Rice Economy of Thailand

Orachos Napasintuwong

ARE Working Paper No. 2562/1

(January 2019)

ภาควิชาเศรษฐศาสตร์เกษตรและทรัพยากร

คณะเศรษฐศาสตร์ มหาวิทยาลัยเกษตรศาสตร์

Department of Agricultural and Resource Economics
Faculty of Economics, Kasetsart University

Agricultural and Resource Economics
Working Paper

Rice Economy of Thailand*

Orachos Napasintuwong[1]

* A previous version of this paper was presented at *"Asian Rice Economies: Country-Experiences and Challenges Ahead*" session at the centennial annual conference of Indian Economic Association, 27-29 December 2017. Nagarjuna University, Guntur, India.

[1] Department of Agricultural Economics. Faculty of Economics, Kasetsart University, 50 Paholyothin Road, Chatuchak, Bangkok 10900 Thailand. Email: orachos.n@ku.ac.th

Agricultural and Resource Economics (ARE) Working Paper aims at disseminating academic writing of the staff members and students of the Department Agricultural and Resource Economics in the fields of agricultural economics, agribusiness, and natural resource and environmental economics.

Department of Agricultural and Resource Economics
Faculty of Economics, Kasetsart University
Chatuchak, Bangkok 10900 Thailand
Tel: +66 2942 8649 to 51
Fax: +66 2942 8047
www.agri.eco.ku.ac.th

Orachos Napasintuwong. 2019. **Rice Economy of Thailand.** *ARE Working Paper No. 2562/1 (January 2019).* Department of Agricultural and Resource Economics, Faculty of Economics, Kasetsart University, Bangkok, Thailand.

ARE Working Paper can be accessed and downloadable at
https://ageconsearch.umn.edu/collection/2192?ln=en

ABSTRACT

Rice has been the main staple food and important to the economy of Thailand. As the country is becoming more developed toward industrialization, the contribution of agricultural sector including the rice sector becomes less to the GDP. Nevertheless, nearly 40 percent of the population depends on agriculture for their living and 70 per cent of them are in rice sector. As Thailand has sent the goal for Thailand 4.0 using advanced technology and smart farming to release itself from the middle income trap, this paper describes the historical background and current situations of Thai rice economy, and discussing its strategic plans to manage current challenges.

Keywords: rice situation, rice policies, Thailand
JEL Classification: Q00, Q18

Introduction

Rice is the main staple food in Thailand, and important to the economy as well as livelihood of rural population. In 2010, the agricultural GDP of Thailand was about 1.137 million THB, and 214,694 THB (less than 20% of which) came from rice production (Office of the National Economic and Social Development Board, 2016a). Nevertheless, the number of rice farming households takes up the majority of the country's farming household, about 72% (Wattanutchariya *et al*., 2013). Thailand has become the upper-middle income country, and still in the middle income trap. The cost competitiveness, for example, is deteriorating. Coping with several challenges in production, marketing and trade, the following sections provide historical background and current situations of Thai rice economy, and discuss Thailand's strategic plans to manage those challenges, particularly under the current national agricultural reform agenda. Important strategic actions aiming at reducing the supply of low quality rice and low productivity areas, and improving quality rice production standards such as certified Good Agricultural Practice (GAP) and Geographical Indication (GI) and adding value rice such as developing and promoting high nutritional value rice and rice products, and strengthening the supply chain of quality rice production as well as farmers organizations and agricultural cooperatives, and public-private-people partnerships.

Rice production situation in Thailand

Rice has taken the largest area of agricultural production in Thailand. In 2015, total rice cultivation land was about 11.19 million hectares, taken up 46.88% of agricultural land or about 21.82% of the whole country's area (Office of Agricultural Economics, 2016). The production of rice in Thailand is distributed throughout the country with highest area of rice cultivation in the Northeast, followed by the North, Central, and only a small area in the South where perennial crops such as oil palm and rubber trees are grown (Figure 1 and Figure 2). The significance of rice as the main crop and rural livelihood is greater in the Northeast than any other regions where diversification of crops is much larger (Figure 3). The irrigated area of the whole country is about 4.8 million hectares, accounting for about 20% of total agricultural land of the country. About 25% of rice cultivation area is irrigated. Compared to the Central plains, the soil suitability of rice cultivation in the Northeast is generally poorer (Figure 4) with a significant smaller area is under irrigation, at about 10%, compared to 74% in the Central plains (Table 1). Thus, most of the areas in the Northeast are rainfed, and can be used for only one crop per year during the wet season. Rice production in the Central region, on the other hand, can be cultivated twice or up to five times in a two year period (Table 2). The production of premium quality rice, Hom Mali, is concentrated in the Northeast region, and three other provinces in the North, namely Chiangmai, Chiangrai, and Phayao (Table 3). The lower Northeast is reputably recognized as the prime area for quality Hom Mali rice production, particularly Thung Kula Rong-hai plains that extends to five provinces of Mahasarakham, Roi-et, Srisaket, Surin, and Yasothon, and also Ubonratchathani. Both of these geographical areas are currently intellectual property rights protected by geographical indication (GI) registrations.

Most of the rice production in the Central region is non-glutinous high-yielding varieties (HYVs), including Pathumthani rice, the non-photoperiod sensitive fragrant rice. The

production of glutinous rice is much smaller than other types of rice, and mostly concentrated in the Northeast, and parts of the North where local people prefer it with local dishes. Evidently, the yield of rice cultivated in the Central is the highest, and the Northeast is the lowest (Figure 5). It is also important to note that Thailand has recognized that the production of rice should be reduced particularly in the unsuitable areas. On November 15, 2016, the government agreed to subsidize farmers who are willing to reduce their 2016/17 off-season rice planting area. The program's goal is to replace off-season rice area of 32,000 hectares in 19 provinces in the Central plains with legumes as well as 320,000 hectares in 35 provinces throughout the country with maize (USDA Foreign Agricultural Service, 2016).

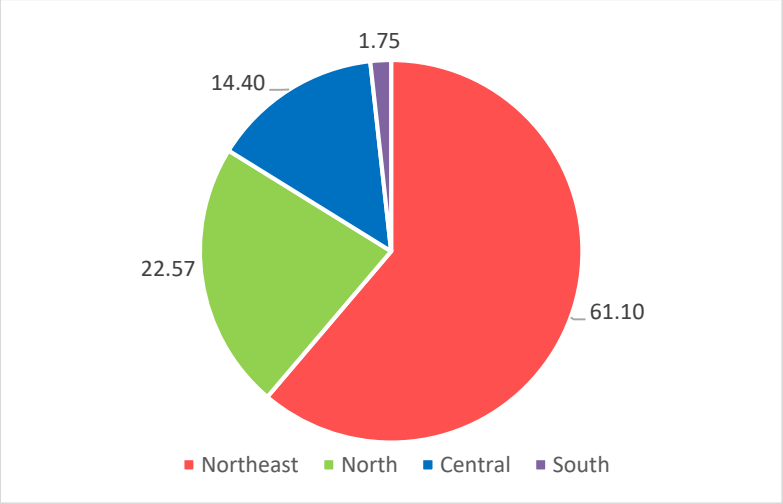

Figure 1. Share of rice cultivation area by region, 2015
Source: Office of Agricultural Economics, 2016

Figure 2: Rice cultivation area in Thailand (shaded in yellow)
Source: GISagro, Geo-Informatics and Space Technology Development Agency

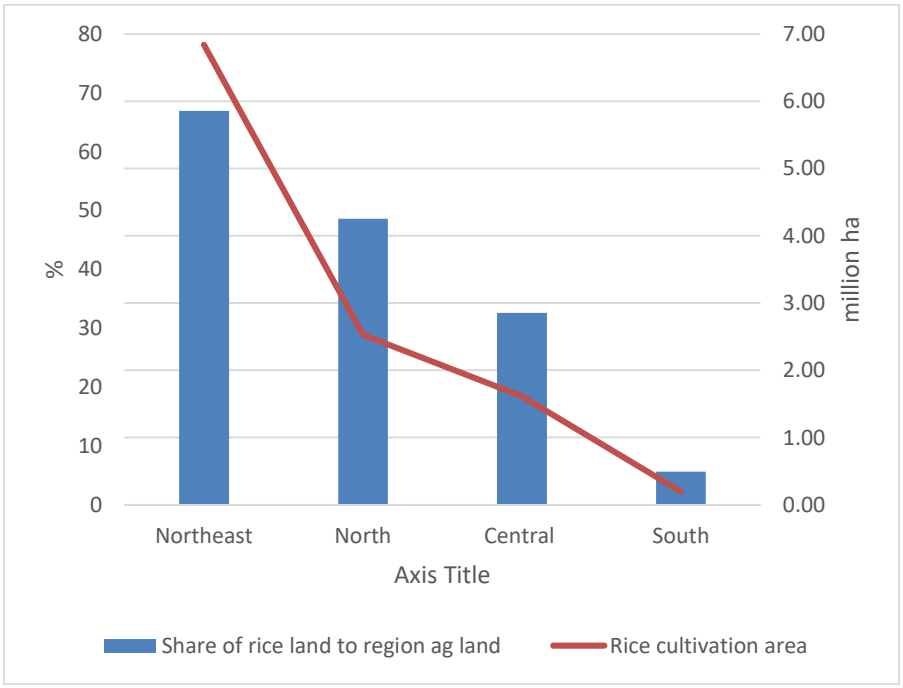

Figure 3. Share of rice to agricultural land by region, 2015
Source: Calculated from Office of Agricultural Economics, 2016

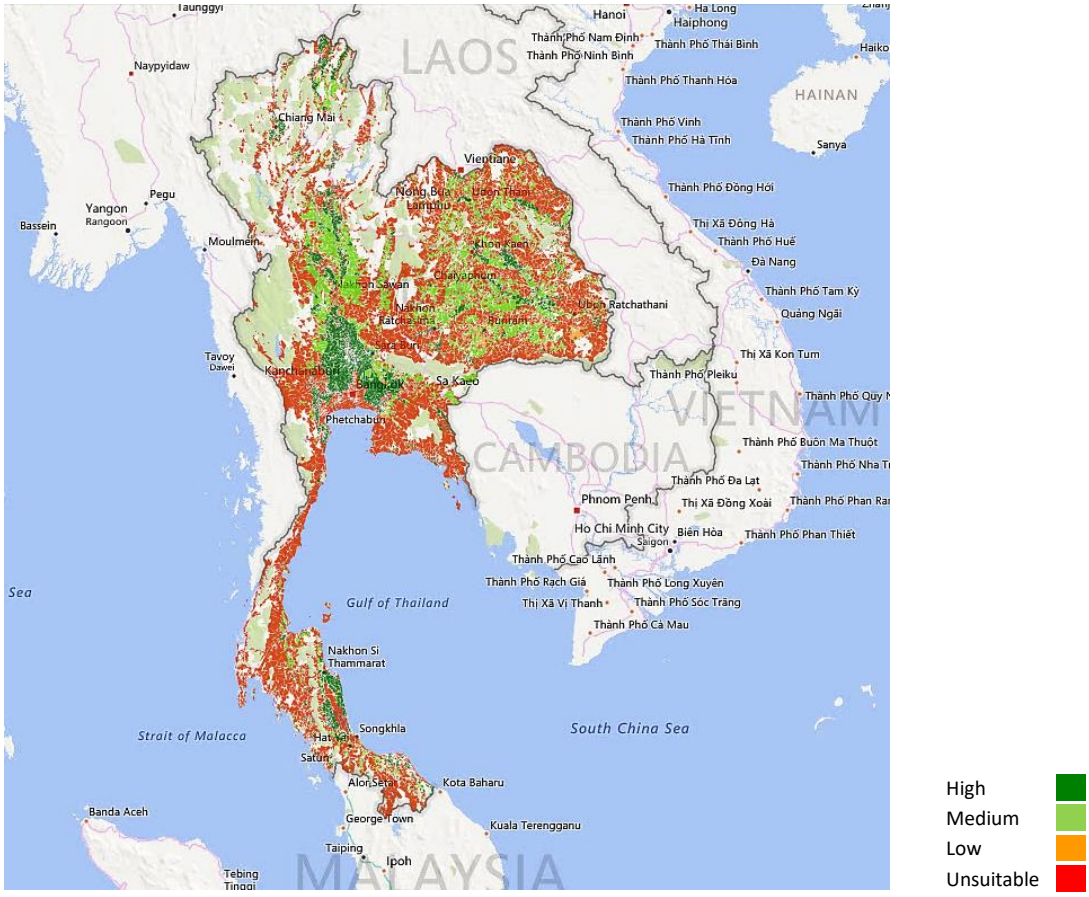

Figure 4: Suitability of soil for rice cultivation in Thailand
Source: GISagro, Geo-Informatics and Space Technology Development Agency

Table 1. Wet season (main crop) rice production by irrigation, 2015/2016 cropping season

	Planted area (million ha)	Harvested area (million ha)	Output (million tons)	Yield per planted area (tons/ha)	Yield per planted area (tons/ha)
Country	9.290	8.815	24.312	2.617	2.758
Irrigated	2.364	2.329	8.152	3.448	3.500
Non-irrigated	6.926	6.486	16.160	2.333	2.491
North	2.043	1.947	6.802	3.329	3.494
Irrigated	0.719	0.701	2.570	3.575	3.667
Non-irrigated	1.324	1.246	4.231	3.196	3.396
Northeast	5.791	5.468	12.231	2.112	2.237
Irrigated	0.596	0.587	1.380	2.313	2.351
Non-irrigated	5.195	4.881	10.851	2.089	2.223
Central	1.322	1.268	4.904	3.710	3.869
Irrigated	0.981	0.974	4.000	4.077	4.107
Non-irrigated	0.341	0.294	0.904	2.654	3.080
South	0.134	0.133	0.374	2.784	2.810
Irrigated	0.068	0.067	0.202	2.976	2.988
Non-irrigated	0.067	0.066	0.173	2.590	2.627

Source: Office of Agricultural Economics, 2017

Table 2. Dry season (second crop) rice production by irrigation, 2016 cropping season

	Planted area (million ha)	Harvested area (million ha)	Output (million tons)	Yield per planted area (tons/ha)	Yield per planted area (tons/ha)
Country	0.822	0.813	3.109	3.783	3.826
Irrigated	0.550	0.546	2.135	3.878	3.912
Non-irrigated	0.272	0.267	0.975	3.589	3.650
North	0.305	0.300	1.144	3.653	3.709
Irrigated	0.110	0.109	0.415	3.765	3.811
Non-irrigated	0.195	0.192	0.729	3.743	3.807
Northeast	0.126	0.124	0.400	3.181	3.217
Irrigated	0.076	0.076	0.254	3.326	3.354
Non-irrigated	0.049	0.049	0.146	2.957	3.006
Central	0.356	0.353	1.455	4.082	4.115
Irrigated	0.335	0.333	1.375	4.104	4.133
Non-irrigated	0.021	0.021	0.080	3.745	3.820
South	0.035	0.034	0.111	3.170	3.209
Irrigated	0.029	0.029	0.091	3.158	3.196
Non-irrigated	0.006	0.006	0.019	3.225	3.275

Source: Office of Agricultural Economics, 2017

Table 3. Wet season rice (main crop) 2015/2016 cropping season

	Planted area (million hectares)	Harvested area (million hectares)	Output (million tons)	Yield per planted area (tons/ha)	Yield per harvested area (tons/ha)	% of harvested area	% of output
Hom Mali rice							
Country	3.9899	3.7679	8.7831	2.2000	2.3313	100.00	100.00
North	0.4296	0.4124	1.2913	3.0063	3.1313	10.95	14.70
Northeast	3.3727	3.1958	7.1246	2.1125	2.2313	84.82	81.12
Central	0.1865	0.1587	0.3649	1.9563	2.3000	4.21	4.15
South	0.0010	0.0010	0.0023	2.3125	2.3375	0.03	0.03
Pathumthani							
Country	0.2077	0.2000	0.8265	3.9813	4.1313	100.00	100.00
North	0.0576	0.0523	0.2077	3.6063	3.9750	26.14	25.13
Northeast	0.0026	0.0023	0.0073	2.7813	3.1438	1.16	0.88
Central	0.1224	0.1206	0.5321	4.3500	4.4125	60.28	64.38
South	0.0251	0.0248	0.0794	3.1688	3.1938	12.42	9.61
Other non-glutinous							
Country	2.4504	2.3473	8.7146	3.5563	3.7125	100.00	100.00
North	1.1393	1.0774	3.9285	3.4500	3.6438	45.90	45.08
Northeast	0.1948	0.1785	0.4973	2.5563	2.7875	7.61	5.71
Central	1.0081	0.9841	3.9964	3.9625	4.0625	41.92	45.86
South	0.1083	0.1073	0.2924	2.7000	2.7250	4.57	3.36
Glutinous							
Country	2.6422	2.5001	5.9873	2.2688	2.3938	100.00	100.00
North	0.4164	0.4047	1.3742	3.3000	3.3938	16.19	22.95
Northeast	2.2208	2.0910	4.6017	2.0750	2.2000	83.64	76.86
Central	0.0049	0.0042	0.0110	2.2438	2.6125	0.17	0.18
South	0.0001	0.0001	0.0003	2.9688	2.9938	0.00	0.00

Source: Office of Agricultural Economics, 2017

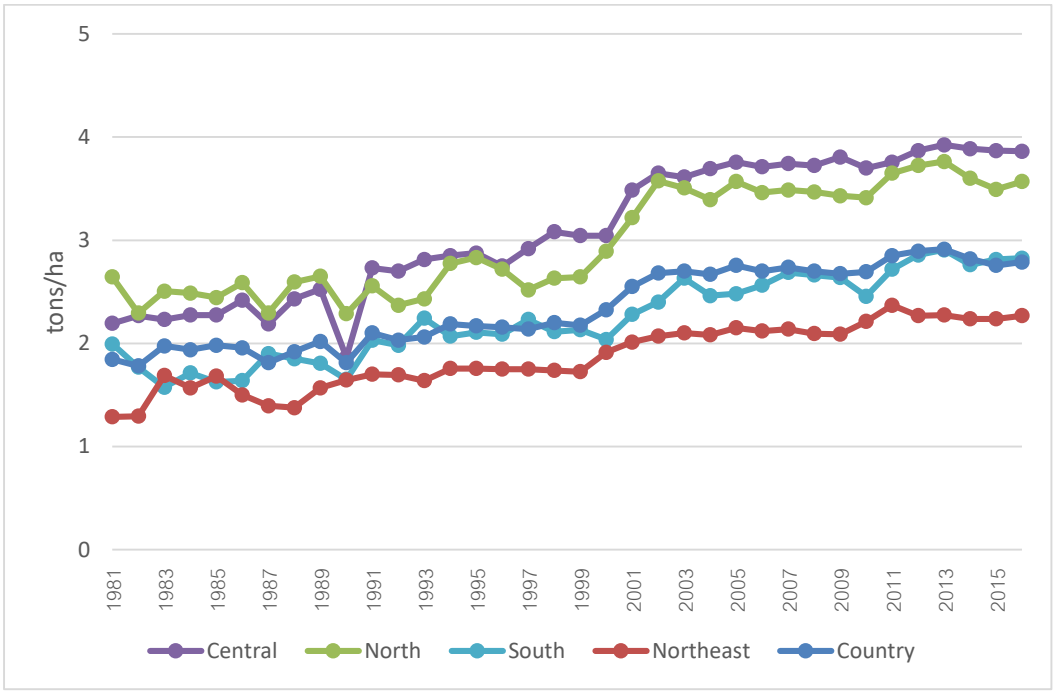

Figure 5. Rice yield in Thailand, by region, 1981-2016
Source: Generated from data from Office of Agricultural Economics, 2017

After the green revolution, the adoption of HYVs has continuously increased the productivity of rice in all Asian countries. Although Thailand is one of the largest rice exporters, its yield is among the lowest in the region (Figure 6). While the productivity growth of rice cultivation in Thailand increased by 54% from 1980 to 2016, Vietnam, India, and Philippines whose yields were not much different than Thailand in 1980 have increased their rice yield for 168%, 85% and 68%, respectively during the same period. One of the reasons that Thailand's rice productivity has not increased as much as others is due to lower population and lower pressure to increase the productivity for food security. Furthermore, irrigation is very limited except for the Central region. On average, only 25% of 9.29 million hectares of rice cultivation is irrigated in the wet season, and 67% of 0.822 million hectares in the dry season (Table 1 and Table 2). The dependency on rainfall and uncontrollable water supply has also created risks which will be discussed in subsequent section. Additionally, Thailand has been land-abundant and prefer good quality rice such as Hom Mali that fetches a much higher price but has a much lower yield potential than HYVs.

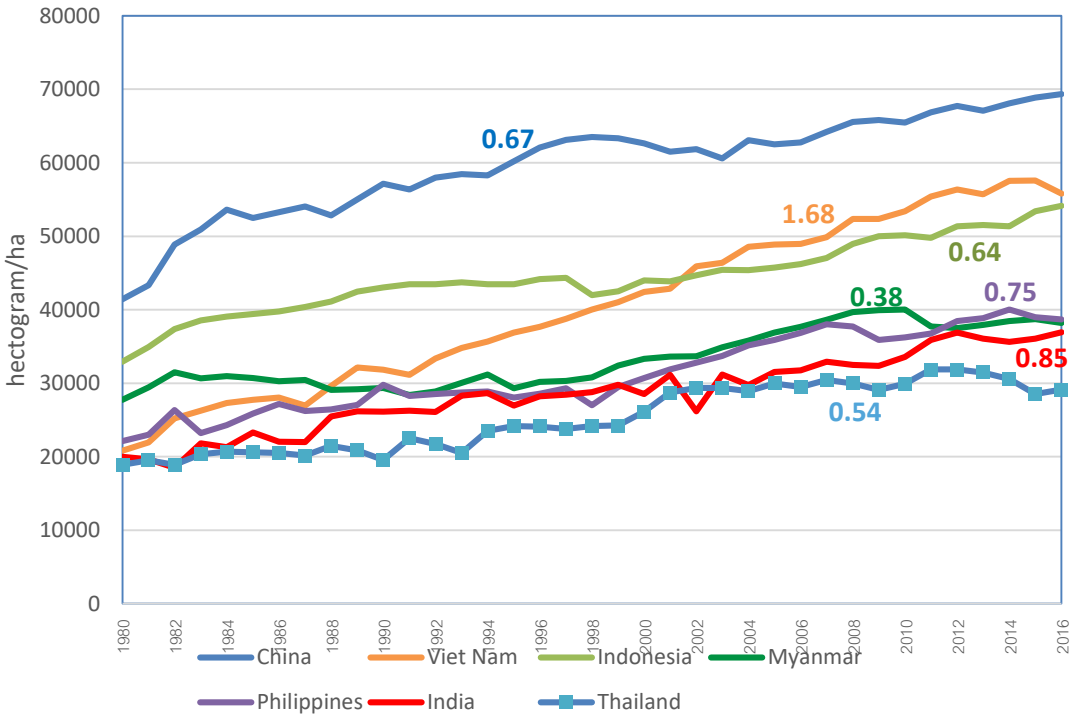

Figure 6. Rice yield in Thailand and other Asian countries by, 1980-2016
Source: FAO, 2017

Rice farmers

Despite some discrepancies for estimates of the number of rice households depending on the definition and methodology, rice is still taken up the largest share of rural population. From the agricultural census in 2013, out of 5.91 million agricultural households, the number of rice farming households was 3.79 million or about 63.9%, covering 9.57 million hectares (National Statistical Office, 2014). The survey of 4,200 nation-wide rice farmers in 2011/2012 cropping season by Wattanutchariya, S. *et al*. (2013) revealed the estimated number of rice farming households was 4.19 million or about 72% of total farm households of the country. From the same survey, it was found that the average land holding area was 4.16 ha and the rice farm size was 2.8 ha/household. About 84% of farmers had land titles, and among them, land rental or

land use with no charge (i.e. parent's ownership) are common. The central plains have the highest proportion (about 33%) of land rental than other regions.

The majority of rice farmers cultivated rice in the wet season, and a much smaller share of them is engaged in more than one seasons a year (Table 4), partly due to access to water and also labor requirement. A very small number of rice farmers depend solely on the cultivation in the dry season. It was found that the majority of rice growers in the wet season cultivated non-glutinous rice, and many of them cultivated both types. A similar trend is also found in the dry season. The average farm size of rice farm was 3.084 hectares/household. In 2013, the farm size in the wet season was much smaller than in the dry season, especially for non-glutinous rice. This is because those who have access to water in the dry season especially in the irrigated area of Central plains had a much larger farm than the overall farmers. Commercial rice farmers who produced rice for sale had a much larger farm size (8.14 hectares compared to 1.102 hectares) than those who are subsistence rice farmers who only produced rice for household consumption (Table 4).

Table 4. Number of land holdings, planted area average farm size and shares by type of rice cultivated and season, 2013

	Number of holdings	Share of holders to country rice farming holders	Planted area (ha)	Average farm size (ha)
Wet season (main crop)				
Non-glutinous	1,391,406	-	6,807,521	4.893
Glutinous	899,701	-	2,250,894	2.502
Non-glutinous and glutinous	816,707	-	-	-
Sub-total wet season	3,107,814	0.823	9,058,415	2.915
Dry season (second crop)				
Non-glutinous	78,075	-	2,476,359	31.718
Glutinous	15,900	-	115,378	7.256
Non-glutinous and glutinous	615	-	-	-
Sub-total dry season	94,590	0.025	2,591,737	27.400
Both seasons				
Non-glutinous	439,725	-	-	-
Glutinous	45,555	-	-	-
Non-glutinous and glutinous	89,786	-	-	-
Sub-total wet season	575,066	0.152	-	-
Whole year rice farming	3,777,470	1.000	11,650,152	3.084
For consumption	992,847	0.263	1,093,741	1.102
For sale	363,644	0.096	2,960,127	8.140
For consumption and sale	2,420,979	0.641	7,596,285	3.138
Total rice farming holders	3,777,470	1.000	11,650,152	3.084

Source: Calculated from National Statistical Office, 2014

Wattanutchariya, S. *et al*. (2013) also found that a significant portion of rice farming households, about 33%, had the heads of the households older than 60 years old, and the average age of rice farmers is 56 years old, implying the direction towards aging society in rice farming. Like several countries that became industrialized, the migration from rural to urban is

common. The supply of labor in rice farming is declining, and in response, several larger farm managers hired immigrant workers from neighboring countries, and the use of machinery is increasing. Poapongsakorn (2011) found that the investment in agricultural machinery especially two wheel walking tractors and water pump has increased significantly during 1980-2000, but declined afterwards.

The technology of machinery used in rice farming has also changed in the past two decades. Table 5 shows that the use of combine harvesters has been substantially increased by rice farmers. The majority of them are not the owners, but employ service providers. In 1998, the use of rice threshers and reapers were popular, but they have significantly reduced as several farmers replaced them by combine harvesters. The millers (small scale community millers), were more commonly used in the early 2000, but has reduce its importance when farmers sell their paddy to the large commercial mills. This is partly the result of policy such as a price-support pledging program. During this period, there was an expansion of milling capacity by several millers, and currently some large millers are overcapacity that cannot be utilized year-round.

Table 5. Number of holdings using machinery and equipment in rice production by source

Year	Type of machinery and equipment	Source of machinery or equipment					Number of holdings using machinery or equipment*
		Owned by holders	Cooperatives or farmer' s group	Agricultural service	Government agency	Others	
1998							
	Combine harvester	3,341	1,049	353,390	48	1,441	359,269
	Rice thresher	42,546	14,159	2,058,407	202	8,236	2,123,550
	Rice reaper	7,151	807	269,618	84	778	278,438
2003							
	Combine harvester	37,976	6,520	957,011	5,705	8,819	1,016,031
	Rice miller	100,745	26,993	2,928,174	8,581	31,124	3,095,617
	Rice and cereal thresher	57,193	8,312	2,050,022	6,298	6,414	2,128,239
	Rice and cereal winnower	6,572	3,386	72,782	3,769	3,593	90,102
	Grain dryer	6,453	7,173	7,706	5,457	4,667	31,456
2008							
	Combine harvester	27,036	2,384	1,422,099	2,640	2,382	1,456,542
	Rice miller	44,493	31,854	2,471,425	4,835	90,094	2,642,701
2013							
	Combine harvester	33,095	3,123	1,588,239	2,456	2,646	1,639,016
	Rice miller	40,515	59,847	1,752,898	9,130	25,564	1,808,871
	Rice and cereal thresher	14,512	2,652	526,713	1,449	2,544	542,887
	Rice and cereal winnower	4,777	3,302	201,873	714	1,969	207,718

Note * Data were not available except for 2013 and were estimated from the summation of all sources
Source: 1998 Intercensal Survey of Agriculture National Statistical Office
Source: 2003 Agricultural Census Whole Kingdom, National Statistical Office
Source: 2008 Agriculture Intercensal Survey, National Statistical Office

Rice market

About 50% of rice production in Thailand is consumed in the domestic market, and about 30% - 50% of the production is exported (Table 6). The production grew about 40% from 2000 to

2013 while the food consumption has been steady. The use of rice for feed and seed have grown in recent years, but the use for industry or for processing has grown dramatically. This trend is consistent with the trend that as the migration from rural to urban increases and as income is larger, the share of rice in food consumption tends to decline as people diversify diets and become more health conscious (Abdullah *et al.*, 2005; Timmer, 2013). In addition, Thailand is strategic plan is also aiming at adding more value to agricultural products, including rice. At the presents there is an increasing trend of using rice for processed food such as noodles, crackers, rice drinks, and consumer goods such as toilette and cosmetic.

Table 6. Rice balance in Thailand (milled equivalent) (million tonnes), 2000-2013

Year	Production	Import	Export	Stock Variation	Domestic supply	Food supply	Feed	Seed	Processing	Losses	Share of food supply to domestic supply	Share of processing to domestic supply	Share of consumption to production	Share of export to production
2000	17.24	0.00	6.29	-0.52	10.44	7.31	1.03	0.50	0.30	1.30	0.70	0.03	0.53	0.36
2001	18.70	0.00	7.84	-0.51	10.35	7.12	1.12	0.50	0.21	1.41	0.69	0.02	0.48	0.42
2002	18.67	0.01	7.50	-0.71	10.46	7.25	1.12	0.50	0.19	1.41	0.69	0.02	0.49	0.40
2003	19.66	0.01	8.57	-0.31	10.79	7.43	1.18	0.49	0.21	1.48	0.69	0.02	0.47	0.44
2004	19.03	0.00	10.22	2.05	10.88	7.44	1.14	0.51	0.29	1.50	0.68	0.03	0.49	0.54
2005	20.20	0.01	7.69	-1.01	11.51	7.71	1.62	0.43	0.24	1.51	0.67	0.02	0.49	0.38
2006	19.77	0.01	7.60	-0.51	11.68	7.88	1.58	0.52	0.21	1.48	0.67	0.02	0.52	0.38
2007	21.41	0.02	9.25	-0.30	11.87	7.45	2.03	0.52	0.28	1.59	0.63	0.02	0.48	0.43
2008	21.11	0.03	10.29	1.57	12.42	7.80	2.11	0.53	0.35	1.62	0.63	0.03	0.51	0.49
2009	21.42	0.04	8.68	-0.25	12.53	7.80	2.14	0.60	0.40	1.59	0.62	0.03	0.51	0.41
2010	22.95	0.03	8.99	-1.01	12.98	7.57	2.30	0.61	0.80	1.70	0.58	0.06	0.49	0.39
2011	24.10	0.04	10.78	-0.30	13.05	7.46	2.41	0.62	0.77	1.79	0.57	0.06	0.47	0.45
2012	24.99	0.06	6.77	-4.55	13.73	7.65	2.50	0.61	1.12	1.86	0.56	0.08	0.48	0.27
2013	24.05	0.05	6.86	-3.64	13.61	7.68	2.41	0.61	1.13	1.79	0.56	0.08	0.49	0.29
% Growth	39.54	2,106.19	9.12	605.15	30.35	5.06	132.57	22.35	274.60	37.59	-19.41	187.37	-7.32	-21.80

Source: FAOSTAT, 2017

Note: domestic supply = production + import - export + stock variation

Consumption = food supply + feed + seed + processing

Several policies have influence the prices of paddy, especially price support programs. The largest price support in recent times was the pledging program between 2011 and 2014 when the government guaranteed no limit on quantities of paddy at a fixed price of 15,000 THB/ton (500 USD/ton) for non-glutinous paddy and 20,000 THB/ton (667 USD/ton) for Hom Mali paddy which were 40%-50% higher than the market prices during 2011 to 2014 (Paopongsakorn and Bunyasiri, 2017). This has evidently raised all domestic non-glutinous paddy prices (Figure 7, Figure 8) but the government managed to keep the non-glutinous rice price relatively low for consumers (Figure 9). After the military coup in May 2014, the pledging program was terminated. The current on-farm pledging programs support rice production through several subsidy programs aiming to stabilize domestic prices during the peak of wet season rice harvest. The subsidies set a target quota of three tons of paddy comprising of two tons of Hom Mali and glutinous rice and one ton of non-glutinous rice including Phthumthani rice. The intervention prices were set below the market, for example, supported price was 9,500 THB/ton of Hom Mali and glutinous rice while the market prices were 11,000 THB/ton and 10,560 THB/ton for Hom Mali and glutinous rice, respectively. Nevertheless, participating farmers received additional storage costs of 1,500 THB/ton (42 USD/ton) and a direct payment of 2,000 THB/ton (57 USD/ton) for certain harvest and postharvest handling costs (up to 12,000 THB (340 USD) per household) so that they receive totally 20-40% above the market prices when supplemental payments are included (USDA Foreign Agricultural Service, 2017a). The pledges consisted of 1.2 million tons of Hom Mali paddy, 0.2 million tons of glutinous paddy, and 0.1 million tons of non-glutinous rice including Pathumthani paddy.

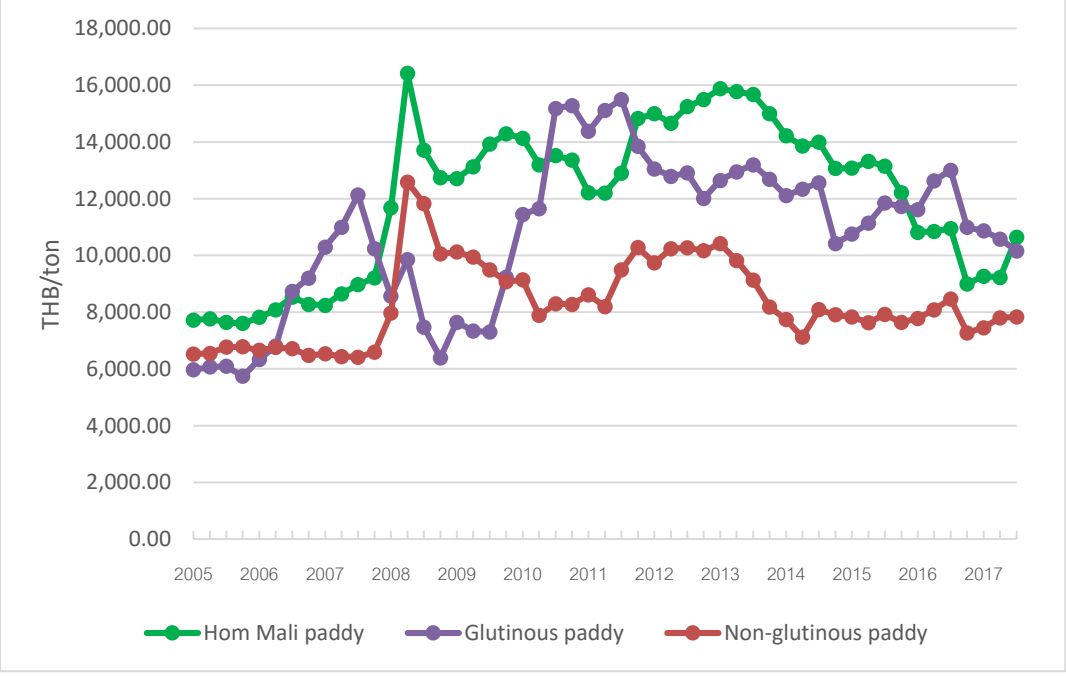

Figure 7. Quarterly farm gate paddy price by type, 2005 – Q3 2017
Source: Office of Agricultural Economic, 2017

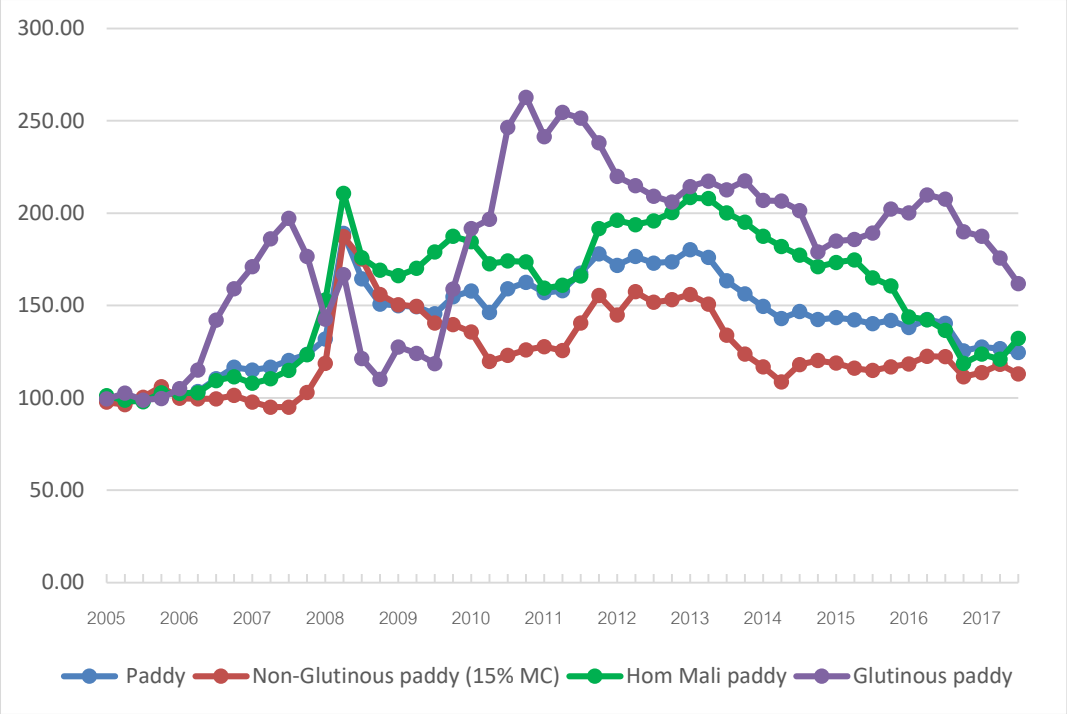

Figure 8. Quarterly farm gate paddy price index by type, 2005 – Q3 2017
Source: Office of Agricultural Economic, 2017

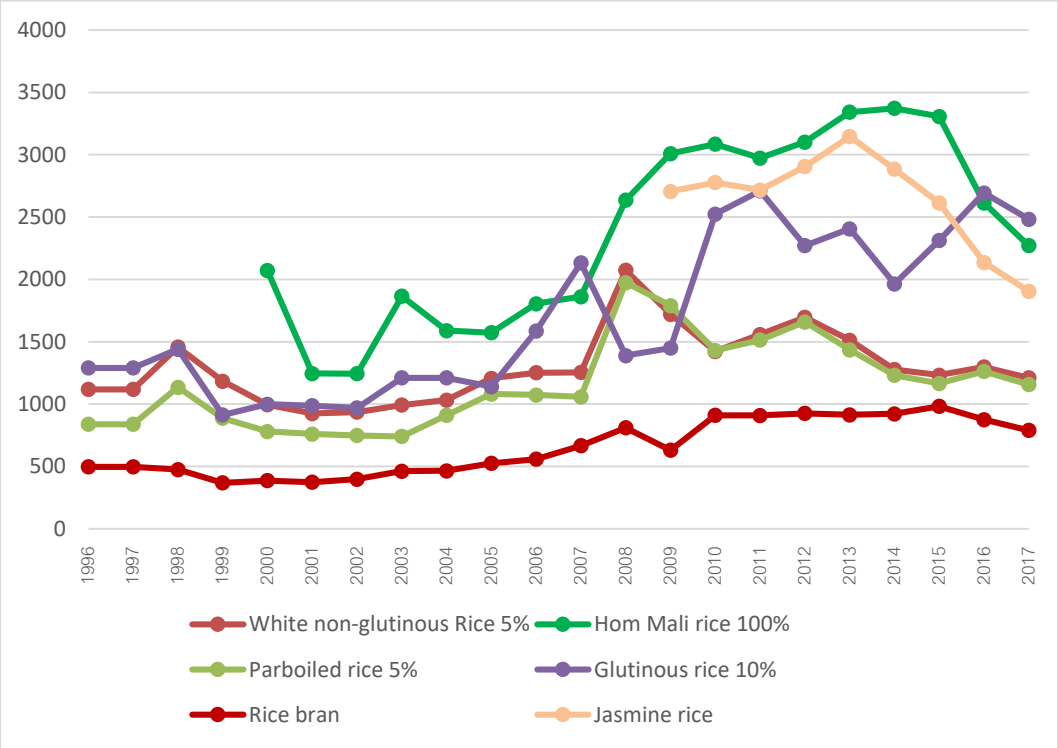

Figure 9. Annual average wholesale price (100 kg), Bangkok market, 1996 - Q1 2017
Source: Department of Internal Trade, 2017
Note: Jasmine rice is Hom Mali rice cultivated outside of Northeast and three Northern provinces

Rice Exports

The exports of rice from Thailand in general has remained steady in the past decade. At present, Thailand does not have any trade policies on rice. Nevertheless, domestic policies and impacts on production i.e. water management, natural disaster that determine the supply has influenced the rice exports, for example, rising rice export prices due to price support programs. The share of rice to crop commodity and agricultural exports are about 30% and 20%, respectively (Table 7). The largest value of rice exports in 2016 came from white non-glutinous rice, followed by Hom Mali rice, parboiled rice and broken rice. Glutinous rice accounts for a small share of rice exports (Figure 10). The growth in exports of rice and rice products was observed, but for certain classes such as white rice 100%, white rice 15-20% and Hom Mali rice 15-20% have experienced a negative growth rate in the last decade. Table 8 reports the quantity of rice exports. Although several rice product classes have shown negative growth in quantity such as unpolished rice, glutinous rice and parboiled rice, but their export values have not. This implies that while export quantity may decline but higher prices (reflecting the cost and quality) may not depreciate the value.

Table 7. Value (million USD) of rice and rice products exports from Thailand, 2000-2016.

	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017 (Jan – Oct)	Growth (%) 2005-2016	Share to total rice/rice products exports
Rice	1,641.0	2,329.0	5,341.1	6,432.4	4,632.3	4,420.4	5,438.7	4,612.9	4,408.4	3,940.5	89.29	1.000
White rice	1,067.5	745.8	1,455.0	2,196.1	1,363.9	1,319.0	1,952.6	1,851.5	1,689.6	1,446.6	126.55	0.383
White rice 100%	851.7	315.3	484.5	591.0	406.8	361.0	382.9	280.5	265.2	346.4	-15.90	0.060
White rice 5-10%	173.3	240.8	666.8	1,115.3	426.6	651.8	1,067.3	1,156.9	1,010.3	611.3	319.65	0.229
White rice 15-20%	28.5	150.0	7.9	140.9	120.3	3.8	88.7	134.7	121.5	24.8	-19.01	0.028
White rice 25-35%	14.0	35.2	239.6	42.4	7.4	8.5	378.3	263.4	272.6	18.5	674.18	0.062
White rice 40-45%	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	232.54	0.000
Other white rice	0.0	4.5	51.2	306.6	402.9	293.8	35.3	16.0	20.0	445.7	340.72	0.005
Hom Mali rice	0.0	653.6	1,687.6	1,631.9	1,526.6	1,704.7	1,398.0	1,329.1	1,206.3	939.8	84.55	0.274
Hom Mali 100%	0.0	650.0	1,647.6	1,608.4	1,510.5	1,688.5	1,381.7	1,313.7	1,193.9	935.3	83.66	0.271
Hom Mali 5-10%	0.0	3.0	28.5	16.3	12.6	15.0	14.8	15.0	12.2	3.9	306.53	0.003
Hom Mali 15-20%	0.0	0.6	11.5	7.1	3.6	1.1	1.5	0.5	0.2	0.5	-71.09	0.000
Broken rice	125.2	282.0	428.7	575.3	392.2	353.1	478.2	390.7	511.7	466.6	81.46	0.116
Broken white rice	116.1	61.0	70.5	98.8	6.7	6.8	127.3	67.9	84.1	120.5	37.82	0.019
Broken Hom Mali rice	0.0	194.6	293.0	366.3	307.7	237.9	199.5	215.3	306.9	213.2	57.75	0.070
Other broken rice	9.0	26.4	65.2	110.2	77.8	108.4	151.4	107.5	120.7	132.9	356.91	0.027
Glutinous rice	44.6	63.2	149.9	151.7	97.3	120.2	116.0	95.9	117.4	102.6	85.85	0.027
Parboiled rice	364.4	535.7	1,533.1	1,767.6	1,191.1	868.9	1,427.7	893.6	828.6	941.3	54.67	0.188
Unpolished rice	38.8	48.6	86.7	109.8	61.2	54.6	66.3	52.1	54.7	43.4	12.59	0.012
Unpolished white rice	0.0	0.7	15.9	11.4	8.6	2.6	5.1	7.1	7.1	5.7	956.72	0.002
Unpolished Hom Mali	0.0	23.8	37.4	33.1	25.7	23.6	23.9	22.3	24.0	16.7	0.82	0.005
Other unpolished rice	38.8	24.1	33.5	65.3	26.9	28.4	37.2	22.7	23.6	21.0	-1.96	0.005
Other rice	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1346.67	0.000
Rice products	121.7	144.7	263.0	312.0	308.5	318.5	314.7	296.5	296.1	253.8	104.56	1.000
White rice flour	10.8	19.0	32.2	35.8	33.6	33.5	32.5	29.2	31.0	25.2	63.64	0.105
Glutinous rice flour	33.2	35.1	72.9	92.3	89.3	88.9	88.2	79.2	81.6	63.2	132.57	0.275
Rice noodles	28.8	37.7	52.3	57.7	53.2	54.3	56.6	57.1	61.9	52.0	64.13	0.209
Rice crackers	46.9	53.0	105.6	126.2	132.4	141.8	137.5	131.0	121.6	113.3	129.42	0.411
Crop commodity exports	4,321	7,742	16,792	23,713	18,065	17,966	17,395	15,403	14,404	14,183	86.05	-
Agricultural exports	7,337	10,447	21,526	29,042	23,452	22,704	22,365	20,169	19,486	18,635	86.52	-
All exports	69,624	110,938	193,298	222,579	229,084	228,499	227,462	214,310	215,388	195,342	94.15	-
Rice exports/crop exports	0.38	0.30	0.32	0.27	0.26	0.25	0.31	0.30	0.31	0.28	-	-
Rice exports/ag exports	0.22	0.22	0.25	0.22	0.20	0.19	0.24	0.23	0.23	0.21	-	-

Source: Ministry of Commerce, 2017a

Note: Data on 2017 from Jan. to Oct.

Table 8. Quantity (tons) of rice and rice products exports from Thailand, 2000-2016.

	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017(Jan - Oct)	Growth (%) 2005-2016
Rice	6,148,261	7,495,904	8,939,630	10,711,549	6,734,427	6,612,702	10,969,370	9,795,781	9,906,393	8,986,696	0.32
White rice	3,484,312	2,632,297	2,875,015	4,238,857	2,457,053	2,647,837	4,857,455	4,867,645	4,665,135	3,861,891	0.77
White rice 100%	2,340,838	1,023,260	806,339	990,028	656,335	632,771	819,096	615,189	622,450	810,636	-0.39
White rice 5-10%	897,689	850,056	1,432,023	2,248,170	763,330	1,400,419	2,642,731	3,099,022	2,835,025	1,638,679	2.34
White rice 15-20%	164,189	612,144	17,260	288,817	226,560	8,256	218,061	359,245	328,782	65,337	-0.46
White rice 25-35%	81,549	131,723	513,119	91,328	17,520	19,568	1,092,402	767,743	841,800	52,066	5.39
White rice 40-45%	46	81	11,250	-	-	-	0	369	213	-	1.64
Other white rice	-	15,034	95,024	620,514	793,307	586,822	85,165	26,076	36,865	1,295,173	1.45
Hom Mali rice	-	1,447,157	1,622,965	1,560,441	1,375,593	1,477,935	1,336,238	1,385,045	1,536,584	1,271,866	0.06
Hom Mali 100%	-	1,438,978	1,580,722	1,535,876	1,359,912	1,463,105	1,318,881	1,366,702	1,519,111	1,264,904	0.06
Hom Mali 5-10%	-	6,615	29,029	16,496	12,024	13,718	15,703	17,806	17,236	6,042	1.61
Hom Mali 15-20%	-	1,565	13,214	8,069	3,657	1,112	1,655	537	236	921	-0.85
Broken rice	732,345	1,198,821	1,011,365	1,170,833	661,441	632,734	1,271,509	1,036,831	1,321,735	1,218,923	0.10
Broken white rice	678,265	283,690	194,555	234,717	12,441	13,392	403,906	204,624	241,442	348,962	-0.15
Broken Hom Mali rice	-	806,389	695,385	765,316	513,037	416,768	510,659	581,471	804,646	566,574	0.00
Other broken rice	54,079	108,741	121,425	170,800	135,964	202,574	356,944	250,736	275,646	303,387	1.53
Glutinous rice	152,988	192,441	199,957	161,696	113,685	137,452	139,396	124,191	164,839	163,217	-0.14
Parboiled rice	1,649,605	1,881,305	3,113,386	3,409,839	2,049,618	1,650,831	3,261,521	2,316,900	2,149,597	2,412,331	0.14
Unpolished rice	126,843	143,881	116,930	169,882	77,036	65,906	103,244	65,166	68,495	58,450	-0.52
Unpolished white rice	63	2,606	21,280	15,439	9,972	2,838	8,498	11,459	12,128	8,905	3.65
Unpolished Hom Mali rice	-	57,525	39,880	33,850	24,027	20,553	22,776	20,716	24,955	18,694	-0.57
Other unpolished rice	126,780	83,750	55,771	120,594	43,038	42,515	71,970	32,991	31,411	30,851	-0.62
Other rice	2,168	2	11	1	1	7	7	2	10	17	3.10
Rice products	153,159	175,463	190,009	190,503	182,392	186,993	198,621	193,970	202,451	167,088	0.15
White rice flour	29,146	38,948	40,136	38,679	35,073	34,290	35,923	35,404	39,261	31,868	0.01
Glutinous rice flour	68,444	72,371	80,152	79,926	79,323	81,243	85,089	79,941	83,816	65,282	0.16
Rice noodles	36,424	41,876	35,133	35,724	30,245	31,217	32,909	33,536	36,725	31,489	-0.12
Rice crackers	17,992	22,268	34,588	36,173	37,751	40,243	44,701	45,089	42,648	38,449	0.92

Source: Ministry of Commerce, 2017a

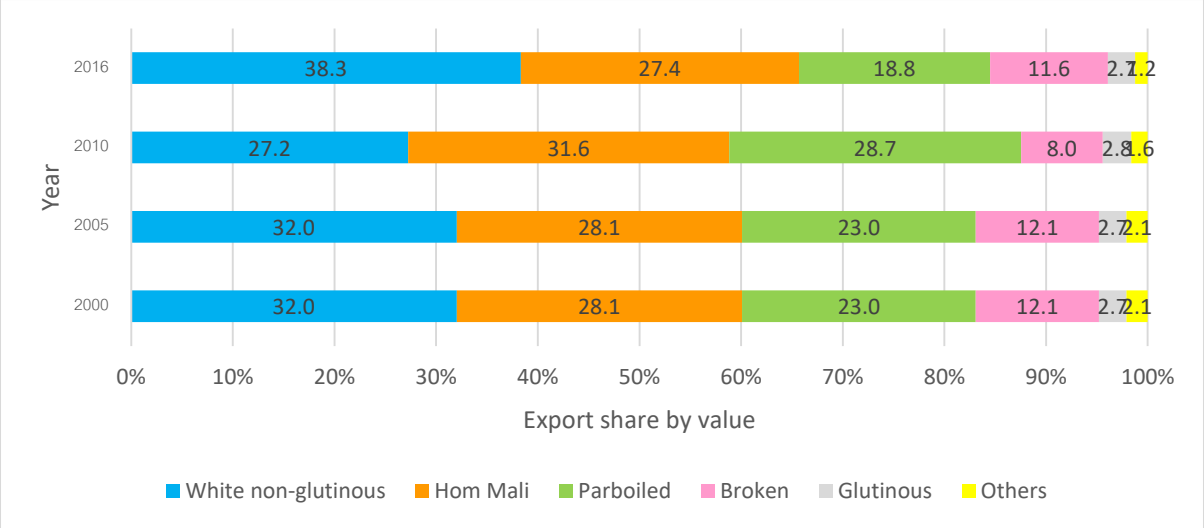

Figure 10. Share of rice exports value by type, 2000-2016
Source: Ministry of Commerce, 2017a

The important markets of rice exports from Thailand depend on the type. Largest importer of normal white rice from Thailand are mostly developing countries that have lower purchasing power such as China and some African countries (Table 9). Major importers of Thai Hom Mali rice are the U.S., Hong Kong and China where consumers prefer premium quality fragrant rice. Parboiled rice has a distinct taste that most Asian consumers do not prefer, but the main markets have been African countries, especially Benin and South Africa have been major importers of parboiled rice. World market for glutinous rice is very small, and specific to a small group of consumers mainly in Southeast Asia. Recently the world price of glutinous rice has progressively increased as the supply is far less than the demand. Most of the glutinous rice is produced in Laos, Vietnam, and Thailand. With limited export potentials from Laos, China has been the major importer of glutinous rice from Thailand.

Table 9. Top 10 destinations of white non-glutinous rice export from Thailand, 2015-2017.

Country	2015		2016		2017 (Jan-Oct)	
	Quantity (million tons)	Value (million USD)	Quantity (million tons)	Value (million USD)	Quantity (million tons)	Value (million USD)
China	536.12	223.76	451.41	175.99	414.88	160.85
Benin	283.95	101.57	365.59	117.96	375.65	128.74
Angola	313.62	123.54	322.38	122.75	333.35	128.11
Mozambique	303.63	110.71	337.26	115.56	341.75	120.14
Cameroon	379.68	130.43	341.24	108.92	278.59	92.51
Japan	268.44	106.74	317.68	116.39	249.41	89.76
Philippines	819.05	296.80	303.45	105.98	244.93	86.87
Malaysia	390.00	141.82	385.43	139.76	208.29	78.25
Kenya	20.13	7.58	70.71	24.78	156.21	58.24
Iran	2.38	1.34	3.46	1.43	141.14	54.49
Others	1,550.63	607.22	1,766.51	660.09	1,117.70	448.67
World	4,867.65	1,851.51	4,665.13	1,689.62	3,861.89	1,446.64

Source: Ministry of Commerce, 2017b

Table 10. Top 10 destinations of Hom Mali rice export from Thailand, 2015-2017.

Country	2015		2016		2017 (Jan-Oct)	
	Quantity (million tons)	Value (million USD)	Quantity (million tons)	Value (million USD)	Quantity (million tons)	Value (million USD)
USA	375.26	370.26	422.88	339.27	359.97	274.86
Hong Kong	150.93	150.42	168.77	142.08	148.43	114.21
China	175.53	156.25	208.40	148.10	145.27	98.95
Iran	1.59	1.61	3.65	2.96	119.75	72.55
Canada	76.42	72.79	86.14	65.45	59.18	45.02
Singapore	78.43	78.43	78.11	66.25	52.60	43.15
Australia	45.18	44.54	47.66	39.36	34.93	28.39
Ghana	55.09	47.10	70.61	49.64	38.98	27.31
Saudi Arabia	37.57	35.88	38.41	29.66	26.58	18.58
Gabon	43.59	40.54	42.64	31.99	21.40	16.17
Others	345.46	331.31	370.82	292.79	19.01	200.56
World	1,385.05	1,329.12	1,538.08	1,207.54	1,271.87	939.77

Source: Ministry of Commerce, 2017b

Table 11. Top 10 destinations of parboiled rice export from Thailand, 2015-2017.

Country	2015		2016		2017 (Jan-Oct)	
	Quantity (million tons)	Value (million USD)	Quantity (million tons)	Value (million USD)	Quantity (million tons)	Value (million USD)
Benin	509.47	188.00	1,030.15	386.61	1,065.42	408.45
South Africa	536.01	207.97	540.88	218.41	549.74	215.71
Bangladesh	-	-	-	-	207.68	82.89
Cameroon	46.64	16.94	134.20	47.41	152.08	59.19
Yemen	203.94	76.89	58.73	22.01	121.47	46.47
Russian Federation	22.03	8.82	22.83	9.00	31.55	12.68
Algeria	9.50	3.62	22.80	8.60	28.34	10.89
U. Arab Emirates	24.96	10.01	33.01	13.53	24.34	10.00
Nigeria	643.96	249.69	58.22	22.51	23.19	9.44
Spain	23.55	10.80	22.06	10.21	17.33	8.16
Others	220.61	90.36	163.15	65.85	155.11	63.47
World	2,240.67	863.09	2,086.02	804.13	2,376.26	927.35

Source: Ministry of Commerce, 2017b

Table 12. Top 10 destinations of glutinous rice export from Thailand, 2015-2017

Country	2015		2016		2017 (Jan-Oct)	
	Quantity (million tons)	Value (million USD)	Quantity (million tons)	Value (million USD)	Quantity (million tons)	Value (million USD)
China	20.38	15.76	59.89	36.48	61.95	35.22
USA	19.27	18.63	19.48	18.74	16.21	14.57
Malaysia	25.78	17.72	15.89	11.80	14.37	8.12
Japan	9.05	6.18	9.45	7.20	8.43	4.98
Philippines	1.85	1.29	2.58	1.33	8.83	4.44
Laos	5.45	2.71	5.97	2.63	8.31	4.31
Taiwan	4.86	3.56	6.17	4.05	6.50	3.66
Vietnam	3.10	1.69	5.54	3.43	6.07	3.61
Hong Kong	6.73	5.41	7.18	5.79	4.79	3.53
Singapore	4.93	3.61	5.67	4.33	5.64	3.50
Others	22.78	19.33	27.02	21.65	22.12	16.63
World	124.19	95.90	164.84	117.43	163.22	102.59

Source: Ministry of Commerce, 2017b

Competitiveness of Thai rice in the world's markets and the evolution of Thai's rice standards

Prior to World War II, Southeast Asia, particularly Burma, Thailand and Indochina, continued to increase their rice exports and dominated the global rice market (Figure 11). After the war, rice exports from Burma and Indochina drastically contracted while Thailand maintained its rice exports. Before the late 1970s, the share of rice exports from Thailand did not increase despite the expansion of the global demand for rice due to the entries of China, the U.S. and other exporters in the world market. Vietnam was later joined Thailand in the 1990s as a major rice exporter. Van Der Eng (2004) described that the main reason for Southeast Asia's (Burma, Thailand and Southern Vietnam) domination in the global rice market was due to high labor productivity that provides a comparative advantage in rice production. Until the 1990s, the comparative advantage of rice production in Southeast Asia was a result of expansion of land and labor with low-input labor-extensive technology such as broadcasting rather than high-yielding (Van Der Eng, 2004; Paopongsakorn *et al.*, 2006).

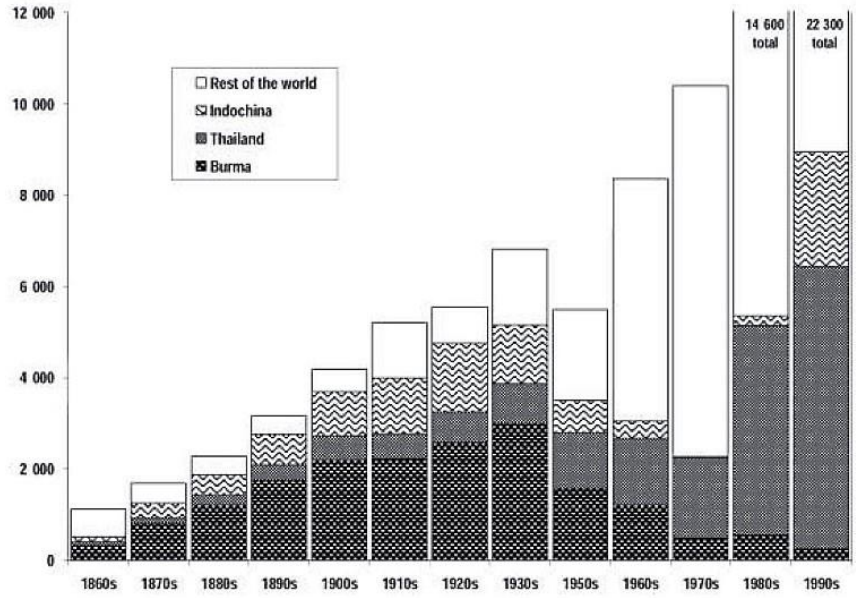

Figure 11. World rice exports (cumulative, millions tons of rice, 10-year average), 1860-1999
Source: Van Der Eng, 2004

The modern economic development in agricultural industry in Thailand during the 1960s to mid-1980s was attributable by land abundance, sound macroeconomic management policy, and public investment in infrastructure. Agricultural GDP growth during this time has led to the expansion of agricultural land and commodities exports including rice (Poapongsakorn, 2011). Public investments in irrigation in the late 1950s, rural roads in the 1970s, and rural electrification in the 1980s, have made it possible for farmers to expand and sell their output at higher farm gate prices. At the same time, compulsory primary education and public spending in rice research attributed to higher productivity of rice farms. From the 1970s to the 2000s, investments in farm machinery, two wheel walking tractors, big tractors and water pumps in particular, increased significantly, especially in the irrigated areas of the Central Plains (Poapongsakorn, 2011). In addition, access to credits among farm households was initiated by the government through the establishment of the Bank for Agriculture and Agricultural

Cooperatives (BAAC) in 1966. At present, more than 90% of farm households have access to the bank's credit partly which, in turn, allows farmers to increase their agricultural investment. From the 1930 to 1990, the labor productivity of rice production in Thailand slightly declined from 17.8 to 15.7 kg/day; whereas, those of Southern Vietnam increased from 13.4 to 24.5 kg/day (Van Der Eng, 2004). Nevertheless, Thailand and Vietnam have much higher labor productivity compared to neighboring countries such as Cambodia (5.5 kg/day in 1988/89). Competitive advantage of rice production in Thailand during the past several decades was attributable to low production cost. Presently Thailand has lost its comparative advantage from increasing cost of production and resource constraints. Real wages of unskilled labor in Thailand rose dramatically from 0.2 USD/day in 1930 to 1.83 USD/day in 1980 while those of Vietnam rose from 0.09 USD/day in 1930 to 0.52 USD/day in 1970 (Van Der Eng, 2004).

Paopongsakorn *et al.* (2006) found that between 1981 and 2003, the GDP growth in crop sector was attributable mainly to capital accumulation i.e. machinery investment and TFP while the growth in labor has shown a negative impact on crop GDP growth. This finding suggests a similar implication from the changes in cost structure of rice production in Thailand. At the real price deflated by paddy's farm gate price, the cost share of labor in rice production during the wet season in Thailand declined from 57.6% in 2007 to 43.2% in 2011 while the cost share of land, fertilizer and seed rose from 8.75%, 14.38% and 9% to 15.23%, 18% and 12.6%, respectively during the same period (Paopongsakorn *et al.*, 2013). Labor contributes to the largest share of the cost of rice production in Thailand. To remain competitive, technology improvements in variety development and seed technology for high-yielding and fertilizer-responsive rice varieties as well as mechanization will play an important role in the rice sector.

At the present, a comparison of the cost of rice production show that exporting countries such as Thailand, Vietnam and India has lower cost of rice production than the importing countries (Figure 12). From classical trade theory, these rice exporters have higher comparative advantage in rice production than the importers. From the overall rice industry perspective, Thailand has the higher comparative advantage than Vietnam but less than India. This is consistent with what was found by Poapongsakorn *et al.* (2010) that the revealed comparative advantage (RCA) of Thailand's rice is lower than that of Vietnam's, but higher than that of India's (Figure 13).

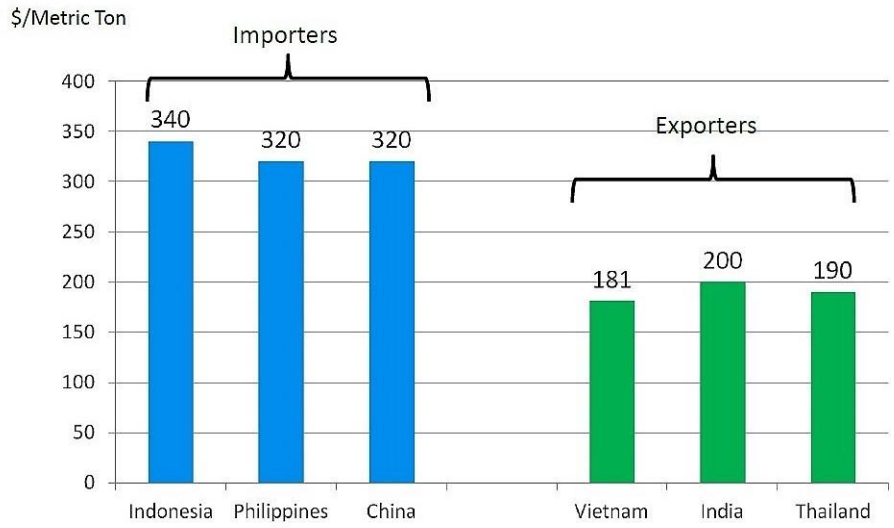

Figure 12. Cost of rice production of major importing and exporting countries
Source: Mohanty, 2015

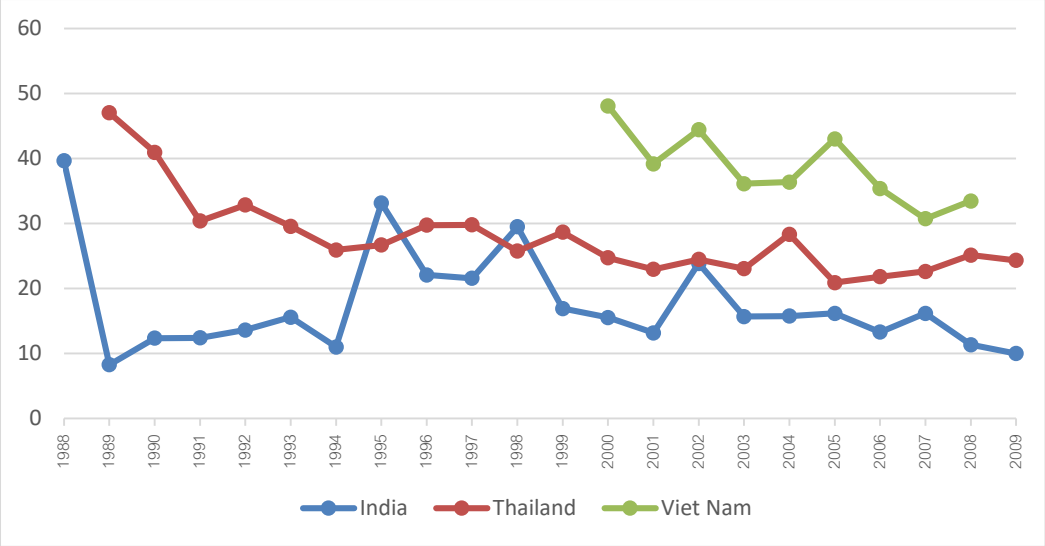

Figure 13. Revealed Comparative Advantage (RCA) Index of rice exports from India, Thailand, and Vietnam
Source: Poapongsakorn *et al.*, 2010.

Warr and Wollmer (1997) used a price-normalized demand equation to estimate the long-run elasticity of demand for Thai rice during 1976 to 1990, and found that elasticity of demand for Thai rice was ranged between -1.2 and -1.9, thus, rejecting the hypothesis of a small exporting country. In other words, Thailand could influence the price of rice in the international market and constituted some monopolistic power. On the contrary, a recent study by Mahathanaseth and Taauer (2014) using the data during 1998 to 2011 by employing residual demand elasticity estimation endorsed that Thailand has no market power in rice export markets. Vietnam was the main competitor in Chinese and Indonesian markets while India was the main competitor in the U.S. and South African markets. Generally, in aggregate, Thailand faces a perfect competition in all major export markets implying that the rice products from competitors are close substitutes to Thai rice. In addition, for Hom Mali rice export markets, namely China, the U.S., and South Africa, Thai rice has the inelastic demand which indicate no market power to control Hom Mali rice export prices. This is not surprised given the evidences that Thailand has lost the fragrant rice market to Vietnam as discussed below.

Thailand's Hom Mali rice has set a high reputation and preferred in several rice consuming countries, particularly China, Hong Kong, and Singapore and countries where Asian consumers have strong demand for aromatic rice such as the U.S. (Goodwin *et al*, 1996; Suwannaporn and Linnemann, 2008; Suwansri *et al*, 2002). Thai consumers highly preferred intermediate amylose that reflects soft texture and fragrant rice (Custodio *et al.*, 2016; Unnevehr, 1986). As the first mover as a market leader of high quality frangrant rice, the preferences towards "Jasminization" of Thai consumers have profoundly shaped the preferences in importing (Philippines and Indonesia) and second-mover Southeast Asia countries (Cambodia and Vietnam) (Custodio *et al.*, 2016).

Nevertheless, the competition in the international market of Jasmine-type fragrant rice (excluding Basmati) is becoming more intensely as Cambodia and Vietnam became key exporters in the past decade. Prior to 2008, Thailand was the only exporter of Jasmine-type

rice. Vietnam and Cambodia have started to export fragrant rice since 2008 and 2013, respectively. As a result, the world's market share of Thailand's fragrant rice has been contracted (Figure 14). The main markets for Thailand's Hom Mali rice are the U.S., China, and Hong Kong; whereas those of Cambodian are the E.U. by exploiting the privilege of the *Everything-But-Arms* zero tariff, and those of Vietnam are China, Ghana and Hong Kong. Vietnam's fragrant rice is much more price competitive than Thailand's Hom Mali rice (Figure 15).

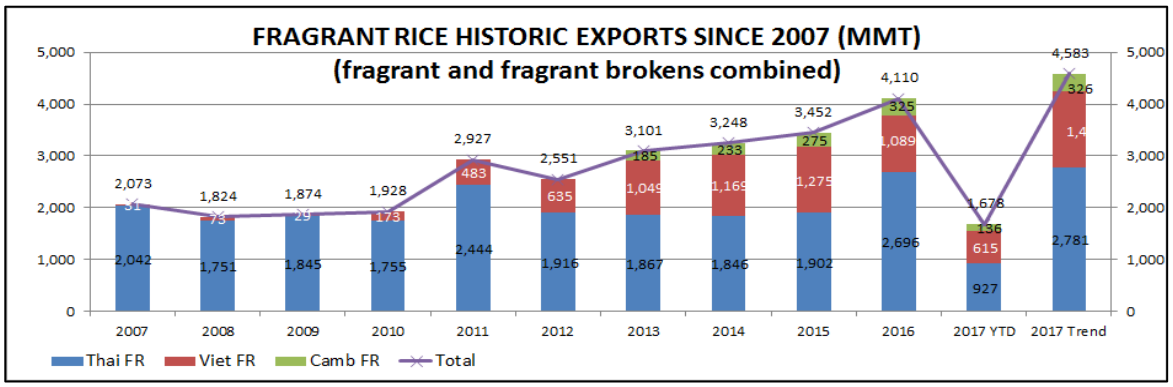

Figure 14. Export of Jasmine-type fragrant rice by country, 2007 – 2017
Note: Thai fragrant rice includes both Hom Mali and Pathumthani
Source: The Rice Trader, 2017

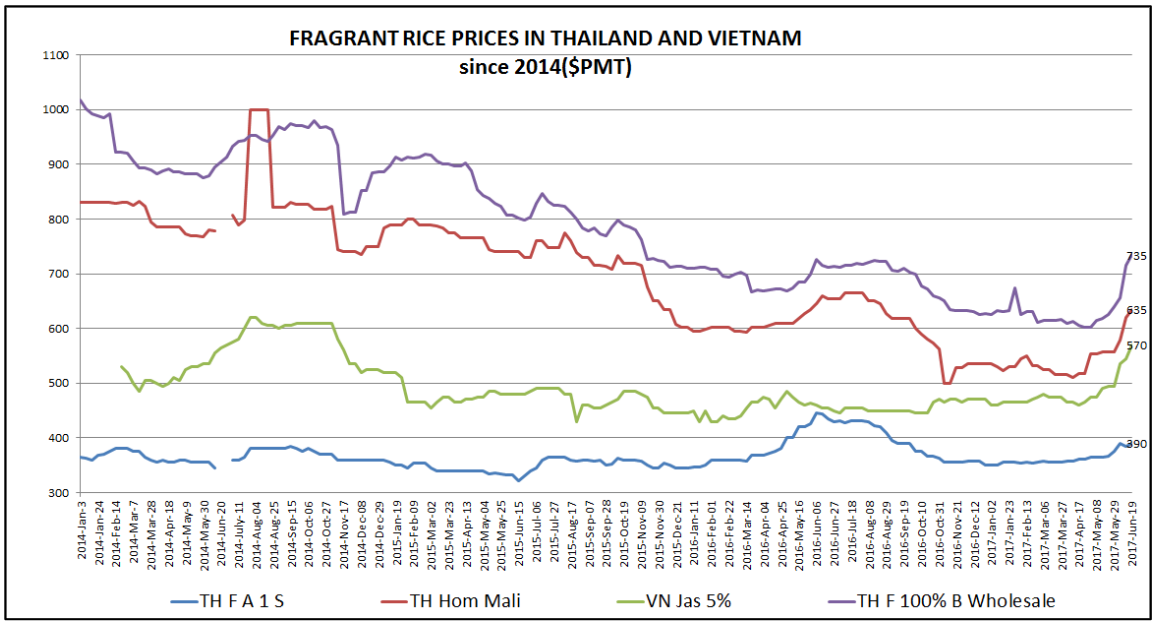

Figure 15. World' price of Jasmine-type fragrant rice by country, Jan 2014 – June 2017
Note: TH FA 1S = Hom Mali broken rice, VN Jas 5% = Vietnam Jasmine rice 5%
Source: The Rice Trader, 2017

On the other hand, the fragrant rice from Cambodia and Myanmar have also set high reputation for quality. Thai Hom Mali rice has won the World's Best Rice Award at The Rice Trader world rice conference in 2009, 2010, 2014, 2016 and 2017. The same award was also given to Paw San rice of Myanmar in 2011, and Phka Rumduol rice of Cambodia in 2012, 2013 and 2014. Aside from having good quality rice, Myanmar and Cambodia were historically major rice exporters that have potentials to regain their status and will challenge other countries in the region (Timmer, 2013).

Furthermore, the U.S. also attempts to substitute its own bred varieties for Hom Mali rice imports. One of the very close substitute is Jazzman-2 developed by Louisiana Ag Center. The variety has very close attributes to Hom Mali rice with moderate amylose content and high aroma similar to Hom Mali rice grown in Thung Kula Rong-Hai, the prime area of high quality Hom Mali rice production. Nevertheless, Jazzman-2 is a short grain rice that still cannot compete with long slender shape of Hom Mali.

In Thailand, high yielding is not necessarily preferred by high quality rice industry, especially when the cooking quality is inferior. Despite several HYV disease- and pest-resistant, stress tolerance fragrant rice varieties were released, KDML105 and RD15 are still the only two varieties covered in Hom Mali rice standard. These two varieties are considered the best cooking quality but still vulnerable to common local pests and diseases. Both are prominently aromatic and photoperiod-sensitive. Pathumthani1, commonly known as Pathumthani in international market is a high-yielding (4.06-4.84 tons/ha) and resistant to major pests and diseases such as brown plant hopper and blast. It is non-photoperiod sensitive that can be cultivated year-round in irrigated areas. However, Pathumthani has a close physical appearance to but lower quality than Hom Mali rice in terms of softness and aroma. After its release in 2000, Pathumthani has been another popular fragrant rice that offered consumers at a more affordable price. To Hom Mali rice industry, Pathumthani has done more damage than the good. Producers often mix Pathumthani to Hom Mali rice; as a result, the price difference between Hom Mali rice and white rice 100% declined from 130% in 1999 prior to the release of Pathumthani to 110% in 2006 (Poapongsakorn and Isvilanonda, 2008).

In response to world's fragrant rice's market competition and the confusion between Thai Jasmine and Thai fragrant rice, Thailand made a major revision in rice standards that became enacted in October 2016 (Department of Foreign Trade, 2016). The revisions consist of:

1. For "**Thai Hom Mali Rice**", KDML105 and RD15 are only two varieties covered. Terminate existing Premium Hom Mali (≥ 98% purity) and Mix Thai Hom Mali (≥80% purity) rice standards. Keep only one Hom Mali rice standard ((≥92%).
2. For fragrant non-glutinous rice so called "**Thai Jasmine Rice**", "**Thai Fragrant Rice**", "**Thai Aromatic rice**" or other related names of the same meaning, this standard was created to compete with lower quality, lower price of Vietnamese fragrant rice that has not been existed before. The standard requires ≥80% purity of fragrant rice varieties that were registered and certified as fragrant rice by Ministry of Agriculture and Cooperatives.
3. Terminate Pathumthani Rice standard. Pathumthani rice is considered fragrant and can be included into the new Thai Jasmine Rice standard.

Timmer *et al*. (2010) found that rice is an inferior good since the mid-1990s (Engel curve), and it is projected a falling rice consumption, especially at a higher rate when rural-urban migration is accelerated (Abdullah *et al.*, 2005; Timmer, 2013). Furthermore, Thai government is promoting different higher standards such as geographical indication (GI), sustainable agriculture (SRP—sustainable rice platform), and organic to differentiate Thai rice from the competitors. The research and development in rice breeding in Thailand has been very compelling in the past, but as international competition is more intensive, there are impediments in regulations such as constraints to access to foreign rice genetic resources (Napasintuwong, 2018). Furthermore, public investments in varietal improvement is very small at about less than 0.2% of rice GDP. The private sector still takes a small role in rice R&D, but

it is expected that they might become more involved in the future especially for specialty rice varietal development and in modern technology such as digital technology, and precision agriculture.

Issues and challenges in current Thai rice economy

The preceding sections have discussed a few challenges in rice industry that Thailand is facing such as labor scarcity, low productivity, losing competitiveness in cost of production, and uncontrollable water supply. The current junta government has one main mission when it took the office; that is to make a national reform. *Thailand 4.0* policy, which emphasizes the utilization of innovation, became a mechanism for *national reform* to pull Thailand out of the middle-income trap, economic disparities, and the imbalance between the environment and society. Among several reforms, agricultural reform is an important one. The results from the Thai rice industry study proposed several issues and challenges, and the structural reform solutions for the rice industry (National Reform Council, 2015a).

1. Key issues and challenges in rice export market

    1.1 Thai rice is facing more competition from existing major exporters such as India and Vietnam and also emerging exporters such as Myanmar and Cambodia while the demand from main importers of Thai rice such as China and African and ASEAN countries do not expect to increase much.

    1.2 Thai rice competitiveness is deteriorating. The price intervention policy of Thai government has created price competitiveness. In recent years, rice export price from Thailand is higher than those of competitors. The average export price of white rice, is about 10-15% higher than those of Vietnam, India and Pakistan. Furthermore, Thailand has lost market share of fragrant rice in Hong Kong, Japan, Singapore, South Africa and Middle Eastern countries to Vietnam and in European countries to Cambodia.

    1.3 Nearly half of rice production is exported. Nevertheless, Thailand does not have the market power to influence the world rice prices. As a result, it still has to compete with other rice exporters. Unless the premium quality of Thailand is distinguished, high cost of production will make it difficult for Thailand to compete with other countries that reap the benefit of lower cost of production.

2. Key issues and challenges in rice production

    2.1 Only about 60% of current rice production area is classified as moderately to highly suitable for rice production. The rest are poorly suitable or unsuitable for rice production at all.

    2.2 The irrigated area is very low at about 23-30% of the whole agricultural area, mainly situated in the Central and Northern regions. Northeastern rice production area which is the largest rice production area is mainly rainfed, and vulnerable to extreme climates and uncontrollable weather resulted in low productivity. Furthermore, most rice farmers are small holders, and lack of labor so agricultural services became more common, but this has increased the cost of production. Without price support, the paddy price which reflects the world price cannot be set high enough to cover the cost resulted in debt of rice farmers.

    2.3 Rice production in Thailand generally has lower productivity than other countries. If Thai rice were to compete with other exporters, productivity has to be improved.

2.4 Persistent use of chemicals for a long period of time resulted in poor soil and land degradation. Overuse of chemicals also damages the ecosystem resulted in increasing use of chemicals to cope with more pests, diseases and weed problems. This not only affects farmers' health but also concerns consumers, for example, the incidence of high levels of heavy metal contamination in rice produced in China created much concern and bad reputation for consumers.

3. Key institutional issues
   3.1 The policies influencing rice industry mainly come from political motives. Changes in government regimes generally discontinue and constantly change government policies. Challenges that need consistent government supports are not able to be implemented.
   3.2 Farmers' organizations are weak and the collective power is not strong enough to drive important arrangements. Although local farmers' institutions exist, many depend on government's and private sector's supports.
   3.3 Labor scarcity and aging farmers is one important problem in Thai agriculture and Thai economy, not just in the rice industry. At the same time 60% of rice farmers are small holders and depend on agricultural services as investment in labor-saving technology may not be worth it. It is also difficult to do labor-intensive farming such as system of rice intensification for higher value, higher quality products.
   3.4 Many of rice farmers are landless or have very small land size. This is due to land fragmentation from passing the land ownership to the next generations of many children. This makes it difficult to collectively manage the area and realize the benefits from economies of scale.

From these key issues and challenges, the solutions for rice industry reform can summarized as follows:

1. Rice zoning area: the policies towards agricultural zoning has been discussed and put in the government strategy for many years, but the action plans has not made it happen. One of the reasons is previous government's price support programs that distorted the market price and created more incentives to explain rice supply but reduce the quality. Thus, government should identify key areas of rice production for different markets. For instance, improve the irrigation system in high quality, high value rice production in the Northeast, and establish supporting industries throughout the whole supply chain. Furthermore, for unsuitable areas, switching to alternative crops or leaving agriculture have to be materialized.
2. Generate less vulnerability for rice farmers from production and market risks. It is also important that the supports should be done through market mechanisms. Thailand has already established crop insurance programs and **the Agricultural Futures Exchange of Thailand (AFET) including** rice in the commodity trade. Crop insurance program in Thailand was started in 1970, but only in 2001 that rice was included. Current crop insurance program cover rice production throughout the country and cover all damages from weather and pests and diseases (National Reform Council, 2015b). Although farmers were partially subsidized for the insurance premiums, the participation rate is still low. Most of the farmers who participated in crop insurance programs are in risk-prone areas. Previously, government's relieve supports where farmers could get direct payment have been used for losses and damages from natural disasters. Thus, government subsidy should be complement with other measures; for example, crop insurance is required by financial institutions when loan is made, and more choices of insurance plans suitable for diverse farmers to make crop insurance mechanism more

realized. Similarly the trade in future market in the past was not much realized because former government price support programs.

3. Promote quality rice production throughout the whole supply chain. Several standards have already been set from farming to manufacturing. Nevertheless, the adoption of those standards are still low, mainly due to lack of price incentives. The production of Geographical Indication (GI) rice, Good Agricultural Practice (GAP) for food safety standards, organic and sustainable rice standard (SRP) should be promoted to local communities. Nevertheless, the system of certification has to create trust for consumers both in domestic and international markets. Consumers' awareness of improved quality and reputation for these specific standards have to be built; otherwise, it is difficult for farmers to adopt these standards. Similarly, Good Manufacturing Practice (GMP) in rice processing should also be promoted.

   Furthermore, value addition to rice products will generate more income for farmers and country. As Thailand is aiming for *Thailand 4.0* policy, using innovations will add more values to the national income. Several food products such as rice flour, rice noodles, rice brand oil and rice crackers are not new, but cosmetic, plastic, rice extracts and other use of rice and rice by-products may need more research and market development.

4. The mechanization in rice farming in Thailand has been adopted for a longer period of time than many other Asian countries. Although labor scarcity is an important issue, the adoption of mechanization has been relatively stable. Research for suitable machineries for specific typography of farmers may be needed. Furthermore, the services for machinery may have to be done through different institutional setting. Many of the existing machinery uses by farmers' organization and local communities are supported by the government or by private companies through corporate social responsible programs, and these will not sustain. The role of community enterprise and agricultural cooperatives in machinery services will need further investigation.
5. Strengthen farmers' associations and agricultural cooperatives, and public-private-people partnership. There are many success stories of farmers' organizations and agricultural cooperatives in rice production in Thailand (Coo, 2017; Dharma, 2017; Kaufman and Petpha, 2016; Napasintuwong, 2017; Patrawart, 2009,). Many successful farmers' organizations aim at sustainable farming and quality rice production that need public and private partnership, and contract farming is one of the measures. Engaging private sector, particularly for high value rice will become more and more important in the future.
6. Utilize appropriate new technology, not only farming, but also digital economy such as digital technology for timely decision making for farmers. Create smart farmers who learn to adopt new technology and be able to reduce cost while moving towards more sustainable rice production. Create platform for e-commerce for direct marketing that small and medium farmers can apply. It is recognized that training and improving the education of young rice farmers is needed.

Those issues and proposed action plans are consistent with the current *12th National Economic and Social Development Plan (NESDP)* (starting from 2017 – 2021) which is a short term strategic plan in accordance with the 20-year strategic plan and reform (2017 – 2036) (Office of the National Economic and Social Development Board, 2016b). The vision of the 20-year strategic plan is "Security, Prosperity, and Sustainability". Key goals related to agricultural and rural economy in the current NESDP include

- Growth in agriculture to reach 3% per year
- Average income of 40% of poorest population to increase by at least 5% per year
- Elementary schools enrolment rate to reach above 90%
- Irrigation area to cover 56,000 hectares
- Greenhouse gas emission to decrease by 7%

In addition, under the 12th NESDP, the *Strategic Plan for Thai Rice* (2015-2019) was also developed (Thammasat University Research and Consultancy Institute, 2015). The Rice Department, which is the main public institute responsible for the rice industry development has started several action plans in accordance to *Strategic Plan of the Rice Department*. The goals were

1. To balance the supply of rice with the demand by reducing the area of excess supply so that the production quantity is no greater than 33 million tons of paddy in 2020.

Strategic actions include

- Specify rice zoning to support suitable areas for rice production
- Manage the irrigated rice production using farmers' participatory management (similar to large field, small farms of Vietnam)
- Change the unsuitable rice production areas to other crops
- Create databases and use digital information about rice for decision making
- Create system of sustainable rice product management

2. To improve rice productivity so that the average yield of all rice varieties is no less than 3.18 ton/hectare, cost of production no greater than 25,000 THB/hectare (765 USD/hectare) and 7, 800 THB/ton (738 USD/ton) by 2020.

Strategic actions include

- Sufficient and timely seed production and distribution
- Promote the use of new technology and support system of rice intensification
- Promote collective paddy field business operation for the whole rice supply chain
- Promote the use of machinery
- Promote the use of organic and bio-fertilizer
- Control the quality, and price of inputs, agricultural services and paddy field rent
- Develop system of detecting and warning for insect and pest infestation in rice
- Improve the efficiency of rice post-harvest system and logistic.
- Expand water and irrigation sources, land restructuring and improve soil fertility for important areas of rice production
- Expedite research and development of rice varieties and technology

3. To improve rice paddy quality so that the certified safety standard of paddy field of no less than 10 million tons.

Strategic actions include

- Expedite supports for high quality rice production
- Support and promote the production of rice for niche market such as standards of GI, organic, fair trade and nutrition rice
- Elevate standards of rice production and improve the efficiency of traceability, quality control, and certification of rice and rice products
- Create systems that connect producers, sellers, and consumers
- Research and development of rice product for value added.
- Advertise and promote the value of rice and rice products

4. To strengthen famers' organizations consisting of agricultural cooperatives, community enterprises and rice seed communities so that 80% of them pass the minimum requirements of good organizations by 2020

Strategic actions include

- Built local rice centers and networks for technology transfer
- Promote the development of local rice farmer hubs
- Elevate farmers' capacity in rice production
- Support risk management in rice production such as crop insurance
- Revise the laws regarding land rent and land use
- Develop national rice research and development foundation
- Research on social and economic issues of rice farmers and develop platform for technology transfer to rice farmers

In conclusion, the challenges in Thai rice industry are both production at farm level and the whole related industries including rice products, and rice seed. The main goals are to improve the productivity and quality of rice, and to set competitiveness for quality instead of quantity.

Conclusions

Rice has always been important to Thailand's economy, and due to many public investments in research and private sector's role in processing, marketing and exporting, Thailand has been the leading rice exporter. Thailand has set a high reputation in quality and tasty rice, and preferences for Thailand's rice, especially Hom Mali rice are distinguished. Nevertheless, there remain many issues and challenges in the rice industry that need a structural reform. Many of the issues are recognized by previous and current government, and many strategic actions were put into place. It is important as a middle income country that Thailand utilizes advanced technology and innovations, not only in product development and production process, but also institutional innovations. This papers summarizes current situations, issues and challenges of Thai rice economy, and discussing strategic plans. The way forward for Thailand's rice is aiming towards quality rice production, and using institutional and production innovations to cope with these challenges.

References

Abdullah, A.B., Ito, S. and Adhana, K. (2005*). Estimate of rice consumption in Asian countries and the world towards 2050.* Japan, Tottori University. pp. 28-42. Available at http://worldfood.apionet.or.jp/alias.pdf.

Coo, C. (2017). *Increasing smallholder sustainability through innovative crop production, organic farm training/management and microfinancing, Siam Organic, Thailand*. Presentation at the 1st Global Sustainable Rice Conference. October 4-5, 2017, The United Nations convention. Bangkok, Thailand.

Dharma, A.W. (2017). *Technology transfer system for sustainable rice value chain.* Presentation at the 1st Global Sustainable Rice Conference. October 4-5, 2017, The United Nations convention. Bangkok, Thailand.

Custodio, M. C., Demont, M., Laborte, A. and Ynion, J. (2016). Improving food security in Asia through consumer-focused rice breeding. *Global Food Security.* 9: 9-28.

Department of Foreign Trade. (2016). *Thailand Standards for Rice*. A collection of Thailand's rice standards. Ministry of Commerce. Nonthaburi, Thailand. (in Thai)

Department of Internal Trade. (2017). *Wholesale price at Bangkok market.* Available at http://www.dit.go.th/pricestat/index.asp (in Thai)

FAOSTAT. (2017). Food and Agriculture Organization of the United Nations. Available at http://www.fao.org/faostat/

GISagro, Geo-Informatics and Space Technology Development Agency. Available at http://gisagro2.gistda.or.th/

Goodwin, H.L., Jr., Holcomb, R.B., and Edward Rister, M. (1996). Implicit price estimation of rice quality attributes for Asian Americans. *Journal of Agricultural and Applied Economics* 28(2): 291-302.

Kaufman, A. and Petpha, N. (2016). Moral Rice Network, Dharma Garden Temple, Yasothon province, Northeast Thailand. In Innovative markets for sustainable agriculture: How innovations in market institutions encourage sustainable agriculture in developing countries, Loconto, A., Poisot, A. S. and Santacoloma, P. (eds.). Food and Agriculture Organization of the United Nations. 181-200.

Patrawart, J. (2009). Branding as the marketing strategy for organic products: A case study on Moral Rice. *Asian Journal of Food and Agro-Industry* Special Issue, S256-S263.

Mahanaseth, I. and Tauer, L.W. (2014). Thailand's market power in its rice export markets. *Journal of Agricultural and Food Industrial Organization*. 12(1): 109-120.

Ministry of Commerce. (2017a). *Export statistics by commodity*. Available at http://www.ops3.moc.go.th/export/recode_export/

Ministry of Commerce. (2017b). *Yearly Export of Thailand*. Available at http://www.ops3.moc.go.th/hs/export_yearly/

Mohanty, S. (2015). *The Changing Rice Production in ASEAN Countries.* Presentation at the Thai Rice Foundation under Royal Patronage National Conference. Kasetsart University, Bangkok. December 14, 2015.

Napasintuwong, O. (2018). *Rice breeding and R&D policies in Thailand*. Food and Fertilizer Technology Center for the Asia and Pacific Region Agricultural Policy Paper. Available at http://ap.fftc.agnet.org/ap_db.php?id=859

Napasintuwong, O. (2017). *The roles of agricultural cooperatives in certification and production of geographical indication rice in Thailand*. Proceeding of the 2017 FFTC-NTIFO International Seminar on Enhancing Agricultural Cooperatives' Roles in Response to Changes in Food Consumption Trends. September 19, 2017. Taipei, Taiwan. Available at http://ap.fftc.agnet.org/ap_db.php?id=793

National Reform Council. (2015a). *Reform Agenda No.14: Agricultural Reform.* Available at http://www.parliament.go.th/ewtadmin/ewt/parliament_parcy/ewt_news.php?nid=30546 (in Thai)

National Reform Council. (2015b). *Special Reform Agenda No.12: Crop Insurance Reform*. Available at http://www.parliament.go.th/ewtadmin/ewt/parliament_parcy/ewt_news.php?nid=30546 (in Thai)

National Statistical Office. (2014). *2013, 2003 Agricultural Census: Whole Kingdom*. Ministry of Information and Communication Technology. Available at http://www.nso.go.th (in Thai)

National Statistical Office. (2009). *2008, 1998 Agricultural Census: Whole Kingdom*. Ministry of Information and Communication Technology. Available at http://www.nso.go.th (in Thai)

Office of Agricultural Economics. (2016, 2017). *Agricultural statistics*. Agricultural Information Center. Available at http://www.oae.go.th (in Thai)

Office of the National Economic and Social Development Board. (2016a). National Income Account. Bangkok, Office of the Prime Minister

Office of the National Economic and Social Development Board. (2016b). *The 12th National Economic and Social Development Plan. Available at* http://www.nesdb.go.th/nesdb_en/main.php?filename=develop_issue

Paopongsakorn, N. and Bunyasiri, I.N. (2017). *Agricultural policy and institutional reforms in Thailand: Experiences, impacts and lessons*. Southeast Asian Agriculture and Development Primer Series 2nd Edition. SEARCA.

Paopongsakorn, N. *et al.* (2013). *Future of Thai Rice: R&D Policy and Strategy.* Reported submitted to Thailand Research Fund. (in Thai)

Poapongsakorn, N. (2011). R&D and Performance of the Thai Agriculture and Food Processing Industry: The Role of Government, Agribusiness Firms, and Farmers. In Intal, P.S. Jr., S. Oum, and M.J.O. Simorangkir (eds.), *Agricultural Development, Trade and Regional Cooperation in Developing East Asia*. Economic Research Institute for ASEAN and East Asia (ERIA).

Poapongsakorn, N. *et al.* (2010). *National Science, Technology and Innovation Policy and Plan for Agriculture and Food Industry (2010-2019).* Report submitted to the National Science, Technology and Innovation Policy Office, Bangkok. (in Thai)

Poapongsakorn, N. and Isvilanonda, S. (2008). *Key Policy Issues in Thai Rice Industry: Myth, Misguided Policies and Critical Issues.* Paper prepared for presentation at the Rice Policy Forum, International Rice Research Institute. Los Baños, Philippines, February 18-19, 2008.

Poapongsakorn, N., Anuchitworawong, C. and Mathrsurasuk, S. (2006). The decline and recovery of Thai agriculture: causes, responses, prospects and challenges. In *Rapid Growth of Selected Asian Economies: Lessons and Implications for Agriculture and Food Security.*

Republic of Korea, Thailand, and Viet Nam. FAO Policy Assistance Series 1/3, Bangkok: FAO.

Suwannaporn, P. and Linnemann, A. (2008). Rice-eating quality among consumers in different rice grain preference countries. *Journal of Sensory Studies* 23: 1-13.

Suwansri, S., Meullenet, J.F., Hankins, J.A., and Griffin, K. (2002). Preference mapping of domestic/imported Jasmine rice for U.S.-Asian Consumers. *Journal of Food Science* 67(6): 2420–2431.

Thammasat University Research and Consultancy Institute. (2015*). The Rice Department Strategic Plan: 2015-2019*. Report submitted to the Rice Department.

The Rice Trader. (2017). *TRT Special Fragrant Rice Report.* 26 June 2017. Email report serve, July 2017.

Timmer, C.P. (2013). Food security in Asia and the Pacific: The rapidly changing role of rice. *Asia and the Pacific Policy Studies*. 1(1): 73-90.

Timmer, C.P., Block, S. and Dawe, D. (2010). Long-run dynamics of rice consumption, 1960–2050, In: Pandey, S., Byerlee, D. and Dawe, D., *et al.* (eds.) *Rice in the Global Economy: Strategic Research and Policy Issues for food Security*, 139–74. International Rice Research Institute, Los Banos, Philippines).

Unnevehr, L.J. (1986). Consumer demand for rice grain quality and returns to research for quality improvement in Southeast Asia. ***American Journal of Agricultural Economics***. 68(3): 634-641.

USDA Foreign Agricultural Service. (2017a). *Thailand: Grain and Feed Annual 2017.* GAIN report number TH7032. Bangkok: Global Agricultural Information Network. Available at https://www.fas.usda.gov/

USDA Foreign Agricultural Service. (2017b). *Rice market and policy changes over the past decade*. GAIN report number TH7011. Bangkok: Global Agricultural Information Network. Available at https://www.fas.usda.gov/data/thailand-rice-market-and-policy-changes-over-past-decade

USDA Foreign Agricultural Service. (2016). *Thailand: Grain and Feed Update 2016.* GAIN report number TH6143. Bangkok: Global Agricultural Information Network. Available at https://www.fas.usda.gov/

Van Der Eng, P. (2004). Productivity and comparative advantage in rice agriculture in South-East Asia since 1870. *Asian Economic Journal*, 18(4): 345–370. doi:10.1111/j.1467-8381.2004.00196.x

Wattanutchariya, S. *et al*. (2013). *A study on socio-economic conditions of rice farmers.* Report submitted to National Research Council of Thailand and Agricultural Research and Development Agency. Bangkok, Thailand.

ภาควิชาเศรษฐศาสตร์เกษตรและทรัพยากร

คณะเศรษฐศาสตร์ มหาวิทยาลัยเกษตรศาสตร์ เขตจตุจักร กรุงเทพฯ 10900

Department of Agricultural and Resource Economics
Faculty of Economics, Kasetsart University
Chatuchak, Bangkok 10900 Thailand
Tel: (+66) 2942 8649 to 51
Fax: (+66) 2942 8047
www.agri.eco.ku.ac.th

ARE Working Paper