CHAPTER V

CHARACTERISTICS OF THE RICE MILLING INDUSTRY

This chapter describes the rice mill samples studied in the survey. Items of information include mill characteristics, such as age of rice mill, educational level of mill owner, the kind of business and power source. In addition, the source of paddy by rice mill, cost of rice mill operation, rice product and marketing channel of rice and problems in rice mill businesses are elaborated.

5.1 Rice mill characteristics

To obtain a general picture of the various rice mill units under study, it was essential to have an idea about the age of rice mill, entrepreneurship, education level of rice millers, and types of power used by the sampled rice mills.

5.1.1 Age of rice mill

In both the study sites, the ages of the sampled rice mills range from 1 to 63 years. In Thailand, 44.4% of the sampled mills were established less than ten years ago, 27.8% of the mills were installed 20 to 29 years ago and 2.8% were more than 40 years old. In contrast to Thailand, 94% of the sampled mills were more than 10 years old in Taiwan. In Taiwan, 37.1% are reported to be 20 to 29 years old. There was also 31.4% of the mills installed between 10 to 19 years.

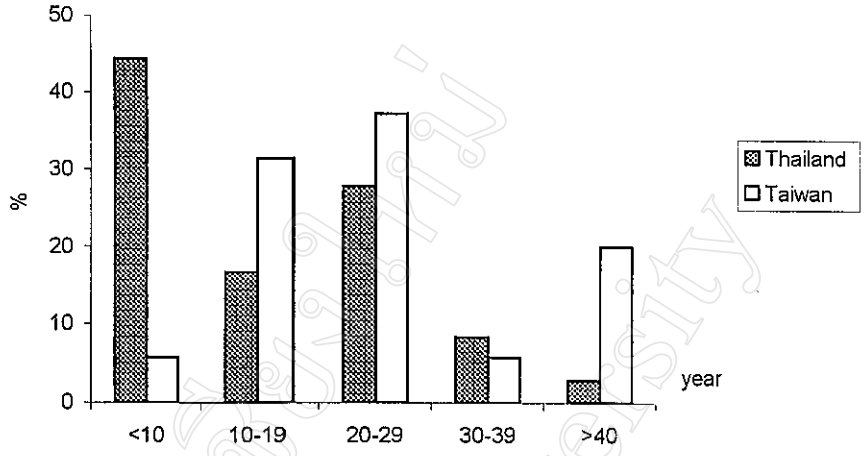


Figure 5.1 Comparison of age of rice mill between Thailand and Taiwan

5.1.2 Entrepreneurship

Success of any industry depends upon the type of entrepreneurship (Entrepreneurship: proprietary, partnership, company, and cooperatives). Survey revealed that more than half of the sampled mills were individually owned in both Thailand and Taiwan. While, the rest were in partnership and company, which accounted for 19.4% and 19.4% in Thailand and 14.3% and 11.4% in Taiwan respectively (Figure 5.2). Management is predominantly a family affair in most cases; as the family members with adequate knowledge of rice mill operations are engaged in the important positions within the business; such as managers, accountants and senior technicians. The remaining units operate as cooperative enterprises in Thailand and as farmer associations in Taiwan.

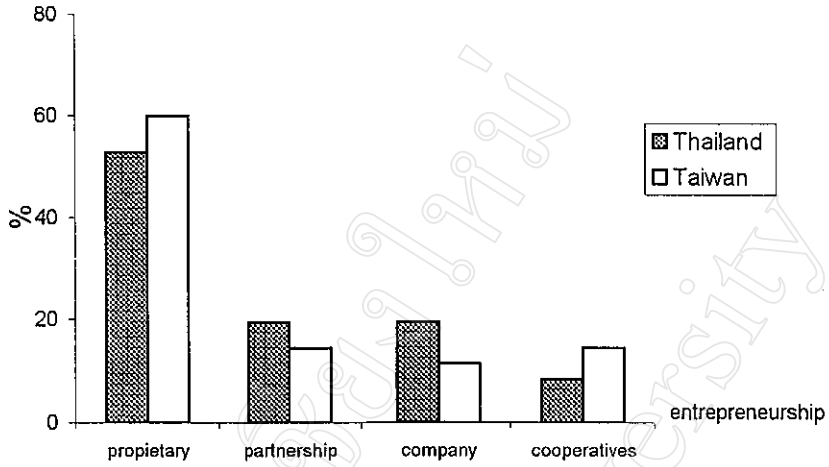


Figure 5.2 Comparison of entrepreneurship of rice mill in Thailand and Taiwan

5.1.3 Age of millers

The age of proprietor percentage in first generation millers of more than 55 years old is about 20%. It was observed that the proportion of proprietors in this age group in Taiwan was less than that of proprietors in Thailand, which account for 25%. However, the lower proprietor age group of 45-54 years in Taiwan accounts for 40% and was a highly proportion than Thailand's proprietors at 13.9%. Considering the importance of rice as an export commodity in Thailand, there exists a tremendous potential for rice milling enterprises, as millers who aged between 25-44 years come into the business of rice milling. The percentages of millers ranging from 25-34 years and 35-44 year were 33.3% and 27.8%, respectively. Comparing to Taiwan's proprietors lower rates, which account for 20% in both age groups. The scenario in Taiwan is different as rice-milling enterprises are almost considered as hereditary affairs and operated as farmer associations, which restrict new entrepreneurs venturing into rice milling. It is also further constrained by limited expansion of rice cultivation (Figure 5.3).

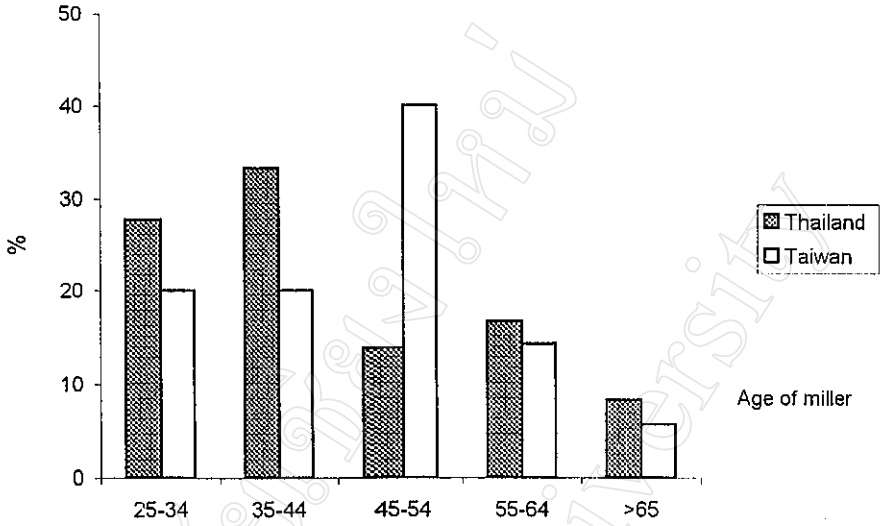


Figure 5.3 Comparison of age of miller between Thailand and Taiwan

5.1.4 Education

The educational level of the millers varied through illiterate, primary, secondary, high school, university and graduate levels. In the case of Thailand, 33.3% of those involved in milling operation have been to university and 27.8% completed had high school level qualification. However, 45.7% of millers in Taiwan only had high school level qualification and 28.6% had attended secondary school. While there were no illiterate managing mills in Thailand, 2.9% of those managing mills in Taiwan were reported to be illiterate. Similarly, the highest level of educational attainment of the miller in Thailand was graduate and only university in case of Taiwan (Figure 5.4).

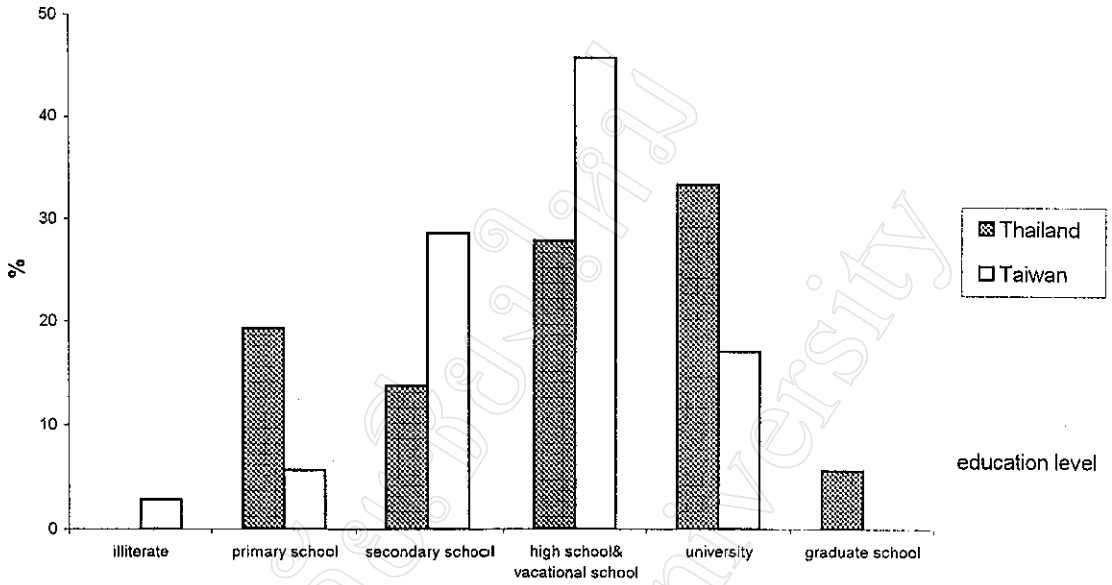


Figure 5.4 Comparison of education level of rice millers in Thailand and Taiwan

5.1.5 Energy source to operate rice mills

In both countries, electricity is extensively used as the energy source for operating rice mills. 50% of mills in Thailand and 57.1% in Taiwan were reported as powered by electricity. The remaining 42.9% of mills in Taiwan are automatic and are powered by electricity. In case of Thailand, 25% are powered by steam engines, 13.9% by electric and steam engines, and 11.1% of the mills use diesel to operate (Figure 5.5).

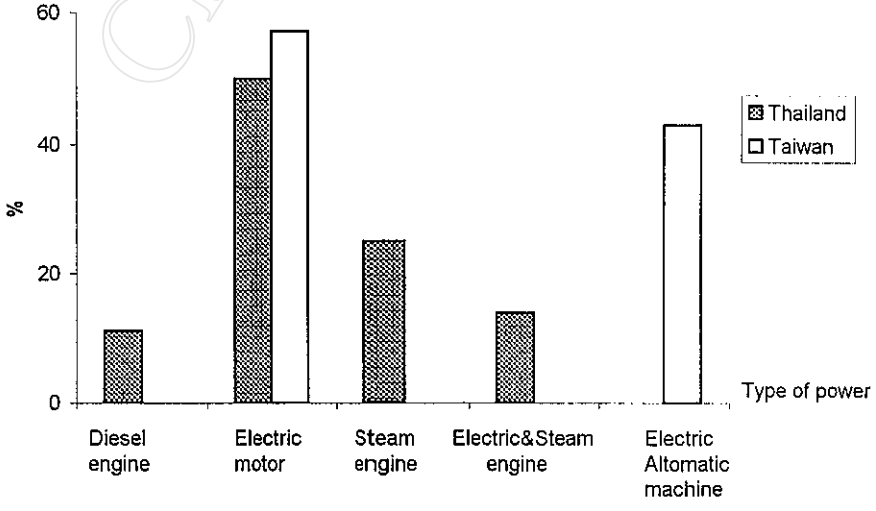


Figure 5.5 Comparison of type of power generation using in rice mil in Thailand and Taiwan

5.2 Sources of paddy for milling

Availability of paddy for processing had a direct impact on the performance of the rice mills. In both Thailand and Taiwan, paddy is often retained for a short period in village stores before dispatching it to the mills or middlemen; a simple shed to protect grains from rain is required for the storage. Immediately after the main crop season, Thai private rice mills purchase paddy rice from farmers, assemblers and farmers contracts accounting to 55.9%, 42.6% and 1.5% respectively. In Taiwan, farmers, assemblers and other rice millers sell paddy to rice mills in following proportions: 61%, 23.5% and 10.9%. In the case of cooperatives and farmer associations, there is a direct transaction with the farmers in term of procurement and input distribution. Cooperatives in Thailand procure paddy from their members amounting to 76.7% followed by 21.6% from other farmers and 1.7% from assemblers. Similarly, farmer associations in Taiwan procure 56% of paddy from members, 38% from non-member farmers, and 6% from assemblers (Table 5.1).

Table 5.1 Important sources of paddy for rice mills in Thailand and Taiwan

Source of paddy	Paddy purchased by rice mill (%)							
	First Crop Season				Second Crop Season			
	Private		Cooperatives		Private		Cooperatives	
	Thailand	Taiwan	Thailand	Taiwan	Thailand	Taiwan	Thailand	Taiwan
Farmer	55.9	61	21.6	38	46.2	22.2	15	6.7
Farmer contract	1.5	5.6	0	0	0	0.4	0	0
Assembly	42.6	23.5	1.7	6	53.8	33.3	0	30
Rice mill	0	10.9	0	0	0	44.1	0	0
Member	0	0	76.7	56	0	0	85	63.3
Total	100	100	100	100	100	100	100	100

Source: Survey, 2001

Following the harvest of the second crop, private rice mills in Thailand purchase 53.8% of paddy rice from assemblers and 46.2% from farmers. Similarly, mills in Taiwan procure paddy rice from other rice mills, assembler, and farmers, at 44.1%, 33.3% and 22.2% respectively. In the case of cooperatives mills in Thailand, of 85% rice comes from members, and 15% is purchased from non-member farmers. Similarly, farmer associations in Taiwan acquire 63.3% of paddy from members 30% from assembler and 6.7% from non-member farmers (Table 5.1).

5.3 Paddy purchasing and paddy storage

5.3.1 Mechanism for purchasing paddy

Most of paddy is purchased directly from farmers by mills, or assemblers went to the regions and bought paddy from the growers, which they transported to the mills. Prior to purchase of paddy from farmers and assemblers, rice mills conduct quality control tests. Criteria for quality testing include percentage of admixture, moisture content of grain, and proportion of adulteration. These quality tests are used to determine the cost of paddy rice.

Paddy prices fluctuate depending on the prevailing supply and demand trends. Study revealed that commercially operated mills in Thailand set discriminating prices for target customers. If each miller sells milled rice to wholesalers or retailers in the city, province and region, the local market paddy price is set based on variety and its quality. But, the miller who sells milled rice to exporters, uses the world market price for rice to determine the rate the miller pays to farmers. The commission agents are the organization that quotes rice prices from exporters or wholesalers in Bangkok.

Millers buy paddy from local rice traders according to the price quotations that they get from commission agents from different qualities (grades) of paddy.

As rice millers in Taiwan trade rice within the country to fulfill domestic requirement, wholesale rice prices for different qualities determine paddy retail prices in the open market. In farmer cooperatives and farmer associations, members get higher paddy price compared to open market price.

There are similar processes of testing the quality of paddy in Thailand and Taiwan. It was observed that experienced millers can identify grades by touch, and inspecting the appearance of paddy. The same method of intuitive quality assessment prevails in most situations.

First, they use a probe to take a sample from a bag of paddy for physical quality inspection. It is followed by a determination of the moisture content of the grain using a moisture meter. A sample of paddy is fed to a small huller for successive grinding in a small cone mill. This milling test allows the miller to determine recovery percentages (head recovery and broken grain %). It is also used to assess grain characteristics like chalkiness, stains and spotted or yellow grains. Finally, the seller and buyer negotiate on the price that is determined by the quality. The trucks that contain paddy are weighed at the weighbridge and then allowed to empty in the hopper for cleaning. After the truck is completely unloaded, it is again weighed to find the net paddy weight.

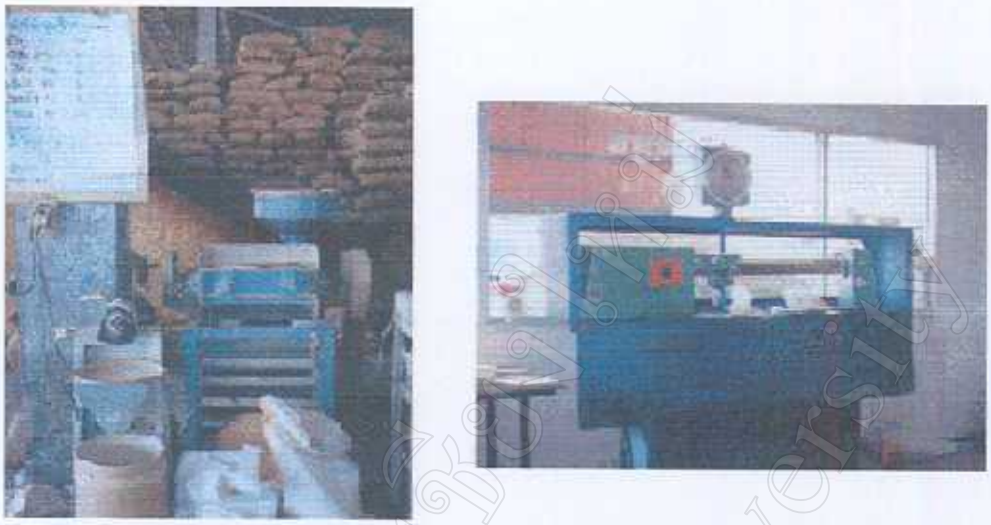


Figure 5.6 Purchasing paddy equipments of rice mills in Thailand

5.3.2 Method for drying and Paddy storage

Harvested paddy contains between 15 and 27 percent moisture, depending on its maturity, the incidence of rain, and the humidity of the atmosphere (Abbott et al., 1972). Since farmers do not sufficiently dry the paddy prior to selling, the millers have to dry it before it is stored for future milling. For a longer shelf life, grain moisture content should be maintained at 12-14%.

The two main kinds of drying are sun drying and mechanical drying. Sun drying is a common practice in Thailand. If the rice mill has a large area, paddy is spread on a concrete drying yard. Rice mill owners hire a lot of labor for sun drying paddy in the rice mill yard. As the concrete floor retains heat and becomes too hot, it causes paddy to dry too quickly resulting in sun crack, and if only partially dried or if it is wetted by rain, the paddy has to be dried again, this also causes excessive cracking of the grain which becomes apparent on milling

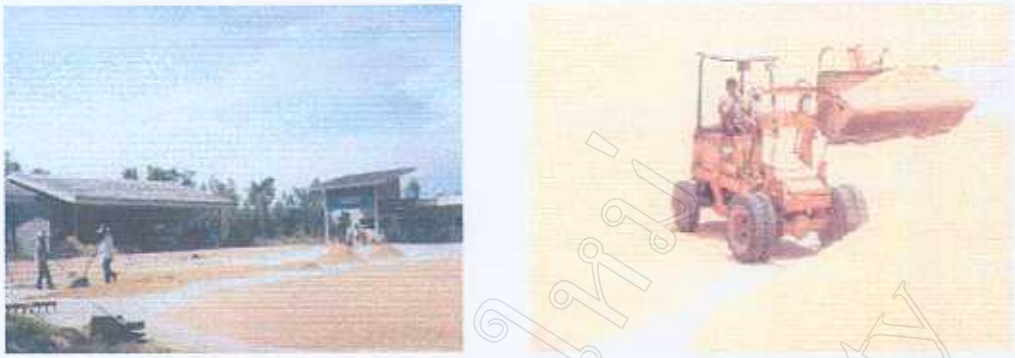
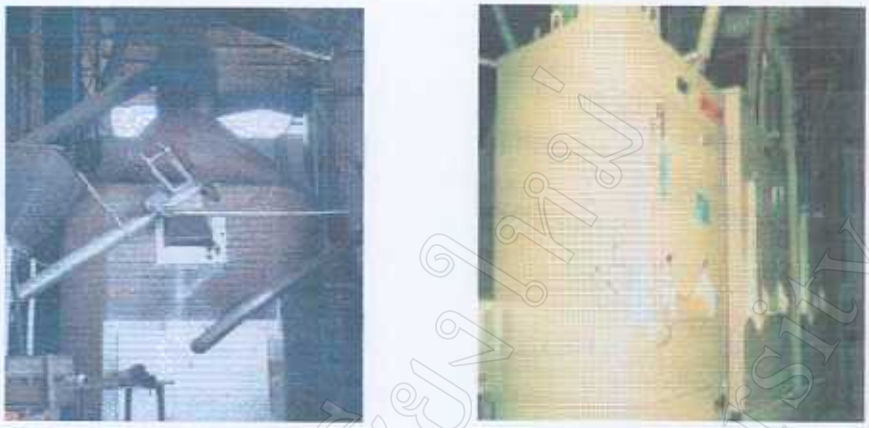


Figure 5.7 Sun drying method to decrease moisture level in paddy in Thailand

Mechanical dryers are more reliable since drying is uniform and could be done anytime of the year. Sun drying is no longer adequate to meet drying needs especially during the peak harvest of the wet season crop. Machine drying with a heated air dryer will lead to more uniform drying of grain and higher milling yield and head rice recovery. The choice of the dryer for a particular drying operation depends on several factors such as the drying capacity needed, ease of installation and of operation, fuel heat source, and the initial cost acquisition. Some processes use hot air generated by an oven using furnace oil or husk, to dry paddy in the bin or container. Another advantage of mechanical dryer is constant air circulation in the godown or room. A fan with a heater unit is then connected to the duct system to supply the required air to dry the paddy. The system has the advantage of shorter drying times, larger volume of paddy can be handled, and more uniform drying of the grains is gained over batch type drying system. Paddy drying with a paddy dryer also brings some problems, as it is known that, fast drying under improper conditions reduces head yield.



(a) (b)

Figure 5.8 Mechanical dryer in Thailand (a) and Taiwan (b)

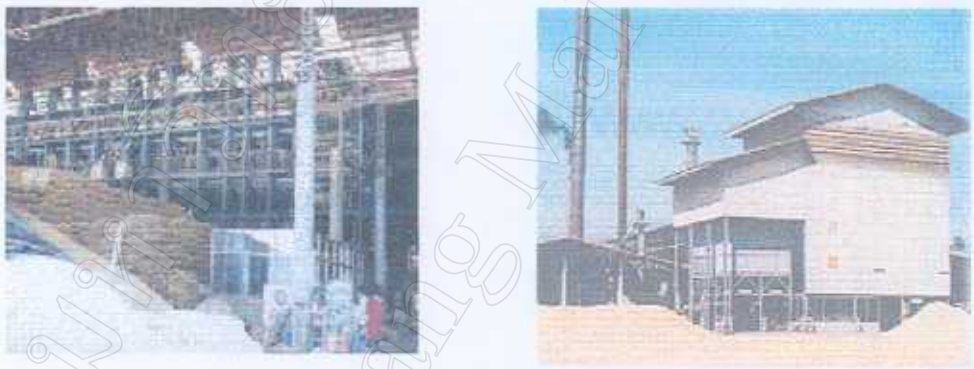
The survey revealed that 47.2% and 17.1% of mills in Thailand and Taiwan do not dry paddy before storage or milling, because they purchased only well dried paddy with less than 16 percent moisture content. In Thailand 19.4% of rice mills use sun drying to maintain the moisture content of paddy, 16.7% use a combination of sun drying and mechanical drying, with 16.7% using mechanical drying only. While in Taiwan, 82.9% of mill operators use machine drying only (Table 5.2).

Table 5.2 Comparison of drying method using in rice mills in Thailand and Taiwan

Drying method	Thailand		Taiwan	
	Number of mill	Percent	Number of mill	Percent
Not drying	17	47.2	6	17.1
Sun drying	7	19.4	-	-
Machine drying	6	16.7	28	82.9
Sun drying and Machine drying	6	16.7	-	-

Source: Survey, 2001.

Once dried, the process of keeping paddy, whether in bags or in bulk, is in a storage structure designed to protect the stored product from inclement weather and pests. This can be for a short or long period of time, to await processing or movement to other locations. Storage at temperatures of 10 to 15°C ensures protection against insect infestation, and mould growth and respiration is reduced to a minimum. The paddy is stored in warehouses or silos connected to a dryer. In Thailand, medium sized mills mainly pack paddy in sacks and store them in a godown. Large commercial mill stored paddy in silos, and bag storage, in a warehouse combination, while most paddy in Taiwan is stored in vertical silos, warehouse storage is also used in parallel. Some mills also pack grains in woven poly bags and store then in refrigerated stores and humidity controlled warehouses (Figure 5.9).



(a)

(b)

Figure 5.9 Comparison of paddy storage in Thailand (a) and Taiwan (b)

5.4 Management practices of rice mills in Thailand and Taiwan

The technical characteristic of the rice mill industry management was basically a family affair with proprietors themselves managing the mills. The range of management practices assessed for study participants was through surveys. The major decisions in the rice milling business were taken in concurrence with the partners who managed the whole business. This ability is necessary in the milling business, especially when the market is very competitive.

Most millers of medium size, both in Thailand and Taiwan, are not industrialists or professional managers. They often make decisions based on their own value judgment rather than statistical information. Their working experience in milling or related fields including formal training, has contributed to management skills. It was found that most of the milers, who are successful in business, usually have over ten years of working experience. However, millers who owned large businesses or had other business related to export rice used more information (such as export price or the government regulations) to composing business decisions.

The staffing pattern of all the selected rice mills in both Thailand and Taiwan, revealed that there were three wings of administrative organization, not clearly delineated, under the control of top management. The first wing dealt with the procurement of paddy and the sale of rice and by-products, the second wing was primarily concerned with maintaining accounts and records, and the third was the processing wing.

In Thailand, most rice mills had no uniform staffing pattern. Among the mills, the assignment of individual responsibilities was to persons involved in office management. Also there was no uniform pattern in obtaining the services of maintenance staff particularly in the case of the foremen boiler attendants, and the other maintenance staff who share the responsibilities among themselves. On the other hand, division of labor and specialization had occurred in Taiwan's rice mills and in modern mills in Thailand. There was a complex operation or set of inter-related activities would be broken down into the number of the working team in order for each to specialize on one of them. This probably leads the firm to have a higher efficiency in production, despite the fact that, the skill of labor can also affected.

Labor in the production side are those persons who control the machines directly. Therefore, the milling quality partly depends on the quality and skill of the labor. To increase the milling quality, highly skilled labor is needed so that they can adjust the machine in an effective way. Both in Thailand and Taiwan, the labors employed in the rice milling industry are mainly lower educated people who graduated at the primary school level. Moreover, job-training systems have never been used in the rice milling industry. The skills that labor acquired are solely obtained from 'learning-by-doing'. Workers with more experience are usually highly paid compared to less experience ones. Large-scale firms are able to hire more skilled labor as due to production processing with modern technology, they can operate more efficiently than the firms that employ relatively unskilled labors. However, the processing department was still headed by an experienced technician or manager, who was responsible for running the mill and for maintenance and repairs. This position decided the degree of drying required the milling standard of paddy and the labor was followed this judgment

The length of operation in terms of number of days in a year increased with the increase in the capacity of the mill. The aggregate of processing in Thailand carried a production period ranging from 220 - 300 days, the remaining days were excluded for holiday, repair, and maintenance. Milling activity concentrated mainly during November to March and June to September was the out of season period, Moreover the length of operation in terms of number of hours per day varied also with the size of the mill. An average sample mill worked for 8 hours per day in medium sample. The processing period of large mills with steam engine machines worked 24 hours per day and was reckoned as the maximum capacity of the unit. The others ranged from 8 to 12 hours per day using diesel engines and electric machines in the rice mills.

The sample mills in Taiwan, on average worked around 10 months in a year. As these mills processed rice to order, and storage technology could maintain paddy at same quality in whole year round. It was observed that the variation in the working hours per day, ranged from 2 to a maximum of 8 hours. High capacity in the high technology machines could produce large amounts of rice within a few hours. The utilization of the capacity was the lowest in the very large sized mills in Taiwan.

It should be mentioned that the total quantity milled, also includes the quantity of paddy milled to custom requirements. Medium size mills in Thailand were more appropriate to process rice with their capacity than large and very large sized mills in Taiwan. Despite the fact that Thai rice mills did the maximum custom milling among the different sizes, mills of this size could not increase the utilization of the capacity.

5.5 The rice mill unit

5.5.1 Input, output and the cost of rice mill operation

The rice mill unit is responsible for processing paddy into rice and other by-products. Its capacity ranges from 20 to 300 tons per day. Some of the prominent features of mills are described in Table 5.3 The costs of operating a rice mill are made up of initial investment and operating expenses. Since depreciation value, replacement cost, and estimation of market value were difficult to obtain for all the mills accurately, only initial investment costs and operation and maintenance costs until 2000 have been taken into consideration for the study.

The investment cost furnished by mill owners for 2000 includes cost of land, warehouse, equipment, machinery and vehicles. On average, land used for installing and operating rice mills Thailand was reported as 18.6 rais and was almost four times more than in Taiwan (4.9 rais). However, millers in Taiwan pay 29,571,979 baht per rai, much higher than their counterparts in Thailand, who pay only about 1,081,832 baht per rai.

While millers in Thailand continue to invest in modern technologies, the majority of millers in Taiwan already use modern scientific technologies in handling and storing paddy. Millers in Taiwan also use the latest technology in milling. Its advanced computer-controlled milling system and optical sorting equipment are used in operation i.e. some rice millers can control their computer machines by cells phone. Therefore, the investment cost of warehouse, machinery, and other equipment in Taiwan's rice mills is relatively high compared to Thailand. Although the numbers of vehicles used for transporting paddy rice and milled rice, are higher in Thailand,

especially in the case of mills in Central and North Eastern areas, the overall transport cost is higher in Taiwan.

Operating expenses also include investment in the purchase of paddy, credit, labor, packaging and other expenditures such as fuel, electricity, insurance and tax, etc. As the volume of rice milled in Taiwan is small compared to Thailand, packaging cost is cheaper in Taiwan. On average the aggregate paddy processed for each mill was reported to be 17,145 tons per year in Thailand and 14,560 tons per year in Taiwan.

In the case of labor, rice mills in Taiwan employed less labor than Thailand's rice mills because labor wages are higher at approximately 28,000 – 60,000 baht per month for one permanent labor and 2,500 baht per day for one temporary labor, compared to 3,000 – 8,000 baht per month for permanent labor and 150 baht per day for temporary labor in Thailand. Despite millers in Taiwan using modern labor saving technology, certain specialized activities are still done manually. This coupled with high living costs in Taiwan, causes wages to be higher than in Thailand.

Head rice is the primary product of milling, while broken rice, fine bran, coarse bran, and husk can be considered as secondary products or by-products. However, this study considered only milled rice for the analysis. Accordingly, it was found that a volume of milled rice handled by mills in Thailand was higher than in Taiwan. On average, Thailand millers handle 9,921 tons milled rice per year and it is 6,964 tons in Taiwan. Finally, cost per kilogram for rice processing in Thailand was less than Taiwan at 10.45 baht and 16.84 baht, respectively.

Table 5.3: Input, output and the cost of rice mill operation per mill in Thailand and Taiwan

Item	Thailand		Taiwan	
	Asset	Value (Baht)	Asset	Value (Baht)
Input				
1. Investment				
➢ Land	18.6 rais	1,081,832 per rai	4.9 rai	29,571,980 per rai
➢ Equipment to purchase paddy	A scale, Moisture meter, Small milling, A grinder	424,371	A scale, Moisture meter, Small milling, A grinder	779,029
➢ Ware House	Paddy house, Silo	9,720,758	Paddy house, Silo, Cooler room	27,680,043
➢ Machine in Operation				
• Rice Processing Machine	Electric, steam, diesel	7,419,750	Electric, computer	17,450,879
•Packaging Machine -Sewing Machine -Packaging Machine	Mostly sewing by labor, use a few sewing machine, Packaging machine	90,615	Sewing machine, Packaging machine	283,875
➢ Vehicle	Tractor, Pick up, Six wheel, Ten wheel, a few folk lift	5,749,028	Tractor, Pick up, Six wheel, Ten wheel, folk lift	6,157,954
2. Operating expense				
➢ Paddy	900-172,800 ton	59,799,824	1,800-64,083 ton	742,760
➢ Credit	over draft &loan	1,060,516	over draft & loan	1,329,946
➢ Labor				
-Permanent Labor	3-62 man (15)	945,576	2-20 man (8)	3,682,340
-Temporary Labor	1-30 man (9)	562,090	1-10 man (4)	986,880
➢ Packaging	Sack, Plastic bag, Thread, Box	2,960,886	Sack, Plastic bag, Thread, Sticker, Box	1,893,529
➢ Other Expenditure	Fuel, Electricity, Water, Telephone, Insurance, Tax etc.	2,738,551	Fuel, Electricity, Water, Telephone, Insurance, Tax etc.	3,880,193
Output				
➢ Milled rice	9,921 ton per year/rice mill	-	6,964 ton per year/rice mill	-
➢ Cost per kg	-	10.45	-	16.84

Note: exchange rate 1 Baht = NT$ 1.2 in 2000
1 acre = 2.50 rais
Source: Survey, 2001.

5.5.2 Rice milling processing

Processing is an essential phase in marketing rice. In contrast to wheat and other cereals, where the grain is ground to fine flour, the objective of rice milling is

de-husking paddy and maintaining high head rice recovery. The technical efficiency of milling is judged by the percentage of head rice recovered. However, the quantity of head rice recovery depends on the mechanical efficiency of the mill, milling methods, and grading, in addition to moisture content of grains and proportion of sun cracked kernels. Two major kinds of rice milling processes are explained in the following sections.

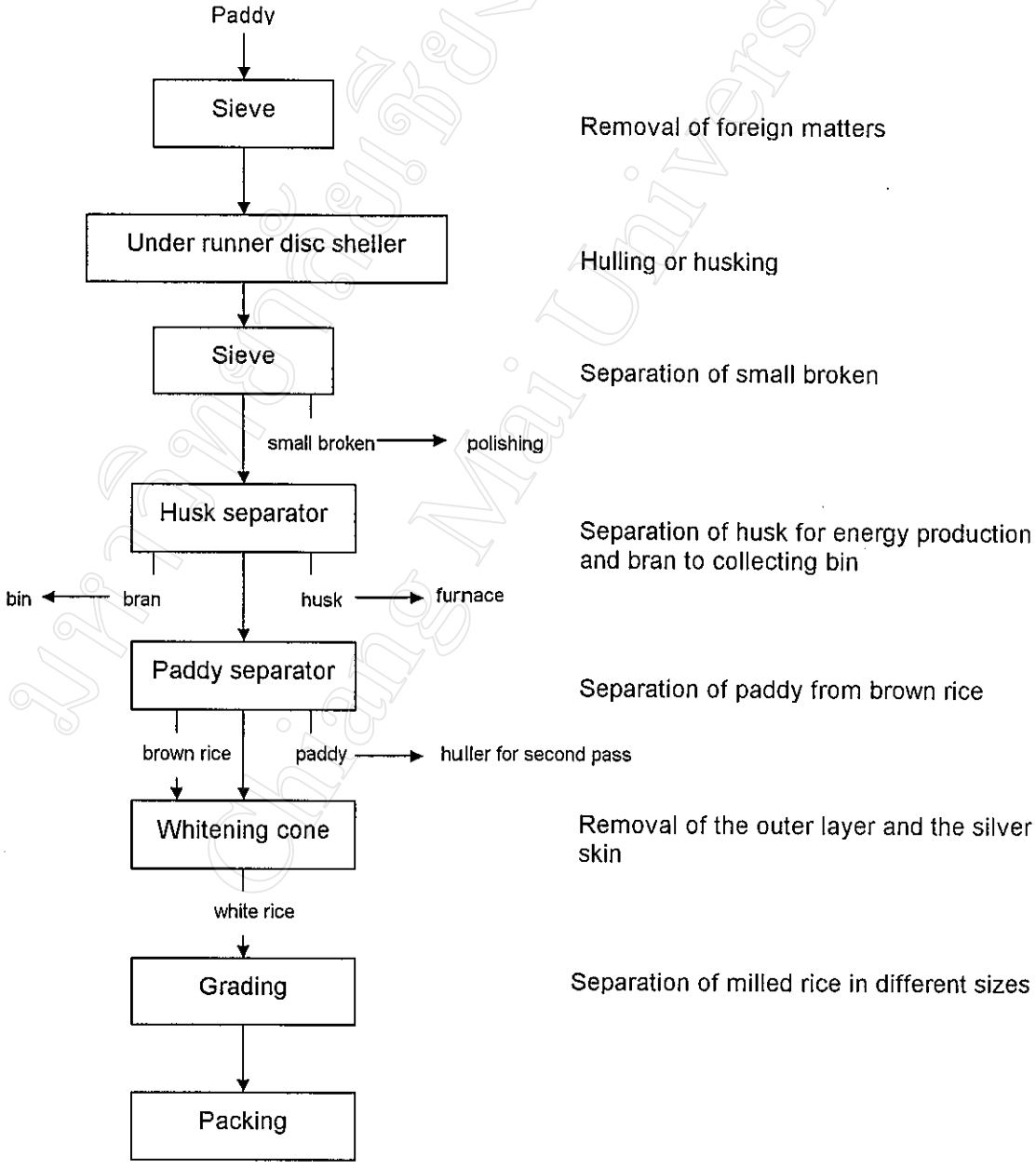
5.5.2.1 The traditional rice milling system

For the last 40-50 years, millers in Thailand have been using traditional rice milling methods. Even today 70-80% of millers in Thailand continue to use traditional milling processes. (Suvattananon et al., 1998).

The predominant source of power in the tradition rice mills is a steam engine. The steps of milling in conventional type operation are i) cleaning the paddy, ii) de-husking, iii) separation of small broken and bran from brown rice, iv) separating husks from grains, v) separating unhusked grain from brown rice, vi) polishing brown rice and vii) grading. The process if depicted in Figure 5.10

Paddy has to be cleaned before milling in order to screen out all foreign material that may damage the blade and also reduce the quality of milled rice. Cleaning usually consists of either vibrating or rotating sieves or their combination to remove foreign particles, which are heavier and smaller or larger than the paddy grain. After cleaning the paddy, the next process is dehusking paddy grain by using dehusking equipment, often referred to as a husker, huller or sheller. The dehusked paddy is called brown rice and by the by-product, husk, is used as a source of fuel in steam-driven mills. Some portions of too small paddy grain are not dehusked and will

be conveyed later to be dehusked by the same process. The brown rice still has a fine bran layer, which must be removed by "polishing". After polishing, the polished rice still contains different sizes of broken rice, bran, and dust. Separation of these particles after polishing is termed "grading".



Source: Survey, 2001

Figure 5.10 The traditional rice milling system in Thailand

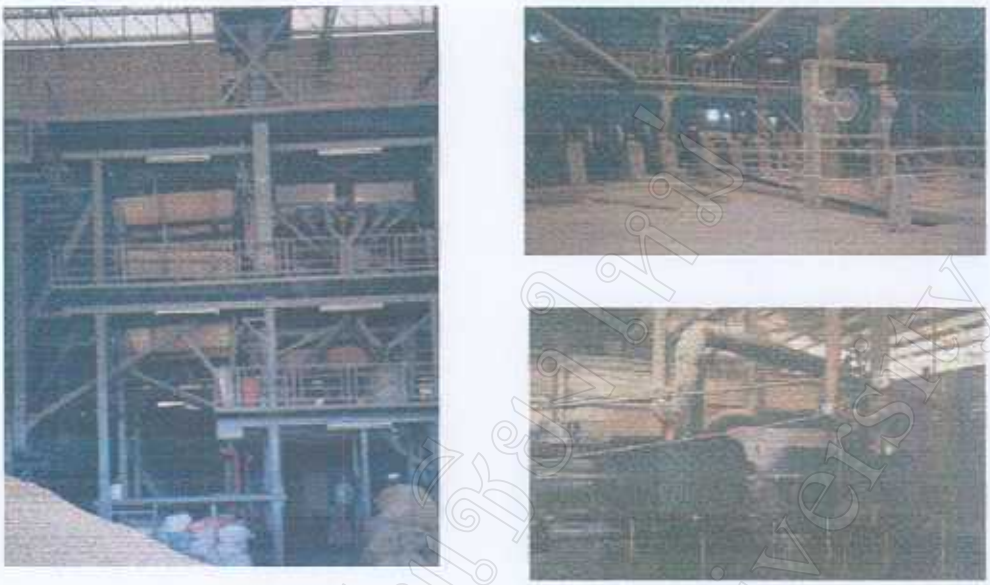


Figure 5.11 Traditional rice mill in Thailand

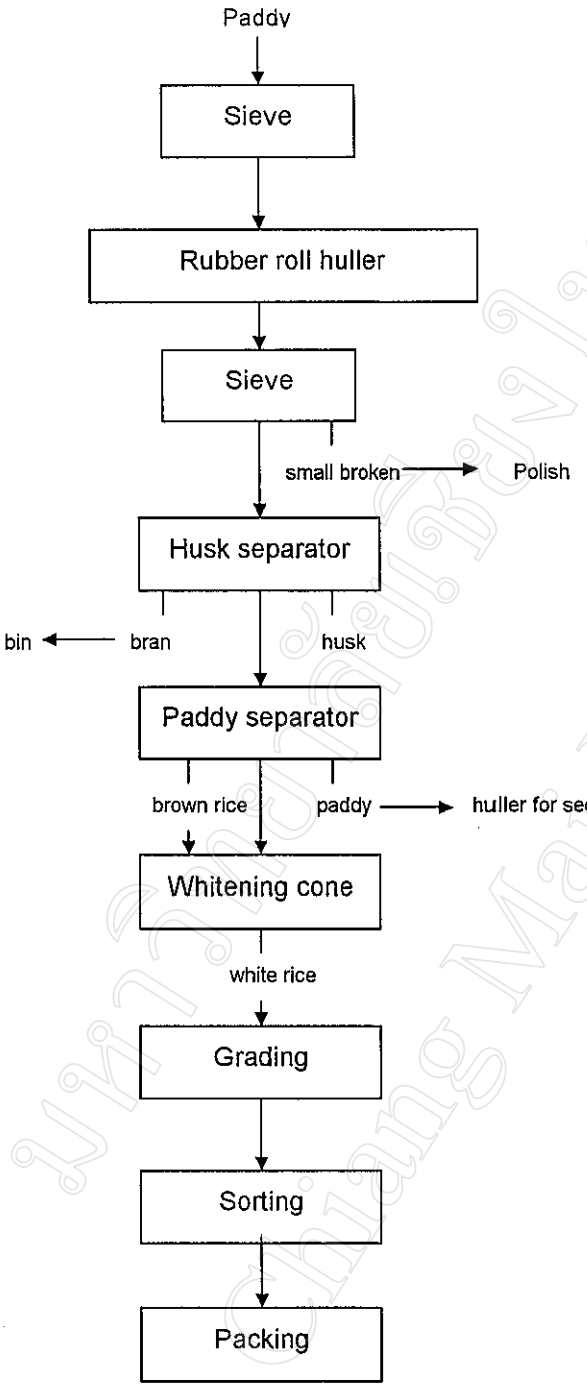
5.5.2.2 The modern rice milling system

The modern rice mill is widely used in Japan, U.S., Europe and now in some of the developing countries, therefore milling of rice has become a sophisticated process. The majority of Taiwanese millers use modern rice mills, while millers in Thailand started using modern machines 10 years ago and they are quickly becoming popular. They are popular for their higher mechanical efficiency (than the conventional type) though they are similar in their working system.

The major differences between the traditional and the modern rice mill are as follows; firstly, a modern mill involves intensive investment and effort in the precleaning, cleaning, and grading procedures. Secondly, all machines in a modern milling system are electrically operated machines, while the traditional milling systems are mechanically operated. Finally, the working details of some machines are different from the older ones.

From those interviewed, it is evident that much greater cleaning effort is required in the modern systems. Precleaning may be done 2 to 3 times before milling. Besides, a modern mill uses a rubber roll huller generally replacing an under runner disc sheller at least in the second pass. An additional step is involved where milled rice is passed before an electronic eye that detects any difference in color. The sorter machine helps to eliminate colored kernels for instance the jet-black and the yellow colored grains. Throughout the system, magnetic separators are attached to cleaning equipment, husk separator, and discharge spouts of elevators, to remove any small metal pieces from the paddy as a final safeguard, and to protect from damage of machinery. Particularly, dust collection is obtained and a dust free environment exists in some modern rice mills.

Figure 5.12 Modern rice mill in Taiwan



Removal of foreign matters

Hulling or husking

Separation of small broken

Separation of husk for energy production and bran to collecting bin

Separation of paddy from brown rice

Removal of the outer layer and the silver skin

Separation of milled rice in different sizes

Removal of rice defects, such as discolorations, yellows, immatures (green)

Source: Survey, 2001

Figure 5.13 The modern rice milling system in Thailand and Taiwan

In milling "high quality" implies well polished milled rice with a very minimum proportion of broken grains, although the food nutrition value of broken rice is no different form that of whole rice.

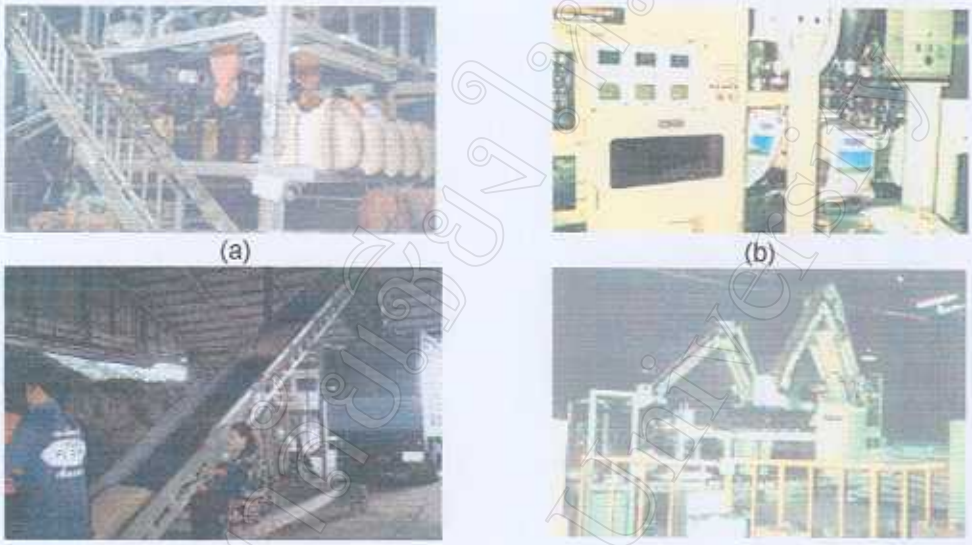


Figure 5.14 Comparison of packing and transporting method in Thailand (a) and Taiwan (b)

After rice enters the final grading phase, it is then ready for marketing. Processed rice may be shipped immediately from the processing plant to market, or may be stored for later sale.

5.6 Rice product and marketing channel of milled rice

Subsequent stages of the marketing channel are very much influenced by the ultimate buyers and consumers. The various intermediaries who may be involved in a rice marketing system, prolong supply of rice from rice mill to other private individuals. To supply, a large number of retailers, including convenience stores and supermarkets, and serving domestic consumers will call for a structure of wholesale distribution systems with capacity to hold supplies in store of rice, and draw upon them to satisfy retailers' needs for small lots at regular intervals. Rice for direct export

goes to exporters, or passes through commission agents before export. There are, however, no fixed patterns or sequence in the marketing channels. Some mills undertake the whole process and combine milling and wholesale or retail trading, or milling and export.

In general, milled rice is commonly packed in one, three, five, ten, and twenty kilogram consumer bags, and fifty, sixty, and one hundred kilogram sacks for commercial customers. The majority of these bulk sacks are destined for export, institutions, and for repackaging by labelers.

There are many types of rice products in Thailand and Taiwan. In Thailand, the sale volumes of 100-kg category was the major product, which accounts for 47.2 % of milled rice sold to commission agents, exporters, and wholesalers. The second category of 50 kg, accounts 38 % of sales from wholesalers in local or other regions, and some retailers. Recently, Thai household consumer behavior changed from buying in sacks, and people favored buying in 5 kg plastic bags from supermarkets and retail outlets. The other packing categories include 30 kg and 2 kg handled by retailer and supermarket; while it is also packed in bulk for transport by ten-wheel trucks to agents or exporters.

Rice is not heavily exported from Taiwan as most rice is consumed domestically. As such, the most common packaging capacity is 30-kg packets, which account for 46.2 % of the volume handled by wholesalers and retailers. Among the packaging categories, either 4.5 or 5-kg products are sold in retailers and supermarkets accounting for 17.2 % of marketed volume. While 8.4% of the marketed volume is packed in 60-kg sacks sold to restaurant and government agencies (military, civil servants and schools).

Table 5.4 Comparison of rice product and market sold by rice mill in Thailand and Taiwan

Rice product	Thailand (%)	Market	Rice product	Taiwan (%)	Market
1) 100 kg	47.2	-agent, export, wholesale	1) 30 kg	46.2	-wholesale, retailer
			2) 4.5-5 kg	17.2	-retail, supermarket
2) 50 kg	38.0	-wholesale and retail	3) 35 kg	11.8	-wholesale, supermarket
3) 5 kg	1.9	-wholesale, retail,	4) 10 kg	6.6	-retail, supermarket
		supermarket	5) 60 kg	8.4	-restaurant, hotel and
4) 30 kg	3.4				government
5) 2 kg	1.2	-retail, supermarket	6) Other	9.8	-retail, supermarket
6) Other	8.3	-agent, exporter,			all market
		wholesale			

Source: Survey, 2001

Figure 5.15 Example of rice product in Thailand

Figure 5.16 Example of rice product in Taiwan

5.7 Decision on rice mill expansion and problem in rice mill business

5.7.1 Decision on rice mill expansion

As modernization was a recent phenomenon in the surveyed rice mills, attempt was made to understand the entrepreneur's contemplations for expanding their mills (Table 5.5). Some Rice millers were aware of the gains through rice mill expansion. Significantly a majority considered improvement of the paddy-rice conversion ratio, availability of better quality of rice and bran, and reduction in the broken rice to be the chief reasons. More than half of the respondents in both Thailand 75% and Taiwan 65.7% did not consider expanding their mills. Among those surveyed millers, the uncertainty of the rice market, poor economic situation and non-availability of finance for complete modernization, were the reasons for not being able to expand their mills in Thailand. In Taiwan, alternatively, the uncertainty of the rice market was because of a decline in the rice sector, and doubts of the effects to the rice trade after Taiwan joins the WTO. In addition, despite high market demand for rice, a lack of adequate capacity to operate in Thailand is a major bottleneck for expansion. However, limited expansion of modern mills, in Taiwan, is also linked to insufficient quantity of rice for operation of modern mills.

Table 5.5 Comparison of miller decision of rice mill expansion between Thailand and Taiwan

Item	Thailand		Taiwan	
	Number of mill	%	Number of mill	%
Do not expand	27	75.0	23	65.7
Expand	9	25.0	12	34.9

Source: Survey, 2001

5.7.2 Problems in rice mill business

Analysis of millers concerns in business revealed that rice millers in Thailand considered high competition (weighted 4.3) as their first priority problem, 75 % of the mills consistently reporting it as problem. 66.7 % reporting high rates of energy expense (weighted: 3.7) ranked as the third most important constraints in the rice milling business.

In Taiwan, high rate of energy expense (weighted 3.2) was considered as the most important problem. 100 % the respondents reported it as a serious problem. Insufficient paddy and lack of labor were ranked as second and third constraint with 96.4 % (at 2.6 points) and 94.3 % (at 2.7 weighted average), respectively. In addition, one of the important concerns of Taiwan rice miller's is the uncertainties of Taiwan joining WTO, with 80% of the mills reporting this and 3.5 average weight, it is considered as a serious concern.

Table 5.6 Comparison of production constrains of rice millers

Problem	Thailand		Taiwan	
	% of rice mill	Weighted [1] average point	% of rice mill	Weighted [2] average point
1. High rate of energy expense	66.7	3.7	100	3.2
2. High labor cost	52.8	2.6	85.1	2.9
3. Lack of labor	61.1	2.4	94.3	2.7
4. Inefficiency machine	55.6	2.3	70.3	2.6
5. High price of paddy	50.0	2.8	94.3	2.7
6. Insubstantial paddy	58.3	2.1	96.4	2.6
7. Quality of paddy	72.2	2.9	88.6	2.7
8. Inefficient to preserve paddy	52.8	2.7	88.6	2.5
9. High interest rate	58.3	3.3	93.0	3.8
10.High competitiveness	75	4.3	91.4	3.0
11.Other	27.8	4.3	91.4	3.1

Source: Survey, 2001

Note: (1), (2) = total score/ number of respondent