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Export Potentials and Constraints for Development of Jasmine Rice Production in Thailand

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I. Introduction

A remarkable development in Thailand's non-agricultural sector in the past few decades has previously created a significant increase in the demand for agricultural labor and consequently resulted in labor shortage in the rural area. The rise in wage rate in turn inflated the cost of rice production. These development in the domestic economy along with the long-term declining trend in rice price in the international market and the increased competition from the low-cost rice economies such as in Vietnam have raise concern whether Thailand could maintain its exportable surplus of rice and future competition strength in the world market (Isvilanonda and Hossain [2000]).

This view is supported by Shintani[2003] who has shown that the land productivity of Thai agriculture continues to increase due to development of land saving technology and the man-land ratio turns down due to the progress of labor saving technology induced by labor shortage. He also found that marginal labor productivity is very closed to the wage rate of agricultural hired labor. These findings, however, imply that the Thai economy has already passed the turning point and Thai agriculture is full of the causes of losing comparative advantage as predicted by Isvilanonda and Hossain.

It is very commonly observed that as the economy grows and the comparative advantage of agricultural sector weakens, the protection level of agricultural commodities increases (Anderson and Hayami [1986], Krueger,

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Schiff and Valdes[1991])).

Thailand had adopted import substitution policies from 1960s' until 1980s' when the industrial policies have been switched over to the export oriented industrialization policies. During the period of import substitution policy, the Thai government burdened export tax on primary goods such as rice, rubber, tin etc. while import substitution industries were protected by import tax and non-tariff barrier. Such industrial and trade policies caused the deficit in balance of payments and the currency overvaluation. The export tax and currency overvaluation had negative effects on agricultural development through downward pressure on farm gate price (Siamwalla and Setboonsarng [1991])). Since late 1980s' when the switchover of industrialization policy from import substitution to export oriented took place, the agricultural policies as above mentioned have started to be liberalized.

The reduction of government intervention in the Thai agriculture can be better understood through a little more examination of the policies for key commodity : rice.

The government intervention in rice began after WW II, when, in response to an Allied demand that Thailand pay its war indemnity in rice, the government imposed a rice export monopoly. Over time, the taxation and multiple exchange rate systems evolved into the specific export premium and other forms of export taxation were added. The government system of export barriers included the export premium, an ad valorem export duty, a rice reserve requirement for exporters as a measure to subsidize domestic consumers and quantitative restrictions on export (Siamwalla[1975])). These export barriers contributed to providing low domestic price of rice with consumers, stabilizing domestic prices and government revenue.

The export barriers have been maintained until 1980s' when the government policies began to shift away from pro-consumer slant (Siamwalla and Setboonsarng). In 1982, the government did away with the cheap rice program. And In 1983 when the world price of rice trended downward, the government began to establish price support policy ("Paddy mortgage program") for farmers. In 1986, for the first time since WW II, the Thai government lifted all

the export restrictions.

The paddy mortgage program which is pro-farmer and pro-miller slant, has been maintained until now. The farmers who participated in this program, can be given a farm loan by BAAC (Bank of Agricultural Cooperative) mortgaging their harvests with BAAC. And when the market price is higher than the support price, the farmers can repay the loan by selling the mortgaged paddy at the market price, while when the market price is lower than the support price, the farmers can sell the mortgaged paddy to BAAC at the support price. The number of the participants changed from 111,117 in 1998 to 683,769 in 2002 depending on the market price.

These facts indicate that the rice policy had been distorted to pro-consumer slant until mid 1980s' and that after the export restrictions were lifted, rice policy shifted away from pro-consumer. The establishment of rice mortgage program may be a sign of rice policy turning into pro-farmer policy. Charuk [2004] has shown that the movements of NRP for rice are consistent with the history of rice pricing policies we have described.

This, however, implies that if agricultural commodities will lose comparative advantage and its importance as economy will grow, government may be forced to implement an agricultural protection policy. There seems to be a big conflict in the present agricultural trade liberalization policy.

Thailand has continuously been a major rice exporter. Nonetheless, among high quality rice trade in international market Thailand Hawm Mali or Jasmine rice has increasingly famous. In recent years, export of jasmine rice has dramatically risen from 0.70 million ton in 1990 to 2.20 million ton in 2003. The specific grain characteristics, particularly aroma and low amylose content made the cooking quality of Jasmine differs from other rice grains. These characteristics of cooking quality are preferred among Asian rice consumers and inevitably generate a premium price for the Thai Jasmine rice. Generally degrees of aroma and grain quality of Jasmine grown in different production regions does not uniform due mostly to production environment, soil nutrients, and cultural management. In Thailand, the premium grain quality essentially comes from the northeastern region which is a specific rice area for

Jasmine production. But the production of Jasmine rice in this region has been reaching the upper limit and spreading over the other rainfed regions in Thailand and the neighboring countries such as Cambodia, Laos.

Under the rice sector protection policy of Thailand, the Jasmine rice has been smuggled from the other country like Cambodia. If the import of Jasmine rice will continue to expand and trade liberalization will be promoted under AFTA-CEPT scheme, the present rice policy will have to be reconsidered.

This paper examines whether the import of Jasmine rice will increase or not under the present rice protection policy, and what will be alternative policies for rice sector if the reform of present rice policy will have to be unavoidable under trade liberalization.

After introduction, section 2 examines the recent trends of Jasmine rice production, focusing on changing pattern by province as well as prices and exports. Section 3 analyzes the profitability and competitiveness of the Jasmine rice production in Thailand, comparing it with Cambodia and Laos. In the last section, we summarize the results of analysis and draw policy implication about direction of policy reform.

II. Recent Trend of Jasmine Rice Production and Trade

1. Trend of Jasmine Rice Area and Production

Jasmine rice is the Khao Dawk Mali (KDML 105) cultivar. It is a photoperiod-sensitive rice variety which can be grown in the wet season in every region of the country. Nonetheless, the most suitable area is in the northeast due particularly to rainfall pattern and soil salinity (Kupkan-
chanakul and Isvilanonda, 2000). In crop year 1990/91, the Jasmine rice area accounted for 11.85 million rai, the area rose to 16.36 million rai in crop year 1997/98 or about 38% (around 5.4% a year) of the area in 1990/91. It reached 18.68 million rai in crop year 2002/03 or about 58% from crop year 1990/91. Furthermore the area change in the second period seems to diminish in growth between crop year 1997/98 and 2002/03 which reduced a percentage change to be 14% or around 2.8% a year (Table 1). Among regions, the lower northeast has the greatest area share or about three- fifth of the total

Table 1. Jasmine rice planted areas in crop years 1990/91 1997/98 and 2002/03 and their percentage changes between periods

Provinces	Crop year			Percentage change between crop years		
	1990/91	1997/98	2002/03	1990/91-97/98	1997/98-02/03	1990/91-02/03
Planted area (rai)1/						
Upper north	510,227	424,490	539,726	-16.80	27.15	5.78
Lower north	473,554	842,486	1,764,382	77.91	109.43	272.58
Upper northeast	3,262,008	3,408,907	4,168,722	4.50	22.29	27.80
Lower northeast	7,067,283	10,471,255	10,976,298	48.17	4.82	55.31
Center	481,943	1,193,790	1,214,723	147.70	1.75	152.05
South	57,702	23,315	19,390	-59.59	-16.83	-66.40
Total	11,852,717	16,364,243	18,683,241	38.06	14.17	57.63
Share of planted area(%)						
Upper north	4.30	2.59	2.89	—	—	—
Lower north	3.99	5.15	9.44	—	—	—
Upper northeast	27.52	20.83	22.31	—	—	—
Lower northeast	59.63	63.99	58.75	—	—	—
Center	4.07	7.30	6.50	—	—	—
South	0.49	0.14	0.11	—	—	—
Total	100.00	100.00	100.00	—	—	—
Production (ton)						
Upper north	246,988	193,867	228,874	-21.51	18.06	-7.33
Lower north	132,986	272,133	595,170	104.63	118.71	347.54
Upper northeast	816,284	914,182	1,157,484	11.99	26.61	41.80
Lower northeast	1,822,824	2,922,182	3,209,754	60.31	9.84	76.09
Center	71,647	357,765	330,049	399.34	-7.75	360.66
South	16,154	6,020	7,204	-62.73	19.67	-55.54
Total	3,106,883	4,666,149	5,528,535	50.19	18.48	77.94
Share of production(%)						
Upper north	7.95	4.15	4.14	—	—	—
Lower north	4.28	5.83	10.77	—	—	—
Upper northeast	26.27	19.59	20.94	—	—	—
Lower northeast	58.67	62.63	58.05	—	—	—
Center	2.31	7.67	5.97	—	—	—
South	0.52	0.13	0.13	—	—	—
Total	100.00	100.00	100.00	—	—	—
Average yield(kg/rai)						
Upper north	484	457	424	—	—	—
Lower north	281	323	337	—	—	—
Upper northeast	250	268	278	—	—	—
Lower northeast	258	279	292	—	—	—
Center	149	300	272	—	—	—
South	280	258	372	—	—	—
Total	262	285	296	—	—	—

Note: 1/ 6.25 rai = 1 hectare

Source: Calculated from data provided by Office of Agricultural Economics, Ministry of Agriculture and Cooperatives.

Jasmine area (Table 1). In recent year, the share of Jasmine rice is one-third of the total wet season rice area.

In crop year 2002/03, the production of Jasmine rice was 5.53 million ton of paddy or about 28.2% of total wet season rice production. This production rose about three-fourth from the crop year 1990/91 or about one-fifth of the production in crop year 1997/98. The major shares of production are inevitably from the lower northeast and upper northeast, respectively.

The average yield of Jasmine rice is relatively low. While the country average yield of wet season rice was 386 kg per rai, the Jasmine rice yield was lower than a hundred kg in crop year 2002/03. A higher yields of Jasmine rice was observed in the upper north due importantly to better soil fertility and smaller farm size for a better crop management. A sandy soils and low fertility in coupled with unfavorable rain-fed lowland in the northeast does not permit relatively efficient utilization of chemical fertilizer inputs (Kupkan-chnakul and Isvilanonda, 2000).

Table 2. Major Jasmine planted area and production by provinces
in crop years 1990/91, 1997/98 and 2002/03

Provinces	Crop year			Percentage change between		
	1990/91	1997/98	2002/03	1990/91-	1997/98-	1990/91-
Major planted area by provinces (rai)1/						
Ubon Ratchathani	1,537,428	1,417,826	1,684,993	-7.78	18.84	17.32
Si Sa Ket	1,376,254	1,789,768	1,922,081	30.05	7.39	47.06
Surin	1,889,953	2,601,789	2,618,621	37.66	0.65	52.58
Buri Rum	1,472,663	1,844,657	2,070,390	25.26	12.23	55.42
Roi Et	1,113,895	1,476,501	1,553,537	32.55	5.21	49.38
Nakhon Rachasima	626,727	2,029,588	1,754,616	213.84	-13.55	193.96
Total	8,016,920	11,160,129	11,604,238	39.21	3.98	44.75
% share to total Jasmine area	67.64	68.20	62.11			
Production (ton)						
Ubon Ratchathani	399,013	364,287	415,520	-8.70	14.06	4.14
Si Sa Ket	415,493	519,336	667,073	24.99	28.45	60.55
Surin	510,596	823,374	743,161	61.26	-9.74	45.55
Buri Rum	380,760	475,611	644,363	24.91	35.48	69.23
Roi Et	273,089	404,683	379,345	48.19	-6.26	38.91
Nakhon Rachasima	89,081	547,253	477,496	514.33	-12.75	436.02
Total	2,068,032	3,134,544	3,326,958	51.57	6.14	60.88
% share to total Jasmine production	66.56	67.18	60.18			

Note: 1/6.25 rai = 1 hectare

A closer look at the major Jasmine rice producing provinces^{1/} is shown in table 2. Except for Roi Et province which is located in the upper northeast, most of major Jasmine rice producing provinces are confined in the lower northeast. The planted area in these 6 provinces accounts for three-fifth of the total Jasmine rice area and shares about 60% of the total Jasmine rice

Table 3. Moderate provincial areas growing Jasmine rice and their expansion, crop years 1990/91, 1997/98 and 2002/03, respectively^{1/}

Provinces	Crop year			Percentage change between crop years		
	1990/91	1997/98	2002/03	1990/91-97/98	1997/98-02/03	1990/91-02/03
Upper North						
Chiang Rai	179,476	136,069	210,363	-24.19	35.32	17.21
Phayao	167,127	184,614	171,965	10.46	-7.36	2.89
Sub total						
Lower North						
Kamphang Phet	61,651	18,294	103,004	-70.32	82.84	67.08
Pitsanulok	62,293	129,442	202,590	107.80	36.11	225.22
Phichit	72,090	70,984	123,710	-1.53	42.62	71.60
Nakhon Sawan	47,595	139,182	649,645	192.42	78.58	1,264.94
Phetchaboon	79,895	226,619	423,459	183.64	46.48	4330.00
Subtotal	323,524	584,521	1,502,408	80.67	157.03	364.39
Upper Northeast						
Nong Bua Lam Phu ^{2/}	—	48,555	167,167	—	70.96	—
Udon Thani	332,400	258,832	260,495	-22.13	0.63	-21.63
Nong Khai	158,456	90,731	126,146	-42.74	28.07	-20.39
Sakon Nakhon	293,090	167,580	259,143	-42.82	35.03	-11.58
Nakhon Phanom	229,044	293,306	314,112	28.06	6.62	37.14
Yasothon	490,121	478,519	467,203	-2.37	-2.42	-4.68
Sub total	1,503,111	1,337,523	1,594,266	-11.10	19.20	6.06
Lower Northeast						
Amnat Charoen ^{3/}	—	340,817	566,148	—	39.86	—
Maha Sarakham	336,335	271,814	507,616	-19.18	46.18	50.93
Kalasin	84,450	46,296	202,491	-45.21	77.15	139.76
Khon Kaen	177,836	250,876	408,123	41.07	38.53	129.49
Chai yaphum	164,258	446,810	359,449	172.02	-24.30	118.83
Subtotal	762,879	1,356,613	2,043,827	77.83	50.66	167.91
Center						
Lop Buri	81,379	413,139	292,260	407.67	-29.26	259.13
Suphan Buri	44,454	196,389	146,049	341.78	-25.63	228.54
Sakaeo ^{4/}	—	315,624	334,101	—	5.85	—
Subtotal	125,833	925,152	772,410	635.22	-16.51	513.84

Note: 1/A criterion for moderate provincial areas is based on the Jasmine rice area in the province of crop year 2002/03 greater than 100,000 rai but less than 1,000,000 rai.

2/Nong Bua Lam Phu province was established in 1994 by separating area of Udon Thani province.

3/Amnat charoen province was established in 1994 by separating area of Ubon Ratchathani province.

4/Sakaeo province was established in 1994 by separating area from Prachin Buri province.

production. Whereas the area change between crop years 1990/91 and 2002/03 was about 45%, the production change in the same period was higher. This reflects an increase in yield of Jasmine rice during the past ten year as a result of improvement in cultural practice. However, trends of area and production changes between crop years 1997/98 and 2002/03 were smaller than that between crop years 1990/91 and 1997/98, implying a diminishing increase in both planted area and production in these major production region.

Other moderate Jasmine producing provinces are shown in table 3. Selected provinces in this group have their production area in crop year 2002/03 larger than 100 thousand rai but less than one million rai. Despite a negative change in Jasmine areas is found in many provinces in upper northeast, high expansion area between crop year 1990/91 and 2002/03 are found in Pitsanulok, Nakhon Sawan, and Phetchaboon provinces in the lower north; Kalasin, Khon Kaen, and Chaiyaphum provinces in lower northeast; and Lop Buri and Suphan Buri provinces in central plain. Expanding Jasmine areas in these provinces are larger than one hundred percent, reflecting the new Jasmine rice growing areas. However, the further the expansion of the Jasmine areas, the lower the Jasmine rice quality would observed. Without any proper policy management for this problem, it would create external effect to the appropriate Jasmine rice area in the northeast, resulting in a declining economic rent generating from a specific grain quality.

2. Trend of Jasmine Rice Price

A low amylose content and mild aroma generates a specific characteristic of grain quality. This reflects by the average Jasmine rice price which is 30% higher than that of non-Jasmine rice^{2/}. That is, whereas the price of Jasmine rice average during 2001-03 is 6.31 baht per kg, that of non-Jasmine rice is 5.15 baht per kg (Table 4). Furthermore, while price trend of Jasmine (at 1998 constant price) rose 5.35% average during 1992-94 and 2001-03, that of non-Jasmine declined 2.57% in the same period, implying the specific quality of Jasmine over the non-Jasmine rice.

The export market of Thai rice is relatively competitive and nearly free

Table 4. Average farm paddy price of Jasmine and Non-Jasmine rice, wholesale and F.O.B. Jasmine prices, 1990-2003.

Year	Average farm paddy price (Baht) ^{2/}		Average farm paddy price at 1998 price (Baht)		Ave. Bangkok Jasmine wholesale price ^{3/} (Baht)		Ave. Jasmine F.O.B. price ^{4/}	
	Jasmine	Non-Jasmine	Jasmine	Non-Jasmine	Nominal price	Constant at 1998 price	Baht	US\$
1990	Na	3.81	Na	5.68	8.05	12.00	9.04	0.371
1991	Na	4.41	Na	6.02	8.36	11.41	9.47	0.382
1992	4.22	3.84	5.77	5.25	8.86	12.11	9.75	0.398
1993	4.91	3.82	6.50	5.06	9.36	12.40	9.97	0.406
1994	4.20	3.81	5.36	4.85	10.35	13.20	12.33	0.492
1995	5.12	4.83	6.17	5.82	9.76	11.76	11.21	0.451
1996	7.14	5.63	8.13	6.41	11.84	13.48	13.53	0.536
1997 ^{1/}	8.44	6.97	9.10	7.52	18.31	19.75	22.37	0.720
1998	6.62	5.61	6.62	5.61	19.22	19.22	24.32	0.589
1999	7.07	4.61	7.05	4.60	14.81	14.77	17.98	0.477
2000	6.12	4.87	6.01	4.78	20.50	20.12	22.08	0.568
2001	5.14	4.81	4.97	4.65	12.45	12.03	18.38	0.378
2002	6.56	5.15	6.30	4.94	12.44	11.94	15.54	0.325
2003	8.44	5.48	7.96	5.17	18.66	17.60	20.43	0.490
Average during								
1992-1994	4.44	3.82	5.88	5.05	9.52	12.57	10.68	0.432
2001-03	6.71	5.15	6.41	4.92	14.52	13.86	18.12	0.398
Average annual growth(%)								
1998-03	6.76	0.01	5.51	-1.18	5.23	3.88	-0.81	0.67

Note: 1/Since July 1997, Thailand has adopted floating exchange rate for the baht currency due to the country's economic crisis, resulting a dramatic decline in baht value per a US\$.

2/The country's average farm price of paddy obtained from Office of Agricultural Economics.

3/The average Bangkok wholesale price of milled Jasmine rice 100% grade 2 obtained from Department of Internal Trade.

4/The average F.O.B price of Jasmine rice 100% obtained from Thailand Exporters Association

from government intervention (Isvilanonda and Poapongsakorn, 1995). A determined price in export market is directly transmitted to domestic market. Consequently, the Bangkok wholesale and export F.O.B. prices of Jasmine rice move in the same direction (Table 4). Nonetheless, the average annual growth of F.O.B export price in term of US dollar during 1998 to 2003 increased slightly around 0.67% but that of real wholesale Jasmine price rose at 3.88%. In the paddy market, while the growth rates of Jasmine paddy prices both in real and nominal value during 1998-2003 increased at the rate of 6.76 and 5.51% per annum, respectively, that of non-Jasmine rice price in real term declined at 1.18% per annum, reflecting a strong competition of non-Jasmine rice in international market.

3. Trend of Jasmine Rice Export and Domestic Use

In 2003, the export of Jasmine rice was 2.03 million ton (around 3.08 million ton of paddy equivalence) or about 29.97% of the total rice export. The exported amount of Jasmine rice has considerably risen from 0.70 million ton in 1990 to 1.24 and 2.20 million ton in 1997 and 2003, respectively. That is the increase in exported amount was about 213.94% between 1990 and 2003. The major imported countries consist of China, USA, Hongkong, Singapore, and Malaysia which previously accounted for 70.58 and 79.20% in 1990 and 1997, respectively. Nonetheless, after the devaluation of Thai baht in 1997, the imported market of Jasmine rice has been diversified from the original markets. As a result, the share of those major imported market declined to 46.82% in 2003 despite a nearly double rise in the exported amount.

Official data for domestic use in 1997/98 was reported at 1.908 ton of milled rice (OAE, 1999). But that calculation obtained minus the amount of domestic production by that of the export. By assuming the growth rate of domestic use at 3%, the rough estimation of domestic use was around 2.431 million ton (about 3.45 million ton) in 2003. This reflects a carrying stock at some considerable amount.

Table 5. Total Jasmine rice export and major imported countries during 1990, 1997, and 2003

Countries	Amount of export (metric ton)			Percentage change between years		
	1990	1997	2003	1990/1997	1997/2003	1990/2003
China	12,145	257,848	211,419	2,023.48	-18.01	1,640.69
United States	122,577	197,274	296,096	60.94	50.03	141.56
Hongkong	215,029	207,424	238,581	3.54	15.02	10.95
Singapore	143,335	172,442	146,719	20.31	-14.92	2.36
Malaysia	2,100	150,458	138,523	7,064.67	-7.93	6,496.33
Sub total	495,206	985,446	1,031,338	99.00	4.66	108.26
Total Jasmine export	701,651	1,244,203	2,202,798	77.33	77.04	213.94
% share of major imported countries	70.58	79.20	46.82	—	—	—

Source: Data from 1990 and 1997 obtained from Department of International Trade. Data from 2003 obtained from Center for Agricultural Information, Office of Agricultural Economics.

III. Profitability and Competitiveness of Jasmine Rice Production

1. Comparison of Production Cost and Profitability of Jasmine Rice in the Greater Mekong Region

Surveys for Thailand were conducted in November 2000. We chose 40 farmers who were growing Jasmine rice at random and made interview with them in Surin Province. We selected Surin Province as our research site because the planted area of Jasmine rice was the largest in Thailand, and this area is located nearby the two major Jasmine rice growing areas in neighboring countries, Battambang, Cambodia and Savannakhet, Laos.

In Cambodia and Laos, the sample numbers of farm households in Cambodia and Laos are 78 and 48, respectively. We conducted the field survey in December 2003 for Cambodia and in March 2004 for Laos in the same way as in Thailand. The study area is Battambang and Banteay Mean Chey provinces for Cambodia. And for Laos, Savannakhet province was chosen as a research site. One of the reasons is thought to be that production environment for Jasmine rice in those provinces closely resemble those of the northeastern Thailand across the Dangrec mountain range and the Mekong river, making it an ideal agricultural environment. In all the study areas, rice is the major agricultural products. While these regions are partially irrigated, rice cultivation is mainly relying on the monsoon rain.

Household resource for rice production is reflected by labor, land, and capital. In Thailand, despite a smaller household size, the size of family labor is by contrast larger than that of Cambodia and Laos. This implies that the farmer households in both Cambodia and Laos has a larger number of child dependence. Land input is reflected by the average farm size. In Thailand, the farm size is just over 3 ha. This is smaller than that of 5.77 ha and 4.2 ha in

Table 6. Land Holding(ha/household)

Country	Owned Land	Leased in Land	Leased out Land	Farm Size
Thailand	2.69	1.06	0.58	3.17
Cambodia	4.42	1.42	0.07	5.77
Laos	3.84	0.41	0.043	4.2

(Source) Authors'survey.

Cambodia and Laos, respectively (Table 6). Nonetheless, the land rental market is more developed in Thailand than that in Cambodia and Laos. Whereas the rental rate of tractor is relatively more expensive in Thailand, the rental rate of thresher is instead seemed to be lower.

Farm asset (including water buffalo, cattle, tractors, pumps, threshing machines) holdings are shown in Table 7. Thai farmers have, on average, the larger asset than Cambodian and Laotian farmers, but the ratio of it to household income is lower than them.

The ratio of the farmers who leased in tractor and threshing machine is the highest in Thailand (Table 8). This indicates that the rental markets of

Table 7. Farm Asset

Country		Thailand		Cambodia		Laos	
Kind of Asset		Number of Households who own the asset	Value per unit (Bahts)	Number of Households who own the asset	Value per unit (Bahts)	Number of Households who own the asset	Value per unit (Bahts)
Power Tiller		17	58701	22	55225	21	31797
Pump		10	5040	5	6150	13	2530
Thresher		1	200000	18	n.a.	15	4099
Rice Mill		0		0		5	11358
Buffalo	Large	30	17083	2	n.a.	86	9252
	Small	22	n.a.	6	n.a.	53	n.a.
Cattle	Bullock	7	n.a.	74	11580	90	4659
	Cow	34	12261	42	8941	8	3194
	Small	n.a.		45	6364	67	n.a.
Total Household Number		40		78		48	

(Source) Authors' survey.

Table 8. Ratio of the Machine Using Farmers (Number of Households)

Country		Thailand		Cambodia		Laos	
Tractor	Owned	17	42.5 (%)	22	28.5 (%)	21	43.8 (%)
	Leased in	23	57.5	39	50	5	10.4
Threshing Machine	Owned	1	2.5	0	0	0	0
	Leased in	39	97.5	65	83.3	17	35.4
Total number of H.H.		40		78		48	

(Source) Authors' survey.

Note) Threshing machine is defined as the thresher which is operated by motor.

This is different from hand-operated thresher.

machine are well developed in Thailand while the development of machine rental markets in Laos are the slowest.

As for the off-farm job, the job opportunities in Thailand and Cambodia are much more widely opened to the farmers than those in Laos (Table 9). And the wage rate in Thailand is the highest. This fact suggests that the labor market in Thailand is well developed and is consistent with the fact findings of Shintani [2003] that Thailand has already passed the turning point in development stages of labor market.

The household income is composed of agricultural income, non-agricultural income and remittance. The average total household income in Thailand is

Table 9. Off-farm Job (man)

Country Kind of Job	Thailand	Cambodia	Laos
Daily Wage Labor	29	42	6
Carpenter, Smithy, Masonry	13	9	9
Factory Worker	0	1	8
Government Employee	3	1	6
Teacher	4	4	0
Trade & Service	6	19	8
Transportation	0	9	3
Cottage Industry	5	7	6
Others	2	11	3
Total	62	103	49

(Source) Authors' survey.

Table 10. Income (Bahts/household)

Country Souce of Income	Thailand		Cambodia		Laos	
Rice Income	19037	24.9 (%)	16635	54.2 (%)	16971.46	61.5 (%)
Jasmine	19037	24.9	7134	23.2	5866.878	21.3
Non-Jasmine	0	0	9501	31	11104.58	40.2
Other Agric. Income	5682	7.4	1007	3.3	1500	5.4
Livestock	3162.5	4.1	n.a.	n.a.	478.9320	1.7
Fruits	550	0.7	n.a.	n.a.	434.8939	1.6
Rent Income	1969.5	2.6	n.a.	n.a.	0	0
Fish	0	0	n.a.	n.a.	587.0729	2.1
Off-farm Income	42932	56.2	12557	40.9	5766.472	20.9
Other Incom	7207	9.4	0	0	0	0
Remittance	1525	2	492	1.6	3367.162	12.2
Total	76383	100	30691	100	27605.99	100

(Source) Authors' survey.

Table 11. Household Characteristics and Factor Prices

Item	Country		
	Thailand	Cambodia	Laos
No. Sample Household (man)	40	78	48
No. Family Member (man)	4.7	5.7	6.2
No. Family Labor (man)	3.7	3.3	3.1
Farm Size (ha)	3.2	5.7	3.3
Planted Area of Jasmine Rice (ha)	3.2	1.79	0.56
Percentage Share (%)	100	31.4	17
Wage of Agricultural Hired Labor (bahts/day)	111	40	60
Rental Rate of Tractor (bahts/rai)	162	100	150
Rental Rate of Thresher (sharing rate of harvest)	1/36	1/20	1/10
Land Rent (sharing rate of harvest)	0.2	0.2	0.26

Source: Author's survey

nearly \$ 2000. Per capita income is around \$ 400. This is almost three times of Cambodian and Laotian farm households. The share of agricultural income is around 30% while those of Cambodian and Laotian are 57.5% and 66.9% respectively (Table 10).

The farmers in Thailand are growing Jasmine rice (Khao Dawk Mali) in almost 100% of their farmland. But Cambodian farmers planted Cambodian Jasmine rice (they are called Phka Mali or Jasmine) in 31.4% of farm land. Laotian farmers planted Lao Jasmine called Lao Mali in only 17% although the profitability of Jasmine rice is significantly higher than that of the other varieties). We do not make sure that Cambodian Jasmine rice and Lao Mali are the same variety as Khao Dawk Mali. But we continue to make an analysis under the assumption that all these varieties are the same.

The factor prices for rice production are shown in Table 11. The figures indicate that labor wage in Thailand is significantly higher than those in Cambodia and Laos while the other factor prices do not show the significant differences between Thailand and the other countries.

2. The International Competitiveness of Jasmine Rice

Here we shall use the production cost per unit weight and Domestic Resource Cost (DRC) as the competitiveness index. The production costs of Jasmine rice here was estimated on the basis of data collected through

Table 12. Comparison of Jasmine Rice Production Costs

Item	Country					
	Thailand		Cambodia		Laos	
	Official Exchange Rate	Real Equilibrium Exchange Rate	Official Exchange Rate	Real Equilibrium Exchange Rate	Official Exchange Rate	Real Equilibrium Exchange Rate
Current Input (baht/ha)	2370	2560	1785	1466	2576	2051
Labor (baht/ha)	4842	5229	2725	2237	7819	6225
Fixed Cost (baht/ha)	1548	1672	1612	1323	1490	1186
Land 9baht/ha)	4126	4456	2044	1678	3920	3121
Total Production Cost (baht/ha)	12888	13919	8166	6704	15805	12584
Yield (kg/ha)	2262		1921		2233	
Unit Weight Production Cost (baht/ha)	5.94	6.42	5	4.1	7.08	5.64
Farm-gate Price(baht/ha)	7.05	7.61	5.5	4.5	8.46	6.74

Source: Authors' Survey

interview surveys are shown in Table 12. For a comparison purpose, we have converted prices to Thai Baht.

It is found that the production costs for Thailand, evaluated by the official exchange rate, are higher than those for Cambodia but not for Laos. The main reason for the former is the higher cost of non-tradable factors such as labor and land reflecting the difference of development stage between two countries. The reason of the latter is that the labor cost is the higher because relative cost of machinery use is higher in comparison to Thailand and Cambodia, and the mechanization of land preparation and threshing has not yet been progressed in proportion to high wages for agricultural labor in Laos due to underdevelopment of factor markets (Table 12).

Nevertheless, we obtained these results under the assumption that there are no distortion in foreign exchange markets. But actually there have been distortions in foreign exchange market caused by macro-economic policies which affected current account imbalance and inflation in Thailand, Cambodia and Laos. Therefore, in order to estimate non-distorted exchange rate, we need to remove such distortions. For that purpose, we estimated the real equilibrium exchange rate and used it to compare production costs in three

countries.

For the method used to estimate the real equilibrium exchange rate, various methods were devised, but in this paper, we adopted a method based on the elasticity approach (See Sadoulet and de Janvry [1995]) with the data we were able to obtain.

In the elasticity approach, the real equilibrium exchange rate is defined as the real equilibrium exchange rate determined at level D^* of a certain allowable trade imbalance. If the actual level of trade revenues and expenditures exceeds D^* , the observed real exchange rate (RER) is greater than the real equilibrium exchange rate (RER^*). The amount of exports E^* at the real equilibrium exchange rate and the amount of imports M^* are calculated from the observed amount of exports E , amount of imports M , export elasticity ε_E , and import elasticity ε_M according to the formula below.

$$E - E^*/E = \varepsilon_E(RER - RER^*)/RER \quad M - M^* = \varepsilon_M(RER - RER^*)/RER$$

From this formula and $D - D^* = (M - M^*) - (E - E^*)$, the real equilibrium exchange rate is expressed as a function of the real exchange rate, trade revenues and expenditures, allowable imbalance of trade revenues and expenditures D^* , observed amount of exports, amount of imports, export elasticity, and import elasticity.

$$RER^* = RER[1 + (D - D^*)/(\varepsilon_E E - \varepsilon_M M)]$$

When using this type of formula, how to set the level of D^* as well as export elasticity and import elasticity becomes extremely problematic.

On the question of D^* , Garcia and Llamas [1989] hypothesize the level at 2% of *GDP* every fiscal year. Also, import elasticity ε_M is estimated in the -0.1 to -2.0 range, and export elasticity ε_E is hypothesized to be 1 (Sadoulet and de Janvry [1995], Khan and Ostry [1992]).

To calculate *DRC*, we need to estimate the shadow prices. For the Cambodian case and Laos case, the estimation methods are shown in Fukui [2005] and Fukui et.al [2005]. Here we focus on the Thai case. We assume that the shadow prices of current inputs including chemical fertilizer, pesticide, seed and oil are the same as market prices because tax burden on those inputs are not so heavy or zero. The shadow wage is also assumed to be the same as

market wage because the rural labor market in Thailand is considered to be in labor shortage and competitive (Shintani[2003]). As for the shadow land rent, share tenancy contracts are predominant in our study area. Therefore, we assume that the land rent per rai calculated from the dominant sharing rate and yield is shadow land rent. For the irrigation fee, we neglect it because our study area is under rainfed condition. Finally, the shadow price of rice is assumed to be equal to market price.

We classify inputs into tradable goods and non-tradable goods. Tradable goods are including current inputs and capital inputs while land and labor are non-tradable goods.

The results of estimation are shown in Table 12. After correcting the overvaluation of Kip and Riel, and undervaluation of Baht, we recalculated the production costs of Jasmine rice, by using the real equilibrium exchange rates. The results of re-estimation of production costs show that the production cost of Laotian Jasmine rice is higher than those of Cambodia but lower than those of Thailand. This means that, if corrected for overvaluation, Thai Jasmine rice might lose competitiveness in international markets.

International competitiveness, however, cannot be judged by comparisons of simple production costs considering non-tradable commodities.

In this paper, "Domestic Resource Cost (DRC)" will be used as an index of international competitiveness in considering this point.

DRC is defined below as a means of gauging international competitiveness by measuring how much foreign currency can be saved utilizing domestic resources.

$$DRC = \frac{(\text{Unit cost of non-tradable inputs})}{(\text{Shadow-price of rice}) - (\text{Unit cost of tradable inputs})}$$

If DRC/Shadow Exchange Rate > 1 , then it is not internationally competitive, but if DRC/Shadow Exchange Rate < 1 , then it is judged to be internationally competitive. Here, the Shadow Exchange Rate (SER) is a shadow exchange rate that balances the supply and demand of foreign exchange.

Ordinarily, the shorthand method of "Conversion Factor (SCF)" below is

used in estimating SER.

$$\text{SER} = \text{Official Exchange Rate}/\text{SCF}$$

$$\text{Here, the SCF} = (M+X)/M \cdot (1+T_m) + X \cdot (1-T_x)$$

M; amount of imports, X; amount of exports,

T_m ; import tariff rate, T_x ; export tariff rate

In this paper, we estimate the DRC/SER for Thai Jasmine rice using the undervalued official exchange rate and then compare with the figures for Cambodia and Laos.

Comparing the results shown in Table 10 using the official exchange rate, we can see that the DRC of Thai Jasmine rice is larger than that of Cambodia while it is smaller than that of Laos, meaning that its international competitiveness is lower than Cambodia but higher than Laos.

The foregoing analysis of production costs, however, suggested that overvaluation and undervaluation of the exchange rates affect the index. In case that overvaluation or undervaluation cannot be explained by distortion in the exchange rate due to tariffs (cases where macroeconomic policy and inflation impact the exchange rate), other methods are needed to sufficiently correct for distorted exchange rates. Therefore, in this paper, the previously estimated real equilibrium exchange rate is used to estimate the revised DRC.

Values for the revised DRC values are shown in Table 13. Whereas in the case of Cambodia and Laos the exchange rate is thought to be overvalued, a surplus of exports in Thailand's case is thought to devalue the exchange rate. Therefore, in the case of the elasticity of import is assumed to be the lowest,

Table 13. DRC of Jasmine Rice

Item	Country		
	Thailand	Cambodia	Laos
Official Exchange Rate	0.75	0.65	0.91
Real Equilibrium Exchange Rate			
$Ex = 1, Em = -0.1$	0.8	0.53	0.68
$Ex = 1, Em = -0.5$	0.78	0.57	0.8
$Ex = 1, Em = -1$	0.77	0.59	0.86
$Ex = 1, Em = -2$	0.77	0.61	0.91

Source: Authors' survey

Note: Ex and Em indicate export and import elasticities, respectively

while the DRC for Laos is lowered to 0.68, Thailand's, by contrast, is raised to 0.81. Thus, similarly to the analysis of production costs, this shows that Laos's Jasmine rice can be internationally more competitive than that of Thailand.

IV. Conclusion

Despite facing a declining trend of competitive strength of Thai rice in international rice trade, a recent expansion trend of Jasmine rice trade which is a high quality rice has stimulated the expansion of Jasmine growing rice area in Thailand. We have shown that the global competitiveness of Thai Jasmine rice is lower than that of the Cambodian and Lao aromatic rice alike Thai Jasmine.

It is highly possible that regardless of formal or informal, the import of aromatic rice from neighboring countries will increase, as trade liberalization will be promoted under AFTA-CEPT scheme and FTA negotiations. At the same time, Thai government will come across the difficulties with continuing the present rice sector protection policy.

In Thailand, it is highly unlikely that the irrigated ecosystem can be further expanded in Thailand. Thus, to cope with the decline of global competitiveness of Thai rice, Thailand must give top priority for research and development for rainfed ecosystem. Particularly, the development of improved Jasmine rice varieties which have drought and submergence tolerance and resistance to brown plant hopper will be key challenges for it.

Notes

1/A province occupies Jasmine planted area larger than one million rai is here classified as the major Jasmine producing province.

2/Calculated by using the average prices of Jasmine and non-Jasmine rice during 2000-2003

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