need for promotion of local industry. In view of these factors, the program is expected to have numerous, immediate effects, such as:

- the maximum use of changes for expansion of exports
- a direct tie-in between the use of the surplus labor force (in particular in the local regions) and expanded exports
- local dispersion of industry
- the general raising of the level of skills among workers.

This program is judged to be extremely realistic and realizable in terms of the medium and long term development of the garment industry and the resolution of problems in the national economy.

The program for establishment of model sewing factories in the Institute for Skill Development is aimed at quickly training skilled sewing, cutting, and other workers and at the same time training engineers for production control and process control. Production control and process control technology is a field which the many small and medium sized companies which have entered the export field must quickly master. The use of such model factories for the technical training at vocational schools and the TID would, it is believed, be tremendously effective.

The biggest obstacle to this program is probably the securing of the required instructors. In this regard, there is no choice be to deal with the problem by assembly manpower from a wide spectrum of society, including skilled workers and engineers who have already accumulated considerable experience in private companies.

The augmentation, strengthening, and use of the TID of [3] is judged to be another urgent and important program in view of the the rapid growth of both the Thai textile and garment industries and the low degree of maturity of their technology and knowhow. At that time, it will be absolutely necessary in view of the manner of development of the Thai textile industry to introduce the principle of the beneficiaries paying for services, even if support can be expected from the outside for the time being. The provision of the services desired by the private companies and the request for them to bear the expenses of the same are essential for invigorating this organization.

In augmenting the TID in this way, it would probably be effective and necessary to engage for a period of three years or so an organizational advisor with experience in running this type of organization.

The promotion of garment exports and the improvement of image of [4] is also an important program. In this regard, the DEP already has considerable experience and has sufficient abilities in planning and execution, it is judged. The problem lies in deepening the understanding among the related agencies and industries of the necessity of raising the

added value of garments and improving the image of Thai fashions. If this can be achieved, then the realization of the program should not be that difficult.

The textile industry "vision" of [5] is a means for encouraging industry to develop in a desired direction while loosening government controls. If it were possible to create a "certain degree" of a common image among related agencies and industries of the Thai textile industry five to 10 years from now, a very effective foundation would be laid for realization of industrial policies, the activities of public service organizations, and cooperation between government and the private sector. However, the "vision" should be formulated through a concensus of the related parties and thus should not be hurried.

## Table 8. Examination of Priorities of Programs (Textiles and Garments)

| | Program | Existence of official promotional organization | Necessity for augmentation or establishment of same | Size of required funds | Possibility of securement of required personnel | Magnitude of direct effects | Urgency of implementation of program | Necessity of outside support | Possibility of realization of support | Evaluation of priority |
|---|---|---|---|---|---|---|---|---|---|---|
| [1] | Augmentation and strengthening of materials supply sector of garments | No (industrial estate for dyeing) | Establishment needed (industrial estate for dyeing) | Large (industrial estate for dyeing) | High (policy advisors) | Large | High | Large (feasibility study for industrial estate for dyeing) | High (policy advisors, feasibility study) | A |
| [2] | Expansion and strengthening of garment industry | No | Establishment needed (training center, TID) | Moderate (training center, TID) | Moderate (instructors) | Large | High | Large | Moderate degree (partial) | A |
| [3] | Enlargement, strengthening, and use of TID | Yes (TID) | Augmentation (training, inspection, and information functions) | Large | Moderate degree (instructors) | Large | High | Large | Moderate degree (partial) | A |
| [4] | Promotion of exports of garments and improvement of image | Yes (DEP) | Augmentation | Small | Not particularly required | Moderate degree | Moderate degree | Moderate | Moderate degree (partial) | B |
| [5] | Textile industry vision | Yes (TIDC) | Establishment of committee | Small | High (policy advisors) | Large in medium and log term | Moderate degree | Small (not particularly required) | | B |

## 3-2. Wooden Furniture Industry

### 3-2-1. Basic Strategy

As the basic strategy for the development and expansion of the wooden furniture industry of Thailand, consideration may be given to the following framework of measures:

(1) Since it is no longer possible to harvest domestic wood resources, except from the rubber tree, securing of a stable supply of logs and lumber should be stressed as a basic policy for the survival of the wooden furniture industry. Toward this end, the maintenance of smooth economic and trade ties with nearby countries and the promotion of investment by Thai companies (in particular lumber companies) in nearby countries as much as possible so as to secure imports of logs and lumber will be essential. Further, promotion of research and development in technology for creating lumber from domestic rubber trees, improvement of the quality of parawood, and standardization of quality will be important. The government should do the most it can in this regard.

(2) For the most effective utilization of the limited supply of wood resources, it will be necessary to maximum the degree of processing and added value of wooden products. Conversely, exports of wood products with low degrees of processing should be suppressed. There is a considerable margin for raising the degree of processing and added value of export-oriented wooden furniture and therefore means should be devised for promoting this throughout the large corporations and the small and medium sized companies. In this regard, promotion of joint ventures and technical tieups with foreign companies which have advanced technology and sales capabilities would be effective.

(3) In promoting the export-oriented wooden furniture industry, it will be essential to raise the level of the small and medium sized companies - both those companies which have begun exports and those which have not. Toward this end, it will be necessary to improve the conditions under which these small and medium sized companies procure logs and lumber and to promote the modernization of the facilities of these small and medium sized companies and further to raise their design and processing skills. For this, promotion of joint ventures and tieups with foreign companies and also strengthening and use of the job training functions of the FIDC would be effective.

(4) The FIDC, along with this basic strategy, should strengthen its functions, in particular its training in design and processing technology, guidance, testing and

inspection of products, and collection and dissemination of information and further should strengthen its services to private companies (in particular small and medium sized wooden furniture manufacturers) through the introduction of the principle of the beneficiaries paying for services. Further, apart from the above, research and development of technology for processing parawood for wooden furniture use should be promoted through cooperation with related organizations.

### 3-2-2. Comprehensive Program

Package of Measures [1]

Augmentation and Strengthening of Job Training, Inspection, Information, and Research and Development Functions of Government Organizations

In particular, with the aim of raising the degree of processing and added value of small and medium sized furniture manufacturers, the service functions of the Furniture Industry Development Center (FIDC), the existing promotional organization in the ISI of the Ministry of Industry, should be strengthened and put to good use. As the service functions, stress should be placed on job training, product testing and inspection, and dissemination of information. Further, the principle of the beneficiaries paying for the services should be introduced so as to invigorate the organization. In addition, research and development should be carried out on the technology for production of parawood from felled rubber trees, in particular with the aim of improving the quality of furniture materials.

Program [1]

Augmentation and Strengthening of FIDC

To finance the strengthening of the functions of the FIDC, the prerequisite is the introduction of the principle of the beneficiaries paying for services and, through this, the revitalization of the organization. In this regard, it will be necessary to establish and put into practice a fee-basis system for the training, testing, and information services and further to establish a system of cooperation with the furniture industry association. For the formulation and realization of such systems, proposal would like to be made of the engagement of an organizational specialist for about one year (for reference: Plan in Detail - 1).

As the service functions of the FIDC, it will be first of all important to improve and put to use the job training function. This will require the training of instructors through overseas training of FIDC staff and engagement of experts. Along with this, the FIDC's training equipment will have to be replaced or augmented. (For the equipment presently owned by the FIDC, see Table III-2-1 and Table III-2-2.For equipment which requires additions, refer to Plan(s) in Detail 2 and 3.) Further, regarding job training at the FIDC, consideration should be given to use of engineers from the private sector so as to make up for the shortage of instructors.

Similarly, the testing and testing function should be improved and put to use. In this regard too, augmentation of testing equipment and training of testers will be needed.

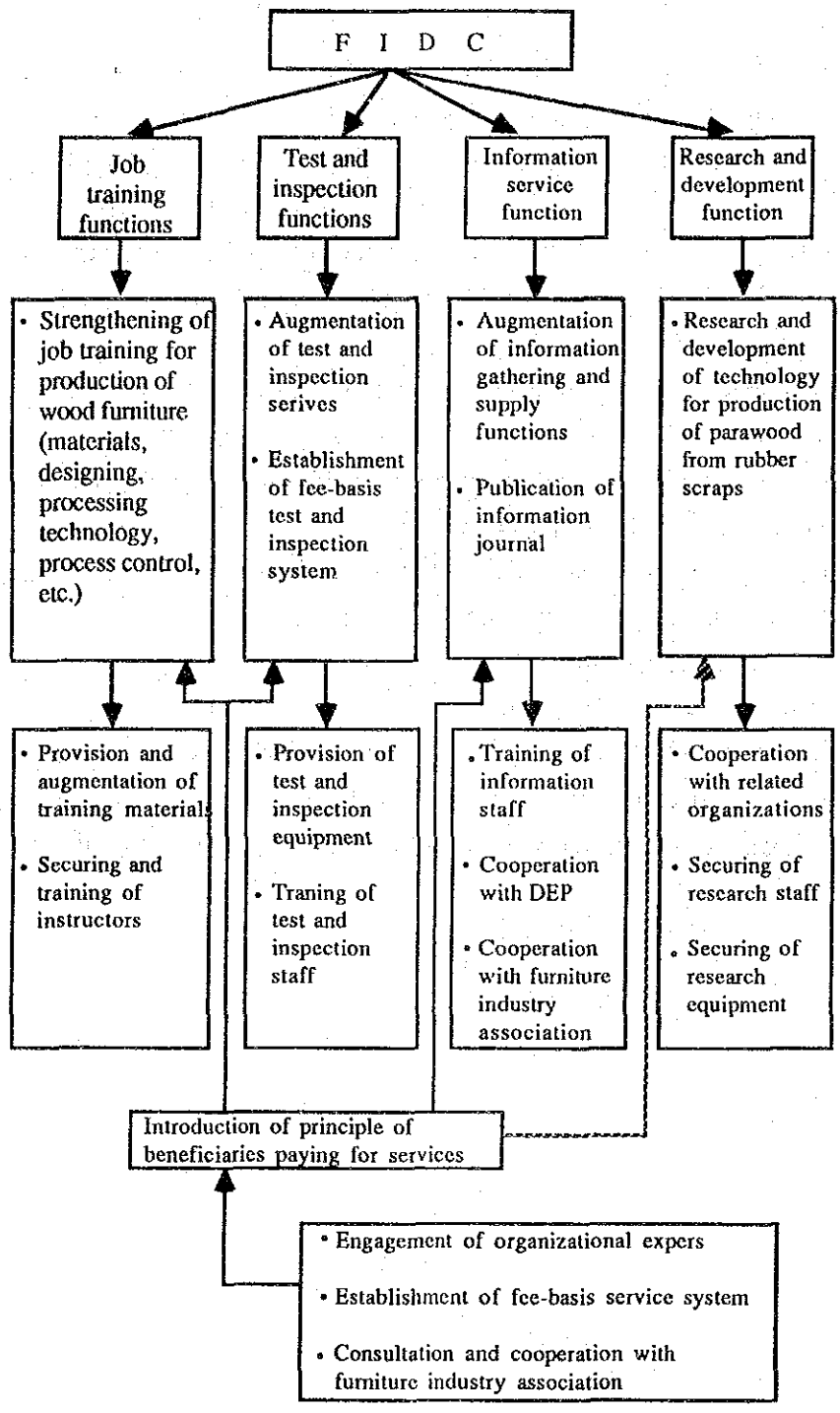
Dispatch of staff overseas for training or engagement of outside experts would again be necessary for this.

Among the functions of the FIDC, stress should also be laid on the information function. Strengthening of the collection and dissemination of information is necessary not only for raising the technical level of the industry, but also for strengthening of product development and marketing etc. Publication of a furniture information journal could be an effective means for such an information service. Stronger cooperation with the DEP and industrial organizations would also be important for strengthening the information activities.

In relation to the training, testing, and information functions mentioned above, the FIDC would find it effective to host seminars, work shops, etc. for private companies. More specifically, these could be run on the themes of production technology for wooden furniture, designing, the overseas furniture markets, etc.

Also, as another function of the FIDC, proposal would like to be made of research and development of the technology for production of parawood from rubber trees. In this regard, a cooperative relationship with related organizations with past experience in this is considered essential, but from the viewpoint of the furniture manufacturers of the need for a stable supply of good quality materials, the FIDC could take the lead in research and development, obtaining cooperation from the furniture industry associations and furniture manufacturers, and make public announcement of its findings so as to promote progress in the industry as a whole.

## Chart 12. Program of Augmentation and Strengthening of FIDC



**[Plan in Detail - 1]**

**Draft Step-by-Step Schedule for Augmentation and Strengthening of FIDC**

| FIDC | Related Organizations |
|---|---|
| **First stage**<br>• Engagement of organizational and project advisors<br>• Preparation draft of plan for augmentation and strengthening<br>• Overseas training of FIDC staff (technical guidance personnel, inspection personnel, and information staff)<br>• Preparation of detailed draft for introduction of principle of beneficiaries paying for services (fee-basis service system)<br>• Sponsoring of seminars and work shops on overseas furniture markets, production technology, industrial and aesthetic design, etc.<br>• Examination and deliberations of cooperative system, basic plans, etc. relating to research and development of parawood production technology | • Deliberations with furniture industry association<br>• Deliberations with furniture industry association<br>• Seeking of cooperation from DEP and furniture industry association and seeking of participation of private small and medium sized companies<br>• Exchange of opinions and deliberations with furniture industry association, Royal Forest Department, etc.<br>(• Export promotion activities of the DEP) |
| **Second stage**<br>• Equipping of testing and inspection materials and equipment<br>• Open to public testing and inspection functions on fee basis<br>• Publication of furniture information journal (fee basis)<br>• Sponsoring of seminars and work shops on overseas furniture markets, production technology, industrial; and aesthetic design, etc. | • Establishment of cooperative system with furniture industry association, DEP, Royal Forest Department, etc. regarding testing and inspection services and information service<br>(• Promotion of joint operations of small and medium size companies)<br>(• Promotion of tieups and joint ventures with foreign companies)<br>(• Continuation of export promotion activities of DEP) |
| **Third stage**<br>• Augmentation and equipping of training and guidance materials and equipment<br>• Sponsoring of training and work shops on fee basis<br>• Start of roving guidance to companies<br>• Equipping of materials and equipment and securement of staff for research and development of parawood production technology<br>• Start of same research and development activities | • Strengthening of cooperative system with furniture industry association<br>• Same as above<br>• Cooperation of related organizations and furniture industry association |

[Plan in Detail - 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 | Pararubberwood<br>25-50mm thickness<br>50-75mm width<br>1500mm length (max.) |
| | Bending angle | Single, as smaller as possible |
| Finger jointing equipment | Micro-computer controlled length-cut system<br>Handling stock 15-50mm thick, 30-220mm wide and 200-2,000mm long.<br>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,<br>250 (Z Axis)mm |
| Electrostatic spray set | Kind of paint | General paint<br>(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<br>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<br>Main body dimensions (WxDxH)<br>4,000Wx2,000 (Water tank 1,500)Dx2,565mmH | |

[Plan in Detail - 3]

## Additional Testing Equipment Required at FIDC

| Equipment | Specifications | |
|---|---|---|
| Equipment for temperature and humidity control room | Room No. 1 (condition test)<br>Test condition<br>Test period<br>Room No. 2 (condition control)<br>Test condition<br>Test period | 3m(W)x 5m(D) x 4m(H)<br>25°C, 65% RH (Constant)<br>7 days<br>2m(W) x 3m(D) x 4m(H)<br>15-60°C, 30-95% RH (Adjustable)<br>3 days |
| Elastic loop dynamo meter (Load calibrator) | Max. cap.<br>Min. cap. | 150Kg<br>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<br>Straightness accuracy | 1-30mm<br>0.5micron/30mm |
| Rockwell hardness tester | Minor load<br>Major load<br>Vertical gap<br>Horizontal reach | 10Kg<br>60,100,150Kg<br>200mm<br>135mm |
| Computer aid design (CAD) | 1set | |
| Weather meter | Light source<br>Temperature<br>Humidity | 6KW water-cooled xeanon long-life arc lamp<br>Room temp. +15~60°C<br>30~60%RH (at 40°C) |
| Wood cutting torque and speed measuring machine | For wood cutting experiment, ie.<br>Minimum piece size | Pararubberwood, monkey pot, etc.<br>30mm(W) x 10mm(T) x 200mm(L) |
| Universal testing machine (Tensile and compressive testing machine with recorder) | Load range<br>Effective distance between frames<br>Crosshead stroke | 1,000Kgf<br>420mm<br>1,100mm |
| Precision gas detector (Free formaldehide meter) | With Absorber<br>Detection tube Disposal type 1,000 pcs | |
| Gross meter | Measuring surface<br>Incident angle | 14x45mm<br>Light emitter (0-85°C)<br>Light-receiving element (0-85°C) |
| Profile projector (Universal projector) | Screen dia. | 350mm |
| Vibration testing machine | Max. loading weight<br>Direction of vibration<br>Vibration table | 150Kg<br>Vericall<br>1,000Wmmx1,000Dmm |
| Caster tester | Size<br>Running speed<br>Installation | Approx. 900Wmmx900Dmmx900Hmm<br>Approx. 800m/min<br>Approx. 1m |
| Scratch hardness tester (Fabric flex tester) | Load max. | 50gf |
| Taber abrasion tester | Revolution<br>Load | 60± 2rpm<br>250g, 500g, 1,000g |
| Equipment for chemical laboratory | Kind of analysis | Wood preservative substances<br>Lacquer, paint, stain and bleaching agents<br>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 | 30Wmmx220lmm |
| 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 |

Package of Measures [2]

Promotion of Small and Medium Sized Companies and Raising of Level of Same

The shortage in domestic wood resources has placed the small and medium sized wooden furniture manufacturers in a more difficult position than the large corporations in the procurement of materials. Further, the small and medium sized companies are suffering from the serious problems of out-dated equipment and a lack of specialized machinery. To improve the situation, measures should be devised through cooperation of the government and related organizations. In addition, there are problems in design and processing technology, but resolution of these problems should be left to the FIDC, as discussed earlier.

Program [2]

Raising of Level of Small and Medium Sized Companies

To raise the level of small and medium sized furniture manufacturers, first of all it will be important to secure stable supplies of wood. For this, government support is hoped for in areas such as the promotion of imports of logs and lumber from nearby countries and the promotion of the investment of lumber businesses in those nearby countries. Proposal would like to be made, as more specific means, of the joint import of wood by small and medium sized furniture manufacturers and the establishment of joint lumber mills and joint drying factories by the same. In relation to this, examination should be given to application of BOI incentives, access to institutional financing, etc. and these realized as much as possible.

Next, it will be important to replace and modernize the machinery and equipment of small and medium sized furniture manufacturers. In this regard, temporary abatement of import duties on related machinery and equipment, access to institutional financing, and the like would be effective

Package of Measures [3]

Improvement of Added Value and Degree of Processing and Export Promotion

Related government agencies should cooperate and provide support to improve the added value and degree of processing of exported wooden furniture and to increase exports. In particular, the functions of the Department of Commerce (DEP), BOI, and DIP (FIDC) should be combined and used so as to promote investment, the improvement of the level of production of small and medium sized furniture manufacturers, and the expansion of exports.

Program [3]

Promotion of Joint Ventures and Tieups and Promotion of Exports

For the promotion of investment, it would first of all be effective to promote joint ventures and tieups with foreign companies through the activities of the BOI and DEP. At that time, it is considered essential to provide sufficient information on the current state and future prospects of procurement of materials in Thailand. The dispatch and receipt of missions for this could also be expected to be effective. In particular, the promotion of technical tieups (including consignment production) with foreign furniture manufacturers would be an effective means for the time being for companies to enter into the export field.

For the promotion of exports, proposal is made of augmentation of the export promotion abilities of the DEP for furniture. In particular, for the small and medium sized furniture manufacturers and companies with little export experience, the participation in overseas furniture trade fairs, dispatch of export missions, and arrangement of tieups with foreign companies would be important. Further, sponsoring of furniture trade fairs in Bangkok, establishment of a standing exhibition center for furniture (costs borne by the beneficiaries), etc. could be effective means.

Package of Measures [4]

Development of Human Resources for Woodworking and Furniture Production

Woodworking related courses at vocational schools, job training centers, etc. should be augmented and tied in to improvements in the degree of processing and added value.

Program [4]

Augmentation of Vocational Education and Training

To realize the above-mentioned improvement in the degree of processing and added value (including for small and medium sized companies), the woodworking and furniture courses at the vocational schools and Institute for Skill Development (ISD) must be augmented. The prerequisite for this would be the securing of practical training functions at the educational and training institutions and securing of instructors for the same. In particular, use of experts in the private sector and active use of on-the-job training at the corporate level would be important.

Package of Measures [5]

Establishment of System for Stable Acquisition of Materials

A system should be established, through deliberation and cooperation among related government organizations and industry, so as to promote the stable acquisition of materials.

Program [5]

Measures for Securing Materials

To ensure stable imports of logs and lumber from nearby countries etc., friendly governmental relations should be maintained and investment of lumber businesses should be promoted in the nearby countries. Further, research and development of technology for the production of parawood for furniture use, through utilization of waste in the rubber industry, should be promoted through cooperation with the FIDC and related organizations.

## Table 9. Comprehensive Program (Wooden Furniture) (1/3)

| Package of Measures | Program | Implementation Method and Schedule | | | | |
|---|---|---|---|---|---|---|
| | | Method | 1st stage | 2nd stage | 3rd stage | 4th stage/on |
| Augmentation and strengthening of training, testing, information, and research and development functions of government organizations<br>- In particular, strengthening and use of functions of existing government organization, FIDC (Furniture Industry Development Center) in ISI of Ministry of Industry, aimed at raising degree of processing and added value of small and medium sized furniture manufacturers | [1] Augmentation and strengthening of FIDC | | | | | |
| | Strengthening of teaching abilities of FIDC staff (strengthening of teaching abilities aimed at higher level engineers of companies) | | | | | |
| | - Technical training of FIDC staff | Engagement of experts | | ○ | ○ | ○ |
| | | Overseas training | ○ | ○ | ○ | |
| | - Augmentation of facilities for above training | Provision of materials and equipment | | | ○ | ○ |
| | Sponsoring of seminars and work shops | Engagement of lecturers | ○ | ○ | | |
| | | Sponsoring of seminars | ○ | ○ | | |
| | Roving guidance to companies | Engagement of experts | | | ○ | ○ |
| | Augmentation of testing and inspection functions (tests, analysis, and inspection of quality) | | | | | |
| | - Equipping of testing and inspection facilities | Equipping of materials and equipment | | | ○ | ○ |
| | - Training of testing and inspection personnel | Engagement of experts | | ○ | ○ | ○ |
| | | Overseas training | ○ | ○ | | |
| | Opening of testing and inspection facilities to public on a fee basis (along with guidance on testing and inspection methods by FIDC) | Private use of facilities | | | ○ | ○ |
| | Research and development of parawood manufacturing technology | | | | | |
| | - Research and development project into chemical treatment technology through cooperation among FIDC, related organizations, and industry | Joint research | | ○ | ○ | ○ |
| | | Equipping of materials and equipment | | ○ | ○ | |
| | - Dissemination and joint utilization of results | Active use of results | ○ | ○ | ○ | |

## Comprehensive Program (Wooden Furniture) (2/3)

| Package of Measures | Program | Implementation Method and Schedule | | | | |
|---|---|---|---|---|---|---|
| | | Method | 1st stage | 2nd stage | 3rd stage | 4th stage/on |
| | Strengthening of information functions | | | | | |
| | - Training of information staff | Engagement of experts | ○ | | | |
| | | Overseas training | ○ | | | |
| | - Publication of furniture information journal (fee basis) (publishing results of tests and analysis etc.) | Publication of information journal | | ○ | ○ | ○ |
| | - Creation of cooperative system with DEP, industrial organizations, etc. | Consultations with related organizations | ○ | | | |
| | Introduction of principle of beneficiaries paying for services | | | | | |
| | - Establishment of fee-basis service system | Introduction of fee-basis services | | ○ | ○ | ○ |
| | - Stationing of organizational and business advisors | Engagement of experts | ○ | ○ | ○ | |
| Promotion and improvement of level of small and medium sized companies<br>- Expanding and stimulation of furniture industry through support measures for weak small and medium sized companies in the areas of securement of materials and facilities and improvement of the level of the same | [2] Raising of level of small and medium sized companies | | | | | |
| | Promotion of cooperative activities by small and medium sized furniture companies | | | | | |
| | - Joint purchasing of lumber | Joint purchasing | ○ | ○ | ○ | ○ |
| | - Establishment of joint lumber mills and joint drying facilities | Joint factories | | ○ | ○ | ○ |
| | - Application of BOI incentives to above | Encouragement of investment | | ○ | ○ | ○ |
| | - Application of SIFO institutional financing to above | Special financing | | ○ | ○ | ○ |
| | Promotion of modernization of facilities of small and medium sized furniture companies | | | | | |
| | - Temporary abatement of import duties on machinery and equipment | Abatement of tariffs | | ○ | ○ | ○ |
| | - Temporary implementation of special financing system | Special financing | | ○ | ○ | ○ |
| Improvement of added value and degree of processing and promotion of exports<br>- Improvement of added value and degree of processing of | [3] Promotion of joint ventures and tieups and promotion of exports | | | | | |
| | Promotion of tieups with foreign companies | Joint ventures and tieups | ○ | ○ | ○ | |

## Comprehensive Program (Wooden Furniture) (3/3)

| Package of Measures | Program | Implementation Method and Schedule | | | | |
|---|---|---|---|---|---|---|
| | | Method | 1st stage | 2nd stage | 3rd stage | 4th stage/on |
| exported wooden furniture and expansion of exports through cooperation and support by related government organizations | Export promotion activities of DEP | | | | | |
| | - Export promotion seminars and market seminars | Seminars | ○ | ○ | | |
| | - Dispatch of export promotion missions | Dispatch of missions | ○ | ○ | | |
| | - Receipt of purchasing missions | Receipt of missions | ○ | ○ | ○ | |
| | - Marketing surveys of key markets | Market surveys | ○ | ○ | ○ | |
| | - Participation in overseas trade fairs and exhibitions | Participation in trade fairs | ○ | ○ | ○ | ○ |
| | - Sponsoring of export furniture trade fair in Thailand | Sponsoring of trade fairs | | ○ | ○ | ○ |
| | - Establishment of standing exhibition of export furniture (introduction of system of beneficiaries paying for services) | Establishment of exhibition hall | | ○ | ○ | ○ |
| | FIDC information activities (mentioned above) | Publication of information journal | | ○ | ○ | ○ |
| Training of personnel in wooden furniture and furniture production<br>- Augmentation of woodworking related courses in vocational training schools etc. and tying in of same with improvement of degree of processing and added value | [4] Augmentation of vocational education and training | | | | | |
| | Augmentation of woodworking and furniture courses in public specialized schools (training of higher level engineers) | | | | | |
| | - Training of teachers | Overseas training | ○ | ○ | ○ | |
| | Augmentation of woodworking courses in institute of skill development | | | | | |
| | - Training of teachers | Overseas training | ○ | ○ | ○ | |
| | Strengthening of OJT in companies | Receipt of experts | | | ○ | ○ |
| Establishment of system for stable acquisition of materials | [5] Measures for securing | | | | | |
| | Measures for stabilization of imports of logs and lumber | | | | | |
| | - Political measures for stabilization of supply | | | | | |
| | - Promotion of investment of lumbering businesses in countries of supply | Promotion of corporate investment | ○ | ○ | ○ | ○ |
| | - Development of parawood manufacturing technology (mentioned before) | Joint research | | ○ | ○ | ○ |

### 3-2-3. Examination of Priorities of Programs

The priorities of the programs in the wooden furniture sector were studied based on the standards of evaluation shown in Table 10.

The program of augmentation and strengthening of the FIDC of [1] comprises primarily the augmentation of training and testing functions to raise the degree of processing and added value of products of small and medium sized furniture manufacturers. In promoting the development of the wooden furniture industry, which has limitations in the supply of raw materials, as an export industry, this program is judged extremely urgent and important for the reason that it is considered the only measure available.

In relation with this, the introduction of the principle of the beneficiaries paying for the services of the FIDC so as to place the services on a fee basis and the use of the revenue from the same for help in improving equipment and services are similarly important. It is considered that the FIDC cannot be revitalized without this being done.

Research and develoment of technology for the production of parawood, which is included in the FIDC program, should be promoted so as to focus on and accelerate the effective utilization of rubber trees, in particular improvements in furniture materials, an area which is already being developed by Thailand in view of the global problem of shrinking forest resources. This can be done by consigning research and development to suitable organizations or launching a joint research and development project among related organizations. There are several options available. Whatever is chosen, it will be important to give consideration to the needs of the furniture manufacturers and to maintain cooperative ties with related organizations with experience in the field.

In the medium and long term, technology for the utilization of rubber trees should be established and hopefully put to use on an international level.

The program of improvement of the level of small and medium sized companies of [2] is aimed at the improvement of the export capabilities of small and medium sized furniture manufacturers and particularly has as its objects the improvement of conditions of procurement of materials and promotion of modernization of facilities. Whatever the case, realization of this program is considered relatively easy through institutional means.

In particular, promotion of joint operations may not seem a method too suited to Thai industry by nature, but it has been proven to be effective in many cases for the development of small and medium sized companies in other countries. It is considered that there are full possibilities for it working well in Thailand as well depending on how it

is tailored to the local situation and how it is organized. If success can be achieved in even one case, this should have a ripple effect and causing similar "joint operations" around it.

The program of promotion of joint ventures and tieups of [3] hopefully will be effective in promoting the development of export markets by the small and medium sized companies. The designs of wooden furniture differ depending on the target market and for this reason alone it would be extremely effective for small and medium sized furniture manufacturers to have joint ventures or tieups with foreign companies in developing export markets. In parallel with this, effort should be made to "sell" Thai furniture around the world. The DEP should go one step beyond its previous stance of opening the door to exports and should pour effort into activities for the promotion of exports through parallel improvement of the degree of processing, added value, and image of Thai products.

The augmentation of vocational education and training of [4] aims at strengthening the development of human resources through the vocational schools and Institute for Skill Development. Woodworking will be an important field in Thailand for many years. The expansion of educational and training capabilities in that field, at the local level as well, would not be wasted, if only for the reason that it would be effective in raising the average level of job skills.

The support for securing materials of [5] means effectively maintenance of friendly relations with nearby countries and promotion of investment in those countries by related companies. The Thai government is already moving in that direction, so it is sufficient that this direction be maintained.

## Table 10. Examination of Priorities of Programs (Wooden Furniture)

| Program | Existence of official promotional organization | Necessity for augmentation or establishment of same | Size of required funds | Possibility of securement of required personnel | Magnitude of direct effects | Urgency of implementation of program | Necessity of outside support | Possibility of realization of support | Evaluation of priority |
|---|---|---|---|---|---|---|---|---|---|
| [1] Augmentation and strengthening of FIDC | | | | High (organizational advisors) | | | | | |
| • Training and testing | Yes | Augmentation | Large | Moderate degree | Large | High | High | Moderate degree (partial) | A |
| • Research and development of parawood | No | Establishment needed (development of furniture materials) | Large | Unknown | Large in medium and long term | Moderate degree | High | Moderate degree (partial) | A |
| [2] Raising of level of small and medium sized companies | Yes (FIDC) | | Moderate (cooperative operations) | Not particularly necessary | Large | Moderate degree | High (joint ventures and tieups) | High (joint ventures and tieups) | B |
| [3] Promotion of joint ventures and tieups and promotion of exports | Yes (BOI/DEP) | | Small | Not particularly necessary | Large | Moderate degree | High (joint ventures and tieups) | High (joint ventures and tieups) | B |
| [4] Augmentation of vocational education and training | Yes (vocational schools, training centers) | Augmentation | Large | Low (teachers and instructors) | Large in medium and long term | Moderate degree | Moderate degree | Moderate degree | B |
| [5] Measures for securing materials | | | Small | Not particularly necessary | Moderate degree | Moderate degree | Small (not particularly necessary) | | B |

# PART-I
# TEXTILE INDUSTRY

# PART-I. TEXTILE INDUSTRY

## 1. Industry Outline

According to NESDB statistics, the percentage of added value of the textile and garment industries in the total manufacturing industry output in Thailand is 11.8% or approximatley 34.7 billion baht for textiles and 15.5% or approximately 45.6 billion baht for garments.

The number of workers employed within the textile industry (includes garments, etc) has steadily increased despite a recession in the industry experienced during the latter half of the 1970s. During the 15-year period from 1972 to 1987 worker numbers increased by more than double, from 340,000 to 720,000 (by approximately 220,000 in the textile industry). It is estimated that textile workers account for more than 25% of the total work force engaged by Thailand's manufacturing industries.

The textile and garment industry has great influence on both the economy and society. In the words of one of the businessmen interviewed, it is a "policy industry". The Thai government has put into effect a number of policies concerning the industry which at times have been aimed at increasing equipment, while at other times it has imposed tight controls on the introduction of equipment.

As a result of such policies the development of the Thai textile industry can be divided into three periods: the period when etnerprises were fostered in order to make it an import substitution industry; and the period when the industry was developed and expanded in order to turn it into an export industry. Today, at a time when the focus of the industry is largely on the export of apparel the textile industry is experiencing a new period of transition.

(* The term textiles refers to yarn and fabric)

### 1-1. Production and Exports and Imports

#### 1-1-1. Production

A feature of the Thai textile industry is that its main raw materials are cotton and polyester and that short fiber spun and woven products account for a large share of the industry's output.

Despite various changes in government policy, the number of spindles and weaving looms in Thailand has continued to increase year by year. As shown in Table I-1-1, in 1987 there were 2.06 million spindles and 93,687 weaving looms. In May 1987

the increase in the export of textile products and domestic demand for yarn and fabric prompted the BOI and the Ministry of Industry to start accepting applications for permits for spindles and weaving looms in order to introduce new equipment and to increase existing levels of equipment. When the application period came to a close at the end of June, a further 1.59 million applications for permission to install spindles and 10,437 applications for weaving looms were received. Although it is unknown how many machines were actually introduced, one company interviewed during the survey estimated that some 700,000 spindles had been introduced. At the same time, there are companies which are concerned about surplus production in the future. A number of these were of the opinion that if so many permits are to be issued companies might as well be allowed to act freely in regard to increasing their equipment. Japanese affiliated companies and Thai companies held contrasting attitudes. Most of the former companies adopted the generally cautious attitude that rather than introducing new additional equipment it was better to replace old weaving looms in order to raise the quality of products. There were many Thai companies, however, which were more positive than Japanese affiliated companies and wanted to combine spinning with weaving due to the high cost of yarn.

As can be seen in Table I-1-1, spinning and weaving output in Thailand during the period from 1984-1987 increased substantially with a growth rate of 17.5% for cotton yarn, 10.1% for synthetic yarn, 13.3% for cotton cloth and 13.8% for synthetic cloth.

**Table I-1-1. Equipment and Production in the Thai Textile Industry, 1962-87**

| Year | Spinning equipment (1,000 spindles) | Weaving looms (no.) | Raw cotton yarn (1,000t.) | Cotton yarn (1,000t.) | Synthetic yarn (1,000t.) | Cotton fabrics (1 million square yards) | Synthetic fabrics (1 million square yards) | Total workers in textile industry (persons) | Garment workers (persons) |
|---|---|---|---|---|---|---|---|---|---|
| 1962 | 112 | 7,464 | | | | | | | |
| 1966 | 246 | 16,069 | | 24 | 1 | 251 | 43 | | |
| 1970 | 373 | 31,081 | 1 | 57 | 8 | 426 | 81 | | |
| 1975 | 1,094 | 53,797 | 39 | 71 | 65 | 558 | 338 | 432,119 | 315,212 |
| 1976 | 1,112 | 56,177 | 56 | 73 | 80 | 624 | 430 | 445,782 | 321,510 |
| 1977 | 1,129 | 57,536 | 78 | 94 | 96 | 684 | 446 | 457,290 | 327,643 |
| 1978 | 1,169 | 59,501 | 91 | 83 | 110 | 711 | 527 | 478,957 | 343,814 |
| 1979 | 1,301 | 63,203 | 98 | 90 | 115 | 732 | 596 | 503,311 | 360,235 |
| 1980 | 1,321 | 67,769 | 102 | 96 | 125 | 759 | 672 | 526,099 | 375,058 |
| 1981 | 1,548 | 70,674 | 113 | 97 | 135 | 786 | 723 | 539,228 | 378,919 |
| 1982 | 1,599 | 72,533 | 98 | 101 | 130 | 851 | 794 | 562,998 | 398,656 |
| 1983 | 1,786 | 77,215 | 114 | 110 | 142 | 886 | 847 | 577,153 | 404,615 |
| 1984 | 1,802 | 79,456 | 116 | 119 | 153 | 936 | 905 | 597,597 | 420,135 |
| 1985 | 1,937 | 79,612 | 127 | 131 | 161 | 984 | 971 | 622,616 | 437,982 |
| 1986 | 1,955 | 79,655 | 133 | 169 | 184 | 1,060 | 1,080 | 649,275 | 457,309 |
| 1987 | 2,068 | 93,687 | 140 | 193 | 204 | 1,360 | 1,332 | 722,499 | 506,076 |

Source: Thai Textile Manufacturing Association

### 1-1-2. Exports

(1) General Situation

Although the Thai textile industry started out as an import substitution industry, it had been expected to expand into an export industry.

Since 1975 the volume of cloth exported from Thailand has constantly exceeded the volume of cloth imported into the country. Synthetic cloth exports have been in the same position since 1974.

Up until 1980 the trade structure was one which centered mainly on textiles. However, a change has since taken place so that today the country's textile trade comprises mainly of garments. In 1987 garment exports accounted for 73.9% of total textile exports (refer to Table I-1-2). But the question remains as to what extent these garment exports will be supported, or can be supported, by the country's textiles.

In 1986 and 1987 cotton yarn exports increased sharply in value, and a similar trend has taken place in synthetic yarns since 1984, and cotton fabric since 1985. Among those interviewed there were some who were of the opinion that the increase in the export of yarn was one factor which has contributed to the increase in the price of yarn within Thailand (refer to Table I-1-2).

Within the Thai textile industry there is little linkage between the upper part and the lower part, so that the various parts have developed in their own separate ways. The supply of materials to the domestic garment industry is one major task facing the textile industry.

(2) Export Destinations

Thailand exports textiles mainly to the United States, Europe and the Middle East. Exports to Japan comprise as little as 3.6% of the country's total textile exports.

Countries such as the United States and European countries impose import quotas, thus limiting the extent to which the volume of exports to those countries can be increased. As a result, it is necessary to expand exports of items not subject to quotas, to increase the added value of current export items, and also to expand exports to countries such as Japan and the Middle East which do not impose quotas (refer to Table I-1-3).

It would seem from the interviews that measures for tackling this problem vary from company to company. While on the one hand there were some companies which are aiming to increase their market for standard items, on the other hand there were those which are aiming to expand their markets by developing items which are more distinctive.

There were many companies which pointed out the difficulty of breaking into the Japanese market. They all cited strict quality standards (including the difficulties involved

in meeting formalin regulations), the fact that orders are for small lots, and rigid demands in regard to price.

(3) Export Promotion

Among incentive measures adopted by the Thai government in order to promote the export of textile products are the exemption of import duties for raw materials used in the manufacture of export products and refunds on other duties. However, many pointed out that in the case of weaving, dyeing and other processes indirectly related to exports, there are few favors given to companies, even when directly exporting the products. This problem has occurred because of the time it takes for processing, and also because of the difficulty of supplementing most indirect exports.

This is a problem which is confronted by all companies which entered the industry during the import substitution period and is also faced when companies which make a priority of the domestic market begin to launch into exports. It is therefore necessary to examine measures to deal with this problem.

The approach taken in regard to the export of textiles varies from company to company. While there are companies which hope to expand the existing market for standard items, there are others which are developing products with their own distinct identity.

## Table I-1-2. Thai Textile Trade (Exports), 1976-87

(Unit: 1,000 baht)

| Year | Raw cotton | Man-made staple fiber | Cotton yarn | Cotton fabrics | Synthetic yarn | Synthetic fabrics | Knitted fabrics | Garments | % | Total exports | (Reference) Total imports |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1976 | 0 | 7,943 | 55,052 | 1,058,354 | 381,428 | 986,195 | 181 | 1,531,215 | 36.1 | 4,020,370 | 3,928,415 |
| 1977 | 6,962 | 108,880 | 160,617 | 982,196 | 458,400 | 1,190,015 | 0 | 1,693,313 | 36.8 | 4,600,386 | 4,616,415 |
| 1978 | 55,722 | 94,092 | 173,174 | 1,113,104 | 622,434 | 2,197,445 | 1,958 | 2,664,991 | 38.5 | 6,922,923 | 4,188,476 |
| 1979 | 27,796 | 62,945 | 83,555 | 1,392,433 | 691,639 | 2,968,914 | 314 | 3,577,212 | 40.6 | 6,804,811 | 5,237,691 |
| 1980 | 306,216 | 94,991 | 72,957 | 1,319,533 | 964,804 | 2,295,120 | 2,027 | 4,913,460 | 49.3 | 9,969,111 | 6,874,930 |
| 1981 | 188,245 | 90,054 | 106,216 | 1,117,045 | 1,079,122 | 3,184,375 | 9,730 | 7,037,569 | 54.9 | 12,812,360 | 7,575,964 |
| 1982 | 449,274 | 201,254 | 133,337 | 1,528,134 | 883,966 | 3,328,972 | 953 | 8,006,427 | 55.2 | 14,510,319 | 6,003,871 |
| 1983 | 85,319 | 166,129 | 119,094 | 1,304,390 | 851,319 | 3,038,784 | 1,040 | 8,865,838 | 61.4 | 14,431,915 | 8,292,537 |
| 1984 | 54,958 | 176,318 | 243,198 | 1,575,016 | 1,079,875 | 3,798,288 | 4,802 | 12,283,931 | 63.4 | 19,376,435 | 10,193,694 |
| 1985 | 77,979 | 309,747 | 593,834 | 2,092,001 | 1,548,471 | 4,310,165 | 6,474 | 14,734,315 | 61.7 | 23,875,950 | 10,191,807 |
| 1986 | 21,036 | 182,795 | 1,083,601 | 2,430,379 | 1,951,400 | 5,345,456 | 35,135 | 20,463,231 | 64.4 | 31,764,824 | 11,627,450 |
| 1987 | 3,762 | 245,303 | 1,675,450 | 3,439,208 | 1,878,101 | 5,214,329 | 80,069 | 36,349,350 | 73.9 | 49,204,517 | 18,160,515 |
| Growth rate (1977/87) | -5.97 | 8.46 | 26.43 | 13.35 | 15.15 | 15.92 | | 35.89 | 7.21 | 26.74 | 14.68 |

Source: Thai Textile Manufacturing Association
Note: Total textile exports includes the export of silk products. Imports include raw cotton.

## Table I-1-3. Total Textile Products (Export)

(Unit: 1 million baht)

| | 1982 | | 1983 | | 1984 | | 1985 | | 1986 | | 1987 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Denmark | 231 | 1.6 | 218 | 1.5 | 301 | 1.6 | 302 | 1.3 | 456 | 1.5 | 716 | 1.5 |
| France | 524 | 3.7 | 413 | 3.0 | 460 | 2.4 | 596 | 2.5 | 1,204 | 3.9 | 1,924 | 4.0 |
| W. Germany | 1,342 | 9.6 | 1,295 | 9.0 | 1,720 | 9.0 | 1,987 | 8.4 | 3,184 | 10.1 | 4,990 | 10.3 |
| Italy | 871 | 6.2 | 682 | 4.8 | 931 | 4.9 | 1,154 | 4.9 | 1,461 | 4.7 | 1,930 | 4.0 |
| Netherlands | 459 | 3.3 | 431 | 3.0 | 523 | 2.7 | 508 | 2.2 | 776 | 2.5 | 1,272 | 2.6 |
| Sweden | 295 | 8.1 | 293 | 2.0 | 312 | 1.6 | 317 | 1.3 | 429 | 1.4 | 475 | 1.0 |
| U.K. | 829 | 5.9 | 600 | 4.2 | 696 | 3.6 | 791 | 3.4 | 1,549 | 5.0 | 2,525 | 5.2 |
| Canada | 165 | 1.2 | 382 | 2.7 | 788 | 4.1 | 745 | 3.2 | 991 | 3.2 | 1,156 | 2.4 |
| U.S.A. | 2,649 | 18.9 | 3,931 | 27.4 | 8,857 | 35.8 | 7,659 | 32.5 | 6,443 | 20.6 | 9,548 | 19.7 |
| Australia | 208 | 1.5 | 368 | 2.6 | 0 | 2.8 | 537 | 2.3 | 857 | 2.7 | 1,100 | 2.3 |
| Japan | 618 | 4.4 | 494 | 3.4 | 563 | 2.9 | 453 | 1.9 | 612 | 2.0 | 1,562 | 3.2 |
| Malaysia | 278 | 2.0 | 213 | 1.5 | 218 | 1.1 | 182 | 0.8 | 308 | 1.0 | 432 | 0.9 |
| Philippines | 25 | 0.1 | 29 | 0.2 | 52 | 0.3 | 109 | 0.5 | 126 | 0.4 | 666 | 1.4 |
| Singapore | 891 | 6.4 | 776 | 5.4 | 771 | 4.0 | 1,157 | 4.9 | 1,569 | 5.0 | 2,316 | 4.8 |
| Indonesia | 176 | 1.3 | 34 | 0.2 | 81 | 0.4 | 50 | 0.2 | 53 | 0.2 | 27 | 0.1 |
| Hong Kong | 835 | 5.9 | 657 | 4.6 | 565 | 2.9 | 690 | 2.9 | 963 | 3.1 | 1,300 | 2.7 |
| Kuwait | 273 | 1.9 | 225 | 1.6 | 284 | 1.5 | 418 | 1.8 | 609 | 1.9 | 776 | 1.6 |
| Saudi Arabia | 719 | 5.1 | 663 | 4.6 | 645 | 3.4 | 1,106 | 4.7 | 2,127 | 6.8 | 3,871 | 8.0 |
| United A.E. | 569 | 4.0 | 747 | 5.2 | 588 | 3.1 | 1,104 | 4.2 | 1,672 | 5.3 | 2,715 | 5.6 |
| Laos | 136 | 6.0 | 200 | 1.4 | 53 | 0.3 | 107 | 0.5 | 122 | 0.4 | 93 | 0.2 |
| Bangladesh | 153 | 1.1 | 239 | 1.7 | 351 | 1.8 | 737 | 3.1 | 1,148 | 3.7 | 479 | 1.0 |
| Others | 1,759 | 12.6 | 1,443 | 10.1 | 1,892 | 9.9 | 2,969 | 12.6 | 4,629 | 14.8 | 8,676 | 17.9 |
| Total | 14,005 | 100.0 | 14,351 | 100.0 | 19,155 | 100.0 | 23,578 | 100.0 | 31,268 | 100.0 | 48.555 | 100.0 |

Source: Bank of Thailand statistics
(The statistics differ in places from TMA statistics)

### 1-1-3. Imports

(1) General Situation

Textiles account for the greater part of all Thailand's textile and garment imports, representing more than 90% of the total. This trend has continued for the past ten years (refer to Table I-1-4).

**Table I-1-4. Share of Textiles and Garments of the Total Exports and Imports**

| | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Exports | | | | | | | | | | |
| Textiles | 63.5 | 61.1 | 52.4 | 47.4 | 47.8 | 41.7 | 38.6 | 39.7 | 36.2 | 27.0 |
| Garments | 36.5 | 38.9 | 47.6 | 52.6 | 52.2 | 58.3 | 61.4 | 60.3 | 63.8 | 73.0 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 2. Imports | | | | | | | | | | |
| Textiles | 91.7 | 94.4 | 93.3 | 93.2 | 92.4 | 92.4 | 92.3 | 93.9 | 91.9 | 93.2 |
| Garments | 8.3 | 5.6 | 6.7 | 6.8 | 7.6 | 7.6 | 7.7 | 6.1 | 8.1 | 6.8 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Source: Thailand Trade Statistics

Dividing these imports into textiles and garments, since 1983 there has been a chronic excess of imports of textiles over exports. The three leading textile items in terms of import value are 1) textiles related to cotton products (includes cotton); 2) man-made fiber (discontinuous); and 3) materials related to man-made fiber (continuous). These three categories comprise 75% of total textile imports, and this trend has virtually remained unchanged for some time.

At the same time, these three types of textile products are very important for exports, and in 1987 they accounted for 84.7% of exports in terms of value. This trend has also become firmly established.

A breakdown of these three types of textiles is provided below:

1) Textiles related to cotton products:

Cotton (raw material) comprises 70% of all imports in this category, with cotton fabric imports accounting for about 20% and cotton yarn accounting for about 10%.

2) Man-made fiber (discontinuous):

Fabric, yarn, and fiber (raw material) account for the bulk of this type of textile imports. In 1987 they comprised 39%, 35% and 26% respectively of man-made fiber (discontinuous) imports.

3) Man-made fiber (continuous):

Fiber comprises approximately 70% of these imports, with yarn accounting for the remaining 30% or so.

(2) Origin of Imports

In general, with the exception of cotton, the main countries from which textile imports originate are China, Hong Kong, South Korea, Taiwan and Japan. A breakdown of the different types of textiles is as follows.

1) Cotton fiber

Cotton is mainly imported from Sudan, Pakistan, the United States, and China. The value of cotton imports has been steadily increasing since 1983. Cotton fabric is imported chiefly from Hong Kong, China, Japan, South Korea, and Taiwan.

2) Man-made fiber (discontinuous)

Man-made fiber (discontinuous) fabric is imported into Thailand from China, South Korea, and Malaysia, and yarn is imported from China, Taiwan, and Indonesia. The main countries exporting fiber to Thailand are Taiwan, Japan, the United States, and Malaysia.

In 1987 these imports were worth a total value of 15.06 billion baht (refer to Table I-1-5).

**Table I-1-5. Import of 3 Main Products Made from Cotton Fiber and Man-made Long Fiber**

(Unit: 1 million baht)

| | 1983 | 1984 | 1985 | 1986 | 1987 |
|---|---|---|---|---|---|
| Cotton products | | | | | |
| Cotton | 3,656 | 4,305 | 4,724 | 4,476 | 6,881 |
| Cotton fabrics | 666 | 801 | 759 | 850 | 1,811 |
| 1) Total | 4,322 | 5,106 | 5,483 | 5,326 | 8,692 |
| Man-made fiber (continuous) | | | | | |
| Long fiber | 315 | 256 | 220 | 423 | 747 |
| Long fiber fabrics | 1,281 | 1,415 | 1,275 | 1,323 | 1,566 |
| 2) Total | 1,596 | 1,671 | 1,495 | 1,746 | 2,313 |
| Man-made fiber (discontinuous) | | | | | |
| Fiber | 612 | 862 | 746 | 798 | 1,038 |
| Yarn | 430 | 450 | 319 | 714 | 1,419 |
| Fabrics | 477 | 768 | 696 | 1,064 | 1,597 |
| 3) Total | 1,519 | 2,080 | 1,761 | 2,576 | 4,054 |
| 1)+2)+3) | 7,437 | 8,857 | 8,739 | 9,648 | 15,059 |
| Percentage of imports | 74.2 | 78.0 | 76.1 | 73.8 | 74.5 |
| Total fabrics | 2,424 | 2,984 | 2,730 | 3,237 | 4,974 |

Source: Thailand Trade Statistics

### 1-1-4. The Relationship Between Exports and Imports

Since 1983 there has been an excess of textile imports over exports, and as has been mentioned above the larger part of this excess has been caused by a similarity between export products and imports in terms of the type of commodity traded.

In the case of raw material imports such as cotton, imports are unavoidable. However, there is a need to examine measures with regard to the import of fabric where exactly the same raw materials are used, and which is a major cause of this excess. As a means of redressing this situation of an excess of imports of materials, in addition to promoting exports it is necessary to examine whether it is possible to substitute these imported materials with domestic materials, and if so, to implement measures to promote this substitution.

In summarising the above, the trade structure for textiles and fabric in Thailand is one where in terms of textiles there is a surplus of imports over exports. This is being compensated for by garment exports, and Thailand is on the whole becoming a textile exporting country (refer to Fig. I-1-1).

**Fig. I-1-1. Thai Textile Trade**

o = Exports > Imports
x = Imports > Exports

| | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
|---|---|---|---|---|---|---|---|---|---|---|
| 50. Silk products | x | x | x | x | x | x | x | x | x | x |
| 51. Man-made fiber (continuous) | o | o | o | o | o | o | o | o | o | x |
| 52. Metallized yarn, etc. | x | x | x | x | x | x | x | x | x | x |
| 53. Animal fiber (wool, etc.) | x | x | x | x | x | x | x | x | x | x |
| 54. Vegetable fiber (ramie, linen, etc.) | x | x | x | x | x | x | x | x | x | x |
| 55. Cotton products | x | x | x | x | x | x | x | x | x | x |
| 56. Man-made fiber (discontinuous) | x | x | x | x | x | x | x | o | o | o |
| 57. Hemp (Manila hemp, jute, etc.) | o | o | o | o | o | o | o | o | o | o |
| 58. Carpet, etc. | x | x | x | x | o | x | x | x | x | x |
| 59. Fabrics made of other materials, etc. | o | o | o | x | x | x | x | x | x | x |
| Total material | o | o | o | x | o | x | x | x | x | x |
| 60. Knitted products | o | o | o | o | o | o | o | o | o | o |
| 61. Outer&inner productso (men's & women's) | | o | o | o | o | o | o | o | o | o |
| 62. Blanket, sheet, etc. | o | o | o | o | o | o | o | o | o | o |
| 63. Accesories | x | x | x | x | x | x | x | x | x | x |
| Total apparel | o | o | o | o | o | o | o | o | o | o |
| Material and apparel | o | o | o | o | o | o | o | o | o | o |

Compiled from Thai Trade Statistics

## 1-2. Structure of the Industry

Since 1962 when the Investment Promotion Act was introduced the Thai textile industry has achieved rapid growth. During the latter half of the 1950s the industry depended on domestic capital to a large extent and was mainly engaged in the spinning and weaving of cotton and the manufacture of knitted fabrics. At that time Thailand was a textile importing country.

When the Investment Promotion Act was enacted in 1962 with the object of developing an import substitution industry, a number of Japanese-Thai joint venture capital companies were established. It was during this period that companies such as Lucky Tex (Thailand) Co Ltd, Tokai Dyeing Co Ltd, Toray Nylon Thai Co Ltd, amd Thai Toray Textile Co Ltd (all of which are Japanese-Thai joint ventures) were established. The production of nylon started at this time, as was also synthetic spinning and weaving production.

This was followed in 1968 by the establishment of Teijin Polyester which saw the start of production of polyester raw cotton and the beginning of self-supply in regard to synthetic raw materials. Later on the Thai Melon Co also commenced production of polyester raw cotton, thus establishing a system for domestic self-supply of raw materials.

In 1973 the BOI gave approval for large-scale expansion of plant and equipment in order to turn the textile industry into an export industry from an import substitution industry. However, the worldwide recession brought about by the first oil crisis in 1973 also affected the textile industry, and combined with other factors such as the decline in border business the Thai textile industry suffered a large-scale recession. In a bid to overcome this slump the government took a number of measures, including a ban on the expansion of spinning and weaving equipment.

A major feature of this period in the 1970s was the withdrawal of Japanese companies and the shift over to Thai capital for Japanese companies in Thailand. This saw large Thai textile business groups funded by local capital assume an even greater role within the industry.

In the early 1980s when apparel exports overtook textiles as the leading export commodity, Japanese capital companies, although few in number, were once again seen setting up operations in Thailand, this time for the manufacture of apparel.

The textile industry is divided into three stages: stage one- raw material manufacture and spinning; stage two- weaving, dyeing and finishing ; and stage three- sewing. In the case of Thailand companies can be classified according to these different

stages into the groups described below.(This is based on "The Textile Industries of Developing Countries During the 1980s" by Professor Suehiro, The Institute of Developing Economies.

Group I (Large companies)

(1) Large companies which adopt integrated production systems starting with synthetic fiber manufacture (these possess all the processes required from the raw material stage through to the sewing of apparel); (2) four companies which have integrated production systems starting with spinning; and (3) synthetic fiber companies (three). This first group alone possesses 74% of the equipment capacity of the Thai textile industry, and it produces 100% of synthetic raw cotton and carries out 60% of total spinning.

Group II

This group comprises of both large spinning and fabric manufacturers, and as a result of the application of the Investment Promotion Act they are part joint venture and partly funded by local capital. (1) 13 companies engaged in a combination of weaving fabric and spinning; (2) 10 companies engaged in spinning; and (3) companies engaged in both weaving fabric and finishing.

Group III

This group comprises of small-scale manufacturers which produce cloth and also knitted fabric and also those involved in finishing. (1) 253 companies belonging to the The Thai Weaving Manufacturing Association (most of which are engaged in cloth and knit manufacture); (2) 428 small cloth companies; and (3) 429 workshops involved in finishing.

Group IV

This group comprises of small workshops which are involved in sewing.

[Note: These are based on 1979 figues as figures are not available for the present time. However, according to 1984 statistics it is estimated that in terms of the size of textile companies there were roughly 691 small-scale companies (10-49 employees), 310 medium-scale companies (50-199 employees), and 119 large companies (more than 200 employees)]

Belonging to an industry structured in this way, Thai textile manufacturers share two main features. Firstly, the closer to the first stage of production the smaller the number of companies involved in that type of production. Incidentally, it may be noted that there are three companies manfuacturing nylon FY, three polyester FY

manufacturers, two polyester POY manufacturers, two polyester SF manufacturers, and one manufacturer of rayon SF.

Secondly, each company favors vertical integration. (For instance, spinning companies want to manufacture fabric and fabric manufacturers want to undertake spinning). However, there are very few instances where the integration extends to the manufacture of apparel. Thus, one characteristic of the Thai textile industry is that the three stages have developed in parallel to one another. It may be noted that the Thai Textile Manufacturing Association, the most influential association within the industry, does not have an apparel division.

Another outstanding feature is that the first stage, in particular spinning, is concentrated among a number of specific company groups. As can be seen in Table I-1-6, 54% of all spinning is carried out by seven groups. These company groups maintain relations with companies within other groups, and those relations are extremely complex.

However, the production of a large proportion of raw materials and yarn by specific companies and specific groups suggests that the system is one in which a price monopoly is easily created.

**Table I-1-6. Number of Spindles and Weaving Looms per Business Group**

| Group name | Spindles | Weaving looms | Spindles (A/B) | Weaving looms (A/B) |
|---|---|---|---|---|
| 1. Sukree Group | 336,434 | 2,786 | 18.8 | 3.6 |
| 2. Saha Union | 271,320 | 4,779 | 15.2 | 6.2 |
| 3. Toray Group | 167,952 | 4,004 | 9.4 | 5.2 |
| 4. Teijin Group | 41,704 | 960 | 2.3 | 1.2 |
| 5. Marubeni Group | 67,428 | 1,900 | 3.7 | 2.5 |
| 6. Praman Group | 47,496 | 1,250 | 2.7 | 1.6 |
| 7. Indo Thai Group | 32,832 | 110 | 1.8 | 0.1 |
| | 100,720 | 1,631 | 5.7 | 2.1 |
| Total (A) | 965,166 | 15,789 | 54.0 | 20.4 |
| Number of equipments in Thailand as of 1983 (B) | 1,786,000 | 77,533 | | |

Data: Compiled from the report on the survey conducted on equipment in the Thai textile industry in 1983 (Japanese Chamber of Commerce).
Number of equipments is from TTMA.

## 1-3. Activities of Industry Groups

There are a number of industry groups within the textile and garment industry which have been formed to deal with specific areas of the industry. The groups are listed below in order of the year of establishment.

### (1) The Thai Weaving Manufacturing Association

The association was established in 1947 at a time when hand-operated looms were used, making it the oldest of all the textile organizations. The first automated looms were brought as samples into the country by the association from Japan and Hong Kong. Approximately 250 companies belong to the association, most of which tend to be small in scale.

### (2) The Thai Textile Manufacturing Association

The association was established in 1960. Although companies engaged in spinning, weaving, knitting, dyeing and finishing, printing and ginning, in other words, most of the textile manufacturing processes, belong to the association there is no division for garment companies. It is said to be the group with the most influence in the Thai textile industry. Among its members are foreign capital (joint venture) companies. A total of 75 companies belong to the association.

### (3) The Thai Silk Manufacturers' Association

The association was established in 1973 and as of 1979 it had 173 members. Its activities are very closely linked to other government related organizations. Its members include companies which are not classified as textile companies.

### *(4) The Thai Synthetic Manufacturers' Association*

The association was established in 1976. Its six members are manufacturers of synthetic raw materials in Thailand.

The associations listed above are recognized by the Trade Association Act. Under the terms of the Act their objectives are as follows: 1) to promote companies; 2) to conduct negotiations representating the interests of their members; 3) to provide information obtained from surveys; 4) to compile statistics; 5) to improve quality and to conduct research with the purpose of raising quality standards; 6) to cooperate with the government to promote the trade, finance and manufacturing industries; 7) to promote products on the domestic and overseas markets; 8) to maintain order within the industry;

and 9) to mediate in problems which may arise between members and between members and outsiders.

These associations all come under the Federation of Textile Associations. The Federation does not have an office of its own, and instead, representatives from the associations take turns in coordinating activities on a two-year rotational basis.

Seeing the objectives of these associations, it can be concluded that it is possible to carry out many activities aimed at promoting the industry through cooperation between the private sector and government-related organizations.

[Note: This federation counts the Garment Manufacturers' Association as a member. The federation consists of five associations.]

### 1-4. Problems and Countermeasures

The Thai textile industry is an important industry - what may be called a "policy industry".

This industry has gone through three periods: [1] a period of import substitution, [2] a period of development and expansion as an export industry, and [3] a period of conversion to apparel exports.

The companies which entered the field or grew during the period of import substitution only naturally produce items for domestic demand. Therefore, when entering into new export markets, they must change over their own management policies and tackle the development of new products.

For this reason, it is necessary to institute policies which would prevent any distortion from occurring between them and companies which benefit from the new export incentives.

The relationship between the midstream and the downstream sectors of the textile industry has already been discussed in Japan, the U.S., etc. Policies are being discussed which would create deeper linkage domestically. At the present time, when apparel exports have become the mainstream of exports, it is necessary for not only government authorities, but also the industrial organizations to deliberate among themselves on what kind of linkage should exist between the midstream and downstream sectors in Thailand and what measures should be taken with respect to export apparel and to take appropriate measures.

The export markets may be classified into quota markets and nonquota markets. For the former, exports of products with greater added value would be desirable. Therefore, product development and improvement would be required. It is necessary for

companies to learn what products are needed by these markets and to obtain information for producing the same. Further, stronger information activities on the part of textile related companies would be desirable. Regarding the latter, it would be necessary to cover a wide range of markets with quality-wise varieties of products. Research on the strategic aspects of exports, i.e., which markets the companies should select, will also be required.

Looking at the industrial structure, the further upstream one goes, the fewer the number of companies. This means a tendency for market dominance by a handful of companies in the area of supply of raw materials and the danger of establishment of monopolistic prices. This has a detrimental effect on not only export competitiveness, but also on the domestic price of textile products. Therefore, seen internationally, care should be taken that rational prices are formed.

Turning to industry activities, Thai textile organizations are allowed to engage in numerous industrial and export promotion activities according to their regulations. There is little exchange between industries and thus active exchanges between such organizations would be desirable. At the same time, active exchanges with the textile policy authorities would be desirable. This would not only be advantageous in the policymaking by textile authorities, but would also enable deeper understanding in areas of production technology.

## 2. Production Activities and Technology

### 2-1. Scope of the Survey

The textile industry is divided into three parts. These are: 1- the manufacture of the textile materials (or upstream, as it is called); 2- the manufacture of intermediate products such as yarn, woven fabrics and knitted fabrics (midstream); and 3- the garment manufacturing process for the end users (downstream). As this survey project focuses mainly on the midstream, cotton production, polyester staple fiber production, and also filament production are considered as belonging to the upstream and are therefore treated from the perspective of a supporting industry. Accordingly, the production of carpet, blankets, industrial materials, and non-woven fabrics, etc., is not dealt with.

Textiles are classified further into the following processing fields: spinning, weaving, knitting, and dyeing. The production systems used in these processes differ according to the form of the materials used. These are shown in Figure I-2-1.

Although markets like Japan's commodity transaction markets have not been established in Thailand, many kinds of standard articles are distributed and marketed in the industry. The production systems, machinery, and equipment used in the manufacture of standard products differ from those used in the manufacture of speciality products. This report is written in consideration of these factors.

The main standard products which appear in this report are:

Yarn: the many types of yarn include: C 20 (cotton yarn with a 20'S yarn count), C 30, C 40, T/C 34 (a blended yarn which is 65% polyester and 35% cotton, and has a 34'S yarn count), T/C 40, T/C 45, T/R 30/2 (a blended yarn which is 65% polyester and 35% rayon, and also a ply yarn with a 30'S yarn count), and T/R 40/2;

Fabric: Plain fabrics such as poplin and broad made using the types of standard yarn listed above, and which are identified according to the combined total number of threads in the warp and weft in the space of an inch (e.g. poplin with 186 ends). Other types of fabric also include twilled fabrics such as serge and gaberdine, tropical fabric which is made using textured yarn, and taffeta which is made using filament yarn.

The 21 companies which were interviewed as part of the survey have been classified according to the type of processes undertaken and according to whether or not they produce standard products. They are included in Table I-2-1.

Fig. I-2-1. Textile Manufacturing System

| Process | System | Main Products |
|---|---|---|
| Spinning | 2 inch less length staple fiber → cotton spinning system { ring system / open-end system } → cotton yarn, T/C*1, T/R*2, CVC*3<br>around 3 inch length staple fiber → worsted spinning system → worsted yarn<br>In addition, woolen spinning system (for woolen yarn), stretch-breaking system (for high balk yarn, silk spun yarn). | |
| Texturing | filament yarn → false twisting system<br>pre-oriented yarn (POY) → draw-texturing system | textured yarn |
| Weaving | { spun yarn / filament yarn / textured yarn } → { flying shuttle system / shuttleless system { jet loom { air / water } / rapier loom } } → { plane → poplin, broad, taffeta, tropical / twill → serge, gabardine / sateen / patterned }<br>In addition, there are the following classifications of loom styles according to the construction of the fabric: tapet system, dobby system, and jacquard system. | |
| Knitting | { spun yarn / filament yarn / textured yarn } → { circular knitting system / weft knitting system / warp knitting system } → { jersey / sweater / tricot, russel } | |
| Dyeing<br>Pretreatment → { designing / reducing for polyester fabric / bleaching }<br>Dyeing<br>yarn: { cone → package dyeing / hank → hank dyeing } → dyed yarn<br>fabric: { knitted goods / woven fabric } → { fabric dyeing { box dyeing / continuous dyeing } → dyed fabric / printing { screen printing / machine printing } → printed fabric }<br>Finishing | | |

*1: blended yarn made of polyester 65% and cotton 35%; *2: blended yarn made of polyester 65% and rayon 35%;
*3: cotton rich blended yarn

**Table I-2-1. Classifications of Companies Visited**

| | Standard Products | Speciality Products | Standard & Speciality |
|---|---|---|---|
| Spinning (according to the above definition for standard products) | | | |
| Total 8 companies | 5 | 2 | 1 |
| Weaving (dyed yarn weaving is included in speciality products, other according to above definition) | | | |
| Total 12 companies | 4 | 5 | 3 |
| Knitting (single & double jersey made from standard product yarn and textured polyester yarn are defined as standard products) | | | |
| Total 8 companies | 1 | 5 | 2 |
| Dyeing (classified according to materials) | | | |
| Total 12 companies | 5 | 5 | 2 |

Details of the companies which were visited are contained in Tables I-2-2, I-2-3, I-2-4 and I-2-5.

## Table I-2-2. Details of Companies Visited (Spinning)

| No. (Standard product) | S-1 (Standard) | S-2 (Special) | S-3 (Standard) | S-4 (Standard/Special) | S-5 | S-6 (Standard) | S-7 (Standard) | S-8 (Standard) | S-9 (Special) |
|---|---|---|---|---|---|---|---|---|---|
| Name of company | Nan Yang Textile Co. | Union Thread Industries Co. | Thai Kurabo Co. | Thai Toray Textile Mills Co. | | Luckytex (Thailand) | The Phiphatana-kit Textile Co. | Kangwal Weaving Factory | Thai Teijin Textiles |
| Lines of business | Spinning, knitting, dyeing | Spinning and dyeing | Spinning and weaving | Spinning, weaving, false twisting, knitting, dyeing | | Spinning, weaving, dyeing | Spinning and weaving | Spinning, yarn dyeing, weaving | Spinning, weaving, dyeing |
| Date of establishment | Scheduled April 1989 | | October 1968 | 1964 | | 1960 | 1948 | 1970 | 1965 |
| Capital | | | 75 MB | 60 MB | | 360 MB | 20 MB | | 70 MB |
| Equity composition | local | Thai (Saha Union affiliate) Japan | Thai (Mitsubishi Corporation Asia) 55% Japan (Kurabo) 45% | Thai 51.7% Japan (Toray) 49.6% | | Thai 51% Japan (none) 49% | local 100% | local 100% | Thai (Kiatti) 75% Japan (C. Itoh) 25% |
| No. of employees | | | 967 | 345 | | 3,237 (man-made fibers and dyeing) | 1,200 (man-made fibers) | 850 | |
| Equipment | 30,000 spindles | 30,000 3 inch spindles 30,000 T/C,C spindles | 32,032 spindles | 21,348 spindles | | 108,592 spindles (of which, OE 924 D) | 45,000 spindles OE 600 spindles combex | 40,000 | 41,704 spindles |
| Production capacity | 327 t/mon (converted to 36'S) | 110 t/mon | 366 t/mon | 320 t/mon (converted to T/R 30/2'S) | | 3.1 mil.lb/mon | 1.35 mil.lb/mon | 1.2 mil.lb/mon | 1.4 mil.lb/mon |

| No. | S-1 | S-2 | S-3 | S-4 | S-5 | S-6 | S-7 | S-8 | S-9 |
|---|---|---|---|---|---|---|---|---|---|
| Production items | Cotton yarn<br>T/C yarn | Acrylic HiBulk (for jacket) sweaters)<br>Acrylic ordinary yarn (for summer sweaters) | T/C 45'S<br>T/C 34'S 90%<br>C 10% | T/R 12'S ~ 40'S (Mainly 32/2'S)<br>T/R (K), T/R (B)<br>T/R(s)<br>T100, T0100 (acrylic)<br>Fancy yarn | | T/C 20'S ~ 50'S 930,000 lb/mon<br>C 16'S ~ 50'S 1,190,000 lb/mon<br>CVC 55/45<br>Ester 100% | T/C 45'S<br>C 10'S ~ 40'S | T/R<br>R<br>Acrylic<br>T/C | T/R 40/25, 30/2S (8'S ~ 50'S)<br>T/W (30 ~ 50)<br>T/linen, T/shilk<br>Man-made fiber ply-twisted yarn |
| Delivered to | Own knitting division | Own knitting division | Own weaving division<br>Domestic yarn sales 20 to 25% | Own weaving division | | Own weaving division | Own weaving division | Own weaving division and exports (Australia, Japan, Middle and Near East) | Own weaving division<br>Exports of 20 to 25% (300,000 to 350,000 lb/mon) |
| Materials used | Cotton 250 t/mon<br>Polyester 120 t/mon (Kanebo Synthetic) | Kanekalon Xlan High Bulk (Toyobo)<br>Tailinen (Taiwan)<br>Townflower (") | Thai cotton<br>Other cotton<br>Polyester (Teijin) | Polyester (Thai Teijin)<br>Rayon (Thai Rayon)<br>Acrylic (Japan Toray) | | Polyester (Teijin)<br>Cotton 10% domestic | Polyester (Thai Melon)<br>Cotton | Polyester<br>Rayon<br>Acrylic<br>Cotton | Polyester<br>Rayon<br>Wool<br>Silk<br>Linen |
| Plans for expansion | None | None | None | About 10% | | 5000 to 6000 spindles applied for | None | 45,000 spindles (ordered) | None |
| Japanese engineers | JODC (Takizawa) | JODC (Muto) | One | Permanently stationed<br>5.9 persons/bale<br>2000 lb/man-mon<br>DT 6 sets | | Permanently stationed | Previously one | One permanently stationed<br>All new types, able to spin up to 60'S, double twisting also possible, ring, DT, mach splicer | JODC 2 and permanently stationed<br>Wool and silk by 2" spinning |

## Table I-2-3. Details of Companies Visited (Weaving)

| No. (Standard product) | W-1 (Standard) | W-2 (Standard) | W-3 (Standard/Special) | W-4 (Standard) | W-5 (Special) | W-6 (Special) | W-7 (Special/Standard) | W-8 (Standard/Special) | W-9 (Special) |
|---|---|---|---|---|---|---|---|---|---|
| Name of company | (S-3) Thai Kurabo Co. | (S-4) Thai Toray Textile Mills Co. | (S-6) Luckytex | (S-7) The Phiphatanakit Textile Co. | Thai Etsusho Co. | Siam Synthetic Textile Industry | (S-9) Thai Teijin Textiles | Soon Heng Lee Textile | Siam Development Weaving |
| Lines of business | Spinning and weaving | Spinning, weaving, false twisting, knitting, and dyeing | Spinning, weaving, and dyeing | Spinning and weaving | Weaving | False twisting, weaving, and dyeing | Spinning, weaving, and dyeing | Dyeing and weaving | Weaving |
| Date of establishment | 1968 | Same as S-4 | Same as S-6 | Same as S-7 | 1972 | 1970 | Same as S-9 | 1948 | 1961 |
| Capital | Same as S-3 | " | " | " | 2 MB | 24.5 MB | " | | 10MB |
| Equity composition | " | " | " | " | Thai 75% Japan 25% | Thai 55% Japan (C. Itoh) 45% | " | local 100% | local 100% |
| No. of employees | 907 | 297 | | 1200 (including spinning) | 40 | 750 (including spinning) | " | 280 (including dyeing) | 200 |
| Equipment | Copchange 824 Air jet 5 | Shuttle looms 234 Rapier looms 84 | Shuttle looms 2,352 AJL 160 | Shuttle looms 500 | Looms 22 Fancy twister 1,370 | Looms 414 Of which, rapiers 78, WJL 4 | Shuttles 108, predyeing 3,500 bolts/mon Shuttles 276 (of shich rapiers 36) | Four color shuttles 300, of which, 200 for yarn dyeing | Copchange 314 Four color rapiers 35 |
| Production capacity | 2.5 mil.yd/mon | 1.1 mil.yd/mon | 8.4 mil yd/mon | | | 550,000 to 600,000 yd/mon | 16,000 bolts/mon | | 700,000 yd/mon |

| No. | W-1 | W-2 | W-3 | W-4 | W-5 | W-6 | W-7 | W-8 | W-9 |
|---|---|---|---|---|---|---|---|---|---|
| Production items | T/C broad | T/R poplin<br>Satin (58"~60") 20 ~ 30%<br>Fancy weave 10% | Shirt (186 poplin) 334 mil. yd/mon<br>Blouse (208 poplin) 43.7 mil. yd/mon<br>Denim 700,000 yd/mon | T/C, C poplin grey fabric | Curtain, bed cover, sofa cover, women's suit, skirt cloth | Organdy, texturized yarn weaves, crepe, georgette, palace | T/R (tropical, poplin, serge, shirting,) fancy dobby (Panama, tropical, shirkskin), total 16,000 bolts/mon, dyed weaves 3,500 bolts/mon | T/C warp-weft 45'S standard product, yarn dyeing looms 300,000 yd/mon | High quality color design weaves, stretch denim |
| Delivered to | Sanpeng | Sanpeng | Thai Garment | 60% Sanpeng<br>40% exported through trading companies | Sanpeng primary wholesalers | Almost all for domestic market | | Standard products for Sanpeng, yarn dyeing cloths exported for sarong use | Sanpeng |
| Domestic sale/export ratio | Domestic 55% (of which 60% indirectly exported)<br>Export 45% (of which 30% to Japan) | Export 40% to Middle and Near East | 80% domestic, of which 60% indirectly exported<br>20% export | Domestivc 60%<br>Export 40% | | | | To Middle East and Burma | Domestic 100% |
| Materials used | T/C 45'S<br>C<br>Own company | T/R<br>Own company | T/C yarn<br>C yarn (50'S)<br>100% polyester yarn<br>Own company | T/C yarn<br>C yarn<br>Own company | | Polyester fil. | Own company's spun yarn | T/C 45'S, 80,000 lb/mon<br>Ester texturized yarn 7000 lb/mon | T/C<br>T/R<br>C<br>Covering yarn |
| Plans for expansion | None | 10% | Expansion of 100 looms applied for | None | 250 looms | WJL 60 | None | None | 60 looms order, 240 applied for |
| Japanese engineers | Permanently stationed | Permanently stationed | Permanently stationed | Previously one | One director | Japanese supervision | Permanently stationed<br>Diverse small-run production function | None<br>100 looms installed last year, copchange | None |

## Table I-2-4. Details of Companies Visited (Weaving) (Knitting) (False Twisting)

| No. (Standard product) | W-10 (Special) | W-11 (Special) | W-12 (Standard) | K-1 (Special) | K-2 (Standard) | F-1 (Standard) | F-2 (Special) |
|---|---|---|---|---|---|---|---|
| Name of company | Jong Pattana Co. | Rachaburi Filament Textile | (S-8) Kangwal Weaving Factory | Nan Yang Knitting Factory Co. | (S-4) Thai Toray Textile Mills Co. | (S-4) Thai Toray Textile Mills Co. | (W-6) Siam Synthetic Textile Industry |
| Lines of business | Weaving | Weaving | Spinning, weaving, and yarn dyeing | Spinning, knitting, and dyeing | Spinning, weaving, knitting, false twisting, and dyeing | Spinning, weaving, knitting, false twisting, and dyeing | False twisting, weaving, and dyeing |
| Date of establishment | 1985 | 1983 | Same as S-8 | 1958 | Same as S-4 | Same as S-4 | Same as W-6 |
| Capital | | | " | | " | " | " |
| Equity composition | local 100% | local 100% | " | local 100% | " | " | " |
| No. of employees | 500 | 235 | 450 (including yarn dyeing) | 250 | 84 (including false twisting) | 84 (including knitting) | |
| Equipment | 452 units, all with dobbies (1/4 copchange, 60 units with Unifil) | 154 units (100 dobby, 54 jacquard), 36 WJL, 24 AJL, | 900 units | Circular knitting machines 120 | Circular knitting machines 40 (double) 2 (single) | False twisting machines 15 (of which DT one) | False twisting machines 15 |
| Production capacity | 800,000 to 900,000 yd/mon | 100,000 yd/mon dobby, 90,000 yd/mon, jacquard | 6.75 mil. yd/mon | 450,000 t/mon | 200,000 yd/mon | 80 t/mon | |

| No. | W-10 | W-11 | W-12 | K-1 | K-2 | F-1 | F-2 |
|---|---|---|---|---|---|---|---|
| Production items | Dyed yarn fabric 70%, Patterned, fabric 30%, Satin, shirting, fancy weaves, metallic, blanket | Curtain fabric, women's wear fabric, georgette, crepe, | Acrylic sarong T/C shirting, poplin, knit, T/R suiting | Cut and sew products, dyed yarn fabric and fabric for piece dyeing | Polyester jersey | Polyester texturized yarn | Polyester texturized yarn, special yarn |
| Delivered to | Sanpeng Indirect exports 10 to 15% | Sanpeng | All to Sanpeng | Thai American | Domestically in Thailand | Own weaving division | Own weaving division |
| Domestic sale/export ratio | | | Border business through Sanpeng 400,000 yd/mon | Sales ratio domestic to foreign: 45:55 | | | |
| Materials used | Polyester fil.(75d, 100d, 150d, 300d) T/R, T/C, 45'S, 34'S Rayon, cotton yarn Metallic, acrylic | Polyester fil. | T/C T/R 65/35 Acrylic 100% R 100% Own company spinning | TC 45'S C 20'S C 30'S C 40'S | Own company false twisted yarn | Polyester TNT, Indonesia, Taiwan | Polyester fil. |
| Plans for expansion | 500 unit quota held | | 500 unit standard product poplin | None | | None | None |
| Japanese engineers | None | One | One | None | Permanently stationed | Permanently stationed | None |

## Table I-2-5. Details of Companies Visited (Dyeing)

| No. (Standard product) | D-1 (Standard) | D-2 (Standard/Special) | D-3 (Special) | D-4 (Standard) | D-5 (Special) | D-6 (Standard) | D-7 (Special) |
|---|---|---|---|---|---|---|---|
| Name of company | Thai Tricot Co. | (K-1) Nan Yang Knitting Co. | (S-2) Union Thread Industries Co. | (S-4) Thai Toray Textile Mills Co. | (S-6) Luckytex | Tokai Dyeing Co. | (W-6) Siam Synthetic Textile Industry |
| Lines of business | Exclusive | Spining, weaving, and dyeing | Spinning and dyeing | Spinning, weaving, false twisting, and knitting | Spinning, weaving, and dyeing | Exclusive | False twisting, weaving, and dyeing |
| Business | Fabric dyeing and prints | Fabric dyeing and yarn dyeing | Yarn dyeing | Yarn dyeing and post-dyeing | Post dyeing and prints | Post dyeing and prints | Post dyeing and prints |
| Date of establishment | 1970 | Same as K-1 | Same as S-2 | Same as S-4 | Same as S-6 | 1963 | Same as W-6 |
| Capital | 94 MB | " | " | " | " | 12 MB | " |
| Equity composition | Thai (Sukree, Sanpeng): 80 Japan (Nomura, Shikibo): 20 | " | " | " | " | Japan (Tokai: 85) Thai: 15 | " |
| No. of employees | 700 | 350 | 47 | 194 | 3,237 (including spinning and weaving) | | |
| Equipment | | Jigger (high pressure, low pressure) 40 units, yarn dyers (Hank, package) 20 units | Hank dyeing machines 10 units, loose carriers 2 units | Jet circular 15 tubes, uniace 6 sets | | | Polyester fil fabric dyeing machines, polyester yarn dyers (hank, package), flat screen print 3 units (1.5 mil. yd/mon), weight reduction apparatuses |

| No. | D-1 | D-2 | D-3 | D-4 | D-5 | D-6 | D-7 |
|---|---|---|---|---|---|---|---|
| Production capacity | Bleaching 2 mil. yd /mon, fabric dyeing and resin 500, high pressure dyeing 120 color prints 30 | | 110 t/mon | 1.3 mil. yd/mon | 5.5 mil. yd/mon | 5.5 mil. yd/mon | 700,000 yd/mon |
| Production items | Shirt fabric 2 mil. yd/mon, texturized yarn weaves 1.2 mil. yd/mon | | Yarn dyeing<br>Bulky yarn | Yarn dyeing<br>Piece dyeing (woven and knit) | Post dyeing<br>Prints<br>Opal processing | Prints 1.5 mil. yd/ /mon, bleached 1 mil. yd/mon, fabric dyeing 2 to 2.5 mil. yd/mon, yarn dyeing and finish 0.5 mil.yd | Polyesterfil weaves, menswear texturized yarn weaves 50%, prints 50% |
| Delivered to | Sanpeng 80%<br>Sukree 20% | Own company | Own company | | | Krabo 20%<br>Elawan Tex 20%<br>Sanpeng 60% | |
| Domestic sale/export ratio | | | | | 70% export<br>30% domestic | Direct export 1.5 mil. yd/mon | 90% domestic<br>10% export |
| Materials used | TR weaves<br>TC weaves<br>C weaves<br>Texturized yarn weaves | TR, TC, C, texturized yarn: own company spinning, own company weaving | C yarn, TC yarn, acrylic yarn: Own company spinning | T/R weave: own company weaving, acrylic yarn: own company spinning, polyester knit: own company weaving | Own company weaving | Wage-based processing | Own company weaving |
| Plans for expansion | None | None | None | None | None | None | None |
| Japanese engineers | JODC one person | None | JODC one person | Permanently stationed | Permanently stationed | Permanently stationed | Japanese engineer |

| No. (Standard product) | D-8 (Standard/Special) | D-9 (Special) | D-10 (Standard) | D-11 (Special) | D-12 (Standard) |
|---|---|---|---|---|---|
| Name of company | (S-9) Thai Teijin Textiles | (W-8) Soon Heng Lee Textile | Saiviwat Industrial Co. | Bamby Textile | (S-8) Kangwal Weaving Factory |
| Lines of business | Spinning, weaving, and dyeing | Weaving and dyeing | Dyeing | Dyeing | Spinning, dyeing, and weaving |
| Business | Yarn dyeing, post -dyeing finishing | Yarn dyeing | Yarn dyeing and fabric dyeing | Prints | Yarn dyeing |
| Date of establishment | Same as S-9 | Same as W-8 | 1979 | 1985 | Same as S-8 |
| Capital | " | " | 7 MB | " | " |
| Equity composition | " | " | Local 100% | " | " |
| No. of employees | | 280 (including dyeing) | 310 | | |
| Equipment | | Package dyeing | High pressure continuous dyeing machine | Automatic flat screen print, hand working screen print | Package dyeing |
| Production capacity | Yarn dyeing 120,000 lb/mon, post-dyeing 16,000 bolts/mon: 19,500 bolts/mon, yarn dyeing finishing 3,5000 bolts/mon | | 1,500 t/year | | |

| No. | D-8 | D-9 | D-10 | D-11 | D-12 |
|---|---|---|---|---|---|
| Production items | Yarn dyeing and post -dyeing products of T/R, T/W, T/S, and T/linen | T/C standard yarn dyeing, ester texturized yarn union cloth | Yarn dyeing, circular knitting, woven fabric: cotton 80%, T/C, ester texturized yarn | Interior use Swimming wear | Yarn dyeing (T/C, T/R, acrylic, rayon) |
| Delivered to | | Own weaving division | | | Own weaving division |
| Domestic sale/export ratio | 75% Sanpeng 25% exported to Middle and Near East | | | 70% export | |
| Materials used | Own spun yarn Own woven cloth | T/C 45'S Ester texturized yarn | C, T/C, polyester texturized yarn | Silk fabric Knitting fabric | T/C, T/R, acrylic rayon |
| Plans for expansion | None | None | None | None | None |
| Japanese engineers | Permanently stationed | None | None | None | One |
| | Fall and winter wear materials: wool mix, silk mix, tetron | | Low formalin High class for export purposes | | |

## 2-2. Production Activities

It is said that Thailand's modern textile industry began with the foundation of Bangkok Weaving Mills Co., Ltd in 1950. This was followed by the establishment of weaving and knitting factories in the 1950s. As a result of the combination of the active induction of foreign capital, the establishment of the BOI, and the promulgation of the Investment Promotion Act in 1962, which caused the inflow of a large number of Japanese companies into Thailand, and the establishment of local capital companies, that the industry really started to grow in the 1960s. Since then the industry has continued to grow steadily. In particular, the commencement of polyester fiber production by Teijin in 1967 provided a major impetus for the development of the Thai textile industry. Table I-2-6 shows the course of the industry's development in terms of equipment and production.

The following 3 points can be deduced from Table I-2-6: i) the industry was in its founding stage at around 1962 when there were extremely few spindles, weaving looms, and knitting machines; ii) Teijin's production of polyester fiber which began in 1967 got into full swing in 1971; and iii) just as if this was taken as a sign a large expansion in weaving looms and knitting machines took place from 1968 to 1970.

Figure I-2-2 shows production and equipment by setting the 1971 level at a value of 100. The figure shows the extremely large increases in polyester products which have been recorded every year with the exception 1982 when there was a recession. However, output has constantly stayed below consumption, so that imports were necessary in order to meet demand. This is something which is acknowledged by the manufacturers themselves, and which is taken account of in planning.

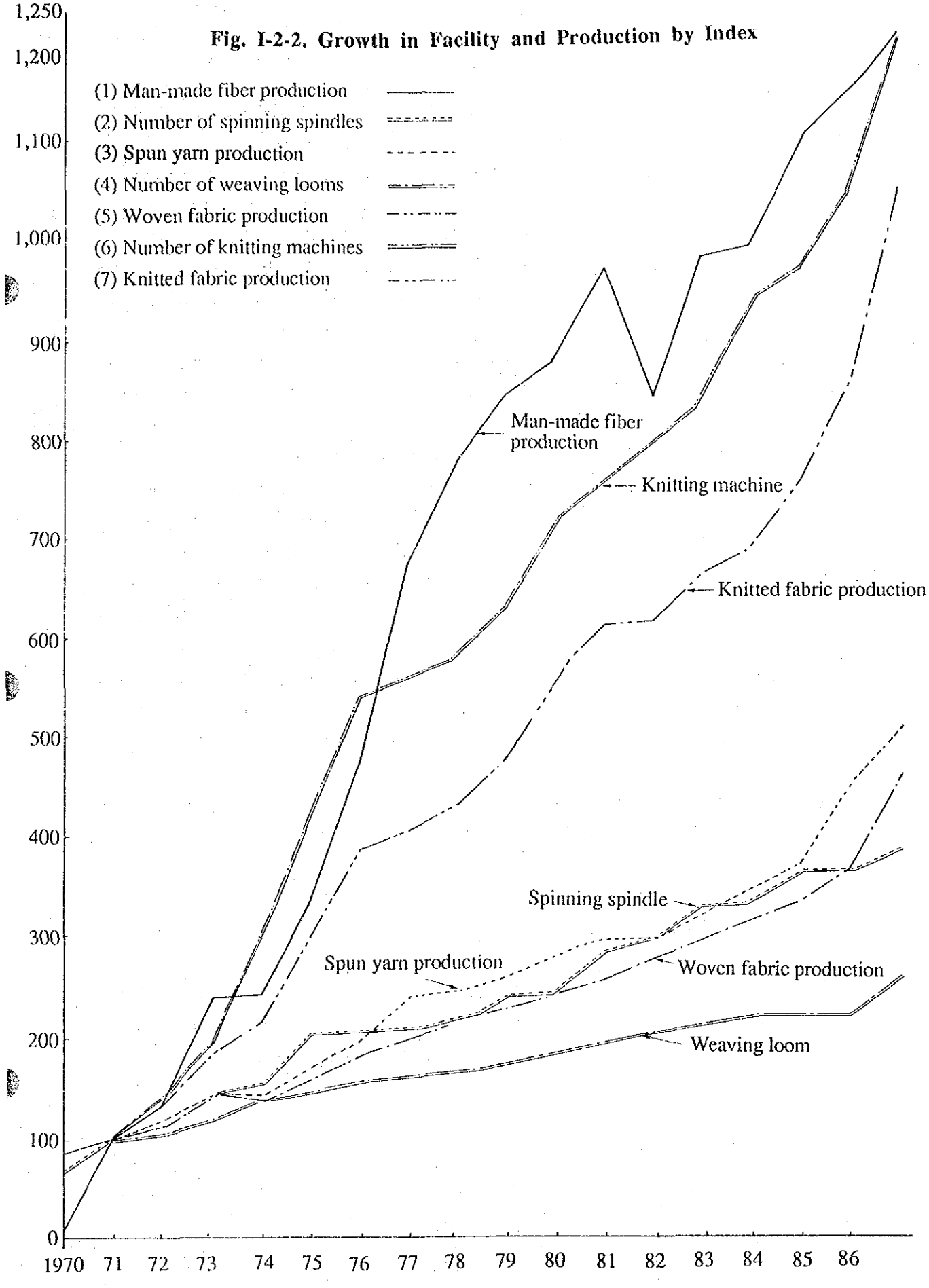
The production of spun yarn has more than doubled over the past ten years. This increase is considerable viewed against many years of controls on spinning equipment which saw equipment increase by 80%. Whereas ten years output per spindle was around 140-165 kilograms per annum (refer to Table I-2-6), this output had increased to 181 kilograms in 1986 and then further to 192 kilograms in 1987. It may be surmised that there was an increase in the rate of operation and that moves were made to produce coarser yarn. However, the increase is also probably due to equipment which should have been discarded when new equipment replaced it being used by other producers. Exactly the same applies to woven fabric production and knit production. It is also possible to infer this from the rate of increase for production as against the rate of increase in equipment capacity for 1986 and 1987 as shown in Figure I-2-2.

# Table I-2-6. Trends in Development of Textile Industry

Source: Thai Textile Manufacturing Association

| | 1962 | 1965 | 1968 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Man-made fiber** | | | | | | | | | | | | | | | | | | | | | |
| Production (tons) | | | | 1,197 | 11,685 | 15,588 | 28,171 | 28,552 | 39,106 | 55,567 | 78,173 | 90,756 | 98,307 | 102,301 | 113,098 | 97,780 | 114,168 | 115,527 | 127,072 | 133,406 | 140,504 |
| Index (% growth) | | | | 10 | 100 | 133 | 241 | 244 | 335 | 476 | 669 | 777 | 841 | 875 | 968 | 837 | 977(16.8) | 989(1.2) | 1087(10.0 | 1142(5.0) | 1202(5.3) |
| Consumption (tons) | | | | 7,578 | 19,623 | 29,031 | 37,405 | 39,271 | 57,771 | 71,112 | 84,970 | 95,682 | 99,939 | 112,080 | 119,505 | 115,859 | 125,057 | 133,438 | 137,405 | 149,172 | 161,034 |
| Index | | | | 39 | 100 | 148 | 191 | 200 | 294 | 362 | 433 | 488 | 509 | 571 | 609 | 590 | 637 | 680 | 700 | 760 | 821 |
| No. of employees | | | | | | 866 | 1,565 | 1,586 | 2,172 | 3,087 | 4,343 | 5,042 | 5,461 | 5,683 | 6,283 | 5,432 | 6,343 | 6,577 | 7,060 | 7,411 | 7,806 |
| Cotton consumption (tons) | | | | 63,005 | 65,448 | 70,094 | 82,166 | 80,387 | 86,758 | 92,903 | 118,519 | 111,037 | 119,789 | 124,204 | 129,150 | 131,866 | 144,301 | 158,512 | 177,777 | 222,239 | 256,853 |
| **Spinning** | | | | | | | | | | | | | | | | | | | | | |
| Facilities (no. of spindles) | 111,556 | 224,756 | 317,656 | 373,084 | 538,958 | 639,720 | 773,404 | 838,060 | 1,094,652 | 1,112,248 | 1,129,144 | 1,168,596 | 1,300,844 | 1,320,844 | 1,547,824 | 1,598,944 | 1,786,342 | 1,801,936 | 1,936,700 | 1,954,700 | 2,068,100 |
| Index | 21 | 42 | 59 | 69 | 100 | 119 | 143 | 155 | 203 | 206 | 210 | 217 | 241 | 245 | 287 | 297 | 331 | 334 | 359 | 363 | 384 |
| No. of employees | | | | | | 17,290 | 19,831 | 20,951 | 24,326 | 24,747 | 25,092 | 25,969 | 27,101 | 27,518 | 30,956 | 31,352 | 33,705 | 33,999 | 35,213 | 35,540 | 37,602 |
| Productivity kg/spindles | | | 119 | 175 | 147 | 144 | 144 | 133 | 123 | 138 | 168 | 165 | 157 | 167 | 150 | 149 | 141 | 151 | 151 | 181 | 192 |
| Production (tons) | | | | | | | | | | | | | | | | | | | | | |
| Cotton yarn | | | 36,602 | 56,798 | 56,788 | 58,280 | 67,008 | 66,902 | 70,502 | 73,003 | 94,270 | 83,312 | 89,990 | 96,181 | 97,271 | 10,213 | 109,687 | 118,837 | 131,472 | 169,470 | 192,709 |
| Manmade fiber yarn | | | 1,126 | 8,475 | 22,202 | 33,815 | 44,056 | 44,589 | 64,654 | 80,421 | 95,656 | 109,543 | 114,865 | 125,029 | 135,166 | 130,399 | 141,882 | 153,359 | 161,482 | 184,145 | 204,003 |
| Total | | | 37,728 | 65,273 | 78,990 | 92,095 | 111,064 | 111,491 | 135,156 | 153,424 | 189,926 | 192,855 | 204,855 | 221,180 | 232,437 | 231,612 | 251,569 | 272,196 | 292,954 | 353,615 | 396,712 |
| Index (% growth) | | | 48 | 83 | 100 | 117 | 141 | 141 | 171 | 194 | 240 | 244 | 259 | 280 | 294 | 293 | 318(8.6) | 345(8.2) | 371(7.6) | 448(20.7) | 502(12.2) |
| Productivity (ton/person) | | | | | | | | | | | | | | | | | 7.5 | 8.0 | 8.3 | 9.9 | 10.6 |
| Consumption (tons) | | | | | | | | | | | | | | | | | | | | | |
| Cotton yarn | | | | 49,797 | 52,143 | 55,974 | 65,058 | 63,607 | 68,399 | 76,006 | 84,552 | 88,593 | 92,085 | 95,753 | 100,365 | 106,883 | 111,530 | 117,950 | 124,295 | 137,850 | 180,943 |
| Manmade fiber yarn | | | | 15,101 | 28,567 | 40,439 | 49,087 | 46,723 | 64,622 | 76,160 | 80,754 | 88,893 | 98,699 | 110,893 | 121,213 | 128,457 | 137,179 | 146,391 | 156,501 | 171,070 | 202,693 |
| Total | | | | 64,898 | 80,710 | 96,413 | 114,145 | 110,330 | 133,021 | 152,166 | 165,306 | 177,486 | 190,784 | 206,646 | 221,578 | 235,340 | 248,709 | 264,341 | 280,796 | 308,920 | 383,636 |
| Index (% growgh) | | | | | 24.4 | 19.5 | 18.4 | -3.3 | 20.6 | 14.4 | 8.6 | 7.4 | 7.5 | 8.3 | 7.2 | 6.2 | 5.7 | 6.3 | 6.2 | 10 | 24.2 |
| **Weaving** | | | | | | | | | | | | | | | | | | | | | |
| Facilities (units) | 7,464 | 13,108 | 22,804 | 31,081 | 36,282 | 38,837 | 44,025 | 50,904 | 53,797 | 56,177 | 57,533 | 59,501 | 63,203 | 67,769 | 70,674 | 72,533 | 77,215 | 79,456 | 79,612 | 79,655 | 93,687 |
| Index (% growth) | 21 | 36 | 63 | 86 | 100 | 107 | 121 | 140 | 148 | 155 | 159 | 164 | 174 | 187 | 195 | 200 | 213(6.5) | 219(2.9) | 219(0.2) | 220(0.0) | 258(17.6) |
| No. of employees | | | | | | 20,992 | 22,012 | 24,832 | 25,618 | 26,750 | 27,396 | 28,334 | 30,096 | 32,270 | 33,654 | 34,540 | 35,914 | 36,956 | 37,028 | 37,048 | 42,584 |
| Productivity (1,000 yd/unit) | | | 15.8 | 16.3 | 16.3 | 17.7 | 18.8 | 15.8 | 17 | 19 | 20.3 | 21.2 | 21.4 | 21.2 | 21.4 | 22.7 | 22.4 | 23.5 | 24.6 | 26.9 | 28.7 |
| Production (1,000 square yards) | | | | | | | | | | | | | | | | | | | | | |
| Cotton yarn | | | 322,236 | 426,285 | 445,986 | 478,413 | 538,716 | 527,295 | 557,841 | 624,415 | 683,715 | 711,381 | 731,658 | 758,505 | 788,510 | 851,520 | 885,765 | 936,210 | 984,180 | 1,060,347 | 1,360,011 |
| Manmade fiber yarn | | | 37,336 | 81,192 | 145,408 | 208,464 | 287,028 | 277,992 | 356,600 | 443,784 | 481,602 | 548,944 | 618,277 | 672,320 | 723,250 | 794,112 | 846,604 | 927,927 | 971,454 | 1,080,139 | 1,332,111 |
| Total | | | 359,572 | 507,477 | 591,394 | 686,877 | 825,744 | 805,287 | 914,441 | 1,068,199 | 1,165,317 | 1,260,325 | 1,349,935 | 1,430,825 | 1,511,760 | 1,645,632 | 1,732,369 | 1,864,137 | 1,955,634 | 2,140,486 | 2,692,122 |
| Index (% growth) | | | 61 | 86 | 100 | 116 | 140 | 136 | 155 | 181 | 197 | 213 | 228 | 242 | 256 | 278 | 293(4.0) | 315(5.7) | 331(5.1) | 362(7.7) | 455(25.8) |
| Productivity | | | | | | | | | | | | | | | | | | | | | |
| Consumption (1,000 square yards) | | | | | | | | | | | | | | | | | | | | | |
| Cotton yarn | | | | 401,082 | 411,517 | 405,253 | 405,702 | 421,468 | 412,198 | 413,451 | 428,306 | 462,019 | 483,764 | 489,232 | 540,012 | 565,088 | 586,880 | 616,245 | 649,329 | 683,419 | 729,892 |
| Manmade fiber yarn | | | | 148,620 | 155,866 | 191,063 | 211,264 | 230,995 | 268,752 | 272,515 | 297,654 | 318,092 | 328,493 | 339,443 | 351,326 | 376,079 | 397,981 | 422,741 | 425,248 | 438,076 | 467,865 |
| Total | | | | 549,702 | 567,383 | 596,316 | 611,966 | 652,463 | 680,950 | 685,963 | 725,960 | 780,111 | 812,257 | 828,675 | 891,338 | 941,167 | 984,861 | 1,038,986 | 1,074,577 | 1,121,495 | 1,197,757 |
| Index (% growth) | | | | | (3.2) | (5.1) | (3.5) | (6.6) | (4.4) | (0.7) | (5.8) | (7.5) | (4.1) | (2.0) | (7.6) | (5.6) | (4.6) | (5.5) | (3.4) | (4.4) | (6.8) |
| **Knitting** | | | | | | | | | | | | | | | | | | | | | |
| Facilities (units) | 109 | 1,115 | 3,113 | 3,680 | 4,207 | 5,985 | 8,404 | 12,992 | 17,980 | 22,779 | 23,733 | 24,503 | 26,537 | 30,008 | 31,711 | 33,137 | 35,377 | 39,222 | 40,767 | 43,982 | 50,106 |
| Index | 3 | 27 | 74 | 87 | 100 | 142 | 200 | 309 | 427 | 541 | 564 | 582 | 631 | 713 | 754 | 788 | 841 | 932 | 969 | 1,045 | 1,191 |
| No. of employees | | | | | | 6,982 | 8,650 | 10,827 | 14,303 | 16,609 | 17,306 | 17,867 | 18,576 | 19,449 | 20,554 | 21,478 | 22,111 | 22,879 | 23,781 | 25,657 | 29,228 |
| Productivity (tons/unit) | | | 1.18 | 1.92 | 2.19 | 2.03 | 1.97 | 1.54 | 1.58 | 1.56 | 1.57 | 1.62 | 1.65 | 1.7 | 1.78 | 1.71 | 1.73 | 1.61 | 1.71 | 1.79 | 1.92 |
| Production (tons) | | | | | | | | | | | | | | | | | | | | | |
| Cotton yarn | | | 2,846 | 3,634 | 3,740 | 3,920 | 6,010 | 5,772 | 7,148 | 8,103 | 9,261 | 10,197 | 11,389 | 12,040 | 12,494 | 12,760 | 13,559 | 14,332 | 15,310 | 20,300 | 29,980 |
| Manmade fiber yarn | | | 812 | 3,415 | 5,489 | 8,225 | 10,570 | 14,198 | 21,180 | 27,460 | 28,010 | 29,580 | 32,390 | 38,899 | 43,851 | 44,058 | 47,547 | 48,873 | 54,397 | 58,290 | 66,038 |
| Total | | | 3,658 | 7,049 | 9,229 | 12,145 | 16,580 | 19,970 | 28,328 | 35,563 | 37,271 | 39,777 | 43,779 | 50,939 | 56,345 | 56,818 | 61,106 | 63,205 | 69,709 | 78,590 | 96,018 |
| Index (% growth) | | | 40 | 76 | 100 | 132 | 180 | 216 | 307 | 385 | 404 | 431 | 474 | 552 | 611 | 616 | 662 | 685 | 755 | 852 | 1,040 |
| Productivity | | | | | | | | | | | | | | | | | | | | | |
| Consumption | | | | | | | | | | | | | | | | | | | | | |
| (1,000 square yards) | | | | 52,836 | 67,501 | 84,547 | 123,111 | 160,146 | 196,748 | 235,465 | 256,238 | 274,938 | 319,634 | 368,663 | 416,412 | 417,100 | 431,661 | 435,190 | 489,476 | 534,003 | 570,315 |
| Share (%) | | | | | 8.8 | 25.3 | 45.6 | 30.1 | 22.9 | 19.7 | 8.8 | 7.3 | 16.3 | 15.3 | 13 | 0.2 | 3.5 | 0.8 | 12.5 | 9.1 | 6.8 |

**Fig. I-2-2. Growth in Facility and Production by Index**



Let us next examine the volume required for each stage of production in relation to output. Consumption is the amount which is supplied to the following process. In other words, consumption of spun yarn is the amount demanded by the weaving and knitting market and is calculated by the following equation: output of spun yarn - amount of spun yarn exports + import volume for spun yarn. This is shown in Table I-2-7.

Including imports, consumption of woven fabrics supplied to the garment manufacturing sector increased at a rate of 4.4% in 1986 and 6.8% in 1987. In terms of quantity these increases are not very big. However, concerning the problem of linkage between the midstream and downstream, while garments have recorded substantial increases over the past several years, the demand for cloth has not fully permeated the midstream (refer to Chapter 4-4). As a result, as of 1987 there was a surplus in weaving productivity against the amount supplied downstream. 18% of cotton cloth and 27% of synthetic cloth produced were exported. Though the same trend applies to knit, because downstream consumption of cotton knit exceeds domestic production, there is an urgent need to raise production levels. This trend has continued over the past several years, with the result that the shortage in cotton yarn for knitting has contributed to the sharp rise in price on the cotton yarn market since 1986. It has been reported that carded 30'S yarn is being used as a substitute for comber yarn for knit. This situation is expected to continue because cotton knit products comprise a major growth commodity among garment exports. As a reflection of this trend, with the addition of a 23% increase in cotton weaving in 1987, the consumption of cotton yarn for the same year increased by 31%, and combined with an 18.5% increase in the consumption of synthetic yarn this caused the self supply ratio for spun yarn to fall sharply from 114.5% in 1986 to 103% the following year. The temporary lifting of controls on equipment by the MOI and BOI in 1987 is therefore seen as a wise measure.

The biggest problem in regard to production activities here, is how to view future demand and what should be done with production activities in light of the existing activities.

Because production of cotton knit is less than demand it is necessary to increase knitting equipment and to raise production of cotton yarn for knitting. It is therefore proposed that in the short term reasonably priced cotton yarn be imported.

## Table I-2-7. Profile of the Spinning, Weaving and Knitting Sectors

| | | | 1983 | 1984 | 1985 | 1986 | 1987 |
|---|---|---|---|---|---|---|---|
| Spinning | | | | | | | |
| Production | Cotton yarn | Volume (tons) | 109,687 | 118,837 | 131,472 | 169,470 | 192,709 |
| | | Rate of increase (%) | 8.4 | 8.3 | 10.6 | 28.9 | 13.7 |
| | Synthetic yarn | Volume (tons) | 141,882 | 153,359 | 161,482 | 184,145 | 204,003 |
| | | Rate of increase (%) | 8.8 | 8.1 | 5.3 | 14 | 10.8 |
| | Total | Volume (tons) | 251,569 | 272,196 | 292,954 | 353,615 | 396,712 |
| | | Rate of increase (%) | 8.6 | 8.2 | 7.6 | 20.7 | 12.2 |
| Exports | Cotton yarn | Volume (tons) | | | | 15,675 | 20,312 |
| | Synthetic yarn | Volume (tons) | | | | 14,614 | 17,762 |
| Imports | Cotton yarn | Volume (tons) | | | | 4,538 | 10,525 |
| | Synthetic yarn | Volume (tons) | | | | 10,362 | 20,308 |
| Consumption | Cotton yarn | Volume (tons) | 111,530 | 117,950 | 124,295 | 137,850 | 180,943 |
| | | Rate of increase (%) | 4.3 | 5.8 | 5.4 | 10.9 | 31.3 |
| | Synthetic yarn | Volume (tons) | 137,179 | 146,391 | 156,501 | 171,070 | 202,693 |
| | | Rate of increase (%) | 6.8 | 6.7 | 6.9 | 9.3 | 18.5 |
| | Total | Volume (tons) | 248,709 | 264,341 | 280,796 | 308,920 | 383,636 |
| | | Rate of increase (%) | 5.7 | 6.3 | 6.2 | 10.0 | 24.2 |
| Self-sufficiency rate (%) | | | 101.1 | 103.0 | 104.3 | 114.5 | 103.4 |
| Weaving | | | | | | | |
| Production | Cotton fabric | Volume (1,000 yd2) | 885,765 | 936,210 | 984,180 | 1,060,347 | 1,360,011 |
| | | Rate of increase (%) | 4.0 | 5.7 | 5.1 | 7.7 | 28.3 |
| | Synthetic fabric | Volume (1,000 yd2) | 846,604 | 927,927 | 971,454 | 1,060,347 | 1,332,011 |
| | | Rate of increase (%) | 6.6 | 9.6 | 4.7 | 11.2 | 23.3 |
| | Total | Volume (1,000 yd2) | 1,732,369 | 1,864,137 | 1,955,634 | 2,140,486 | 2,692,122 |
| | | Rate of increase (%) | 4 | 5.7 | 5.1 | 7.7 | 25.8 |
| Exports | Cotton fabric | Volume (1,000 yd2) | 137,812 | 158,230 | 167,474 | 209,340 | 243,702 |
| | Synthetic fabric | Volume (1,000 yd2) | 287,290 | 340,378 | 343,066 | 380,711 | 355,159 |
| Imports | Cotton fabric | Volume (1,000 yd2) | 26,782 | 30,006 | 21,875 | 27,866 | 76,653 |
| | Synthetic fabric | Volume (1,000 yd2) | 25,972 | 26,796 | 26,207 | 55,980 | 67,598 |
| Consumption | Cotton fabric | Volume (1,000 yd2) | 586,880 | 616,245 | 649,329 | 683,419 | 729,892 |
| | | Rate of increase (%) | 3.9 | 5 | 5.4 | 5.3 | 6.8 |
| | Synthetic fabric | Volume (1,000 yd2) | 397,981 | 422,741 | 425,298 | 438,076 | 467,865 |
| | | Rate of increase (%) | 5.8 | 6.2 | 0.6 | 3 | 6.8 |
| | Total | Volume (1,000 yd2) | 984,861 | 1,038,986 | 1,074,577 | 1,121,495 | 1,197,757 |
| | | Rate of increase (%) | 4.6 | 5.5 | 3.4 | 4.4 | 6.8 |
| Self-sufficiency rate (%) | | | 175.9 | 179.4 | 182 | 190.9 | 224.8 |
| Knitting | | | | | | | |
| Production | Cotton knit products | Volume (1,000 yd2) | 84,794 | 90,624 | 96,179 | 127,136 | 140,000 |
| | | Rate of increase (%) | 5.4 | 6.9 | 6.1 | 32.2 | 10.1 |
| | Synthetic knit products | Volume (1,000 yd2) | 370,867 | 397,566 | 424,297 | 478,390 | 500,000 |
| | | Rate of increase (%) | 7.9 | 7.2 | 6.7 | 12.7 | 4.5 |
| | Total | Volume (1,000 yd2) | 455,661 | 488,190 | 520,476 | 605,526 | 640,000 |
| | | Rate of increase (%) | 7.4 | 7.1 | 6.6 | 16.3 | 5.7 |
| Consumption | Cotton knit products | Volume (1,000 yd2) | 97,965 | 101,662 | 103,043 | 140,814 | 150,389 |
| | | Rate of increase (%) | 7.6 | 3.8 | 1.4 | 36.7 | 6.8 |
| | Synthetic knit products | Volume (1,000 yd2) | 333,696 | 333,528 | 386,433 | 393,189 | 419,926 |
| | | Rate of increase (%) | 2.3 | -0.1 | 15.9 | 1.7 | 6.8 |
| | Total | Volume (1,000 yd2) | 431,661 | 435,190 | 489,476 | 534,003 | 570,315 |
| | | Rate of increase (%) | 3.5 | 0.8 | 12.5 | 9.1 | 6.8 |
| Self-sufficiency rate (%) | | | 105.6 | 112.2 | 106.3 | 113.4 | 112.2 |