Field Document No.52

REGIONAL WOOD ENERGY DEVELOPMENT PROGRAMME IN ASIA
GCP/RAS/154/NET

IMAGES OF WOOD AND BIOMASS ENERGY IN INDUSTRIES IN THAILAND

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
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For copies write to: Regional Wood Energy Development
Programme in Asia
c/o FAO Regional Offcie for Asia and the Pacific
Maliwan Mansion, Phra Atit Road,
Bangkok, Thailand

Tel: 66-2-280 2760
Fax: 66-2-280 0760
E-mail: rwedp@fao.org
Internet: http://www.rwedp.org

FOREWORD

In Thailand, as in other countries, numerous industrial activities use wood or other biomass as their main fuel. Many of these industries are small scale, are located in a rural or urban environment, and employ traditional production processes. Some of the industries avail of modern technology to make efficient use of wood and biomass fuels in a cost-effective way.

Some years ago, within the framework of the Thai Forestry Sector Masterplan, Thailand implemented a nationwide survey of rural industrial wood consumption. This generated a wealth of data on types and characteristics of industries utilising fuelwood. Now, the Royal Forest Department of Thailand has taken a systematic look at this data, and complemented it with recent information of industrial and commercial relevance. The result is a systematic photo-illustrated overview of main wood/biomass-fuel based industries in Thailand. The overview provides lots of information about production, technologies, fuel characteristics, entrepreneurial aspects, etc. This type of information will be relevant for strategies, policies and programmes not only in the energy and forestry sectors, but also with respect to industrial development, employment generation, technology development, regional development, and others. The overview may be equally relevant for other countries where similar industrial activities take place.

This Document has been prepared by experts from the Royal Forest Department with advice from RWEDP, in particular Mr. A. Koopmans, Wood Energy Conservation Specialist, and Mr.T. Bhattarai, Wood Energy Resources Specialist. It is a pleasure to thank our colleagues at the RFD for their outstanding work and for the excellent cooperation which RWEDP has enjoyed throughout the years.

Related documentation on industrial woodfuel uses is contained in previous RWEDP Reports which focus on a specific country or on the region as a whole. Special reference is made to RWEDP Report No.32 on priorities for assistance to biomass energy using industries.

Dr. W.S. Hulscher
Chief Technical Adviser
FAO/RWEDP

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1. PHOTO-ILLUSTRATED DOCUMENTATION OF WOOD/BIOMASS-FUEL BASED INDUSTRIAL AND COMMERCIAL ACTIVITIES IN THAILAND

1.1 Introduction

The importance of woodfuel as an energy source for the rural areas in Thailand can not be over-emphasized. It is still the cheapest fuel available and it will remain the major alternative to commercial energy sources for the foreseeable future.

Many rural small-scale industries still depend on woodfuel for energy. It is the main source of energy of industries like agro-processing, food-processing, mineral-based industries, etc. Thus, wood energy will continue to be a major component of total energy consumption in Thailand. In order to be able to plan the woodfuel demand and supply effectively, as well as to promote awareness of woodfuel issues, appropriate information is necessary. Unfortunately, there is a dearth of reliable information on the wood energy supply and demand situation, particularly with reference to wood/biomass-fuel based industrial commercial activities. It would therefore appear to be very useful to collect this information into a compendium which provides a reference list of typical wood/biomass-fuel based industrial commercial activities along with details of the activities. This would highlight the socio-economic importance of these rural based industries with a view to contributing to refining and improving prevailing policies and strategies of the sectors concerned.

This report presents an overview of available material collected in 1991–92 during a nationwide survey of rural industrial wood consumption carried out within the framework of the Thai Forestry Sector Master Plan as well as supplementary material collected more recently. Where possible, the information is presented in conformity with the matrixes shown in table 1 and table 2 which were adopted for the report of the 1991-2 survey.

1.2 Objectives

The broad objective of the documentation exercise is to collect and compile photo-illustrated information about the different types of traditional fuel based industrial commercial activities of socio-economic importance in Thailand in order to make this information available to policy makers and programme planners. It is intended that it should contribute to the refinement/improvement of policies and strategies designed to ensure the sustainable development of the traditional fuel sector. Traditional fuels include woody/non-woody biomass of different kinds such as firewood, charcoal, crop and animal residues.

The specific objectives are:

1. To collect and compile photographs of and specific information about all woodfuel based industrial commercial activities in Thailand of socio-economic significance. These may be operating as formal or informal enterprises in the private or public sector.

2. To compile and collate descriptive information on these enterprises concerning their distribution, consumption of raw material and energy, capacity range and average annual production. The information will be organised by specific technology/activity type, energy mix and supply sources, etc.
3. To present a photo illustrated compendium of Thai wood/biomass-fuel based industrial commercial activities of socio-economic significance for use as a reference material by concerned persons in Thailand as well as in other RWEDP member countries in Asia.

1.3 Methodology

1. Personal contact: to gather the photos, slides and specific information
2. Literature review: to gather wood/biomass-fuel based industrial and country level information
3. Organization contact: to gather country level information and statistics of provincial industry offices
4. Industry visits / Interviews

Table 1. Rural industries classification criteria and characteristics

Classification Criteria	Cottage Activities	Village Enterprise	Rural Industries
Location	Household	Village vicinity	Vicinity/outside village
Ownership	Women/Family	Extended family Cooperative Entrepreneurs	Entrepreneurs
Labour	Family	Extended family Villagers	Villagers Non-villagers
Organisation	Non-wage Shared tasks	Non-wage Rudimentary wage Special	Wage Special contract
Technology	Low	Medium	High Imported
Scale	Very small	Small	Medium
Regularity	Irregular	Seasonal/Regular	Regular
Formality	Informal	Rudimentary formal	Formal
Fuel Flexibility	Low	Medium	High

Table 2. Rural industries by seven broad groupings

Group	Industry type
Agro-Processing Industries	Coconut products, Coffee, Rice parboiling, Tea leaf drying, Rubber smoking, Spice processing, Sugar processing, Tobacco products, Vegetable ghee/oil crushing, etc.
Food-Processing Industries	Bakeries, Coffee roasting, Dairy products, Distilleries, Fish smoking, Food preservation, Fruit preservation, Herbal medicine, Meat processing, Oil & fats, Rice products, Roasting nuts, Sugar products, etc.
Forest Products Industries	Bamboo and cane, Extraction/Distillation, Timber drying, Turpentine distillation, etc.
Metal Processing Industries	Blacksmith, Foundries, Jewellery, etc.
Mineral Based Industries	Brick making, Tile making, Lime production, Pottery, Ceramic production, etc.
Textile Based Industries	Dyeing/Printing, Silk, etc.
Miscellaneous Industries	Ceremonies, Cremations, Animal fat processing, Laundries, Road tarring, Soap making, Tyre retreading, Eating houses, Paper making, Fishing nets/boats, etc.

1.4 Characteristics of Thai Wood/Biomass-fuel Based Industrial and Commercial Activities

In “A Survey on Industrial Fuelwood Consumption in Thailand”, a report compiled for the Thai Forestry Sector Master Plan Project 1991-1992, it was concluded that woodfuel is still an important household and industrial energy source in Thailand. Out of an estimated 2,877 industries which were expected to be currently using woodfuel as a source of energy, 754 industries, distributed in all regions, were surveyed. The results revealed that 71.49% of these industries still used woodfuel as an energy source. The estimated total amount of fuelwood used by the industries was about 10,301,177 m^3/year. In the Northern region, a large amount of fuelwood was used in tobacco curing and in the ceramic industry. Fuelwood was also used in the wood carving (for drying), brick making, tea curing, wood drying and bamboo shoot preservation industries and in slaughterhouses. In the Northeastern region, most of the fuelwood was used in the brick making, noodle, and tobacco curing industries and in slaughterhouses. In the Central region, most of the fuelwood was used in the brick making, fishmeal, ceramic, and noodle industries and in slaughterhouses. And in the Southern region, most of the fuelwood was used in the fishmeal, brick making, rubber smoking and lime production industries.

The number of people employed in fuelwood using industries was about 89,334. In the Northern region, the majority were employed in the tobacco curing, wood carving and ceramic industries. In the Northeastern region, the noodle, tobacco curing, and pottery industries and slaughterhouses employed the majority. In the Southern region, the rubber smoking, wood

drying, brick making and fishmeal industries employed the largest number. In the Central region, the majority were employed in slaughterhouses, and in the wood drying, brick making, bamboo shoot preservation, and noodle industries.

The use of fuelwood from forest lands and village woodlots can be found in every region. Waste wood from the construction industry was also used in every region except the Southern region. Fuelwood from forest plantations was used exclusively in the Northeastern and Central regions although in the latter only a very small quantity was used. Saw dust is an important source of energy in every region, especially in the Central region.

This document covers selected industries for which photographs and information are available. In total, 33 industries are represented:

1. Agro-Processing Industries
   - Cassava pellet
   - Coconut oil
   - Preserved fruit
   - Palm oil
   - Rice flour chips
   - Rice milling
   - Rubber smoking
   - Soy bean sheet
   - Soy sauce
   - Sugar making
   - Tapioca
   - Tea curing
   - Tobacco curing
   - Vinegar

2. Food-Processing Industries
   - Bakery
   - Chinese sausage
   - Fishmeal
   - Meatball
   - Noodle
   - Noodle (meesua)
   - Preserved food
   - Steamed fish

3. Metal Processing Industries
   - Blacksmith

4. Forest Products Industries
   - Preserved bamboo shoot
   - Wood carving
   - Wood drying (for drying after carving)

5. Mineral Based Industries
   - Brick making
   - Ceramic production
   - Lime production
   - Pottery

6. Textile Based Industries
   - Silk dyeing

7. Miscellaneous Industries (All other activities)
   - Slaughterhouse
   - Tyre retreading

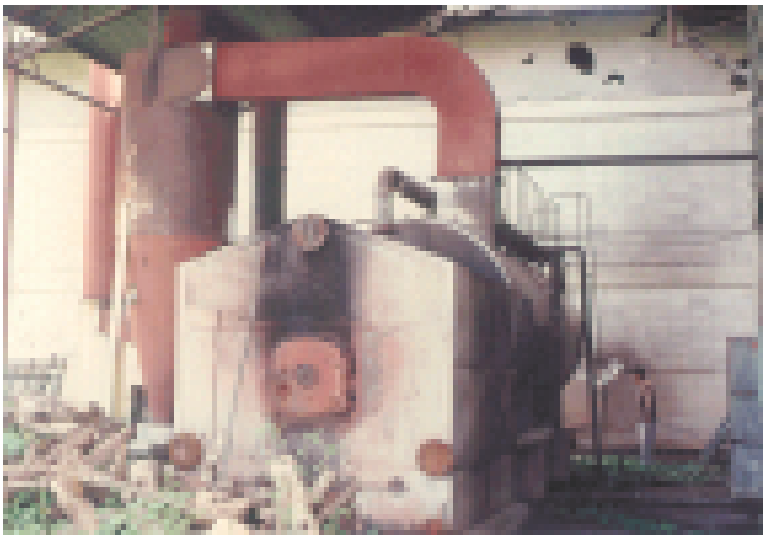
2. AGRO-PROCESSING INDUSTRIES

2.1 Cassava Pellet Production

1. Category : **Village Enterprise**
2. Activity Group : **Agricultural Product Processing**

Specific Information of Representative Industry

3. Specific Activity : **Cassava Pellet Production**
4. Name of Industry : **Aung Sun Li Ltd.**
5. Location : **Kabin Buri District, Prachinburi Province**
6. Ownership : **Entrepreneur**



Wood fired boiler for process steam generator

7.	Labour Supply Source and Operation :	**Family & Villagers**	
8.	Scale of Operation (Production Capacity) :		
8.1	Raw Material Requirement :	**Cassava roots**	
8.2	Range Within the Specific Industry Type :		
	Smallest Unit		
	Largest Unit	**Data not available**	
	Average Unit		
8.3	Scale of Operation/Output :		
8.4	Range of Output : (Between industries of the same type)		
	Smallest Unit		
	Largest Unit	**Data not available**	
	Average Unit		
8.5	Raw Material Supply Source :	**Local**	
9.	Investment Requirement :		
	Minimum	**0.05**	**mil. baht**
	Maximum	**167.30**	**mil. baht**
	Average	**5.68**	**mil. baht**
10.	Regularity of Production :	**Seasonal (November - March)**	
11.	Annual Fuel Requirement:		
	Fuelwood and Charcoal	**Fuelwood 300 tonnes**	
	Other Biomass	-	
	Commercial Fuel	-	
11.1	Fuelwood Supply Source :	**Forest and Non-forest Lands**	
11.2	Fuel Use Flexibility	**Low**	
12.	Organization :		
12.1	Non - wage/Wage	**Wage**	
12.2	Shared Task/Rudimentary Wage/Special Contract :	**Rudimentary Wage**	
13.	Complexity of Technology Adopted :	**Medium**	
14.	Formality of Organization :	**Rudimentary Formal**	
15.	Significance of the Industry :		
15.1	Fuel Consumption :	**Data not available**	
15.2	Contribution to Employment and Income :		
	(1) High (2) Medium	**(3) Low**	
15.2	Contribution to Food Production and Security :		
	(1) High Local Use (2) Medium	(3) Low	

15.4 Nutrition and Health Value :

(1) High **(2) Medium** (3) Low/No value

15.5 Impact on the Environment :

(1) Significant (2) Medium **(3) Not Significant**

Country Level Information of Industry Type

16. Country Level Information

16.1 Estimated Total Number of Industries of this Type :

19 plants

16.2 Geographical Distribution:

North = 0 South = 0 Central = 19 Northeast = 0

16.3 Commonly Preferred Location : (Large Urban Centres/Small Towns/Rural Areas)

Small Towns

16.4 Estimated Total Amount of Energy Used by all Industries of this Type :

Fuelwood = 5,596 m^3/year

16.5 Estimated Total Number of People Employed in all Industries of this Type

People employed = 266

2.2 Coconut Oil Production

1.	Category :	**Rural Industry**
2.	Activity Group :	**Agricultural Product Processing**

Specific Information of Representative Industry

3.	Specific Activity :	**Coconut Oil Production**
4.	Name of Industry :	**Srisimongkol**
5.	Location :	**Bang Khonthi District, Samut Song Khram Province**
6.	Ownership :	**Entrepreneur**

Wood fired furnace for cooking crushed copra before expelling the oil

7.	Labour Supply Source and Operation :	**Villagers & Non-Villagers**
8.	Scale of Operation (Production Capacity) :	
8.1	Raw Material Requirement :	**7,300,000 kg of coconuts/year**
8.2	Range Within the Specific Industry Type :	
	Smallest Unit	**2,800,000 kg of coconuts/year**
	Largest Unit	**9,125,000 kg of coconuts/year**
	Average Unit	**5,191,667 kg of coconuts/year**
8.3	Scale of Operation/Output :	**182,500 kg of coconut oil/year**
8.4	Range of Output : (Between industries of the same type)	
	Smallest Unit	**182,500 kg of coconut oil/year**
	Largest Unit	**1,585,000 kg of coconut oil/year**
	Average Unit	**1,181,875 kg of coconut oil/year**
8.5	Raw Material Supply Source :	**Local & Other Provinces**
9.	Investment Requirement :	
	Minimum	**0.63 mil. baht**
	Maximum	**2.51 mil. baht**
	Average	**1.57 mil. baht**
10.	Regularity of Production :	**Regular**
11.	Annual Fuel Requirement:	
	Fuelwood and Charcoal	**Fuelwood = 5,840 m^3**
	Other Biomass	-
	Commercial Fuel	-
11.1	Fuelwood Supply Source :	**Non-forest Lands**
11.2	Fuel Use Flexibility	**Low**
12.	Organization :	
12.1	Non - wage/Wage	**Wage**
12.2	Shared Task/Rudimentary Wage/Special Contract :	**Rudimentary Wage**
13.	Complexity of Technology Adopted :	**Low**
14.	Formality of Organization :	**Rudimentary Formal**
15.	Significance of the Industry :	
15.1	Fuel Consumption :	
	fuelwood 1 m^3 : 31.25 kg of coconut oil	
15.2	Contribution to Employment and Income :	
	(1) High (2) Medium	(3) Low

15.3 Contribution to Food Production and Security :

(1) High Local Use (2) Medium (3) Low

15.4 Nutrition and Health Value :

(1) High (2) Medium **(3) Low/No value**

15.5 Impact on the Environment :

(1) Significant **(2) Medium** (3) Not Significant

Country Level Information of Industry Type

16. Country Level Information

16.1 Estimated Total Number of Industries of this Type :

16.2 Geographical Distribution:

16.3 Commonly Preferred Location : (Large Urban Centres/Small Towns/Rural Areas)

16.4 Estimated Total Amount of Energy Used by all Industries of this Type :

16.5 Estimated Total Number of People Employed in all Industries of this Type:

2.3 Palm Oil Production

1.	Category :	**Rural Industry**
2.	Activity Group :	**Agricultural Product Processing**

Specific Information of Representative Industry

3.	Specific Activity :	**Palm Oil Production**
4.	Name of Industry :	**Ruammitre Palm Oil**
5.	Location :	**Muang District, Krabi Province**
6.	Ownership :	**Entrepreneur**

Palm kernel shells for use in the boiler

7.	Labour Supply Source and Operation :	**Villagers & Non-villagers**
8.	Scale of Operation (Production Capacity) :	
8.1	Raw Material Requirement :	**150,000 kg of palm/year**
8.2	Range Within the Specific Industry Type :	
	Smallest Unit	**150,000 kg of palm/year**
	Largest Unit	**19,020,000 kg of palm/year**
	Average Unit	**9,547,500 kg of palm/year**
8.3	Scale of Operation/Output :	**108,000 kg of palm oil/year**
8.4	Range of Output : (Between industries of the same type)	
	Smallest Unit	**108,000 kg of palm oil/year**
	Largest Unit	**6,750,000 kg of palm oil/year**
	Average Unit	**3,463,800 kg of palm oil/year**
8.5	Raw Material Supply Source :	**Local & Other Provinces**
9.	Investment Requirement :	
	Minimum	
	Maximum	**Data not available**
	Average	
10.	Regularity of Production :	**Regular**
11.	Annual Fuel Requirement:	
	Fuelwood and Charcoal	**Fuelwood = 4,300 m^3**
	Other Biomass	-
	Commercial Fuel	-
11.1	Fuelwood Supply Source :	**Forest**
11.2	Fuel Use Flexibility	**Low**
12.	Organization :	
12.1	Non - wage/Wage	**Wage**
12.2	Shared Task/Rudimentary Wage/Special Contract :	**Rudimentary Wage**
13.	Complexity of Technology Adopted :	**High**
14.	Formality of Organization :	**Formal**
15.	Significance of the Industry :	
15.1	Fuel Consumption :	
	Fuelwood 1 m^3 : 25.11 kg of palm oil	
15.2	Contribution to Employment and Income :	
	(1) High **(2) Medium** (3) Low	
15.3	Contribution to Food Production and Security :	
	(1) High Local Use (2) Medium (3) Low	

15.4 Nutrition and Health Value :

(1) High **(2) Medium** (3) Low/No value

15.5 Impact on the Environment :

(1) Significant **(2) Medium** (3) Not Significant

Country Level Information of Industry Type

16. Country Level Information

16.1 Estimated Total Number of Industries of this Type : **31 plants**

16.2 Geographical Distribution:

North = 0 South = 31 Central = 0 Northeast = 0

16.3 Commonly Preferred Location : (Large Urban Centres/Small Towns/Rural Areas)

Small Towns

16.4 Estimated Total Amount of Energy Used by all Industries of this Type :

Fuelwood = 109,148 m^3/year

16.5 Estimated Total Number of People Employed in all Industries of this Type

People employed = 1,013

2.4 Rice Flour Chips Production

1.	Category :	**Village Enterprise**
2.	Activity Group :	**Agricultural Product Processing**

Specific Information of Representative Industry

3.	Specific Activity :	**Rice Flour Chips Production**
4.	Name of Industry :	**Kim Lia Seng Factory**
5.	Location :	**Muang District, Chiang Rai Province**
6.	Ownership :	**Family**

Wood fired furnaces with steamer where the chips are dried and packed

7.	Labour Supply Source and Operation :	**Family & Villagers**
8.	Scale of Operation (Production Capacity) :	
8.1	Raw Material Requirement :	**41,760 kg of rice flour /year**
8.2	Range Within the Specific Industry Type :	
	Smallest Unit	**2,000 kg/year**
	Largest Unit	**254,040 kg/year**
	Average Unit	**53,829 kg/year**
8.3	Scale of Operation/Output :	**36,000 kg of rice flour chips/year**
8.4	Range of Output : (Between industries of the same type)	
	Smallest Unit	**1,800 kg/year**
	Largest Unit	**219,000 kg/year**
	Average Unit	**58,710 kg/year**
8.5	Raw Material Supply Source :	**Local**
9.	Investment Requirement :	
	Minimum	**0.14 mil. baht**
	Maximum	**3.02 mil. baht**
	Average	**1.41 mil. baht**
10.	Regularity of Production :	**Regular**
11.	Annual Fuel Requirement:	
	Fuelwood and Charcoal	**Fuelwood = 730 m^3**
	Other Biomass	**-**
	Commercial Fuel	**-**
11.1	Fuelwood Supply Source :	**Non-forest Lands**
11.2	Fuel Use Flexibility	**Low**
12.	Organization :	
12.1	Non - wage/Wage	**Wage**
12.2	Shared Task/Rudimentary Wage/Special Contract :	**Rudimentary Wage**
13.	Complexity of Technology Adopted :	**Low**
14.	Formality of Organization :	**Rudimentary Formal**
15.	Significance of the Industry :	
15.1	Fuel Consumption :	
	Fuelwood 1 m^3 : 49 kg of Rice Flour Chips	
15.2	Contribution to Employment and Income :	
	(1) High (2) Medium	**(3) Low**

15.3 Contribution to Food Production and Security :

(1) High Local Use (2) Medium (3) Low

15.4 Nutrition and Health Value :

(1) High **(2) Medium** (3) Low/No value

15.5 Impact on the Environment :

(1) Significant (2) Medium **(3) Not Significant**

Country Level Information of Industry Type

16. Country Level Information

16.1 Estimated Total Number of Industries of this Type : **21 plants**

16.2 Geographical Distribution:

North = 1 **South = 5** **Central = 6** **Northeast = 9**

16.3 Commonly Preferred Location : (Large Urban Centres/Small Towns/Rural Areas)

Large Urban Centres

16.4 Estimated Total Amount of Energy Used by all Industries of this Type :

Fuelwood = 9,965 m^3/year

16.5 Estimated Total Number of People Employed in all Industries of this Type

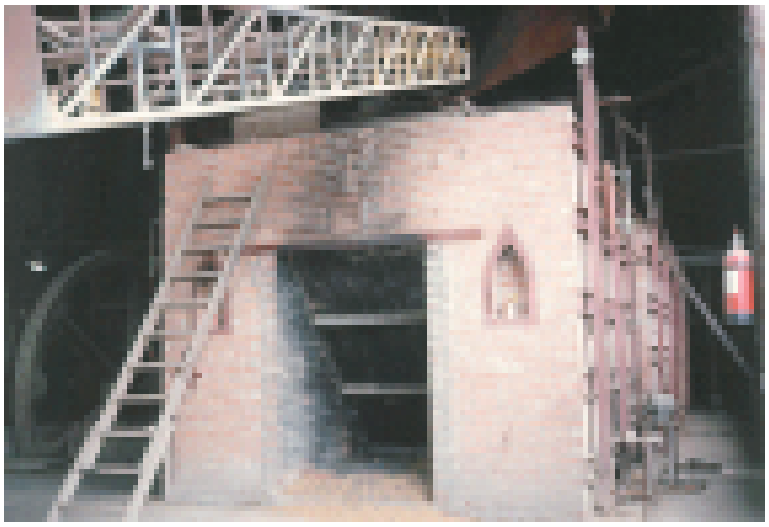
People employed = 304

2.5 Rice Milling

1.	Category :	**Rural Industry**
2.	Activity Group :	**Agricultural Product Processing**

Specific Information of Representative Industry

3.	Specific Activity :	**Rice Milling**
4.	Name of Industry :	**Sri Thanapornchai Ltd.**
5.	Location :	**Muang District, Saraburi Province**
6.	Ownership :	**Entrepreneur**



Rice husk fired furnace with step grate which provides process heat for generating the steam which is used to drive the equipment

7.	Labour Supply Source and Operation :	**Villagers & Non-villagers**
8.	Scale of Operation (Production Capacity) :	
8.1	Raw Material Requirement :	**5,475,000 kg of raw rice/year**
8.2	Range Within the Specific Industry Type :	
	Smallest Unit	
	Largest Unit	**Data not available**
	Average Unit	
8.3	Scale of Operation/Output :	**3,318,180 kg of white rice/year**
8.4	Range of Output : (Between industries of the same type)	
	Smallest Unit	
	Largest Unit	**Data not available**
	Average Unit	
8.5	Raw Material Supply Source :	**Local & Other Provinces**
9.	Investment Requirement :	
	Minimum	**0.01 mil. baht**
	Maximum	**13.50 mil. baht**
	Average	**0.38 mil. baht**
10.	Regularity of Production :	**Regular**
11.	Annual Fuel Requirement:	
	Fuelwood and Charcoal	**-**
	Other Biomass	**Rice husk = 793,800 kg**
	Commercial Fuel	**Electricity**
11.1	Fuelwood Supply Source :	**Non-forest Lands**
11.2	Fuel Use Flexibility	**Low**
12.	Organization :	
12.1	Non - wage/Wage	**Wage**
12.2	Shared Task/Rudimentary Wage/Special Contract :	**Rudimentary Wage**
13.	Complexity of Technology Adopted :	**High**
14.	Formality of Organization :	**Rudimentary Formal**
15	Significance of the Industry :	
15.1	Fuel Consumption :	
	Rice husk 1 kg : 4.18 kg of white rice	
15.2	Contribution to Employment and Income :	
	(1) High (2) Medium	(3) Low
15.3	Contribution to Food Production and Security :	
	(1) High Local Use (2) Medium	(3) Low

15.4 Nutrition and Health Value :

(1) High (2) Medium (3) Low/No value

15.5 Impact on the Environment :

(1) Significant **(2) Medium** (3) Not Significant

Country Level Information of Industry Type

16. Country Level Information

16.1 Estimated Total Number of Industries of this Type :

16.2 Geographical Distribution:

16.3 Commonly Preferred Location : (Large Urban Centres/Small Towns/Rural Areas)

16.4 Estimated Total Amount of Energy Used by all Industries of this Type :

16.5 Estimated Total Number of People Employed in all Industries of this Type

2.6 Rubber Smoking

1.	Category :	**Rural Industry**
2.	Activity Group :	**Agricultural Product Processing**

Specific Information of Representative Industry

3.	Specific Activity :	**Rubber Smoking**
4.	Name of Industry :	**Huay Shuan Co., Ltd.**
5.	Location :	**Muang District, Chantaburi Province**
6.	Ownership :	**Entrepreneur**

Rubber sheets hanging over supporting rods for smoking/drying in the kiln

7.	Labour Supply Source and Operation :	**Villagers & Non-villagers**
8.	Scale of Operation (Production Capacity) :	
8.1	Raw Material Requirement :	**7,040,000 kg of rubber sheets/year**
8.2	Range Within the Specific Industry Type :	
	Smallest Unit	**660,000 kg of rubber sheets/year**
	Largest Unit	**24,000,000 kg of rubber sheets/year**
	Average Uni	**9,971,400 kg of rubber sheets/year**
8.3	Scale of Operation/Output :	**6,723,000 kg of smoked rubbersheets/year**
8.4	Range of Output :	
	Smallest Unit	**400,000 kg of smoked rubber sheets/year**
	Largest Unit	**21,600,000 kg of smoked rubber sheets/year**
	Average Unit	**10,335,413 kg of smoked rubber sheets/year**
8.5	Raw Material Supply Source :	**Local & Other Provinces**
9.	Investment Requirement :	
	Minimum	**3.40 mil. baht**
	Maximum	**35.90 mil. baht**
	Average	**19.65 mil. baht**
10.	Regularity of Production :	**Seasonal (October - January)**
11.	Annual Fuel Requirement:	
	Fuelwood and Charcoal	**Fuelwood = 2,200 m^3**
	Other Biomass	-
	Commercial Fuel	-
11.1	Fuelwood Supply Source :	**Non-forest Lands (Rubber Plantation)**
11.2	Fuel Use Flexibility	**Low**
12.	Organization :	
12.1	Non - wage/Wage	**Wage**
12.2	Shared Task/Rudimentary Wage/Special Contract :	**Special Contract**
13.	Complexity of Technology Adopted :	**Medium**
14.	Formality of Organization :	**Formal**
15.	Significance of the Industry :	
15.1	Fuel Consumption :	
	Fuelwood 1 m^3 : 3,055 kg of Smoked rubber sheets	
15.2	Contribution to Employment and Income :	
	(1) High (2) Medium (3) Low	
15.3	Contribution to Food Production and Security :	
	(1) High Local Use (2) Medium **(3) Low**	

15.4 Nutrition and Health Value :
(1) High (2) Medium **(3) Low/No value**

15.5 Impact on the Environment :
(1) Significant **(2) Medium** (3) Not Significant

Country Level Information of Industry Type

16. Country Level Information

16.1 Estimated Total Number of Industries of this Type :
123 plants

16.2 Geographical Distribution:
North = 0 South = 118 Central = 5 Northeast = 0

16.3 Commonly Preferred Location : (Large Urban Centres/Small Towns/Rural Areas)
Large Urban Centres

16.4 Estimated Total Amount of Energy Used by all Industries of this Type :
Fuelwood = 388,858 m^3/year

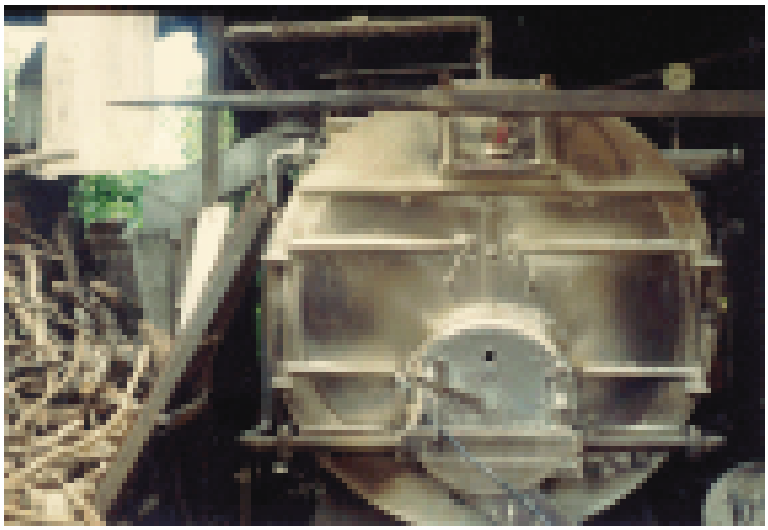
16.5 Estimated Total Number of People Employed in all Industries of this Type
People employed = 27,932

2.7 Soy Bean Sheet Production

1.	Category :	**Rural Industry**
2.	Activity Group :	**Agricultural Product Processing**

Specific Information of Representative Industry

3.	Specific Activity :	**Soy Bean Sheet Production**
4.	Name of Industry :	**Rungkit Industry Ltd.**
5.	Location :	**Muang District, Lamphun Province**
6.	Ownership :	**Entrepreneur**



Wood/Biomass fired steam boiler used in the production of soybean sheets

7.	Labour Supply Source and Operation :	**Villagers & Non-villagers**
8.	Scale of Operation (Production Capacity) :	
8.1	Raw Material Requirement :	**80,640 kg of soy beans/year**
8.2	Range Within the Specific Industry Type :	
	Smallest Unit	
	Largest Unit	**Data not available**
	Average Unit	
8.3	Scale of Operation/Output :	**54,560 kg of soy bean sheets/year**
8.4	Range of Output :	
	Smallest Unit	
	Largest Unit	**Data not available**
	Average Unit	
8.5	Raw Material Supply Source :	**Local & Other Provinces**
9.	Investment Requirement :	
	Minimum	**0.10 mil. baht**
	Maximum	**24.10 mil. baht**
	Average	**4.20 mil. baht**
10.	Regularity of Production :	**Regular**
11.	Annual Fuel Requirement:	
	Fuelwood and Charcoal	**Fuelwood = 5,475 m^3**
	Other Biomass	-
	Commercial Fuel	-
11.1	Fuelwood Supply Source :	**Non-forest Lands**
11.2	Fuel Use Flexibility	**Low**
12.	Organization :	
12.1	Non - wage/Wage	**Wage**
12.2	Shared Task/Rudimentary Wage/Special Contract :	**Formal**
13.	Complexity of Technology Adopted :	**Medium**
14.	Formality of Organization :	**Formal**
15.	Significance of the Industry :	
15.1	Fuel Consumption :	
	Fuelwood 1 m^3 : 9.96 kg of soy bean sheets	
15.2	Contribution to Employment and Income :	
	(1) High **(2) Medium** (3) Low	
15.3	Contribution to Food Production and Security :	
	(1) High Local Use (2) Medium (3) Low	

15.4 Nutrition and Health Value :

(1) High (2) Medium (3) Low/No value

15.5 Impact on the Environment :

(1) Significant (2) Medium **(3) Not Significant**

Country Level Information of Industry Type

16 Country Level Information

16.1 Estimated Total Number of Industries of this Type :

18 plants

16.2 Geographical Distribution:

North = 5 South = 0 Central = 12 Northeast = 1

16.3 Commonly Preferred Location : (Large Urban Centres/Small Towns/Rural Areas)

Large Urban Centres

16.4 Estimated Total Amount of Energy Used by all Industries of this Type :

Fuelwood = 1,904 m^3/year

Sawdust = 3,231 m^3/year

16.5 Estimated Total Number of People Employed in all Industries of this Type

People employed = 146

2.8 Soy Sauce Production

1.	Category :	**Rural Industry**
2.	Activity Group :	**Agricultural Product Processing**

Specific Information of Representative Industry

3.	Specific Activity :	**Soy Sauce Production**
4.	Name of Industry :	**Tang Li Seng Ltd.**
5.	Location :	**Muang District, Nonthaburi Province**
6.	Ownership :	**Entrepreneur**

Wood fired furnace with cooking pot used to produce soy sauce

7.	Labour Supply Source and Operation :	**Villagers & Non-villagers**
8.	Scale of Operation (Production Capacity) :	
8.1	Raw Material Requirement :	**9,980 kg of soy beans/year**
8.2	Range Within the Specific Industry Type :	
	Smallest Unit	**2,400 kg of soy beans/year**
	Largest Unit	**10,980 kg of soy beans/year**
	Average Unit	**8,233 kg of soy beans/year**
8.3	Scale of Operation/Output :	**688,600 bottles of soy sauce/year**
8.4	Range of Output : (Between industries of the same type)	
	Smallest Unit	**156,000 bottles of soy sauce/year**
	Largest Unit	**710,000 bottles of soy sauce/year**
	Average Unit	**532,650 bottles of soy sauce/year**
8.5	Raw Material Supply Source :	**Local & Other Provinces**
9.	Investment Requirement :	
	Minimum	**0.08 mil. baht**
	Maximum	**62.30 mil. baht**
	Average	**6.79 mil. baht**
10.	Regularity of Production :	**Regular**
11.	Annual Fuel Requirement:	
	Fuelwood and Charcoal	**Fuelwood = 313 m^3**
	Other Biomass	-
	Commercial Fuel	-
11.1	Fuelwood Supply Source :	**Non-forest Lands**
11.2.	Fuel Use Flexibility	**Low**
12	Organization :	
12.1	Non - wage/Wage	**Wage**
12.2	Shared Task/Rudimentary Wage/Special Contract :	**Rudimentary Wage**
13.	Complexity of Technology Adopted :	**Low**
14.	Formality of Organization :	**Formal**
15.	Significance of the Industry :	
15.1	Fuel Consumption :	
	Fuelwood 1 m^3 : 2,200 bottles of soy sauce	
15.2	Contribution to Employment and Income :	
	(1) High (2) Medium	(3) Low
15.3	Contribution to Food Production and Security :	
	(1) High Local Use (2) Medium	(3) Low

15.4 Nutrition and Health Value :
(1) High **(2) Medium** (3) Low/No value

15.5 Impact on the Environment :
(1) Significant **(2) Medium** (3) Not Significant

Country Level Information of Industry Type

16. Country Level Information

16.1 Estimated Total Number of Industries of this Type :
17 plants

16.2 Geographical Distribution:
North = 0 South = 13 Central = 4 Northeast = 0

16.3 Commonly Preferred Location : (Large Urban Centres/Small Towns/Rural Areas)
Large Urban Centres

16.4 Estimated Total Amount of Energy Used by all Industries of this Type :
Fuelwood = 2,299 m^3/year

16.5 Estimated Total Number of People Employed in all Industries of this Type
People employed = 169

2.9 Sugar Manufacturing (White Sugar)

1.	Category :	**Village Enterprise**
2.	Activity Group :	**Agricultural Product Processing**

Specific Information of Representative Industry

3.	Specific Activity :	**Sugar Manufacturing (White Sugar)**
4.	Name of Industry :	**-**
5.	Location :	**Taphan Hin District, Phichit Province**
6.	Ownership :	**Entrepreneur**

Wood fired furnace for sugar production (boiling of juice)

7.	Labour Supply Source and Operation :	**Villagers**
8.	Scale of Operation (Production Capacity) :	
8.1	Raw Material Requirement :	**1,200 m^3 of sugar cane/year**
8.2	Range Within the Specific Industry Type :	
	Smallest Unit	
	Largest Unit	**Data not available**
	Average Unit	
8.3	Scale of Operation/Output :	**21,000 kg of white sugar/year**
8.4	Range of Output : (Between industries of the same type)	
	Smallest Unit	
	Largest Unit	**Data not available**
	Average Unit	
8.5	Raw Material Supply Source :	**Local**
9.	Investment Requirement :	
	Minimum	**0.05 mil. baht**
	Maximum	**22.80 mil. baht**
	Average	**2.90 mil. baht**
10.	Regularity of Production :	**Seasonal (December - April)**
11.	Annual Fuel Requirement:	
	Fuelwood and Charcoal	**Fuelwood = 20 m^3**
	Other Biomass	**Bagasse = 600 m^3**
	Commercial Fuel	-
11.1	Fuelwood Supply Source :	**Non-forest Lands**
11.2	Fuel Use Flexibility	**High**
12.	Organization :	
12.1	Non - wage/Wage	**Wage**
12.2	Shared Task/Rudimentary Wage/Special Contract :	**Rudimentary Wage**
13.	Complexity of Technology Adopted :	**Medium**
14.	Formality of Organization :	**Rudimentary Formal**
15	Significance of the Industry :	
15.1	Fuel Consumption :	
	Fuelwood 1 m^3 : 1,050 kg of white sugar or Bagasse 1 m^3 : 35 kg of white sugar	
15.2	Contribution to Employment and Income :	
	(1) High (2) Medium **(3) Low**	
15.3	Contribution to Food Production and Security :	
	(1) High Local Use (2) Medium (3) Low	

15.4 Nutrition and Health Value :

(1) High (2) Medium **(3) Low/No value**

15.5 Impact on the Environment :

(1) Significant **(2) Medium** (3) Not Significant

Country Level Information of Industry Type

16. Country Level Information

16.1 Estimated Total Number of Industries of this Type :

12 plants

16.2 Geographical Distribution:

North = 8 South = 0 Central = 4 Northeast = 0

16.3 Commonly Preferred Location : (Large Urban Centres/Small Towns/Rural Areas)

Small Towns

16.4 Estimated Total Amount of Energy Used by all Industries of this Type :

Fuelwood = 254 m^3/year

16.5 Estimated Total Number of People Employed in all Industries of this Type

People employed = 294

2.10 Tapioca Pellet Production

1.	Category :	**Cottage Activity**
2.	Activity Group :	**Agricultural Product Processing**

Specific Information of Representative Industry

3.	Specific Activity :	**Tapioca Pellet Production**
4.	Name of Industry :	**Kuang Nhuan**
5.	Location :	**Muang District, Prachuap Khiri Khan**
6.	Ownership :	**Family**

Wood fired down draft furnace to provide heat for drying the tapioca pellets

7.	Labour Supply Source and Operation :	**Family & Villagers**
8.	Scale of Operation (Production Capacity) :	
8.1	Raw Material Requirement :	**Cassava flour**
8.2	Range Within the Specific Industry Type :	
	Smallest Unit	
	Largest Unit	**Data not available**
	Average Unit	
8.3	Scale of Operation/Output :	**216,000 kg of tapioca/year**
8.4	Range of Output : (Between industries of the same type)	
	Smallest Unit	
	Largest Unit	**Data not available**
	Average Unit	
8.5	Raw Material Supply Source :	**Local**
9.	Investment Requirement :	
	Minimum	**0.21 mil. baht**
	Maximum	**29.50 mil. baht**
	Average	**9.39 mil. baht**
10.	Regularity of Production :	**Irregular**
11	Annual Fuel Requirement:	
	Fuelwood and Charcoal	**Fuelwood = 200 m^3**
	Other Biomass	-
	Commercial Fuel	-
11.1	Fuelwood Supply Source :	**Non-forest Lands (Sawmill)**
11.2	Fuel Use Flexibility	**Low**
12.	Organization :	
12.1	Non - wage/Wage	**Non-wage**
12.2	Shared Task/Rudimentary Wage/Special Contract :	**Shared Task**
13.	Complexity of Technology Adopted :	**Low**
14.	Formality of Organization :	**Informal**
15.	Significance of the Industry :	
15.1	Fuel Consumption :	
	Fuelwood 1 m^3 : 1,090 kg of Tapioca	
15.2	Contribution to Employment and Income :	
	(1) High (2) Medium	**(3) Low**
15.3	Contribution to Food Production and Security :	
	(1) High Local Use (2) Medium	(3) Low

15.4 Nutrition and Health Value :
(1) High **(2) Medium** (3) Low/No value

15.5 Impact on the Environment :
(1) Significant (2) Medium **(3) Not Significant**

Country Level Information of Industry Type

16. Country Level Information

16.1 Estimated Total Number of Industries of this Type :
2 plants

16.2 Geographical Distribution:
North = 0 South = 0 Central = 2 Northeast = 0

16.3 Commonly Preferred Location : (Large Urban Centres/Small Towns/Rural Areas)
Small Towns

16.4 Estimated Total Amount of Energy Used by all Industries of this Type :
Fuelwood = 400 m^3/year

16.5 Estimated Total Number of People Employed in all Industries of this Type
People employed = 14

2.11 Tea Curing

1.	Category :	**Rural Industry**
2.	Activity Group :	**Agricultural Product Processing**

Specific Information of Representative Industry

3.	Specific Activity :	**Tea Curing**
4.	Name of Industry :	**-**
5.	Location :	**Muang District, Phrae Province**
6.	Ownership :	**Family**

Wood fired boiler for generating the steam which is used for fermenting tea (miang)

7.	Labour Supply Source and Operation :	**Villagers**
8.	Scale of Operation (Production Capacity) :	
8.1	Raw Material Requirement :	**57,600,000 kg of tea leaves/year**
8.2	Range Within the Specific Industry Type :	
	Smallest Unit	
	Largest Unit	**Data not available**
	Average Unit	
8.3	Scale of Operation/Output :	**5,760,000 kg of dried tea leaves/year**
8.4	Range of Output : (Between industries of the same type)	
	Smallest Unit	
	Largest Unit	**Data not available**
	Average Unit	
8.5	Raw Material Supply Source :	**Local**
9.	Investment Requirement :	
	Minimum	**0.61 mil. baht**
	Maximum	**8.80 mil. baht**
	Average	**7.51 mil. baht**
10.	Regularity of Production :	**Seasonal (November - April)**
11.	Annual Fuel Requirement:	
	Fuelwood and Charcoal	**Fuelwood = 2,995 m^3**
	Other Biomass	-
	Commercial Fuel	-
11.1	Fuelwood Supply Source :	**Forest**
11.2	Fuel Use Flexibility	**Low**
12.	Organization :	
12.1	Non - wage/Wage	**Wage**
12.2	Shared Task/Rudimentary Wage/Special Contract :	**Rudimentary Wage**
13.	Complexity of Technology Adopted :	**Medium**
14.	Formality of Organization :	**Rudimentary Formal**
15	Significance of the Industry :	
15.1	Fuel Consumption :	
	Average = 1 m^3 : 341.8 kg of dried tea leaves	
15.2	Contribution to Employment and Income :	
	(1) High (2) Medium	**(3) Low**
15.3	Contribution to Food Production and Security :	
	(1) High Local Use (2) Medium	(3) Low

15.4 Nutrition and Health Value :

(1) High (2) Medium **(3) Low/No value**

15.5 Impact on the Environment :

(1) Significant (2) Medium **(3) Not Significant**

Country Level Information of Industry Type

16. Country Level Information

16.1 Estimated Total Number of Industries of this Type :

12 plants

16.2 Geographical Distribution:

North = 12 South = 0 Central = 0 Northeast = 0

16.3 Commonly Preferred Location : (Large Urban Centres/Small Towns/Rural Areas)

Small Towns

16.4 Estimated Total Amount of Energy Used by all Industries of this Type :

Fuelwood = 30,005 m^3/year

16.5 Estimated Total Number of People Employed in all Industries of this Type

People employed = 100

2.12 Tobacco Curing

1.	Category :	**Rural Industry**
2.	Activity Group :	**Agricultural Product Processing**

Specific Information of Representative Industry

3.	Specific Activity :	**Tobacco Curing**
4.	Name of Industry :	**Raw Keaw Factory**
5.	Location :	**Hang Chat District, Lampang Province**
6.	Ownership :	**Entrepreneur**

Tobacco curing barns using wood to generate process heat

7.	Labour Supply Source and Operation :	**Family & Villagers & Non-villagers**
8.	Scale of Operation (Production Capacity) :	
8.1	Raw Material Requirement :	**1,728,000 kg of tobacco leaves/year**
8.2	Range within the Specific Industry Type :	
	Smallest Unit	**4,000 kg of tobacco leaves/year**
	Largest Unit	**686,400,000 kg of tobacco leaves/year**
	Average Unit	**44,018,813 kg of tobacco leaves/year**
8.3	Scale of Operation/Output :	**1,200,000 kg of dried tobacco - leaves/year**
8.4	Range of Output :	
	Smallest Unit	**600 kg/year**
	Largest Unit	**68,640,000 kg/year**
	Average Unit	**4,219,213 kg/year**
8.5	Raw Material Supply Source :	**Local & Other Provinces**
9.	Investment Requirement :	
	Minimum	**0.003 mil. baht**
	Maximum	**168.06 mil. baht**
	Average	**7.29 mil. baht**
10.	Regularity of Production :	**Regular**
11.	Annual Fuel Requirement:	
	Fuelwood and Charcoal	**Fuelwood = 6,190.56 m^3**
	Other Biomass	-
	Commercial Fuel	-
11.1	Fuelwood Supply Source :	**Forest**
11.2	Fuel Use Flexibility	**Low**
12.	Organization :	
12.1	Non - wage/Wage	**Wage**
12.2	Shared Task/Rudimentary Wage/Special Contract :	**Special Contract**
13.	Complexity of Technology Adopted :	**High**
14.	Formality of Organization :	**Formal**
15.	Significance of the Industry :	
15.1	Fuel Consumption :	
	Fuelwood 1 m^3 : 193.86 kg of dried tobacco leaves	
15.2	Contribution to Employment and Income :	
	(1) High (2) Medium (3) Low	
15.3	Contribution to Food Production and Security :	
	(1) High Local Use (2) Medium **(3) Low**	

15.4 Nutrition and Health Value :

(1) High (2) Medium **(3) Low/No value**

15.5 Impact on the Environment :

(1) Significant **(2) Medium** (3) Not Significant

Country Level Information of Industry Type

16. Country Level Information

16.1 Estimated Total Number of Industries of this Type :

956 plants

16.2 Geographical Distribution:

North = 194 South = 0 Central = 0 Northeast = 762

16.3 Commonly Preferred Location : (Large Urban Centres/Small Towns/Rural Areas)

Small Towns

16.4 Estimated Total Amount of Energy Used by all Industries of this Type :

Fuelwood = 3,528,840 m^3/year

16.5 Estimated Total Number of People Employed in all Industries of this Type

People employed = 11,560

2.13 Vinegar Production

1.	Category :	**Cottage Activity**
2.	Activity Group :	**Agricultural Product Processing**

Specific Information of Representative Industry

3.	Specific Activity :	**Vinegar Production**
4.	Name of Industry :	**-**
5.	Location :	**Muang District, Phetchaburi Province**
6.	Ownership :	**Women**

Wood fired furnace with vinegar distillation unit

7.	Labour Supply Source and Operation :	**Single Family**
8.	Scale of Operation (Production Capacity) :	
8.1	Raw Material Requirement :	**Glutinous Rice**
8.2	Range Within the Specific Industry Type :	
	Smallest Unit	
	Largest Unit	**Data not available**
	Average Unit	
8.3	Scale of Operation/Output :	
8.4	Range of Output : (Between industries of the same type)	
	Smallest Unit	
	Largest Unit	**Data not available**
	Average Unit	
8.5	Raw Material Supply Source :	**Local**
9.	Investment Requirement :	
	Minimum	
	Maximum	**Data not available**
	Average	
10.	Regularity of Production :	**Irregular**
11.	Annual Fuel Requirement:	
	Fuelwood and Charcoal	**Fuelwood = 73 m^3**
	Other Biomass	-
	Commercial Fuel	-
11.1	Fuelwood Supply Source :	**Forest**
11.2	Fuel Use Flexibility	**Low**
12.	Organization :	
12.1	Non - wage/Wage	**Non-wage**
12.2	Shared Task/Rudimentary Wage/Special Contract :	**Shared Task**
13.	Complexity of Technology Adopted :	**Low**
14.	Formality of Organization :	**Informal**
15	Significance of the Industry :	
15.1	Fuel Consumption :	
	Data not available	
15.2	Contribution to Employment and Income :	
	(1) High (2) Medium	**(3) Low**
15.3	Contribution to Food Production and Security :	
	(1) High Local Use (2) Medium	(3) Low

15.4 Nutrition and Health Value :
(1) High (2) Medium **(3) Low/No value**

15.5 Impact on the Environment :
(1) Significant (2) Medium **(3) Not Significant**

Country Level Information of Industry Type

16. Country Level Information

16.1 Estimated Total Number of Industries of this Type :
1 plant

16.2 Geographical Distribution:
North = 0 South = 0 Central = 1 Northeast = 0

16.3 Commonly Preferred Location : (Large Urban Centres/Small Towns/Rural Areas)
Small Towns

16.4 Estimated Total Amount of Energy Used by all Industries of this Type :
Fuelwood = 73 m^3/year

16.5 Estimated Total Number of People Employed in all Industries of this Type
People employed = 2

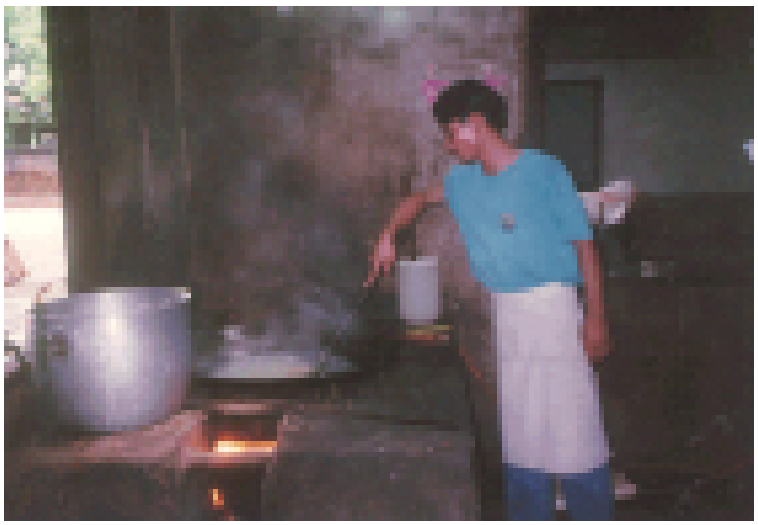
3 . FOOD-PROCESSING INDUSTRIES

3.1 Pastry Production

1.	Category :	**Village Enterprise**
2.	Activity Group :	**Food Processing Industries**

Specific Information of Representative Industry

3.	Specific Activity :	**Pastry Production**
4.	Name of Industry :	**3A Bakery**
5.	Location :	**Muang District, Ratchaburi Province**
6.	Ownership :	**Family**



Sawdust fired furnace with step grate used to produce pastry filling

7.	Labour Supply Source and Operation :	**Family & Villagers**
8.	Scale of Operation (Production Capacity) :	
8.1	Raw Material Requirement :	**10,000 kg of flour/year**
8.2	Range Within the Specific Industry Type :	
	Smallest Unit	
	Largest Unit	**Data not available**
	Average Unit	
8.3	Scale of Operation/Output :	**1,080,000 of pastry items year**
8.4	Range of Output : (Between industries of the same type)	
	Smallest Unit	
	Largest Unit	**Data not available**
	Average Unit	
8.5	Raw Material Supply Source :	**Local**
9.	Investment Requirement :	
	Minimum	**0.02 mil. baht**
	Maximum	**68.50 mil. baht**
	Average	**3.47 mil. baht**
10.	Regularity of Production :	**Regular**
11.	Annual Fuel Requirement:	
	Fuelwood and Charcoal	-
	Other Biomass	**Sawdust = 30 m^3 (33%)**
	Commercial Fuel	**Gas (66%)**
11.1	Fuelwood Supply Source :	**Non-forest Lands**
11.2	Fuel Use Flexibility	**High**
12.	Organization :	
12.1	Non - wage/Wage	**Wage**
12.2	Shared Task/Rudimentary Wage/Special Contract :	**Rudimentary Wage**
13.	Complexity of Technology Adopted :	**Low**
14.	Formality of Organization :	**Rudimentary Formal**
15	Significance of the Industry :	
15.1	Fuel Consumption :	
	Sawdust 1 m^3 : 36,000 pastry items	
15.2	Contribution to Employment and Income :	
	(1) High (2) Medium	**(3) Low**
15.3	Contribution to Food Production and Security :	
	(1) High Local Use (2) Medium	(3) Low

15.4 Nutrition and Health Value :

(1) High (2) Medium (3) Low/No value

15.5 Impact on the Environment :

(1) Significant (2) Medium **(3) Not Significant**

Country Level Information of Industry Type

16. Country Level Information

16.1 Estimated Total Number of Industries of this Type :

16.2 Geographical Distribution:

16.3 Commonly Preferred Location : (Large Urban Centres/Small Towns/Rural Areas)
Large Urban Centres

16.4 Estimated Total Amount of Energy Used by all Industries of this Type :

16.5 Estimated Total Number of People Employed in all Industries of this Type

3.2 Chinese Sausage Production

1.	Category :	**Village Enterprise**
2.	Activity Group :	**Food Processing Industries**

Specific Information of Representative Industry

3.	Specific Activity :	**Chinese Sausage Production**
4.	Name of Industry :	**Wattanajitpong Ltd.**
5.	Location :	**Muang District, Nakhon Ratchasima Province**
6.	Ownership :	**Entrepreneur**

Preparation of meat mixture by boiling before sausages are made

7.	Labour Supply Source and Operation :	**Villagers**
8.	Scale of Operation (Production Capacity) :	
8.1	Raw Material Requirement :	**Pork**
8.2	Range Within the Specific Industry Type :	
	Smallest Unit	
	Largest Unit	**Data not available**
	Average Unit	
8.3	Scale of Operation/Output :	**90,000 kg of Chinese sausages /year**
8.4	Range of Output :	
	Smallest Unit	**21,600 kg/year**
	Largest Unit	**90,000 kg/year**
	Average Unit	**55,800 kg/year**
8.5	Raw Material Supply Source :	**Local**
9.	Investment Requirement :	
	Minimum	**0.04 mil. baht**
	Maximum	**11.50 mil. baht**
	Average	**1.56 mil. baht**
10.	Regularity of Production :	**Regular**
11.	Annual Fuel Requirement:	
	Fuelwood and Charcoal	**Fuelwood = 2,604 m^3/year (50%)**
	Other Biomass	**Coconut Shell (50%)**
	Commercial Fuel	-
11.1	Fuelwood Supply Source :	**Non-forest Lands (Sawmill)**
11.2	Fuel Use Flexibility	**Medium**
12.	Organization :	
12.1	Non - wage/Wage	**Wage**
12.2	Shared Task/Rudimentary Wage/Special Contract :	**Rudimentary Wage**
13.	Complexity of Technology Adopted :	**Medium**
14.	Formality of Organization :	**Rudimentary Formal**
15	Significance of the Industry :	
	Fuel Consumption :	
	Fuelwood 1 m^3 : 34.56 kg of Chinese sausages	
15.2	Contribution to Employment and Income :	
	(1) High **(2) Medium** (3) Low	
15.3	Contribution to Food Production and Security :	
	(1) High Local Use (2) Medium (3) Low	

15.4 Nutrition and Health Value :

(1) High (2) Medium (3) Low/No value

15.5 Impact on the Environment :

(1) Significant (2) Medium **(3) Not Significant**

Country Level Information of Industry Type

16. Country Level Information

16.1 Estimated Total Number of Industries of this Type :

16 plants

16.2 Geographical Distribution:

North = 0 South = 0 Central = 0 Northeast = 16

16.3 Commonly Preferred Location : (Large Urban Centres/Small Towns/Rural Areas)

Large Urban Centres

16.4 Estimated Total Amount of Energy Used by all Industries of this Type :

Fuelwood = 20,462 m^3/year

16.5 Estimated Total Number of People Employed in all Industries of this Type

People employed = 177

3.3 Fishmeal Production

1.	Category :	**Rural Industry**
2.	Activity Group :	**Food Processing Industries**

Specific Information of Representative Industry

3.	Specific Activity :	**Fishmeal Production**
4.	Name of Industry :	**Ban Don Fishery Co., Ltd.**
5.	Location :	**Muang District, Suratthani Province**
6.	Ownership :	**Entrepreneur**

Storage of raw fish before processing it into fishmeal for animal feed production

7.	Labour Supply Source and Operation :	**Villagers & Non-villagers**
8.	Scale of Operation (Production Capacity) :	
8.1	Raw Material Requirement :	**16,800,000 kg of fish /year**
8.2	Range Within the Specific Industry Type :	
	Smallest Unit	**288,000 kg/year**
	Largest Unit	**16,800,000 kg/year**
	Average Unit	**6,783,111 kg/year**
8.3	Scale of Operation/Output :	**3,600,000 kg of fishmeal /year**
8.4	Range of Output : (Between industries of the same type)	
	Smallest Unit	**120,000 kg/year**
	Largest Unit	**47,450,000 kg/year**
	Average Unit	**6,118,182 kg/year**
8.5	Raw Material Supply Source :	**Local & Other Provinces**
9.	Investment Requirement :	
	Minimum	**1.05 mil. baht**
	Maximum	**19.00 mil. baht**
	Average	**9.49 mil. baht**
10.	Regularity of Production :	**Regular**
11.	Annual Fuel Requirement :	
	Fuelwood and Charcoal	**Fuelwood = 36,000 m^3**
	Other Biomass	-
	Commercial Fuel	-
11.1	Fuelwood Supply Source :	**Non-forest Lands**
11.2	Fuel Use Flexibility	**Low**
12.	Organization :	
12.1	Non - wage/Wage	**Wage**
12.2	Shared Task/Rudimentary Wage/Special Contract :	**Rudimentary Wage**
13.	Complexity of Technology Adopted :	**High**
14.	Formality of Organization :	**Formal**
15.	Significance of the Industry :	
15.1	Fuel Consumption :	
	Fuelwood 1 m^3 : 100 kg of fishmeal	
15.2	Contribution to Employment and Income :	
	(1) High (2) Medium	(3) Low
15.3	Contribution to Food Production and Security :	
	(1) High Local Use (2) Medium	(3) Low

15.4 Nutrition and Health Value :
(1) High (2) Medium **(3) Low/No value**

15.5 Impact on the Environment :
(1) Significant (2) Medium (3) Not Significant

Country Level Information of Industry Type

16. Country Level Information

16.1 Estimated Total Number of Industries of this Type :
81 plants

16.2 Geographical Distribution:
North = 0 South = 52 Central = 29 Northeast = 0

16.3 Commonly Preferred Location : (Large Urban Centres/Small Towns/Rural Areas)
Large Urban Centres

16.4 Estimated Total Amount of Energy Used by all Industries of this Type :
Fuelwood = 1,049,786 m^3/year
Saw Dust = 203,742 m^3/year

16.5 Estimated Total Number of People Employed in all Industries of this Type
People employed = 3,162

3.4 Meatball Production

1.	Category :	**Village Enterprise**
2.	Activity Group :	**Food Processing Industries**

Specific Information of Representative Industry

3.	Specific Activity :	**Meatball Production**
4.	Name of Industry :	**Utai Meatball Factory**
5.	Location :	**Muang District, Nakhonsawan Province**
6.	Ownership :	**Family**

Wood fired furnace for boiling beef balls for sale to noodle shops

7.	Labour Supply Source and Operation :	**Family & Villagers**
8.	Scale of Operation (Production Capacity) :	
8.1	Raw Material Requirement :	**45,500 kg of meat /year**
8.2	Range Within the Specific Industry Type :	
	Smallest Unit	**1,700 kg/year**
	Largest Unit	**1,095,000 kg/year**
	Average Unit	**213,463 kg/year**
8.3	Scale of Operation/Output :	**54,250 kg of meatballs/year**
8.4	Range of Output : (Between industries of the same type)	
	Smallest Unit	**2,853 kg/year**
	Largest Unit	**1,825,000 kg/year**
	Average Unit	**240,610 kg/year**
8.5	Raw Material Supply Source :	**Local & Other Provinces**
9.	Investment Requirement :	
	Minimum	**0.04 mil. baht**
	Maximum	**8.00 mil. baht**
	Average	**7.13 mil. baht**
10.	Regularity of Production :	**Regula**r
11.	Annual Fuel Requirement:	
	Fuelwood and Charcoal	**Fuelwood = 40 m^3**
	Other Biomass	-
	Commercial Fuel	-
11.1	Fuelwood Supply Source :	**Non-forest Lands (Sawmill)**
11.2	Fuel Use Flexibility	**Low**
12.	Organization :	
12.1	Non - wage/Wage	**Wage**
12.2	Shared Task/Rudimentary Wage/Special Contract :	**Rudimentary Wage**
13.	Complexity of Technology Adopted :	**Low**
14.	Formality of Organization :	**Rudimentary Formal**
15.	Significance of the Industry :	
15.1	Fuel Consumption :	
	Fuelwood 1 m^3 : 1,356 kg of meatballs	
15.2	Contribution to Employment and Income :	
	(1) High (2) Medium	**(3) Low**
15.3	Contribution to Food Production and Security :	
	(1) High Local Use (2) Medium	(3) Low

15.4 Nutrition and Health Value :

(1) High (2) Medium (3) Low/No value

15.5 Impact on the Environment :

(1) Significant (2) Medium **(3) Not Significant**

Country Level Information of Industry Type

16. Country Level Information

16.1 Estimated Total Number of Industries of this Type :

43 plants

16.2 Geographical Distribution :

North = 13 South = 9 Central = 6 Northeast = 15

16.3 Commonly Preferred Location : (Large Urban Centres/Small Towns/Rural Areas)

Large Urban Centres

16.4 Estimated Total Amount of Energy Used by all Industries of this Type :

Fuelwood = 14,610 m^3/year

16.5 Estimated Total Number of People Employed in all Industries of this Type

People employed = 725

3.5 Noodle Production

1.	Category :	**Cottage Activity**
2.	Activity Group :	**Food Processing Industries**

Specific Information of Representative Industry

3.	Specific Activity :	**Noodle Production**
4.	Name of Industry :	**-**
5.	Location :	**Mae Sod District, Tak Province**
6.	Ownership :	**Family**

Biomass fired steam boiler used to provide process heat for noodle production (steaming)

7.	Labour Supply Source and Operation :	**Family & Villagers**
8.	Scale of Operation (Production Capacity) :	
8.1	Raw Material Requirement :	**7,200 kg of rice /year**
8.2	Range Within the Specific Industry Type :	
	Smallest Unit	**7,200 kg/year**
	Largest Unit	**8,212,500 kg/year**
	Average Unit	**322,097 kg/year**
8.3	Scale of Operation/Output :	**5,720 kg of noodles /year**
8.4	Range of Output : (Between industries of the same type)	
	Smallest Unit	**5,720 kg/year**
	Largest Unit	**8,212,500 kg/year**
	Average Unit	**283,720 kg/year**
8.5	Raw Material Supply Source :	**Local**
9.	Investment Requirement :	
	Minimum	**0.03 mil. baht**
	Maximum	**19.45 mil. baht**
	Average	**1.69 mil. baht**
10.	Regularity of Production :	**Irregular**
11.	Annual Fuel Requirement:	
	Fuelwood and Charcoal	**Fuelwood = 131.04 m^3**
	Other Biomass	**Corncob = 900 m^3**
	Commercial Fuel	-
11.1	Fuelwood Supply Source :	**Forest**
11.2	Fuel Use Flexibility	**Medium**
12.	Organization :	
12.1	Non - wage/Wage	**Non-wage**
12.2	Shared Task/Rudimentary Wage/Special Contract :	**Shared Task**
13.	Complexity of Technology Adopted :	**Medium**
14.	Formality of Organization :	**Informal**
15.	Significance of the Industry :	
15.1	Fuel Consumption :	
	Fuelwood 1 m^3 : 43.65 kg of noodles	
15.2	Contribution to Employment and Income :	
	(1) High (2) Medium	**(3) Low**
15.3	Contribution to Food Production and Security :	
	(1) High Local Use (2) Medium	(3) Low

15.4 Nutrition and Health Value :

(1) High (2) Medium (3) Low/No value

15.5 Impact on the Environment :

(1) Significant (2) Medium **(3) Not Significant**

Country Level Information of Industry Type

16. Country Level Information

16.1 Estimated Total Number of Industries of this Type :

314 plants

16.2 Geographical Distribution :

North = 46 South = 59 Central = 141 Northeast = 68

16.3 Commonly Preferred Location : (Large Urban Centres/Small Towns/Rural Areas)

Large Urban Centres

16.4 Estimated Total Amount of Energy Used by all Industries of this Type :

Fuelwood = 183,919 m^3/year

Sawdust = 77,821 m^3/year

16.5 Estimated Total Number of People Employed in all Industries of this Type

People employed = 3,085

3.6 Noodle (Meesua) Production

1.	Category :	**Cottage Activity**
2.	Activity Group :	**Food Processing Industries**

Specific Information of Representative Industry

3.	Specific Activity :	**Noodle (Meesua) Production**
4.	Name of Industry :	**Srichalearn Panit**
5.	Location :	**Muang District, Phitsanulok Province**
6.	Ownership :	**Family**

Wood fired furnace used to boil the rice flour. After boiling, the rice flour is extended into strands which are dried, packed and sold to noodle shops

7.	Labour Supply Source and Operation :	**Family**
8	Scale of Operation (Production Capacity) :	
8.1	Raw Material Requirement :	**22,750 kg of rice /year**
8.2	Range Within the Specific Industry Type :	
	Smallest Unit	**17,520 kg/year**
	Largest Unit	**22,750 kg/year**
	Average Unit	**20,135 kg/year**
8.3	Scale of Operation/Output :	**24,500 kg of meesua /year**
8.4	Range of Output : (Between industries of the same type)	
	Smallest Unit	**24,500 kg/year**
	Largest Unit	**25.550 kg/year**
	Average Unit	**25,025 kg/year**
8.5	Raw Material Supply Source :	**Local**
9.	Investment Requirement :	
	Minimum	
	Maximum	**Data not available**
	Average	
10.	Regularity of Production :	**Irregular**
11.	Annual Fuel Requirement:	
	Fuelwood and Charcoal	**Fuelwood = 55 m^3**
	Other Biomass	-
	Commercial Fuel	-
11.1	Fuelwood Supply Source :	**Non-forest Lands**
11.2	Fuel Use Flexibility	**Low**
12.	Organization :	
12.1	Non - wage/Wage	**Non-wage**
12.2	Shared Task/Rudimentary Wage/Special Contract :	**Shared Task**
13	Complexity of Technology Adopted :	**Low**
14	Formality of Organization :	**Informal**
15	Significance of the Industry :	
15.1	Fuel Consumption :	
	Fuelwood 1 m^3 : 445.45 kg of meesua	
15.2	Contribution to Employment and Income :	
	(1) High (2) Medium	**(3) Low**
15.3	Contribution to Food Production and Security :	
	(1) High Local Use (2) Medium	(3) Low

15.4 Nutrition and Health Value :

(1) High (2) Medium (3) Low/No value

15.5 Impact on the Environment :

(1) Significant (2) Medium **(3) Not Significant**

Country Level Information of Industry Type

16. Country Level Information

16.1 Estimated Total Number of Industries of this Type :

2 plants

16.2 Geographical Distribution:

North = 1 South = 1 Central = 0 Northeast = 0

16.3 Commonly Preferred Location : (Large Urban Centres/Small Towns/Rural Areas)

Large Urban Centres

16.4 Estimated Total Amount of Energy Used by all Industries of this Type :

Fuelwood = 120 m^3/year

16.5 Estimated Total Number of People Employed in all Industries of this Type

People employed = 9

3.7 Dried Shrimp Production

1.	Category :	**Rural Industry**
2.	Activity Group :	**Food Processing Industries**

Specific Information of Representative Industry

3.	Specific Activity :	**Dried Shrimp Production**
4.	Name of Industry :	**-**
5.	Location :	**Muang District, Prachuap Khiri Khan Province**
6.	Ownership :	**Entrepreneur**

Wood fired furnace used to provide process heat for boiling shrimp. Afterwards the shrimps are dried in the sun before being packed

7.	Labour Supply Source and Operation :	**Family & Villagers & Non-villagers**
8.	Scale of Operation (Production Capacity) :	
8.1	Raw Material Requirement :	**864,000 kg of fresh shrimp /year**
8.2	Range Within the Specific Industry Type :	
	Smallest Unit	**864,000 kg/year**
	Largest Unit	**1,090,000 kg/year**
	Average Unit	**977,000 kg/year**
8.3	Scale of Operation/Output :	**7,200 kg of dried shrimp /year**
8.4	Range of Output : (Between industries of the same type)	
	Smallest Unit	**7,200 kg/year**
	Largest Unit	**91,250 kg/year**
	Average Unit	**81,625 kg/year**
8.5	Raw Material Supply Source :	**Local & Other Provinces**
9.	Investment Requirement :	
	Minimum	**0.34 mil. baht**
	Maximum	**3.77 mil. baht**
	Average	**2.38 mil. baht**
10.	Regularity of Production :	**Seasonal (6 month/year)**
11.	Annual Fuel Requirement:	
	Fuelwood and Charcoal	**Fuelwood = 288 m^3**
	Other Biomass	-
	Commercial Fuel	-
11.1	Fuelwood Supply Source :	**Non-forest Lands**
11.2	Fuel Use Flexibility	**Low**
12.	Organization :	
12.1	Non - wage/Wage	**Wage**
12.2	Shared Task/Rudimentary Wage/Special Contract :	**Rudimentary Wage**
13.	Complexity of Technology Adopted :	**Medium**
14.	Formality of Organization :	**Formal**
15.	Significance of the Industry :	
15.1	Fuel Consumption :	
	Fuelwood 1 m^3 : 250 kg of dried shrimp	
15.2	Contribution to Employment and Income :	
	(1) High **(2) Medium** (3) Low	
15.3	Contribution to Food Production and Security :	
	(1) High Local Use (2) Medium (3) Low	

15.4 Nutrition and Health Value :

(1) High (2) Medium (3) Low/No value

15.5 Impact on the Environment :

(1) Significant (2) Medium **(3) Not Significant**

Country Level Information of Industry Type

16. Country Level Information

16.1 Estimated Total Number of Industries of this Type :

14 plants

16.2 Geographical Distribution:

North = 0 South = 5 Central = 9 Northeast = 0

16.3 Commonly Preferred Location : (Large Urban Centres/Small Towns/Rural Areas)

Small Towns

16.4 Estimated Total Amount of Energy Used by all Industries of this Type :

Fuelwood = 2,952 m^3/year

16.5 Estimated Total Number of People Employed in all Industries of this Type

People employed = 215

3.8 Preserved Banana Production

1.	Category :	**Village Enterprise**
2.	Activity Group :	**Food Processing Industries**

Specific Information of Representative Industry

3.	Specific Activity :	**Preserved Banana Production**
4.	Name of Industry :	**Mae Sean Pho Factory**
5.	Location :	**Ban Lad District, Phetchaburi Province**
6.	Ownership :	**Family**

Wood fired furnace with shallow pan in which the banana mixture is boiled and dehydrated. Note the mixing mechanism to prevent over-heating.

7.	Labour Supply Source and Operation :	**Family & Villagers**
8.	Scale of Operation (Production Capacity) :	
8.1	Raw Material Requirement :	**600,000 kg of bananas /year**
8.2	Range Within the Specific Industry Type :	
	Smallest Unit	**37,300 kg/year**
	Largest Unit	**600,000 kg/year**
	Average Unit	**303,650 kg/year**
8.3	Scale of Operation/Output :	**300,000 kg of preserved bananas /year**
8.4	Range of Output :	
	Smallest Unit	**65,700 kg/year**
	Largest Unit	**300,000 kg/year**
	Average Unit	**182,850 kg/year**
8.5	Raw Material Supply Source :	**Local & Other Provinces**
9.	Investment Requirement :	
	Minimum	**0.22 mil. baht**
	Maximum	**9.02 mil. baht**
	Average	**3.30 mil. baht**
10.	Regularity of Production :	**Regular**
11.	Annual Fuel Requirement:	
	Fuelwood and Charcoal	**Fuelwood = 600 m^3**
	Other Biomass	-
	Commercial Fuel	-
11.1	Fuelwood Supply Source :	**Both**
11.2	Fuel Use Flexibility	**Low**
12.	Organization :	
12.1	Non - wage/Wage	**Wage**
12.2	Shared Task/Rudimentary Wage/Special Contract :	**Rudimentary Wage**
13.	Complexity of Technology Adopted :	**Medium**
14.	Formality of Organization :	**Rudimentary Formal**
15.	Significance of the Industry :	
15.1	Fuel Consumption :	
	Fuelwood 1 m^3 : 500 kg of preserved bananas	
15.2	Contribution to Employment and Income :	
	(1) High **(2) Medium** (3) Low	
15.3	Contribution to Food Production and Security :	
	(1) High Local Use (2) Medium (3) Low	

15.4 Nutrition and Health Value :

(1) High (2) Medium (3) Low/No value

15.5 Impact on the Environment :

(1) Significant (2) Medium **(3) Not Significant**

Country Level Information of Industry Type

16. Country Level Information

16.1 Estimated Total Number of Industries of this Type :

13 plants

16.2 Geographical Distribution:

North = 1 South = 0 Central = 12 Northeast = 0

16.3 Commonly Preferred Location : (Large Urban Centres/Small Towns/Rural Areas)

Small Towns

16.4 Estimated Total Amount of Energy Used by all Industries of this Type :

Fuelwood = 2,484 m^3/year

16.5 Estimated Total Number of People Employed in all Industries of this Type

People employed = 115

3.9 Steamed Fish Production

1.	Category :	**Cottage Activity**
2.	Activity Group :	**Food Processing Industries**

Specific Information of Representative Industry

3.	Specific Activity :	**Steamed Fish Production**
4.	Name of Industry :	**-**
5.	Location :	**Phon Phisai District, Nong Khai Province**
6.	Ownership :	**Family**

Wood fired furnace with steamer. Fish are packed in bamboo/rattan containers for steaming

7.	Labour Supply Source and Operation :	**Family**
8.	Scale of Operation (Production Capacity) :	
8.1	Raw Material Requirement :	**32,400 kg of cleaned fish"(pla tu)" /year**
8.2	Range Within the Specific Industry Type :	
	Smallest Unit	**7,300 kg/year**
	Largest Unit	**146,000 kg/year**
	Average Unit	**66,075 kg/year**
8.3	Scale of Operation/Output :	**32,400 kg of steamed fish /year**
8.4	Range of Output :	
	Smallest Unit	**7,300 kg/year**
	Largest Unit	**146,000 kg/year**
	Average Unit	**66,075 kg/year**
8.5	Raw Material Supply Source :	**Local & Other Provinces**
9.	Investment Requirement :	
	Minimum	**0.18 mil. baht**
	Maximum	**2.60 mil. baht**
	Average	**0.98 mil. baht**
10.	Regularity of Production :	**Irregular**
11.	Annual Fuel Requirement:	
	Fuelwood and Charcoal	**Fuelwood = 91 m^3**
	Other Biomass	-
	Commercial Fuel	-
11.1	Fuelwood Supply Source :	**Both Forest Land and Non-forest Land**
11.2	Fuel Use Flexibility	**Low**
12.	Organization :	
12.1	Non - wage/Wage	**Non-wage**
12.2	Shared Task/Rudimentary Wage/Special Contract :	**Shared Task**
13.	Complexity of Technology Adopted :	**Low**
14.	Formality of Organization :	**Informal**
15	Significance of the Industry :	
15.1	Fuel Consumption :	
	Fuelwood 1 m^3 : 356 kg of steamed fish	
15.2	Contribution to Employment and Income :	
	(1) High (2) Medium	**(3) Low**
15.3	Contribution to Food Production and Security :	
	(1) High Local Use (2) Medium	(3) Low

15.4 Nutrition and Health Value :

(1) High (2) Medium (3) Low/No value

15.5 Impact on the Environment :

(1) Significant **(2) Medium** (3) Not Significant

Country Level Information of Industry Type

16. Country Level Information

16.1 Estimated Total Number of Industries of this Type :

9 plants

16.2 Geographical Distribution:

North = 0 South = 0 Central = 0 Northeast = 9

16.3 Commonly Preferred Location : (Large Urban Centres/Small Towns/Rural Areas)

Large Urban Centres

16.4 Estimated Total Amount of Energy Used by all Industries of this Type :

Fuelwood = 182 m^3/year

16.5 Estimated Total Number of People Employed in all Industries of this Type

People employed = 72

4. METAL PROCESSING INDUSTRIES

4.1 Blacksmith (Knife Making)

1.	Category :	**Cottage Activity**
2.	Activity Group :	**Metal Processing Industries**

Specific Information of Representative Industry

3.	Specific Activity :	**Blacksmith (Knife Making)**
4.	Name of Industry :	**-**
5.	Location :	**Nakhon Luang, Ayutthaya Province**
6.	Ownership :	**Family**

Blacksmith at work with small forge in background

7.	Labour Supply Source and Operation :	**Family**
8.	Scale of Operation (Production Capacity) :	
8.1	Raw Material Requirement :	**1,460 plates of steel /year**
8.2	Range Within the Specific Industry Type :	
	Smallest Unit	
	Largest Unit	**Data not available**
	Average Unit	
8.3	Scale of Operation/Output :	**18,250 knives /year**
8.4	Range of Output : (Between industries of the same type)	
	Smallest Unit	
	Largest Unit	**Data not available**
	Average Unit	
8.5	Raw Material Supply Source :	**Local**
9.	Investment Requirement :	
	Minimum	**0.03 mil. baht**
	Maximum	**4.50 mil. baht**
	Average	**1.08 mil. baht**
10.	Regularity of Production :	**Regular**
11.	Annual Fuel Requirement:	
	Fuelwood and Charcoal	**Charcoal = 1,440 kg/year**
	Other Biomass	-
	Commercial Fuel	-
11.1	Fuelwood Supply Source :	
11.2	Fuel Use Flexibility	**Low**
12.	Organization :	
12.1	Non - wage/Wage	**Non - wage**
12.2	Shared Task/Rudimentary Wage/Special Contract :	**Shared task**
13.	Complexity of Technology Adopted :	**Low**
14.	Formality of Organization :	**Informal**
15	Significance of the Industry :	
15.1	Fuel Consumption :	
	Charcoal 1 kg : 12.67 knives	
15.2	Contribution to Employment and Income :	
	(1) High (2) Medium	**(3) Low**
15.3	Contribution to Food Production and Security :	
	(1) High Local Use (2) Medium	(3) Low

15.4 Nutrition and Health Value :

(1) High (2) Medium **(3) Low/No Value**

15.5 Impact on the Environment :

(1) Significant (2) Medium **(3) Not Significant**

Country Level Information of Industry Type

16. Country Level Information

16.1 Estimated Total Number of Industries of this Type :

16.2 Geographical Distribution:

16.3 Commonly Preferred Location : (Large Urban Centres/Small Towns/Rural Areas)

16.4 Estimated Total Amount of Energy Used by all Industries of this Type :

16.5 Estimated Total Number of People Employed in all Industries of this Type

5. FOREST PRODUCTS INDUSTRIES

5.1 Preserved Bamboo Shoot Production

1.	Category :	**Rural Industry**
2.	Activity Group :	**Forest Products Industries**

Specific Information of Representative Industry

3.	Specific Activity :	**Preserved Bamboo Shoot Production**
4.	Name of Industry :	**-**
5.	Location :	**Muang District, Tak Province**
6	Ownership :	**Entrepreneur**

Wood fired furnace used to provide process steam for sterilizing the bamboo shoots

7.	Labour Supply Source and Operation :	**Villagers & Non-villagers**
8.	Scale of Operation (Production Capacity) :	
8.1	Raw Material Requirement :	**450,000 kg of bamboo shoot /year**
8.2	Range Within the Specific Industry Type	
	Smallest Unit	**13,000 kg/year**
	Largest Unit	**800,000 kg/year**
	Average Unit	**421,000 kg/year**
8.3	Scale of Operation/Output :	**180,000 kg of preserved bamboo shoot /year**
8.4	Range of Output :	
	Smallest Unit	**5,000 kg/year**
	Largest Unit	**300,000 kg/year**
	Average Unit	**161,667 kg/year**
8.5	Raw Material Supply Source :	**Local & Other Provinces**
9.	Investment Requirement :	
	Minimum	**0.12 mil. baht**
	Maximum	**4.13 mil. baht**
	Average	**1.15 mil. baht**
10.	Regularity of Production :	**Seasonal**
11.	Annual Fuel Requirement:	
	Fuelwood and Charcoal	**Fuelwood = 423 m^3**
	Other Biomass	-
	Commercial Fuel	-
11.1	Fuelwood Supply Source :	**Non-forest Lands**
11.2	Fuel Use Flexibility	**Low**
12.	Organization :	
12.1	Non - wage/Wage	**Wage**
12.2	Shared Task/Rudimentary Wage/Special Contract :	**Rudimentary Wage**
13.	Complexity of Technology Adopted :	**Medium**
14.	Formality of Organization :	**Formal**
15	Significance of the Industry :	
15.1	Fuel Consumption :	
	Fuelwood 1 m^3 : 425.5 kg of preserved bamboo shoot	
15.2	Contribution to Employment and Income :	
	(1) High (2) Medium (3) Low	
15.3	Contribution to Food Production and Security :	
	(1) High Local Use (2) Medium (3) Low	

15.4 Nutrition and Health Value :
(1) High **(2) Medium** (3) Low/No value

15.5 Impact on the Environment :
(1) Significant **(2) Medium** (3) Not Significant

Country Level Information of Industry Type

16. Country Level Information

16.1 Estimated Total Number of Industries of this Type :
39 plants

16.2 Geographical Distribution:
North = 8 South = 0 Central = 31 Northeast = 0

16.3 Commonly Preferred Location : (Large Urban Centres/Small Towns/Rural Areas)
Small Towns

16.4 Estimated Total Amount of Energy Used by all Industries of this Type :
Fuelwood = 43,742 m^3/year

16.5 Estimated Total Number of People Employed in all Industries of this Type
People employed = 2,622

5.2 Wood Carving

1. Category : **Rural Industry**
2. Activity Group : **Forest Products Industries**

Specific Information of Representative Industry

3. Specific Activity : **Wood Carving** (woodfuel is used for drying after carving)
4. Name of Industry : **Pun Prasit Factory**
5. Location : **Mae Tha District, Lamphun Province**
6. Ownership : **Entrepreneur**

After roughly carving the desired shape, the wood is dried in the wood fired drying chamber. Then the carving is completed

7.	Labour Supply Source and Operation :	**Villagers & Non-villagers**
8.	Scale of Operation (Production Capacity) :	
8.1	Raw Material Requirement :	**12 m^3 of wood /year**
8.2	Range Within the Specific Industry Type :	
	Smallest Unit	**12 m^3/year**
	Largest Unit	**51,480 m^3/year**
	Average Unit	**17,225 m^3/year**
8.3	Scale of Operation/Output :	**1,200 items of carved wood/year**
8.4	Range of Output : (Between industries of the same type)	
	Smallest Unit	**25 items/year***
	Largest Unit	**840,000 items/year**
	Average Unit	**201,945 items/year**
8.5	Raw Material Supply Source :	**Local & Other Provinces**
9.	Investment Requirement :	
	Minimum	**0.01 mil. baht**
	Maximum	**7.70 mil. baht**
	Average	**1.73 mil. baht**
10.	Regularity of Production :	**Regular**
11.	Annual Fuel Requirement:	
	Fuelwood and Charcoal	**Fuelwood = 12 m^3**
	Other Biomass	-
	Commercial Fuel	-
11.1	Fuelwood Supply Source :	**Non-forest Lands**
11.2	Fuel Use Flexibility	**Low**
12.	Organization :	
12.1	Non - wage/Wage	**Wage**
12.2	Shared Task/Rudimentary Wage/Special Contract :	**Rudimentary Wage**
13.	Complexity of Technology Adopted :	**Medium**
14.	Formality of Organization :	**Formal**
15	Significance of the Industry :	
15.1	Fuel Consumption :	
	Fuelwood 1 m^3 : 100 items of carved wood	
15.2	Contribution to Employment and Income :	
	(1) High **(2) Medium** (3) Low	

* number of items depends on size of carved wood as well

15.3 Contribution to Food Production and Security :

(1) High Local Use (2) Medium (3) Low

15.4 Nutrition and Health Value :

(1) High (2) Medium **(3) Low/No value**

15.5 Impact on the Environment :

(1) Significant **(2) Medium** (3) Not Significant

Country Level Information of Industry Type

Country Level Information

16.1 Estimated Total Number of Industries of this Type :

47 plants

16.2 Geographical Distribution:

North = 47 South = 0 Central = 0 Northeast = 0

16.3 Commonly Preferred Location : (Large Urban Centres/Small Towns/Rural Areas)

Small Towns

16.4 Estimated Total Amount of Energy Used by all Industries of this Type :

Fuelwood = 146,076 m^3/year

16.5 Estimated Total Number of People Employed in all Industries of this Type

People employed = 5,029

5.3 Wood Drying

1.	Category :	**Rural Industry**
2.	Activity Group :	**Forest Products Industries**

Specific Information of Representative Industry

3.	Specific Activity :	**Wood Drying**
4.	Name of Industry :	**P. Panit**
5.	Location :	**Muang District, Uttaradit Province**
6	Ownership :	**Entrepreneur**

Wood fired drying chambers for drying the parquet

7	Labour Supply Source and Operation :	**Villagers & Non-villagers**
8.	Scale of Operation (Production Capacity) :	
8.1	Raw Material Requirement :	**14,400 m^3 of parquet /year**
8.2	Range Within the Specific Industry Type :	
	Smallest Unit	**800 m^3/year**
	Largest Unit	**240,000 m^3/year**
	Average Unit	**66,106 m^3/year**
8.3	Scale of Operation/Output :	**14,400 m^3 of dried parquet /year**
8.4	Range of Output : (Between industries of the same type)	
	Smallest Unit	**800 m^3/year**
	Largest Unit	**240,000 m^3/year**
	Average Unit	**66,106 m^3/year**
8.5	Raw Material Supply Source :	**Local**
9.	Investment Requirement :	
	Minimum	**1.50 mil. baht**
	Maximum	**12.20 mil. baht**
	Average	**6.73 mil. baht**
10.	Regularity of Production :	**Regular**
11.	Annual Fuel Requirement:	
	Fuelwood and Charcoal	-
	Other Biomass	**Sawdust = 240 m^3**
	Commercial Fuel	-
11.1	Fuelwood Supply Source :	**Non-forest Lands (Sawmills)**
11.2	Fuel Use Flexibility	**Low**
12.	Organization :	
12.1	Non - wage/Wage	**Wage**
12.2	Shared Task/Rudimentary Wage/Special Contract :	**Rudimentary Wage**
13.	Complexity of Technology Adopted :	**Medium**
14.	Formality of Organization :	**Formal**
15.	Significance of the Industry :	
15.1	Fuel Consumption :	
	Sawdust 1 m^3 : 60 m^3 of dried parquet	
15.2	Contribution to Employment and Income :	
	(1) High (2) Medium	(3) Low
15.3	Contribution to Food Production and Security :	
	(1) High Local Use (2) Medium	(3) Low

15.4 Nutrition and Health Value :
(1) High (2) Medium **(3) Low/No value**

15.5 Impact on the Environment :
(1) Significant **(2) Medium** (3) Not Significant

Country Level Information of Industry Type

16. Country Level Information

16.1 Estimated Total Number of Industries of this Type :
44 plants

16.2 Geographical Distribution:
North = 7 South = 27 Central = 6 Northeast = 4

16.3 Commonly Preferred Location : (Large Urban Centres/Small Towns/Rural Areas)
Small Towns

16.4 Estimated Total Amount of Energy Used by all Industries of this Type :
Fuelwood = 162,648 m^3/year
Sawdust = 152,232 m^3/year

16.5 Estimated Total Number of People Employed in all Industries of this Type
People employed = 8,146

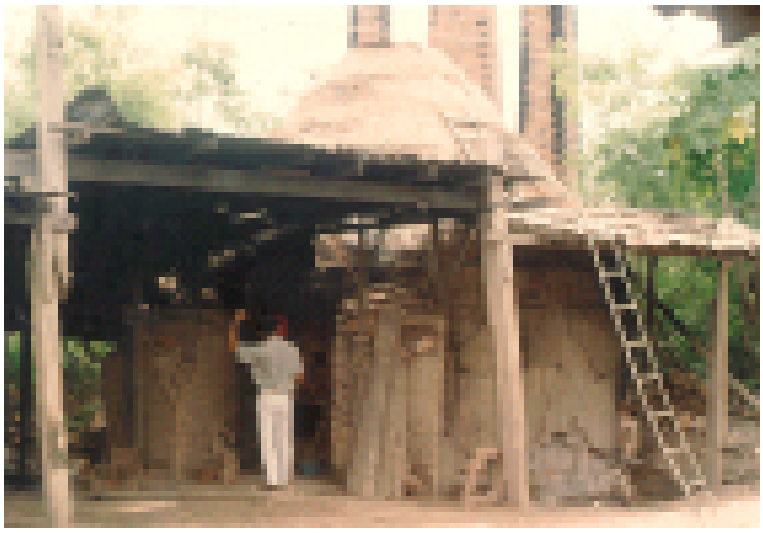
6 . MINERAL BASED INDUSTRIES

6.1 Brick Making

1.	Category :	**Village Enterprise**
2.	Activity Group :	**Mineral Based Industries**

Specific Information of Representative Industry

3.	Specific Activity :	**Brick Making**
4.	Name of Industry :	**Lumphunchai Show**
5.	Location :	**Dok Kham Tai District, Phayao Province**
6.	Ownership :	**Entrepreneur**



Round down/cross draft wood fired brick kiln

7.	Labour Supply Source and Operation :	**Villagers**
8.	Scale of Operation (Production Capacity) :	
8.1	Raw Material Requirement :	**4,320 m^3 of clay /year**
8.2	Range Within the Specific Industry Type :	
	Smallest Unit	**240 m^3/year**
	Largest Unit	**28,000 m^3/year**
	Average Unit	**4,874 m^3/year**
8.3	Scale of Operation/Output :	**360,000 bricks/year**
8.4	Range of Output : (Between industries of the same type)	
	Smallest Unit	**96,000 bricks/year**
	Largest Unit	**28,800,000 bricks/year**
	Average Unit	**2,213,250 bricks/year**
8.5	Raw Material Supply Source :	**Local & Other provinces**
9.	Investment Requirement :	
	Minimum	**0.02 mil. baht**
	Maximum	**67.50 mil. baht**
	Average	**1.33 mil. baht**
10.	Regularity of Production :	**Regular**
11.	Annual Fuel Requirement:	
	Fuelwood and Charcoal	**Fuelwood = 90 m^3 (20%)**
	Other Biomass	**Rice Husk (80%)**
	Commercial Fuel	**-**
11.1	Fuelwood Supply Source :	**Non-forest Lands**
11.2	Fuel Use Flexibility	**High**
12.	Organization :	
12.1	Non - wage/Wage	**Wage**
12.2	Shared Task/Rudimentary Wage/Special Contract :	**Rudimentary Wage**
13.	Complexity of Technology Adopted :	**Medium**
14.	Formality of Organization :	**Rudimentary Formal**
15.	Significance of the Industry :	
15.1	Fuel Consumption :	
	Fuelwood 1 m^3 : 4,000 bricks	
15.2	Contribution to Employment and Income :	
	(1) High **(2) Medium** (3) Low	
15.3	Contribution to Food Production and Security :	
	(1) High Local Use (2) Medium (3) Low	

15.4 Nutrition and Health Value :
(1) High (2) Medium **(3) Low/No value**

15.5 Impact on the Environment :
(1) Significant **(2) Medium** (3) Not Significant

Country Level Information of Industry Type

16. Country Level Information T

16.1 Estimated Total Number of Industries of this Type :
302 plants

16.2 Geographical Distribution:
North = 73 South = 151 Central = 70 Northeast = 8

16.3 Commonly Preferred Location : (Large Urban Centres/Small Towns/Rural Areas)
Small Towns

16.4 Estimated Total Amount of Energy Used by all Industries of this Type :
Fuelwood = 1,191,036 m^3/year

16.5 Estimated Total Number of People Employed in all Industries of this Type
People employed = 6,932

6.2 Ceramic Production

1.	Category :	**Rural Industry**
2.	Activity Group :	**Mineral Based Industries**

Specific Information of Representative Industry

3.	Specific Activity :	**Ceramic Production**
4.	Name of Industry :	**Ceramic Factory**
5.	Location :	**Utai District, Ayutthaya Province**
6.	Ownership :	**Entrepreneur**

Round updraft fired ceramic kiln. Note the pot shards on top which are used to keep the heat inside during the later stage of the firing

7.	Labour Supply Source and Operation :	**Villagers & Non-villagers**
8.	Scale of Operation (Production Capacity) :	
8.1	Raw Material Requirement :	**Clay**
8.2	Range Within the Specific Industry Type :	
	Smallest Unit	**120,000 kg of clay /year**
	Largest Unit	**2,730,000 kg/year**
	Average Unit	**1,850,000 kg/year**
8.3	Scale of Operation/Output :	**720,000 ceramic items/year**
8.4	Range of Output : (Between industries of the same type)	
	Smallest Unit	**180,000 items/year**
	Largest Unit	**3,780,000 items/year**
	Average Unit	**1,259,625 items/year**
8.5	Raw Material Supply Source :	**Local & Other provinces**
9.	Investment Requirement :	
	Minimum	**0.27 mil. baht**
	Maximum	**66.76 mil. baht**
	Average	**12.94 mil. baht**
10.	Regularity of Production :	**Regular**
11.	Annual Fuel Requirement:	
	Fuelwood and Charcoal	**Fuelwood = 2,000 m^3**
	Other Biomass	-
	Commercial Fuel	-
11.1	Fuelwood Supply Source :	**Non-forest Lands**
11.2	Fuel Use Flexibility	**Low**
12.	Organization :	
12.1	Non - wage/Wage	**Wage**
12.2	Shared Task/Rudimentary Wage/Special Contract :	**Rudimentary Wage**
13.	Complexity of Technology Adopted :	**Medium**
14.	Formality of Organization :	**Formal**
15	Significance of the Industry :	
15.1	Fuel Consumption :	
	Fuelwood 1 m^3 : 360 ceramic items	
15.2	Contribution to Employment and Income :	
	(1) High **(2) Medium** (3) Low	
15.3	Contribution to Food Production and Security :	
	(1) High Local Use (2) Medium (3) Low	

15.4 Nutrition and Health Value :
(1) High (2) Medium **(3) Low/No value**

15.5 Impact on the Environment :
(1) Significant **(2) Medium** (3) Not Significant

Country Level Information of Industry Type

16. Country Level Information

16.1 Estimated Total Number of Industries of this Type :
88 plants

16.2 Geographical Distribution:
North = 68 South = 0 Central = 18 Northeast = 2

16.3 Commonly Preferred Location : (Large Urban Centres/Small Towns/Rural Areas)
Small Towns

16.4 Estimated Total Amount of Energy Used by all Industries of this Type :
Fuelwood = 1,001,453 m^3/year

16.5 Estimated Total Number of People Employed in all Industries of this Type
People employed = 3,282

6.3 Lime Production

1.	Category :	**Village Enterprise**
2.	Activity Group :	**Mineral Based Industries**

Specific Information of Representative Industry

3.	Specific Activity :	**Lime Production**
4.	Name of Industry :	**-**
5.	Location :	**Muang District, Ratchaburi Province**
6.	Ownership :	**Entrepreneur**

Updraft line kiln with 2 firing shafts which run over the whole width of the kiln

7.	Labour Supply Source and Operation :	**Family & Villagers**
8.	Scale of Operation (Production Capacity) :	
8.1	Raw Material Requirement :	**2,700,000 kg of limestone /year**
8.2	Range Within the Specific Industry Type :	
	Smallest Unit	**36,000 kg/year**
	Largest Unit	**5,280,000 kg/year**
	Average Unit	**1,824,000 kg/year**
8.3	Scale of Operation/Output :	**1,350,000 kg of lime /year**
8.4	Range of Output : (Between industries of the same type)	
	Smallest Unit	**33,000 kg/year**
	Largest Unit	**5,280,000 kg/year**
	Average Unit	**1,427,182 kg/year**
8.5	Raw Material Supply Source :	**Local & Other provinces**
9.	Investment Requirement :	
	Minimum	**0.23 mil. baht**
	Maximum	**43.57 mil. baht**
	Average	**5.64 mil. baht**
10.	Regularity of Production :	**Regular**
11.	Annual Fuel Requirement :	
	Fuelwood and Charcoal	**Fuelwood = 630 m^3 (30%)**
	Other Biomass	**Lignite (70%)**
	Commercial Fuel	**-**
11.1	Fuelwood Supply Source :	**Both**
11.2	Fuel Use Flexibility	**High**
12.	Organization :	
12.1	Non - wage/Wage	**Wage**
12.2	Shared Task/Rudimentary Wage/Special Contract :	**Rudimentary Wage**
13.	Complexity of Technology Adopted :	**Medium**
14.	Formality of Organization :	**Rudimentary Formal**
15.	Significance of the Industry :	
15.1	Fuel Consumption :	
	Fuelwood 1 m^3 : 2,143 kg of lime	
15.2	Contribution to Employment and Income :	
	(1) High **(2) Medium** (3) Low	
15.3	Contribution to Food Production and Security :	
	(1) High Local Use (2) Medium (3) Low	

15.4 Nutrition and Health Value :
(1) High (2) Medium **(3) Low/No value**

15.5 Impact on the Environment :
(1) Significant **(2) Medium** (3) Not Significant

Country Level Information of Industry Type

16. Country Level Information

16.1 Estimated Total Number of Industries of this Type :
71 plants

16.2 Geographical Distribution:
North = 6 South = 54 Central = 10 Northeast = 1

16.3 Commonly Preferred Location : (Large Urban Centres/Small Towns/Rural Areas)
Small Towns

16.4 Estimated Total Amount of Energy Used by all Industries of this Type :
Fuelwood = 240,126 m^3/year

16.5 Estimated Total Number of People Employed in all Industries of this Type
People Employed = 606

6.4 Pottery Production

1.	Category :	**Rural Industry**
2.	Activity Group :	**Mineral Based Industries**

Specific Information of Representative Industry

3.	Specific Activity :	**Pottery Production**
4.	Name of Industry :	**Kai Kan Kaew Ltd.**
5.	Location :	**Chok Chai District, Nakhon Ratchasima Province**
6.	Ownership :	**Entrepreneur**

Simple updraft pottery kiln using wood as fuel

7.	Labour Supply Source and Operation :	**Villagers & Non-villagers**
8.	Scale of Operation (Production Capacity) :	
8.1	Raw Material Requirement :	**1,800 m^3 of clay /year**
8.2	Range Within the Specific Industry Type :	
	Smallest Unit	**300 m^3/year**
	Largest Unit	**1,800 m^3/year**
	Average Unit	**1,000 m^3/year**
8.3	Scale of Operation/Output :	**360,000 items/year**
8.4	Range of Output : (Between industries of the same type)	
	Smallest Unit	**12,000 items/year**
	Largest Unit	**360,000 items/year**
	Average Unit	**88,083 items/year**
8.5	Raw Material Supply Source :	**Local & Other provinces**
9.	Investment Requirement :	
	Minimum	**0.17 mil. baht**
	Maximum	**62.50 mil. baht**
	Average	**8.20 mil. baht**
10.	Regularity of Production :	**Regular**
11.	Annual Fuel Requirement:	
	Fuelwood and Charcoal	**Fuelwood = 1,008 m^3**
	Other Biomass	**-**
	Commercial Fuel	**-**
11.1	Fuelwood Supply Source :	**Both Forest and Non-forest Land**
11.2	Fuel Use Flexibility	**Low**
12.	Organization :	
12.1	Non - wage/Wage	**Wage**
12.2	Shared Task/Rudimentary Wage/Special Contract :	**Rudimentary Wage**
13.	Complexity of Technology Adopted :	**Medium**
14.	Formality of Organization :	**Formal**
15	Significance of the Industry :	
15.1	Fuel Consumption :	
	Fuelwood 1 m^3 : 357 items of pottery	
15.2	Contribution to Employment and Income :	
	(1) High **(2) Medium** (3) Low	
15.3	Contribution to Food Production and Security :	
	(1) High Local Use (2) Medium (3) Low	

15.4 Nutrition and Health Value :
(1) High (2) Medium **(3) Low/No value**

15.5 Impact on the Environment :
(1) Significant **(2) Medium** (3) Not Significant

Country Level Information of Industry Type

16. Country Level Information

16.1 Estimated Total Number of Industries of this Type :
18 plants

16.2 Geographical Distribution:
North = 0 South = 10 Central = 5 Northeast = 3

16.3 Commonly Preferred Location : (Large Urban Centres/Small Towns/Rural Areas)
Small Towns

16.4 Estimated Total Amount of Energy Used by all Industries of this Type :
Fuelwood = 11,907 m^3/year

16.5 Estimated Total Number of People Employed in all Industries of this Type
People Employed = 998

7. TEXTILE BASED INDUSTRIES

7.1 Silk Dyeing

1.	Category :	**Rural Industry**
2.	Activity Group :	**Textile Based Industries**

Specific Information of Representative Industry

3.	Specific Activity :	**Silk Dyeing**
4.	Name of Industry :	**-**
5.	Location :	**Pak Thong Chai District, Nachon Ratchasima Province**
6.	Ownership :	**Entrepreneur**

Wood fired furnace with stainless steel pot in which the diluted dye is boiled and in which the silk is dyed

7.	Labour Supply Source and Operation :	**Villagers**
8.	Scale of Operation (Production Capacity) :	
8.1	Raw Material Requirement :	**1,092,000 yards of raw silk /year**
8.2	Range Within the Specific Industry Type :	
	Smallest Unit	
	Largest Unit	**Data not available**
	Average Unit	
8.3	Scale of Operation/Output :	**1,092,000 yards of dyed silk /year**
8.4	Range of Output : (Between industries of the same type)	
	Smallest Unit	**58,656 yards/year**
	Largest Unit	**1,092,000 yards/year**
	Average Unit	**575,328 yards/year**
8.5	Raw Material Supply Source :	**Local**
9.	Investment Requirement :	
	Minimum	**0.50 mil. baht**
	Maximum	**5.52 mil. baht**
	Average	**3.06 mil. baht**
10.	Regularity of Production :	**Regular**
11.	Annual Fuel Requirement :	
	Fuelwood and Charcoal	**Fuelwood = 50 m^3**
	Other Biomass	**-**
	Commercial Fuel	**-**
11.1	Fuelwood Supply Source :	**Forest**
11.2	Fuel Use Flexibility	**Low**
12.	Organization :	
12.1	Non - wage/Wage	**Wage**
12.2	Shared Task/Rudimentary Wage/Special Contract :	**Rudimentary Wage**
13.	Complexity of Technology Adopted :	**Medium**
14.	Formality of Organization :	**Formal**
15.	Significance of the Industry :	
15.1	Fuel Consumption :	
	Fuelwood 1 m^3 : 21,840 yards of dyed silk	
15.2	Contribution to Employment and Income :	
	(1) High **(2) Medium** (3) Low	
15.3	Contribution to Food Production and Security :	
	(1) High Local Use (2) Medium (3) Low	

15.4 Nutrition and Health Value :
(1) High (2) Medium **(3) Low/No value**

15.5 Impact on the Environment :
(1) Significant (2) Medium **(3) Not Significant**

Country Level Information of Industry Type

16. Country Level Information

16.1 Estimated Total Number of Industries of this Type :
13 plants

16.2 Geographical Distribution:
North = 0 South = 0 Central = 0 Northeast = 13

16.3 Commonly Preferred Location : (Large Urban Centres/Small Towns/Rural Areas)
Small Towns

16.4 Estimated Total Amount of Energy Used by all Industries of this Type :
Fuelwood = 938 m^3/year

16.5 Estimated Total Number of People Employed in all Industries of this Type
People Employed = 213

8 . MISCELLANEOUS INDUSTRIES

8.1 Slaughterhouse

1.	Category :	**Village Enterprise**
2.	Activity Group :	**Miscellaneous Industries**

Specific Information of Representative Industry

3.	Specific Activity :	**Slaughterhouse**
4.	Name of Industry :	**Khon Kaen Slaughterhouse**
5.	Location :	**Muang District, Khon Kaen Province**
6.	Ownership :	**Municipal**

Wood fired furnaces with pots in which water is boiled for dehairing carcasses

7.	Labour Supply Source and Operation :	**Villagers**
8.	Scale of Operation (Production Capacity) :	
8.1	Raw Material Requirement :	**2,880 cows & buffaloes/year**
8.2	Range Within the Specific Industry Type :	
	Smallest Unit	**634 pigs or cows or buffaloes/year**
	Largest Unit	**63,400 pigs or cows or buffaloes/year**
	Average Unit	**11,937 pigs or cows or buffaloes/year**
8.3	Scale of Operation/Output :	**2,880 cows & buffaloes/year**
8.4	Range of Output : (Between industries of the same type)	
	Smallest Unit	**634 pigs or cows or buffaloes/year**
	Largest Unit	**63,400 pigs or cows or buffaloes/year**
	Average Unit	**11,937 pigs or cows or buffaloes/year**
8.5	Raw Material Supply Source :	**Local**
9.	Investment Requirement :	
	Minimum	**0.20 mil. baht**
	Maximum	**17.70 mil. baht**
	Average	**6.54 mil. baht**
10.	Regularity of Production :	**Regular**
11.	Annual Fuel Requirement:	
	Fuelwood and Charcoal	**Fuelwood = 939 m^3**
	Other Biomass	-
	Commercial Fuel	-
11.1	Fuelwood Supply Source :	**Both**
11.2	Fuel Use Flexibility	**Low**
12.	Organization :	
12.1	Non - wage/Wage	**Wage**
12.2	Shared Task/Rudimentary Wage/Special Contract :	**Shared task**
13.	Complexity of Technology Adopted :	**Low**
14.	Formality of Organization :	**Formal**
15.	Significance of the Industry :	
15.1	Fuel Consumption :	
	Fuelwood 1 m^3 : 3 cows & buffaloes	

15.2 Contribution to Employment and Income :

(1) High (2) Medium **(3) Low**

15.3 Contribution to Food Production and Security :

(1) High Local Use (2) Medium (3) Low

15.4 Nutrition and Health Value :

(1) High (2) Medium (3) Low/No value

15.5 Impact on the Environment :

(1) Significant **(2) Medium** (3) Not Significant

Country Level Information of Industry Type

16. Country Level Information

16.1 Estimated Total Number of Industries of this Type :

423 plants

16.2 Geographical Distribution:

North = 146 South = 0 Central = 90 Northeast = 187

16.3 Commonly Preferred Location : (Large Urban Centres/Small Towns/Rural Areas)

Small Towns

16.4 Estimated Total Amount of Energy Used by all Industries of this Type :

Fuelwood = 193,046 m^3/year

Sawdust = 18,219 m^3/year

16.5 Estimated Total Number of People Employed in all Industries of this Type

People Employed = 3,696

8.2 Tyre Retreading

1.	Category :	**Village Enterprise**
2.	Activity Group :	**Miscellaneous Industries**

Specific Information of Representative Industry

3.	Specific Activity :	**Tyre Retreading**
4.	Name of Industry :	**Phisanulok Thai Nakhon Tyre Retreading**
5.	Location :	**Pak Thong Chai District, Nakhon Ratchasima Province**
6.	Ownership :	**Family**

Wood fired steam boiler used to provide process heat for vulcanizing retreaded tyres

7.	Labour Supply Source and Operation :	**Family & Villagers**
8.	Scale of Operation (Production Capacity) :	
8.1	Raw Material Requirement :	**18,000 tyres/year**
8.2	Range Within the Specific Industry Type :	
	Smallest Unit	**420 tyres/year**
	Largest Unit	**18,000 tyres/year**
	Average Unit	**6,976 tyres/year**
8.3	Scale of Operation/Output :	**18,000 yres/year**
8.4	Range of Output : (Between industries of the same type)	
	Smallest Unit	**420 tyres/year**
	Largest Unit	**18,000 tyres/year**
	Average Unit	**6,976 tyres/year**
8.5	Raw Material Supply Source :	**Local**
9.	Investment Requirement :	
	Minimum	**0.01 mil. baht**
	Maximum	**57.00 mil. baht**
	Average	**6.28 mil. baht**
10.	Regularity of Production :	**Regular**
11.	Annual Fuel Requirement:	
	Fuelwood and Charcoal	**Fuelwood = 800 m^3**
	Other Biomass	-
	Commercial Fuel	-
11.1	Fuelwood Supply Source :	**Both**
11.2	Fuel Use Flexibility	**Low**
12.	Organization :	
12.1	Non - wage/Wage	**Wage**
12.2	Shared Task/Rudimentary Wage/Special Contract :	**Rudimentary Wage**
13.	Complexity of Technology Adopted :	**Medium**
14.	Formality of Organization :	**Rudimentary Formal**
15.	Significance of the Industry :	
15.1	Fuel Consumption :	
	Fuelwood 1 m^3 : 22.5 tyres	
15.2	Contribution to Employment and Income :	
	(1) High **(2) Medium** (3) Low	
15.3	Contribution to Food Production and Security :	
	(1) High Local Use (2) Medium (3) Low	

15.4 Nutrition and Health Value :
(1) High (2) Medium **(3) Low/No value**

15.5 Impact on the Environment :
(1) Significant (2) Medium **(3) Not Significant**

Country Level Information of Industry Type

16 Country Level Information

16.1 Estimated Total Number of Industries of this Type :
39 plants

16.2 Geographical Distribution:
North = 7 South = 1 Central = 23 Northeast = 8

16.3 Commonly Preferred Location : (Large Urban Centres/Small Towns/Rural Areas)
Small Towns

16.4 Estimated Total Amount of Energy Used by all Industries of this Type :
Fuelwood = 38,830 m^3/year
Sawdust = 2,950 m^3/year

16.5 Estimated Total Number of People Employed in all Industries of this Type
People employed = 564

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Annex 1: WOOD/BIOMASS-FUEL BASED RURAL INDUSTRIES

Framework for Illustrating with Selected Photographs

1 Category :
1.1 Cottage Activity 1.2 Village Enterprise 1.3 Rural Industry

2 Activity Group :
2.1 Agricultural Product Processing 2.2 Food Processing Industries
2.3 Metal Processing Industries 2.4 Forest Products Industries
2.5 Metal Based Industries 2.6 Textile Based Industries
2.7 Miscellaneous Industries (All other activities)

3 Specific Activity :
4 Name of Industry :
5 Location :
6 Ownership :
(Women or Family / Extended Family or Cooperative / Entrepreneur)
7 Labour Supply Source and Operation :
(Single Family/Extended Family or Villagers/Others (Not villagers))

8 Scale of Operation (Production Capacity) :
8.1 Raw Material Requirement :
8.2 Range Within the Specific Industry Type :
(tonne/cubic metre, etc., per year)
Smallest Unit …… Largest Unit …… Average Unit ……
8.3 Scale of Operation/Output :
(tonne/cubic metre, number, etc. per year)
8.4 Range of Output : (Between industries of the same type)
Smallest Unit …… Largest Unit……Average Unit ……
8.5 Raw Material Supply Source :
(Local/Other Provinces/Import)

9 Investment Requirement :
Minimum …….. Maximum …… Average ……..……

10 Regularity of Production :
(Irregular/Seasonal/Regular)

11 Annual Fuel Requirement:
Fuelwood and Charcoal ……
Other Biomass ……
Commercial Fuel ……
11.1 Fuelwood Supply Source : (Mostly Forest/Mostly Non-forest/Both)
11.2 Fuel Use Flexibility (Capacity to switch over to alternative energy sources)
(Low/Medium/High)

12 Organization :
12.1 Non - wage/Wage
12.2 Shared Task/Rudimentary Wage/Special Contract :

13 Complexity of Technology Adopted :
(Low/Medium/High ; Imported/Local)

14 Formality of Organization :
(Informal/Rudimentary Formal/Formal)

15 Significance of the Industry :
15.1 Fuel Consumption : (Ratio of fuel consumption and product output)
15.2 Contribution to Employment and Income :
(1) High (2) Medium (3) Low
15.3 Contribution to Food Production and Security :
(1) High Local Use (2) Medium (3) Low
15.4 Nutrition and Health Value :
(1) High (2) Medium (3) Low/No value
15.5 Impact on the Environment :
(1) Significant (2) Medium (3) Not Significant

16 Country Level Information (Specified Industry Type)
16.1 Estimated Total Number of Industries of the Type :
16.2 Geographical Distribution:
(If possible, number by different regions, provinces, amphurs, etc.)
16.3 Commonly Preferred Location (for establishment) :
(Large Urban Centres/Small Towns/Rural Areas)
16.4 Estimated Total Amount of Energy Used by all Industries of the Type :
(If possible, by fuel type, i.e. fuelwood, biomass, petroleum fuel, coal, electricity, etc.)
16.5 Estimated Total Number of People Employed in all Industries of the Type

Annex 2: CONTRIBUTION TO EMPLOYMENT AND INCOME OF 33 REPRESENTATIVE INDUSTRIES

Industry type	Manpower	Product Output (unit/year)
Bakery	10	1,080,000 pastries
Blacksmith (Knife making)	3	18,250 knives
Brick making	12	360,000 bricks
Cassava pellet	6	
Ceramic	25	720,000 items
Chinese sausage	15	90,000 kg
Coconut oil	46	2,825,000 kg
Fish meal	40	3,600,000 kg
Lime production	11	1,350,000 kg
Meatball	10	54,250 kg
Noodle	5	5,720 kg
Noodle (meesua)	4	24,500 kg
Palm oil	19	1,200,000 kg
Pottery	18	360,000 items
Preserved bamboo shoot	62	180,000 kg
Dried shrimp	20	72,000 kg
Preserved banana	13	300,000 kg
Rice flour chips	9	36,000 kg
Rice milling	123	3,318,180 kg
Rubber smoking	30	6,723,000 kg
Silk dyeing	18	1,092,000 yards
Slaughterhouse	6	2,880 cows & buffaloes
Soy bean sheet	23	80,640 kg
Soy sauce	19	688,600 bottles
Steamed fish	4	32,400 kg
Sugar making	10	21,000 kg
Tapioca	7	216,000 kg
Tea curing	40	5,760,000 kg

Industry type	Manpower	Product Output (unit/year)
Tobacco curing	26	1,200,000 kg
Tyre retreading	14	18,000 tyres
Vinegar	2	
Wood carving	22	1,200 pieces
Wood drying	61	14,400 m^3

Source : The survey on industrial fuelwood consumption in Thailand. 1992

Annex 3: RANGE OF RAW MATERIAL REQUIREMENT WITHIN THE SPECIFIC INDUSTRY TYPE

Industry type	Raw material requirement of representative industry		Range of raw material of industry type	
	type	(unit/year)	Largest (unit/year)	Smallest (unit/year)
Bakery	flour	10,000 kg		
Blacksmith	plate steel	1,460 plates		
Brick making	clay	4,320 m^3	58,000 m^3	240 m^3
Cassava pellet	cassava root			
Ceramic	clay		2,730,000 kg	120,000 kg
Chinese sausage	pork			
Coconut oil	coconut	7,300,000 kg	9,125,000 kg	2,800,000 kg
Fish meal	fish	16,800,000 kg	189,800,000 kg	288,000 kg
Lime production	lime	2,700,000 kg	5,280,000 kg	36,000 kg
Meatball	meat	45,500 kg	1,095,000 kg	1,700 kg
Noodle	rice	7,200 kg	8,212,500 kg	7,200 kg
Noodle (meesua)	flour	22,750 kg	22,750 kg	17,520 kg
Palm oil	palm	1,800,000kg	1,902,000 kg	150,000 kg
Pottery	clay	1,800 m^3	1,800 m^3	300 m^3
Preserved bamboo shoot	bamboo shoot	450,000 kg	800,000 kg	13,000 kg
Dried shrimp	shrimp	864,000 kg	1,090,000 yard	864,000 kg
Preserved banana	fruit	600,000 kg	600,000 kg	7,300 kg
Rice flour chips	rice flour	41,760 kg	254,040 kg	2,000 kg
Rice milling	raw rice	5,475,000kg		
Rubber smoking	rubber sheet	7,040,000 kg	24,000,000 kg	660,000 kg
Silk dyeing	raw silk	1,092,000 yards	1,092,000 yard	58,656 yards
Slaughterhouse	cows & buffaloes	2,880	63,400	634
Soy bean sheet	soy bean	80,640 kg		
(Soy bean cake)			40,500 kg	1,600 kg

Industry type	Raw material requirement of representative industry		Range of raw material of industry type	
	type	(unit/year)	Largest (unit/year)	Smallest (unit/year)
Soy sauce	soy bean	9,980 kg	10,980 kg	2,400 kg
Steamed fish	fish	32,400 kg	146,000 kg	7,300 kg
Sugar making	sugar cane	1,200 m^3		
Tapioca	cassava flour			
Tea curing	tea leaves	57,600,000 kg		
Tobacco curing	tobacco leaf	1,728,000 kg	686,400,000 kg	4,000 kg
Tyre retreading	tyres	18,000 tyres	18,000 tyres	420 tyres
Vinegar	glutinous rice			
Wood carving	wood	12 m^3	51,480 m^3	12 m^3
Wood drying	wood	14,400 m^3	240,000 m^3	800 m^3

Source : The survey on industrial fuelwood consumption in Thailand 1992

Annex 4: RANGE OF OUTPUT WITHIN THE SPECIFIC INDUSTRY TYPE

Industry type	Product output of representative industry (unit/year)	Range of output of industry type	
		Largest (unit/year)	Smallest (unit/year)
Bakery	1,080,000 pastries		
Blacksmith	18,250 knives		
Brick making	360,000 bricks	28,800,000 bricks	96,000 bricks
Cassava pellet			
Ceramic	720,000 items	3,780,000 items	180,000 items
Chinese sausage	90,000 kg	90,000 kg	21,600 kg
Coconut oil	2,825,000 kg	3,650,000 kg	1,125,000 kg
Fish meal	3,600,000 kg	47,450,000 kg	120,000 kg
Lime production	1,350,000 kg	3,300,000 kg	33,000 kg
Meatball	54,250 kg	1,825,000 kg	2,853 kg
Noodle	5,720 kg	8,212,500 kg	5,720 kg
Noodle (meesua)	24,500 kg	25,550 kg	24,500 kg
Palm oil	1,200,000 kg	10,566,666 kg	108,000 kg
Pottery	360,000 items	360,000 items	12,000 items
Preserved bamboo shoot	180,000 kg	300,000 kg	5,000 kg
Dried shrimp	72,000 kg	91,250 kg	72,000 kg
Preserved banana	300,000 kg	300,000 kg	65,700 kg
Rice flour chips	36,000 kg	219,000 kg	1,800 kg
Rice milling	3,318,180 kg		
Rubber smoking	6,723,000 kg	21,600,000 kg	400,000 kg
Silk dyeing	1,092,000 yards	1,092,000 yards	58,656 yards
Slaughterhouse	2,880 pigs	63,400 pigs	634 pigs
	cows	cows	cows
	buffaloes	buffaloes	buffaloes
Soy bean sheet	34,560 kg		

Industry type	Product output of representative industry (unit/year)	Range of output of industry type	
		Largest (unit/year)	Smallest (unit/year)
(Soy bean cake)		912,500 pieces	36,500 pieces
Soy sauce	688,600 bottles	710,000 bottles	156,000 bottles
Steamed fish	32,400 kg	146,000 kg	7,300 kg
Sugar making	21,000 kg		
Tapioca	216,000 kg		
Tea curing	5,760,000 kg		
Tobacco curing	1,200,000 kg	68,640,000 kg	600 kg
Tyre retreading	18,000 tyres	18,000 tyres	420 tyres
Vinegar			
Wood carving	1,200 items	840,000 items	25 items
Wood drying	14,400 m^3	240,000 m^3	800 m^3

Source : The survey on industrial fuelwood consumption in Thailand, 1992

Annex 5: ESTIMATED INVESTMENT REQUIREMENT OF INDUSTRY TYPE

Industry type	Maximum (million baht)	Minimum (million baht)	Average (million baht)
Bakery	68.50	0.02	3.47
Blacksmith	4.50	0.03	1.08
Brick making	67.50	0.02	1.33
Cassava pill	167.30	0.05	5.68
Ceramic	456.81	0.27	36.30
Chinese sausage	11.50	0.04	1.56
Coconut oil	2.51	0.63	1.57
Fish meal	19.00	1.05	9.49
Lime production	43.57	0.10	3.78
Meatball	8.00	0.04	7.13
Noodle	19.45	0.03	1.69
Noodle (meesua)			
Palm oil			
Pottery	62.50	0.13	7.83
Preserved bamboo shoot	4.13	0.12	1.15
Dried shrimp	3.77	0.34	2.38
Preserved banana	9.02	0.22	3.30
Rice flour chips	3.02	0.14	1.41
Rice milling	13.50	0.01	0.38
Rubber smoking	35.90	3.40	19.65
Silk dyeing	5.52	0.50	3.06
Slaughterhouse	22.50	0.20	8.57
Soy bean sheet/cake	24.10	0.10	4.20
Soy sauce	62.30	0.08	6.79
Steamed fish	2.60	0.18	0.98
Sugar making	22.80	0.05	2.90

Industry type	Maximum (million baht)	Minimum (million baht)	Average (million baht)
Tapioca	29.50	0.21	9.39
Tea curing	48.80	0.61	7.51
Tobacco curing	168.06	0.003	7.29
Tyre retreading	57.00	0.01	6.28
Vinegar			
Wood carving	7.70	0.01	1.73
Wood drying	12.20	1.50	6.73

Source : The Statistics of the Provincial Industry Office (Central 1, Central 2, North, Northeast, South), 1992

Annex 6: RATIO OF WOODFUEL CONSUMPTION (33 REPRESENTATIVE INDUSTRIES)

Industry type	Fuel consumption (m^3/year)	Product output (unit/year)	Ratio of fuel consumption
Bakery	30.00 (sawdust)	1,080,000 pastries	$1m^3$/36,000 pastries
Blacksmith (knife making)	1,440 kg (charcoal)	18,250 knives	1kg/12.67 knives
Brick making	90.00	360,000 bricks	$1m^3$/4,000 bricks
Cassava pellet	300,000.00 kg		
Ceramic	2,000.00	720,000 items	$1m^3$/360 items
Chinese sausage	2,604.00	90,000 kg	$1m^3$/34.56 kg
Coconut oil	5,840.00	2,825,000 kg	$1m^3$/483.73 kg
Fish meal	36,000.00	360,000 kg	1 m^3/100 kg
Lime production	630.00	1,350,000 kg	$1m^3$/2142.85 kg
Meatball	40.00	54,250 kg	$1m^3$/1,356 kg
Noodle	131.04	5,720 kg	$1m^3$/43.65 kg
Noodle (meesua)	55.00	24,500 kg	$1m^3$/445.45 kg
Palm oil	4,300.00	1,200,000 kg	$1m^3$/279 kg
Pottery	1,008.00	360,000 items	$1m^3$/357 items
Preserved bamboo shoot	423.00	180,000 kg	$1m^3$/425.5 kg
Dried shrimp	288.00	72,000 kg	$1m^3$/250 kg
Preserved banana	600.00	300,000 kg	$1m^3$/500 kg
Rice flour chips	730.00	36,000 kg	$1m^3$/49 kg
Rice milling	793,800.00 kg (rice husk)	3,318,180 kg	1kg /4.18 kg
Rubber smoking	2,200.00	6,723,000 kg	$1m^3$/3,055 kg
Silk dyeing	50.00	1,092,000 yards	$1m^3$/21,840 yards
Slaughterhouse	939.00	2,880 cows & buffaloes	$1m^3$/3 cows & buffaloes

Industry type	Fuel consumption (m^3/year)	Product output (unit/year)	Ratio of fuel consumption
Soy bean sheet	5,475.00	34,560 kg	$1m^3$/6.3 kg
Soy sauce	313.00	688,600 kg	$1m^3$/220 bottles
Steamed fish	91.00	32,400 kg	$1m^3$/356 kg
Sugar making	20.00	21,000 kg	$1m^3$/1,050 kg
Tapioca	200.00	216,000 kg	$1m^3$/1,090 kg
Tea curing	16,848.00	5,760,000 kg	$1m^3$/341.8 kg
Tobacco curing	6,190.56	1,300,000 kg	$1m^3$/193.8 kg
Tyre retreading	800.00	18,000 types	$1m^3$/22.5 tyres
Vinegar	73.00		
Wood carving	12.00	1,200 items	$1m^3$/100 items
Wood drying	240.00 (saw dust)	14,400 m^3	$1m^3$/60 m^3

Source : The survey on industrial fuelwood consumption in Thailand, 1992

Annex 7: CONTRIBUTION TO FOOD PRODUCTION AND SECURITY (33 REPRESENTATIVE INDUSTRIES)

Industry type	Percentage of Local use	Place of sale	Percentage of export	Country of sale
Bakery	100	Ratchaburi	-	-
Blacksmith (knife making)	100	Ayutthaya	-	-
Brick making	100	Phayao	-	-
Cassava pellet	100	Chonburi, Chachoengsao	-	-
Ceramic	100	Sing Buri, Chainat Ang Thong, Suphanburi	-	-
Chinese sausage	100	Nakhon Ratchasima	-	-
Fishmeal	100	Bangkok	-	-
Lime production	100	Bangkok, Chanta buri	-	-
Meatball	100	Nakhon Sawan	-	-
Noodle	100	Tak	-	-
Noodle (meesua)	100	Phitsanulok	-	-
Wood drying	100	Bangkok Phuket Khon Kaen	-	-
Pottery	100	Bangkok	-	-
Preserved bamboo shoot	100	Bangkok	-	-
Dried shrimp	100	Bangkok	-	-
Preserved banana	100	Phetchaburi	-	-
Rice flour chips	100	Chaing Rai	-	-
Rubber smoking	-	-	100	Japan, China
Silk dyeing	100	Bangkok	-	-
Slaughterhouse	100	Khon Kaen	-	-
Soy sauce	100	Bangkok, Nonthaburi	-	-
Soy bean sheet	100	Chaing Mai, Lamphun	-	-

Industry type	Percentage of local use	Place of sale	Percentage of export	Country of sale
Steamed fish	100	Nong Khai	-	-
Sugar making	100	Phichit, Bangkok, other provinces	-	-
Tapioca	100	Songkhla	-	-
Tobacco curing	10	Lampang	90	Japan, England, Egypt
Tyre retreading	100	Phitsanulok, other provinces in the North	-	-
Vinegar	100	Phetchaburi	-	-
Wood carving	100	Chiang Mai, Bangkok	-	-
Coconut oil	100	Bangkok	-	-
Tea curing	10	Bangkok	90	USA, Taiwan, Japan
Palm oil	100	Bangkok	-	-
Rice milling	100	Saraburi, other provinces	-	-
Wood drying	100	All over country	-	-

Source : The survey on industrial fuelwood consumption in Thailand, 1992

Annex 8: ESTIMATED TOTAL NUMBER OF INDUSTRIES OF TYPE IN DIFFERENT REGIONS

Industry type	Estimated total number of industries				Total
	North	South	Central	North East	
Bakery					
Blacksmith					
Brick making	73	151	70	8	302
Cassava pellet	-	-	19	-	19
Ceramic	68	-	18	2	88
Chinese sausage	-	-	-	16	16
Coconut oil					
Fish meal	-	52	29	-	81
Lime production	6	54	10	1	71
Meatball	13	9	6	15	43
Noodle	46	59	141	68	314
Noodle (meesua)	1	1	-	-	2
Palm oil	-	31	-	-	31
Pottery	-	10	5	3	18
Preserved bamboo shoot	8	-	31	-	39
Dried shrimp	-	5	9	-	14
Preserved banana	1	-	12	-	13
Rice flour chips	1	5	6	9	21
Rice milling					
Rubber smoking	-	118	5	-	123
Silk dyeing	-	-	-	13	13
Slaughterhouse	146	-	90	187	423
Soy bean sheet/cake	5	-	12	1	18

Industry type	Estimated total number of industries				
	North	South	Central	North East	Total
Soy sauce	-	13	4	-	17
Steamed fish	-	-	-	9	9
Sugar making	8	-	4	-	12
Tapioca	-	-	2	-	2
Tea curing	12	-	-	-	12
Tobacco curing	194	-	-	762	956
Tyre retreading	7	1	23	8	39
Vinegar	-	-	1	-	1
Wood carving	47	-	-	-	47
Wood drying	7	27	6	4	44

Source : The survey on industrial fuelwood consumption in Thailand, 1992

Annex 9: ESTIMATED TOTAL AMOUNT OF WOODFUEL CONSUMPTION OF INDUSTRY TYPE

Industry type	Amount of woodfuel consumption(m^3/year)				Total (m^3/year)
	North	South	Central	Northeast	
Fishmeal	-	933,776	116,010	-	1,049,786
	-	28,800*	174,942*	-	203,742
Brick making	88,559	756,062	163,969	182,446	1,191,036
Slaughterhouse	38,580	-	85,808	68,658	193,046
	-	-	1,181*	17,038*	18,219
Rubber smoking	-	379,658	9,200	-	388,858
Coconut oil					
Lime production	5,838	225,588	6,300	2,400	240,126
Cassava pellet	-	-	5,596	-	5,596
Wood drying	-	162,648	-	-	162,648
	60,000*	3,232*	77,706*	11,294*	152,232
Noodle	10,072	22,418	48,848	102,581	183,919
	-	5,178*	43,619*	29,024*	77,821
Meatball	2,905	7,360	1,811	2,534	14,610
Rice flour chips	304	5,282	1,090	3,289	9,965
Preserved banana	1,440	-	1,044	-	2,484
Tyre retreading	1,544	3,000	27,276	7,010	38,830
	-	-	2,950*	-	2,950
Preserved bamboo shoot	22,320	-	21,422	-	43,742
Pottery	-	5,659	1,400	4,848	11,907

Industry type	Amout of woodfuel consumption(m^3/year)				Total (m^3/year)
	North	South	Central	Northeast	
Soy sauce	-	1,260	1,039	-	2,299
Tapioca	-	-	400	-	400
Dried shrimp	-	360	2,592	-	2,952
Soy bean sheet & cake	1,600	-	304	0	1,904
	-	-	2,318*	913*	3.231
Tobacco curing	3,418,329	-	-	110,511	3,528,840
Chinese sausage	-	-	-	20,462	20,462
Silk dyeing	-	-	-	938	938
Steamed fish	-	-	-	182	182
	-	-	-	6,053*	6,053
Ceramic	950,032	-	47,977	3,444	1,001,453
Wood carving	146,076	-	-	-	146,076
Tea curing	30,005	-	-	-	30,005
Noodle (meesua)	55	65	-	-	120
Sugar making	104	-	150	-	254
Bakery					
Blacksmith					
Rice milling					
Palm oil	-	109,148	-	-	109,148
Vinegar	-	-	73	-	73

N.B. * = sawdust consumption

Source : The survey on industrial fuelwood consumption in Thailand, 1992

Annex 10: ESTIMATED TOTAL NUMBER OF PEOPLE EMPLOYED BY INDUSTRY TYPE

Industry type	Number of people employed				Total
	North	South	Central	Northeast	
Bakery					
Blacksmith					
Brick making	991	3,774	2,017	150	6,932
Cassava pellet	-	-	266	-	266
Ceramic	3,308		556	52	3,916
Chinese sausage	-	-	-	177	177
Coconut oil					
Fishmeal	-	2,740	422	-	3,162
Lime production	106	383	110	7	606
Meatball	249	84	111	281	725
Noodle	574	299	1,126	1,086	3,085
Noodle (meesua)	4	5	-	-	9
Palm oil	-	1,013	-	-	1,013
Pottery	-	182	135	681	998
Preserved bamboo shoot	940	-	1,682	-	2,622
Dried shrimp	-	35	180	-	215
Preserved banana	13	-	102	-	115
Rice flour chips	9	45	54	196	304
Rice milling					
Rubber smoking	-	27,825	107	-	27,932
Silk dyeing	-	-	-	213	213

Industry type	Number of people employed				Total
	North	South	Central	Northeast	
Slaughterhouse	340	-	2,700	656	3,696
Soy bean sheet & cake	79	-	61	6	146
Soy sauce	-	119	50	-	169
Steamed fish	-	-	-	72	72
Sugar making	270	-	24	-	294
Tapioca	-	-	14	-	14
Tea curing	100	-	-	-	100
Tobacco curing	8,508	-	-	3,052	11,560
Tyre retreading	48	6	293	217	564
Vinegar	-	-	2	-	2
Wood carving	5,029	-	-	-	5,029
Wood drying	109	5,686	2,298	53	8,146

Source : The survey on industrial fuelwood consumption in Thailand, 1992

Annex 11: ESTIMATED TOTAL AMOUNT OF FUELWOOD CONSUMPTION BY INDUSTRY TYPE IN KTOE

Industry type	Fuelwood consumption	
	m^3/year	Ktoe*
Bakery		
Blacksmith		
Brick making	1,191,036	270.47
Cassava pellet	5,596	1.27
Ceramic	1,001,453	227.42
Chinese sausage	20,462	4.65
Coconut oil		
Fishmeal	1,049,786	238.39
Lime production	240,146	54.53
Meatball	14,610	3.32
Noodle	183,919	41.77
Noodle (meesua)	120	0.03
Palm oil	109,148	24.79
Pottery	11,907	2.70
Preserved bamboo shoot	43,742	9.93
Dried shrimp	2,952	0.67
Preserved banana	2,484	0.56
Rice flour chips	9,965	2.26
Rice milling		
Rubber smoking	388,858	88.30
Silk dyeing	938	0.21
Slaughterhouse	193,046	43.84
Soy bean sheet & cake	1,904	0.43
Soy sauce	2,299	0.52

Industry type	Fuelwood consumption	
	m^3/year	Ktoe*
Steamed fish	182	0.04
Sugar making	254	0.06
Tapioca	400	0.09
Tea curing	30,005	6.81
Tobacco curing	3,528,840	801.36
Tyre retreading	38,930	8.84
Vinegar	73	0.02
Wood carving	146,076	33.17
Wood drying	162,648	36.94

* Ktoe = fuelwood consumption in m^3 * 600 * 0.37848/1,000*1,000
= 0.000227088 m^3