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TECHNOLOGY TRANSFER IN RURAL INDUSTRIES OF THAILAND: THE CASE OF DESSERT AND PALM TREE INDUSTRIES

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ABSTRACT

In last decade, the small industrial sector has increasingly received attention from Thai policy makers. This study investigates the relationship between small industries and community in rural area in term of technology transfer. In the research area, knowledge and experience gathered from workplace as an employee and family businesses are the core resources to establish and run businesses. Technically, technology transfer is divided into 2 characteristics; intra-enterprise and inter-enterprise. Intra-enterprise technology transfer comes from employers to employees, emphasizing production development. Beside, technology transfer of inter-enterprise has two directions. Firstly, direction points from the entrepreneur to material suppliers aiming to secure raw material quality. Secondly direction points from consumers to the entrepreneur aiming to put a great emphasis on product development, quality control and management.

Key words: small industry, technology transfer, inter/intra-enterprise, dessert/palm tree industry

INTRODUCTION

Unquestionably, small industries are playing an important role in economic growth especially in local areas. For example, local small industries have enormous influences not only on local employment but also on the promotion of local agricultural products such as raw materials. Therefore, promoting rural small industries is of the essence especially for small industries which proceed under different circumstances [*Anderson*, 1982]. Apart from the significance of socio-economic factors mentioned above transferring knowledge and technology to local people is also important. From the study of the *United Nations* [1990], small industries are playing an important role in technology transfer, technical knowledge

and management to local people. As heavily depended on local labors and technology, the technology applied to small industries is not too much complicated and sophisticated. As a result, the workers and other people are able to gain benefits. For instance, local people's well-being is enhanced because of their higher income from selling raw materials to the factories. Small industries not only provide employment for local people and promote local agricultural products, but also produce future owners of enterprises [*Biggs*, 1990; *Piek*, 1998]. *Turare* [1999, 151] states that 'technology is often regarded as a part of solution for any development. Technology changes the way we live and promises improvement in our living standard. Appropriate technology is designed to help those needy people around the globe to improve their living and reduce drudgery they face in all walks of life'. The challenge for this study is to come up with possible strategies which promote rural development in term of technology by small industries.

THE METHODS

Qualitative approach and phenomenology were employed in this study. Phenomenology is a study of lived experiences [*Marshall* and *Rossman*, 1990]. The objectives of this study are to deeply investigate and describe the phenomenon of technology transfer and its effects on local people.

Selection and Sampling

Purposive sampling was used. Theoretically, purposive sampling is a 'strategy in which particular settings, persons or events are selected deliberately in order to provide important information' [*Lekoko*, 2005, 316]. Accordingly, multi-stage sampling method was practice in primary data collection. The stages are as follows.

Stage – I Selection of the district. One of the main objectives of the study is to evaluate the role and contribution of small industry in the rural development of Petchaburi Province. In order to meet the objective, one of the rural small industries at the district level was chosen for the purpose. Through this sampling method, Khao-Yoy Districts of Petchaburi Province was selected as a study area. Among different varieties of rural small industries, small and micro community enterprise (SMCE) and its rural characteristics are considered essential.

Stage – II Selection of industrial units and other related. For the selection of industrial units from the district, simple random sampling method was adopted. In this study, Dessert and Palm Tree enterprises were selected because of their abundant resources, labor-intensive industries and low technological applications. Then, the target group was designed as follow: Finally, the type of sampling for this study was purposive using convenient and criterion based techniques to approach the actual participants in this study. Table 1 show the number of responden who will considered in this study.

Table 1: Category-wise Distribution of Sample Selected Units

Category	No. of entrepreneurs (persons)	No. of workers (persons)
Dessert Industry	10	10
Palm Tree Industry	10	10
Total	20	20

Source: [*Pansuwan*, 2004].

Data Collection

To study the technology transfer of Small Industries, the research explores and analyzes information of enterprises located in Khao-Yoy District. In this study, in-dept interviews and participant observation with the owners of the enterprises and the workers were introduced. The research puts emphasis on all data including the information background of the owners and workers experience, production procedures, transferring of production technology and problems that occur in each unit.

The interviews conducted in this study were guided by interview checklists. The techniques ensured that questions asked were tailored to the research problems and that basically similar questions were asked in each situation. Questions in this interview guideline were constantly modified to shed light on the relationships between knowledge and quality of life development, especially in economic aspect.

Data Analysis

Case study and content analysis method were used. Analysis in this case meant to 'working with data, organizing it, breaking it into manageable units, synthesizing it, searching for patterns, discovering what is important and what is to be learned' [*Lekoko*, 2005, p.318]. Three coding categories of selective were used. Finally, three broad focuses were separated as follow; (i) Background in Work Experiences, (ii) Training Experiences and (iii) Beneficiaries of Personal. To achieve these three focuses, analysis of the discrete parts, serious examination and comparison between similarities and differences were practiced. During this process, ideas and thoughts that were 'found to be conceptually similar in nature or related in meaning were grouped under a category' [*Lekoko*, 2005, p.318].

RESULTS AND DISCUSSION

Khao-Yoy District, Petchaburi Province

The district is a long and narrow area, ranging about 30 km from north to south (Fig. 1). Its climate is tropical monsoon with heavy rainfall, where precipitation ranges from 1,100 mm/year. The western part of the region is mountainous. Reflecting these features, agricultural products in the region are diverse. The valleys are suitable for upland crops such as sugar cane, cassava and

maize which are considered main yields in this area. The east is fertile and suitable for lowland crops and paddy field such as rice coconut and palm trees. The Dessert and Palm Products Industry is the main enterprise in this area. However, lack of capital and basic technology has made this area lagging behind industry development especially small or household industry [*District Administration*, 2002].

Entrepreneur Background

Table 2 clearly reveals that there are two types of establishment. The first one is the enterprise owned by the entrepreneur who gained experience in manufacturing products from lots of previous backgrounds as an employee, from family business and more experience in other enterprises. Secondly, the government assistance such as the production training courses and factory visits.

However, it is found that most of entrepreneurs who received government support possess low efficiency for production development, whereas self-supported entrepreneurs possess strong potentials and ability in R&D by observation, market information and experiment by themselves. As a result, it can be concluded that the entrepreneurs who received government support will never have backgrounds in industrial culture, most of they are farmer. Then, when the government attempts to promote non-farming activities such as one tambon one products: OTOPs Project, it is very difficult to succeed because basic knowledge in OTOP production and management will be given to them for one or two weeks. Besides, the findings show that Palm Tree industries need at least six months for production trainings and need to put a larger amount of capital into the industries. Because of time and budget consuming, the government, therefore, never supports training programs as such for the entrepreneurs.

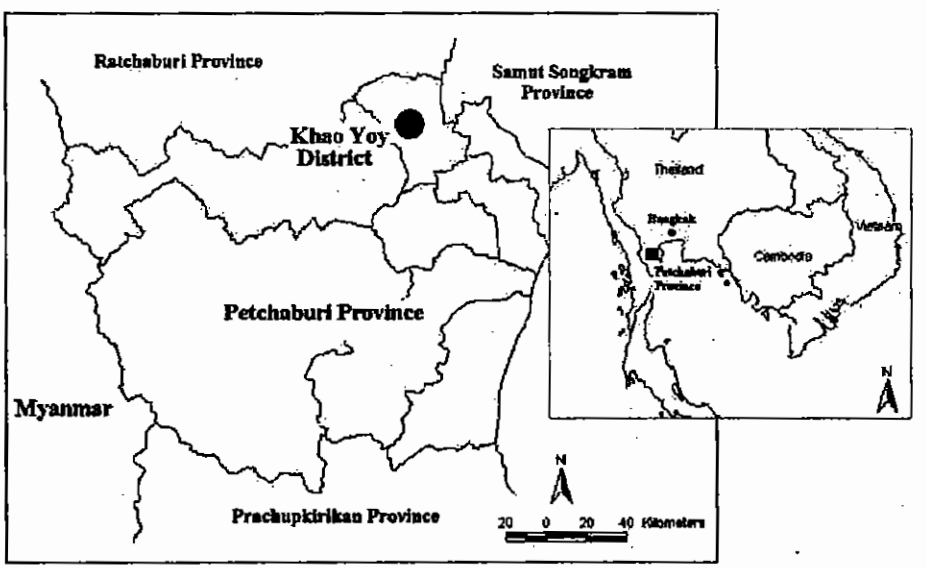

Figure 1. The Map of Khao-Yoy District in Petchaburi Province

Table 2. Enterpreneur Experience by Sample Industrial Units

Category	Types of Technology	Sources of Experience	R&D methodology
Dessert Industry	1. Experience in production marketing and management	1.From being as an employee in the same industry 2.From the family business learning 3.From being an other career	1.Experiment by themselves 2.Observation from other enterprises
	2. Experience in production	1.The government's support in training program	1.Lack of production development
Palm Tree Industry	Experience in production marketing and management	1.From being as an employee in the same industry 2.From being as an owner other enterprises	1.Observation from other enterprises 2.Learning from market order (product designs and production)

Source: [*Pansuwan*, 2004].

Based on Dessert Industry case, it indicates that the entrepreneur's experience and skills are very important factors for R&D capacity and enterprise success. For example, one of the entrepreneurs used to work in a Thai dessert house. Therefore, she learned how to make Thai desserts and later she runs her own business in food and desserts. Another entrepreneur who gained knowledge and the technology of manufacturing from her mother while she was her assistant later became the owner of a Thai food shop. In comparison, it points out that the skills and level of ability in product development of the second producer who directly gained knowledge from her family are far better than the first example simply because she devoted her times to learn right from wrong. After interviews, it is discovered that he or she who learns directly from the family will become Thai dessert production successor and cuisine recipe, product tips, raw materials suppliers and selection and provide.

According to management study, it illustrates that most enterprises are household-based running by family members. As such, the procedures are flexible. A prompt decision is made easily. Additionally, most entrepreneurs are local people and they lay emphasis on employing local people. Therefore, all members of the enterprise know the source of raw materials which results in fast management. However, the knowledge management in production, commercialization and finance management is really dynamic, the entrepreneurs, therefore, need further education to develop their enterprises and business management.

However, the knowledge and technology transfer and development vary from enterprise to enterprise In the Dessert Industry, the owners are hardly involved in the details of cooking. They have their own techniques for their career and they run the business by themselves. Therefore, most of cooking tips are cover for worker, it is found that some workers will learn some tips or recipes while they are working. As a result, the process of learning from such activities takes time. For the Palm Tree Industry, the entrepreneurs need experience and skills in promoting their enterprises, which result in good production. Then, they attempt to promote and train the workers for production skill. However, the production technique is not too complicated; so an employee tends to become an entrepreneur more easily.

In conclusion, it is obvious that there are several factors encouraging new entrepreneurs, such as knowledge and production techniques, which result from studying, experience or training. Besides, capital and the local market are important too. However, the most important factor that produces the successful entrepreneur is experience and skills. Experience and skills enable the development of products, making the enterprise sustained.

Technology Transfer

Technology transfer is divided into 2 characteristics called *intra-enterprise* and *inter-enterprise* (Fig. 2) [*Allen*, 1978; *Amsden*, 1993; *Piek*, 1998]. Firstly, technology transfer of intra-enterprise comes from the entrepreneur to workers, for production development and quality control purposes. Secondly, technology transfer of inter-enterprise is divided into 2 connections. The first connection comes from the entrepreneur to material suppliers in terms of raw material specification criteria to ensure the quality product. The second connection comes from consumers to entrepreneur in terms of product design and development, quality control and management.

For intra-enterprise of technology transfer, workers' backgrounds need to be discovered. General laborers working in small industry are local people. They are agricultural workers or simple employees. Experienced laborers decide to work for the big enterprises where wages are well paid. Thus, small industry encounters restrictions in recruiting and selecting qualified laborers. Usually, laborers in small industry are 40 years old up and young people who work as part-timers after school or during the weekends.

Seeking local labor is not difficult, especially for jobs that need no experience, such as cleaning raw materials, rubbing sand paper, shipping, etc. Therefore, there is no problem regarding a lack of labor. As most laborers are agricultural workers, they have leisure times during post-harvesting periods. One enterprise that needs experienced and skillful laborers is the food and dessert industry, since cooking and baking need special attention. The entrepreneurs have to transfer the know-how and technique of cooking, for example monitoring temperatures and packaging (see Table 3).

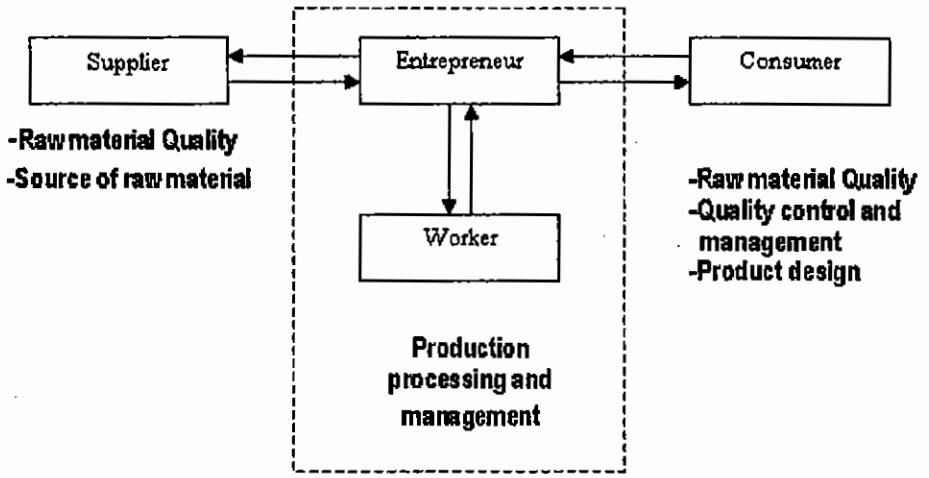

Figure 2. Intra-Enterprise and Inter-Enterprise of Technology Transfer in Small Industry

Table 3: Technology Transfer by Sample Industrial Units

Category	Types of Technology	Intra -enterprise of Technology Transfer	Inter-enterprise of Technology Transfer
Dessert Industry	1. Experience in production 2. Product development 3. Packaging designs	1. Raw material characteristics selection 2. General production knowledge	Observation from other enterprises in term of packaging and product development
Palm Tree Industry	1. Experience in production 2. Product development 3. Product designs	1. Raw material characteristics selection 2. General production knowledge 3. Machine operation and maintenance	1. Raw material characteristics choosing and resource 2. Product development in term of quality control 3. Product designs from 4. The contractors or sellers, especially from other countries

Source: [*Pansuwan*, 2004].

In Table 3, it can be seen that for the industry of palm tree products, laborers must have experience in selecting raw materials. Cutting old palm trees can prompt lower prices, because they are of low quality. In an enterprise that needs experienced labor, the entrepreneur has to instruct employees on production technique and watch them carefully as the perception of individuals is different. Laborers have different education levels and different attitudes towards work. For example, in the industry of tractor repair, the entrepreneur has to hire experienced

laborers only. In metal mending, the entrepreneur will transfer knowledge to laborers directly.

On the other hands, intra-enterprise of technology transferring is complex and most of this is informal networks. First and foremost, the type of enterprise and its backgrounds must be studied. Most small industries are self-production though some enterprises hire subcontractors to manufacture products. Most small industries do not concern the contractor because they are local industries that respond to the demands of a local market. In addition, the products are similar to districts. However, some products require original equipment manufacture (OEM), or the owners hire a subcontractor to manufacture products for them. They are generally handicrafts that are unique of the district, for instance local souvenirs, the products from palm trees and coconuts, especially the products from the palm tree that are unique to Petchaburi. Many products have been placed to tourist attractions in the province.

A subcontractor has been hired from Japan to design the products for special orders. The quality of the products is emphasized. This is an indirect transfer of product development which results in various international styles of products. For example, in the past, products from palm tree were transformed into mortar, pen display boxes, handicraft glass. At present, products from palm trees are developed into handicraft candle holders, wine glasses etc.

In the subcontracting, the contractor always gives advice to the subcontractor when they have orders. The advice includes the solution for troublesome products and manufacturing techniques before and after the production. The method for receiving products is also mentioned. This results in business development which includes production technology, the management system and punctual delivery. In the past, there was no condition of time. The quality and styles of products came from the local market. However, it is found that the quality of the products is not well-controlled if there are a large amount of orders because of limited manufacturing factors, labor and raw materials. For example, in the palm industry, the wood is not thoroughly dry, which causes fungi. Consequently, the products are returned and the entrepreneur loses the orders. Such shortcomings usually take place in the workers' homes, causing troublesome products. The products are not of the same quality.

For the enterprise, the product quality is simply controlled resulting in fewer returned products. To respond to customers' orders, the entrepreneur will hire local producers at household levels if they are in great demand. Based on the study, it is found that the household production generates flexibility in accordance with the demand of the market, which is varied annually. For example, during the period of normal palm production, the entrepreneurs will hire household laborers on special occasions such as New Year festival, Chinese New Year celebration, and Songkran festival, etc. In this case, the entrepreneur will give advice to the laborers at the beginning of the work on how to do simple work which does not require much experience, such as sandpapering a surface of an object, polishing products

etc. The laborers will gradually develop their skills from simple works to more complicated works.

In case of a large amount of urgent orders, especially from abroad and limited capacity of manufacture, laborers at household level will be temporarily employed as a stopgap measure. The classified household labor is experienced labor and fresh labor. As for the experienced laborers, the entrepreneurs provide them the patterns of products and make a contract. Sometimes, the entrepreneur also prepares raw materials for them. As the amounts of palm trees are unpredictable each season, the annual prices are different. In the rainy season, the farmers grow rice, and they do not cut trees, which prompt expensive raw materials. In the case of hiring inexperienced laborers, the owners have to instruct and transfer the technique of production from the beginning. In this case, the contractors have to monitor and control all production procedures including the quality control, raw materials, and the production. Therefore, most products meet the quality and quantity of the orders. However, the frequency of transferring knowledge and production technology associates with the frequency of the orders. According to the study, knowledge and technology transfer occurs when products do not reach the quality of the orders.

It is also found in the study that the type of enterprise affects knowledge and technology transfer. In the dessert industry, the owners of the dessert house do not transfer their knowledge. On the other hand, they have the products tested by quality control measures, which results in higher costs and the delay of developing products. Besides, there are many losses in the test. For example, in baking Kha Nom Mor Kaeng, also known as a sweet soy bean custard, one needs to heat the oven appropriately. Inappropriate heat levels can spoil the dessert. Some owners suffer heavy losses in the trial and error baking until their skills in heat control are improved.

Finally, we conclude that technology transfer is found both inside and outside enterprise. For Intra-enterprise, technology transfer is the key success of enterprise especially quality control. Most of this is formal network such as training. For inter-enterprise, backward and forward technology transfer linkages are found. The main technology and knowledge are quality control and product designs. The key success of technology transfer is basic knowledge and experience of entrepreneur.

CONCLUSION

From the study of the characteristics of enterprises and the production structure in Khao-Yoy District, Petchaburi Province, it is found that enterprises are initiated by the knowledge and ability of the entrepreneurs learned from education, from being employees, or from the family business. The outside factor that enables new enterprises is the government support that launches the OTOP policy for SMCE's. In management, it is found that experienced entrepreneurs can manage

enterprises and solve problems at all levels, including the selection of raw materials, marketing and product development while inexperienced entrepreneurs who receive support from the government have restrictions in managing production.

There are two categories of technology transfer in small scale industry: intra-enterprise and inter-enterprise. In the study of technology transfer inside the enterprise, it is found that the employers are instructors to their employees. However, the perceptions of laborers depend on the backgrounds of individuals such as the education, and the attitude towards work. The types of enterprise are also an important factor for knowledge development and technology transfer. In the food and dessert industry, the entrepreneurs will transfer only the basic knowledge of production.

The technology transfer outside the enterprise is an interaction between the enterprise and suppliers, and contractors or consumers. The suppliers will posses the knowledge of desired materials. Usually, the contractors need to give advice when they have orders and when there are troublesome products. Sometimes, there comes to both direct and indirect interaction between the manufacturer and the consumers in terms of product development, quality control, and management including punctual products shipment. If orders are made from abroad, the advice will always be given with the styles of products requested and the characteristics of desired products to the workers. For example, the manufacturer must not add dangerous substances to the polished palm products.

In conclusion, albeit many goals and objectives in industry development, the significance of value-added products and rural economic growth is strongly pronounced [*Cortes et al.*, 1990; *Dhanani* and *Scholtès*, 2002]. With inextricable linkage between public infrastructure resources and private sector potentiality, sector-based development is burgeoning employment opportunities and sound economic growth for many areas. Programs designed at the local levels emphasize cooperation and communication to overcome obstacles and optimize opportunities. All technology transfer of enterprises in rural areas can cause effective interventions on the development of knowledge and technology from outside areas to the community. However, without basic technology and knowledge, there will be no continuous development of innovations and knowledge will remain scarce and gradually withered away [*Emmanuel*, 1982; *Gillespie*, 1983].

NOTES

Some notes related to the existing industries analysed in this studies are:

1. In 2002, the total numbers of industries are 85 units registered by the Provincial Industry Office or the Department of Industrial Works in Khao-Yoy. Among registered industries 69 units are small scales. However, if fifteen Small and Micro Community Enterprises (SMCE) registered by the District

Social Development Office are included, the total small-scaled industry registration comes to 84 units.

2. The One Tambon One Product (OTOP) project was launched by the Thaksin's administration which was the brainchild of the town of Oita in Japan In 2002, the worth of export volume of Thailand was 10 billion baht. It was estimated that the worth of exports soared to (and it is anticipated that exports would soar to) over 20 billion baht in 2003. It is hoped that revenue earned by communities would rise up if support is given on a sustainable basis. The objective of OTOP project is aimed to encourage people living in communities to use their skills in manufacturing products while the government and the private sector would render assistance on developing the products and exploring the markets in order to create jobs, income and strengthening the communities. More than 10,000 items are now produced and developed under the OTOP project of which approximately 460 items have been initially selected as outstanding products with fine quality.

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