

THE WOOD-BASED INDUSTRIES IN THAILAND

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INTRODUCTION

The Deterioration of Thai Forests

Thailand is a tropical country with an area of 513,115 km² and with the population of about 63 million. In recent years its economic growth has been phenomenal; its buoyant economy has been fueled by both agricultural and industrial exports. These development, however, has had adverse effects on the environment, mainly by upsetting the land-use

balance. The country has been rapidly losing its forests to agriculture and other land uses. In 1961, they covered, 53.3% of the land area. In 1998, they covered only 25.3% and then increased to 33.1% and 32.7% in 2000 and 2004, respectively. The technical increased have been come from the larger scale of photograph of Landsat-5 (Table1). In addition, most of the remaining forests have been heavily over-exploited, so that they are now seriously deficient in growing stock and in biodiversity.

Table 1. Forest area, 1988-2004

Year	North	North-East	East	Central	South	Total	%
1,988	80,402	23,693	7,834	17,244	14,630	143,803	28.03
1,989	80,222	23,586	7,786	17,223	14,600	143,143	27.95
1,991	77,143	21,799	7,691	16,616	13,449	136,698	26.64
1,993	75,231	21,473	7,634	16,408	12,808	133,554	26.03
1,995	73,886	21,265	7,591	16,288	12,455	131,485	25.62
1,998	73,057	20,984	7,507	16,049	12,125	129,722	25.28
2,000	96,270	26,527	8,438	21,462	17,413	170,111	33.15
2,004	92,068	28,096	8,240	21,243	17,943	167,591	32.66

Note : unit : sq.km.

Source : Forestry Statistic of Thailand, 2004

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Deforestation has damaged agriculture, energy production, transportation, industry and human settlements. As the topsoil from the hills gets washed off into the rivers, flooding becomes more serious after heavy rains, and water shortages become more common during prolonged dry periods.

After a devastating flood wiped out two villages in 1988, public opinion pressed the Royal Thai Government (RTG) to impose a total ban on logging in 1989. The ban has stopped the legal domestic supply to wood-processing plants. Import and illegal logging have widely done.

The 40% Forest Cover Goal and Reforestation

RTG has attempted to rehabilitate the forest resources. The country policy determined its official goal of at least 40% of

the country under forest cover but the present forest area in only 32.7% remaining, massive reforestation would be necessary for 7.3% or 3.75 million hectares

Wood and Wood Products Points of View

Thailand was one of the world wood export country. After logging banned, The imported volume of forest products were continually increased. In 2004 Thailand's total import value of log, sawntimber, wood products, pulp and paper was approximately USD 1,710 million which increased from the previous year which value about USD 1,663 million. These products were also exported approximately USD 2,319 million which higher than in the year 2000 for 30%. (Table 2 and 3) Economic Situation of Thailand

Table 2. Export of wood and wood products, 2000-2004

Item	2000		2001		2002		2003		2004	
	Quantity	Value								
Log/Sawntimber	379	5,233	403	5,517	1,562	7,131	1,106	9,192	1,791	11,945
Wood products	-	34,938	-	37,991	-	41,197	-	40,559	-	46,775
Pulp	254,484	6,843	346,933	5,691	190,869	3,106	273,184	4,513	167,155	2,973
paper	809,702	23,844	865,078	26,799	826,514	26,789	884,320	29,563	913,665	31,063
Total		70,848		75,998		78,223		83,827		92,760

Note : Quantity : X 1,000 cu.m. for log/sawntimber, metric ton for pulp and paper

Value : million baht (40 baht = USD 1)

Source : Forestry Statistic of Thailand, 2004

Table 3. Import of wood and wood products, 2000-2004

Item	2000		2001		2002		2003		2004	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Log/ Sawntimber	1,515	14,517	1,802	15,267	2,566	16,408	2,244	20,732	2,217	21,866
Wood products	-	1,938	-	2,337	-	2,700	-	3,199	-	5,150
Pulp paper	428,607	10,912	400,466	8,845	472,786	9,220	1,573,077	15,731	459,795	9,857
Total		49,753		50,399		53,707		66,507		68,413

Note : Quantity : X 1,000 cu.m. for log/sawntimber, metric ton for pulp and paper

Value : million baht (40 baht = USD 1)

Source : Forestry Statistic of Thailand, 2004

In 2005, Thailand economic growth slowed down from the previous year. The softer growth was due to several negative factors. Adverse domestic factors included the tsunami at the end of 2004, prolonged drought, unrest in the south and the return of avian influenza outbreak in poultry. Meanwhile, external pressure came from persistent high oil prices and tightening monetary condition around the world. Given the strong economic fundamentals coupled with an ability to respond well to those disturbance, overall growth and stability remained satisfactory.

In 2006, the Thai economy was expected to continue its growth momentum. The key underlying assumption were : (1) comparable world economic growth with that of the previous year (2) crude oil price upswing moderated from last year (3) supply side risks,

for example drought, flood and avian flu outbreak, ameliorated, and (4) public investment projects.

THAI WOOD PRODUCTS RESOURCES

The important source of Wood industries in Thailand were divided into 3 sources as follows :

Natural Forest

There are several distinct forest types in Thailand, namely: tropical evergreen, mixed deciduous, dry dipterocarpus, pine, mangrove and scrub.

As the previous mention that 32.7% forest area remained is natural conservation forest. It was forest zoning of the national forest re-

serves which cannot be utilized as wood production. At present, wood raw materials were imported from the neighboring countries such as Malaysia, Myanmar, Laos, Cambodia and Indonesia and from other countries in America, Africa, Australia and Europe.

Forest Plantations

Reforestation in Thailand dates back to 1906. Teak was then planted by foreign concessionaires. From then until 1960 small area were planted annually.

The reforestation programme gradually expanded after 1961 mainly the Northern and Northeastern regions. The government proceeded the forest plantation for wood industry after the promulgated of Forest Plantation Act 1992. After the year, reforested area was drastically expanded especially private sector.

1. Eucalyptus

1.1 Planted by the government project

Eucalyptus plantation was started aiming to restructure of farmer production as well as other fast growing tree e.g. Acacia mangium etc. in order to substitute for 4 economic crops: rice, cassava, coffee, and pepper. The planting achieved the target of 108,800 hectares during 1994-1996.

1.2 Planted by the private sector

Wood-based industry investors especially in producing paper pulp, chip

fiberboard and cement-bonded particleboard. There were two groups of company that planted mainly Eucalyptus in their own land and farmer contracting system. The first group, Advance Agro Alliance Company, planted of 40,000 hectares and farmer contracted of 60,000 hectares. The second group, Paper and Packaging, Siam Cement, planted by contract farming (system) of 25,600 hectares and non-member who residing in the radius of 150 km. around factory of more than 50,000 hectares. The pulpwood, 3-5 years old, was harvested and sent to the factories with an average price approximately USD 30 per ton depending on log diameter class. In 2004-2006, Ministry of Agriculture and Cooperatives has promoted the farmer to plant Eucalyptus by agroforestry systems.

2. Teak

The Royal Forest Department (RFD) hold a project of the Farmer Extension for Forest Plantation for 5 years (1994-1995). In the next phase later for 12 years (1999-2005) based on the target, it was extended to be 1.28 million hectares. However, during 1994-1996 Teak was the popular for planting of 88,000 hectares.

The government has promoted to plant emphasized Thai's indigenous economic forest tree species in the first phase and Eucalyptus was enhanced to plant half of the area in the second phase.

Rubberwood Plantation

Thailand has an area of rubberwood plantation for the second ranking of the world from Indonesia (2.2 million hectares). The purposed of rubberwood planting is for latex (Thailand export latex 2.6 million tons/year, the world's first ranking) planting in the southern 85%, eastern 13% and northeastern 2%. In addition, RTG has promoted rubberwood plantation as a special in the northern and northeastern of 160,000 hectares.

The rubberwood has given standard latex until 25 years old and then be cut for replanting programme. Thus, the government supported by setting the Rubberwood Replanting Aid Fund which paid for 7,300 baht/rai (6.25 rai = 1 hectare) (USD 1,140 per hectare)(33 baht = 1USD) for replanting. In each year the target to cut down is 56,000 hectares which supplied wood about 250 cu.m/ hectare. Approximately half were sawnwood to be used mainly for furniture production and the rest were top and branch with residues from sawmill to be used for wood-based panels and fuelwoods. In term of present uses, The rubberwood were utilized to produce furniture, toys, particleboard, medium density fiberboard (MDF), parquet flooring, frame, kitchenwares, wire spool, pallet, crate, fuelwood and charcoal.

In conclusion, the source of wood in the past was from the natural forest but at present time most of the natural forest is reserved for environment conservation. Thus, in present

sources of wood are from wood, importation rubberwood and woods from plantation. Thinnings could be carried out when the plantation aged 3-7 years. This provided the small wood with 3-6 inch diameter and a small portion of heartwood with low strength. Also, high susceptibility by insects and fungus. The utilization of these juvenile woods should be extended the cutting time or using as raw materials for the obtained juvenile would will be usable raw material for wood composites and pulping production. If the thinning could be delayed of one or more years.

PROCESSING UTILIZATION AND MARKETING

Production technology for wood processing and utilization in Thailand can be divided into 2 levels as followings :

Primary Processing

1. Sawing

The ripping with two men frame saw is usually common practice for local people with both vertical and horizontal types. The chain saw probably is introduced for headsaw. The lumbering with circular saw is mostly done after headsawing.

At present, mostly sawmills permitted from government have been closed because of logging ban. However, it was found that over 500 of sawmills still active. The number of pre-

vious mentioned sawmills almost were rubberwood sawmill using bandsaw in order to improve lumber yield. The small log from plantation being used, has diameter of 4-10 inches 1.0-2.0 meter length. The lumber recovery rate of these logs about 20-30%.

2. Wood Preservation

Generally, fast growing trees should be protected from wood destroying agents with two methods as followings:

2.1 Non-chemical treatment

The employed technique are soaking in running water, boiling in water, heat treatment, etc. Mechanical protection are needed to prevent the boring insects.

2.2 Chemical treatment

There are many Non-pressure method are usually applied such as brushing or spraying, dipping, soaking, etc. With more commercialized are use pressure method by vacuum and pressure treatment (Full cell method). This treatment use vacuum and pressure machines to impregnate the require chemical solutions lumber. The favour chemical solution is water borne preservatives e.g. CCA (copper chrom arsenic) for exterior used and Boron compound or Pyretroid for interior.

3. Drying

3.1 Seasoning

Moisture content (MC) of wood after seasoning is varied. To reduce MC to be less than 25% (Fiber saturation point, FSP) need

a long period and difficult to consistently control MC.

3.2 Kiln Drying

Kiln drying could be controlled temperature, relative humidity and air-circulation system for drying with faster than seasoning 10-30 times. Commercially must be employed. The lumbers have been controlled according to specific drying schedule to minimal drying defect, e.g. bow, hardening, case hardening, check, honeycombing. etc.

Secondary Processing

1. Furniture and Joinery Products Industries

1.1 Furniture industry

The Thai furniture industry has three segments : export furniture production, official production for the domestic market and non-recorded furniture production for the local and national markets.

Expansion is export driven. Promotion and incentives have provided by the government in its drive to make Thailand one of the largest furniture production centres in Asia. Total furniture exports in 2005 were worth 51,553 million baht (USD 1,289 million) of which wooden furniture accounted for 34,925 million baht (USD 873 million). The export of furniture and parts was one of the fastest growing export sectors in Thailand in the 1990s and continue growing until 2005 (Table 2). In term of value, growth was about 10%

annually. Expected that the upward trend in the furniture industry will continue.

The manufacture of rubberwood furniture and parts is the fastest growing subsector within the furniture industry. Rubberwood furniture accounts for 60% of total wooden furniture exports. About 1.6 million cu.m. of sawn rubberwood are used annually in furniture manufacture.

The main markets for wooden furniture are USA and Japan, both of which are growing markets for rubberwood furniture. These two countries accounted for about 60% of furniture exports in 2005. United Kingdom, Australia, Canada, Malaysia, and Germany are other important markets. Prospects in domestic market are rather good because of the gradually increased purchasing power of the Thai people, the growth in the construction sector which implies the increasing in demand for furniture, and the preference of consumers for wooden furniture.

1.2 Joinery and other wood converting industry

This industry comprises a wide range of enterprises such as parquet, door, window frame, kitchen cabinets, wooden utensil, wooden frame, and wooden toy manufacture. In 2004 the value of the exports of converted wood products amounted to 11,994 million baht (USD 300 million)

Import of wooden furniture and joinery products have been accounted

in 2004 of 1,503 million baht (USD 38 million)

2. Plywood and veneer industry

At present, number of plywood and veneer factories are 21 and 14 respectively. The majority of plywood factories produce veneer by themselves. These factories have been faced shortage of plylog, high cost. Some factory imported log for veneer production and re-export or overlay on wood products.

About 75% of the plywood consumed was used in construction, 20% in furniture manufacture, and 5% in other uses such as containers and advertising boards. Other materials are increasingly being substituted for plywood, mainly because of increasing scarcity of veneer logs and higher price.

Export of plywood and veneer sheets have been accounted in 2004 of 429 million baht (USD 11) and import of the product have been accounted 2,079 million baht (USD 52).

3. Wood composition board industry

Wood composition boards include three major aggregates product namely particleboard, fiberboard and wood cement board

3.1 Particleboard Industry

Particleboard industry in Thailand was started in 1958. But the larger factories were established since 1986. At present, particleboard industry has 18 factories, total capacity 2.40 million cu.m.. Raw materials are rubberwood, and bagasse. (Table 4) (Laemsak, 2006)

Table 4. Particleboard factory

Company	Annual capacity (cu.m.)	Source
1. Thai Panel	60,000	Rubberwood
2. Particle planner	123,000	Rubberwood
3. Metro Particle	300,000	Rubberwood
4. MP Particleboard	70,000	Bagasse
5. Sahachai Particleboard	45,000	Rubberwood
6. Molar Wood Product	75,000	Rubberwood
7. Molar Wood Product (2)	135,000	Rubberwood
8. Green panel	195,000	Rubberwood
9. Rayong Particleboard	54,000	Rubberwood
10. Rayong Particleboard (2)	240,000	Rubberwood
11. Pangnga Particleboard	60,000	Rubberwood
12. Pangnga Particleboard (2)	90,000	Rubberwood
13. S.Kitchai	30,000	Rubberwood
14. S.Kitchai (2)	90,000	Rubberwood
15. Vanachai Panel Industries	300,000	Rubberwood
16. Vanachai Panel Industries (2)	450,000	Rubberwood
17. Siam Riso Wood Products	84,000	Rubberwood
18. Asia Planner	100,000	Rubberwood
Total	2,401,000	

Source : Laemsak, 2006

Export of particleboard have been accounted in 2004 of 4,368 million baht (USD 109 million). The country imported 186 million baht (USD 5 million).

3.2 Fiberboard Industry

Fiberboard production in Thailand has two types : hardboard and medium density fiberboard (MDF). Almost all of hardboard produced are wet process. Raw materials are Eucalyptus, Acacia, waste wood from processing and bagasse. Raw materials of

MDF are rubberwood, Eucalyptus, Acacia and bagasse. Their number factoring are 5 and 7 respectively with annual capacity 1.24 million cu.m. (Table 5,6) (Laemsak, 2006)

Export of fiberboard have been accounted in 2004 of 4,600million baht (USD 115 million). The country imported 292 million baht (USD 7 million).

3.3 Wood cement board industry

Wood wool cement board, the first plant in Thailand, was established in 1956 using

Table 5 Medium density fiberboard factory

Company	Annual capacity (cu.m.)	Source
1. Vanachai MDF	300,000	Rubberwood
2. MDF Planner	217,800	Rubberwood
3. Green MDF	115,500	Rubberwood
4. Metro MDF	113,900	Rubberwood
5. Metro MDF (2)	115,500	Rubberwood
6. Thai Plywood	99,000	Eucalyptus
7. AgroMats	133,900	Eucalyptus
Total	960,100	

Source : Laemsak, 2006

Table 6 Hardboard factory

Company	Annual capacity (cu.m.)	Source
1. Thai plywood	66,000	Eucalyptus & Plywood waste & Acacia
2. Thai Caneboard	50,000	Bagasse & Eucalyptus
3. Metro Fiber	27,000	Eucalyptus
4. Agro Lines	38,000	Eucalyptus
5. Vanachai MDF (Molded)*	100,000	Rubberwood & Eucalyptus
Total	281,000	

Source : Laemsak, 2006

* Dry Process

Tetrameles nudiflora as wood raw material. The capacity is about 1,000 tons/year. The second and third plant produced wood cement particleboard from Eucalyptus. In 2000-2004, Wood cement fiberboards, plank for exterior sidings were launched and highly increased the production.

Demand for these wood composition boards is expected to grow for a number of reasons, mainly that substitutes for sawnwood and plywood are needed because of the increasing scarcity of sawlogs and plylogs, and because of growing demand for the end-use products.

4. Pulp and paper Industry

In 2003, pulp and paper industry in Thailand was significantly improved as a result of economic growth as well as the rapidly uptrend price adjustment in the industry globally, evidenced since mid 1999. The total pulp and paper capacity has accounted 4.9 million tons, production has accounted 5.3 million tons and consumption has accounted 5.9 million tons.

4.1 Pulp industry

In 2003, total production capacity for short fiber pulp was 0.99 million tons, slightly increased in 2004 with 0.1 million tons of the new bleached bagasse pulp.

In 2003, fiber consumption in Thailand was 5.9 million tons, 10% increased from 2002, consisted of 0.754 million tons of short fiber, 0.426 million tons of long fiber and

2.149 million tons of recovered paper.

In 2004-2008, domestic pulp consumption is estimated to grow 6% annually in line with the growth for paper industry. Thailand has imported 100% of long fiber pulp account 0.426 million tons in 2003 and was increased about 5%.

In 2003, recovered papeconsumption totaled 2.1 million tons, an increased 15% of the previous in response to higher utilization of kraft paper and paperboard. In addition, the environmentally friendly products have played an important role in stimulating the use of recycled pulp.

4.2 Paper industry

Paper capacity in 2003 was 3.95 million tons, 7% increased over the previous year resulted from kraft paper in order to meet continuous rising domestic demand while insignificant change in other paper grade.

The total paper capacity in 2003 can be categorized into 2.40 million tons, for Kraft paper, 1.04 million tons for Printing & Writing paper, 0.30 million tons for Paperboard, 0.86 million tons for tissue paper and 0.125 million tons for Newsprint paper.

Total consumption of paper in Thailand was approximately 2.7 million tons in 2003, up 7% over the previous year. The increase mostly came from the boost in Kraft paper and Printing & Writing paper demand driven by export sector and booming in publishing and advertising sectors. As a result,

per capita consumption of paper moved up to 42 kg, 3 kg up from 2002.

In 2003, import of paper raised up to 0.514 million tons, sharply increased by approximately 11% from the previous year. This import was mainly contributed to short fall in Newsprint and high quality Printing & Writing paper especially carbonless paper and to meet the requirement for higher circulation of additional pages of newspaper.

Export was decreased from previous three years due to the recovery in domestic demand mainly from Kraft paper and Newsprint.

5. Fuelwood and Charcoal Production

Modern energy sources, such as petroleum products, are increasingly being used in the daily life of the Thai people. Among rural Thais, however, fuelwood and charcoal are still the main energy sources in the household.

The household sector uses about 20 million tones of wood annually in the form of fuelwood and charcoal, but wood supplies from around the houses, (from home gardens, woodlots, and public forests) are able to fill the demand.

Commercial charcoal produce usually with brick beehive kiln. Eucalyptus and rubberwood are main sources for charcoal production. However, good quality charcoal comes from mangrove forests that declining production, because of the deforestation.

Charcoal consumption is annual approximately 3 million tons. Demand

for charcoal and charcoal briquette for export are gradually increased.

FUTURE PROSPECTS AND STRATEGY

Hardwood Sawmilling

In the present situation and with the present structure, it is difficult to find much specific strength in the industry. The only aspects with can be considered as strengths are the knowledge of local conditions and markets. The biggest weakness of the industry is the limited and insecure log supply from both domestic and foreign sources. The structure of the industry is also weak, with too many small and inefficient sawmills. Technically the mills have not been adapted to the present log supply which reduces the recovery rate and overall efficiency. Yet, the industry can not invest to modernize itself under the present insecure log supply situation

Rubberwood Sawmilling

The greatest strength of the rubberwood sawmilling industry is its domestic raw material base, which still allows it to expand. The industry also has a relatively long history in the country, which allows it to have a good understanding on the processing requirements of rubberwood. There is a ready market for sawn rubberwood, and competition is less because it is grown extensively in only a few countries. In

addition, these sawmills could be sawn other plantation grown species as now.

The principal weakness is the poor technical standard of the small size mills. Another is the insecure log supply during the rainy season due to the inadequate road network and remote location of many of the plantations. In addition, since 2002, sharply increased of the latex price has negative supplies impact of logs.

Plywood and Veneer Manufacture

The strengths and weakness of the plywood industry are the same as those of the hardwood sawmill industry. In addition, the whole existence of the plywood industry is dependent on the import duty. In the future, only modern and efficient mills can be internationally competitive, and only if raw material can be procured at reasonable cost.

Manufacture of Furniture and Joinery Products

The production technology varies greatly from completely manual, to mechanized production line employing numerically controlled machining units, Rubber- wood furniture and kitchen cabinet factories tend to be more modern than the traditional furniture factories. Vertical integration which improves wood raw material usage is common, and many factories also produce other products than furniture

components.

The Thai furniture industry still has potential for substantial growth since rubberwood is increasingly accepted in the international market, and rubberwood resources allow a considerable expansion of sawnwood, and therefore of furniture production.

The industry, however, also has its weakness. The scarcity and high cost of traditional furniture species, such as teak and rosewood, threaten the existence of the old backbone of the The Thai furniture industry.

Manufacture of Composition Boards

Technology used in the manufacture of particleboard and fiberboard are modern. However, some mill use second hand machineries. Also, rubberwood resources in the south present prospects for future growth. However, the rapid expansion of the production capacity of panel products mills will likely bring fierce competition for market share and wood raw material. The over capacity forced the mills to export. An added threat to the competitiveness of locally produced panels is the high price of adhesives. The mills, which are based on plantation wood to be obtained from the open market. On the other hand, structural composites e.g. OSB, OSL, etc., will be the answer in some application substitute sawnwood and plywood in the near future.

Manufacture of Pulp and Paper

The pulp and paper industry in Thailand is privately owned, and the paper mills are located mainly within 100-150 km. of Bangkok the main reason for this concentration originally is that most mills are dependent on the use of recycled fiber as raw material and therefore need to be within reasonable reach of the main population. Furthermore, the converting industries and other end users are located surrounding Bangkok.

Strengths of the industry is short fiber supply from Eucalyptus and weaknesses is no long fiber supply.

INSTITUTIONAL CAPACITY

Forestry research in Thailand has its roots in the search for knowledge on the extent of teak resources in the last years of 1890s, and for teak propagation technology in the early 1900s. Much of this search for knowledge cannot strictly be called scientific research, as it was mainly based on cursory observation.

A strongly impetus of forestry research was provided by the establishment of Kasetsart University, Faculty of Forestry (KUFF) in 1936. Its baccalaureate programme, which was started in 1994, required the preparation of thesis. In 1956, Department of Forest Products was established in KUFF. At present, the department has offered two program degrees of bachelor and master in Wood Science and Technology

program and Pulp and Paper Technology program.

RFD's research programme received the attention it deserved only after the second world war. In 1952 forest products research in RFD was concerned with the survey of commercial wood, mechanical and physical properties of wood, wood processing, seasoning and preservation, wood deterioration, wood-base industry, and non-wood forest products.

State agencies, however, that are concerned with forestry research related activities include the National Research Council of Thailand (NRTC), KUFF, RFD and other state and private sector institutions.

The other state University such as King Mongkut University-North Bangkok, Walailuk University, Prince Songkhla University are also being done the specific study and research. The private companies are being undertaken particular on forest plantation and products development such as the Siam Cement group, Advance Agro Alliance group of companies.

In addition, The Thailand Research Fund (TRF) in the name of Wood and Pulp Research Program Coordinating Office, have been supported the cooperate industrial research with private wood industry companies.

POLICY AND LEGISLATION

The national forestry policy and legislation have main objectives as followings:

1. To stop the destruction of the remaining natural habitats and biodiversity, and to reverse the current trend.

2. To rehabilitate deteriorated watersheds.

3. To promote social justice and equity in forest-based rural development.

4. To meet most of the national needs for forest-based products from domestic sources.

5. To help to increase the income of the rural communities and strengthen the national economy.

6. To support international efforts to control global warming.

The specific policy on forest-based industries are:

1. The state has promote rural industries and processing based on non-wood forest products.

2. The country aim for self-sufficiency in most wood-based products.

3. Export of round-wood have been banned.

4. Processing and in-country transport of raw materials and products have been deregulated.

5. Effective safeguards have been adopted by existing and new industries to protect the environment.

Policy and legislation concerned with wood utilization in Thailand are as following :

1. National Forest Policy

The National Forest Policy was created

in 1983 for the long term in forest resources management and development. The approach is proceeded together government and private. The policy was enhanced the wood industry through government and private to reforestation giving the wood supply in domestic consumption, the industrial benefit, export. The Policy also enhanced the community forest plantation, reforest in the state land, in the form land. Moreover, promoted the wood factory and pulp mill for utilized wood residues and wood substituted materials.

2. Thai Forestry Sector Master Plan

Thai Forestry Sector Master Plan was formulated during 1990-1993 by the technical assistant of the Finland government. The plan indicated the approach in promoting the rural industry, non-wood products industry and reforestation as a sources of wood. The planning strategy emphasized the wood industry was being shortage of raw materials through the management of forest plantation, community forest and private forest.

3. Forestry Act

The affected of forest act to Thailand's wood industry have to consider from the past that the government had promulgated the act to protect the selection cutting and illegal logging. The act has generally controlled wood factories cause them difficulty in business.

The Forest Act 1941, never be improved for 60 years, had more complex

practice for wood industries. The new act, the Forest Plantation Act 1992, was promulgated to promote the forest plantation and protect the investor's right.

4. Funding Support

The government launched the funding support policy in forest plantation to the farmer for the extension program. The National Rubberwood Policy Committee was taken responsibility on rubberwood industry and promoted the capability on using the rubberwood products for domestic consumption and export. The Rubberwood Replanting Aid Fund supported 7,300 baht/rai (USD 1,140/hectares) for replanting program.

5. One village, one product campaign policy

RTG has now launched a campaign namely One village, one product or OTOP to promote indigenous knowledge to create their own specific product. Wood and Non-wood forest products are very famous items for the villages.

6. Thai Industrial Standard

Most of the wood-based products have been set the specifications by the Thai Industrial Standard Institute (TISI) which is only one authorized body under Ministry of Industry. Generally, the standards of wood-based panels were modified from the previous issues and adopted from ISO in the same products

or tested categorized.

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