Rice Production, Prices and Related Policy in Thailand

Nongnooch Poramacom, PhD
Assistant Professor
Department of Agricultural and Resource Economics
Faculty of Economic
Kasetsart University
Bangkok 10900, Thailand

Abstract

Rice is the major export product of Thailand. How did the two different schemes affect to rice? How well prices did transmits among price levels at different selling points? The objectives were to compare farmers' perceptions regarding different schemes, to calculate the return from rice production and to analyze co-integration on rice prices, comparing 5% white rice and 100% grade 2 jasmine rice of Thailand. The results will benefit the Thai rice industry by providing an understanding of the price transmission among price levels at different selling points. The results showed that farmers preferred the income guarantee scheme to the pledging scheme during the period 2010–2012. Since 2003, farmers have received a positive return of rice production. This study applied co-integration analysis to 5% white rice and 100% grade 2 jasmine rice of Thailand using the farm price and the wholesale price, and using the farm price and the FOB price. The farm price was affected positively by the wholesale price and the farm price was affected positively by the FOB price. The estimated coefficients associated with the explanatory variable agreed with a priori expectations, and were statistically significant. Signs of all estimated coefficients agreed with expectations and were statistically significant.

Keywords: co-integration, income guarantee scheme, returns of production, 5% white rice, 100% grade 2 jasmine rice, Thailand

1. Introduction

Rice is the most important agricultural product to Thai people. Rice has been the primary agricultural product exported for a decade; for example, Thai rice exports reached a record 9.00 million tonnes in 2011 when Thailand supplied 28.79 % of the world's rice export—more than any other country (Table 1). Rice has remained the main food source for the Thai people throughout history, as it has for many Asian countries. The rice-related policies proposed by politicians have affected election results. During the period 2010–2011, the then prime minister Apisit Vejchashiva launched the "Income Guarantee Policy" for rice. During the period 2011–2012, Prime Minister Yingluck Shinawatra launched the "Rice Pledging Policy", where the government announced a plan to buy rice from farmers at above-market prices—a scheme that a government member described as a strategy aimed at winning votes. The government enacted the policy and it commenced in the buying stage from October 2011 to February 2012 for the un-milled main rice crop. Economists warned the program would make Thai rice less competitive. However, the government members defended the scheme as a way to generate more income for Thai farmers and help push international prices higher in the process. The government offered to buy un-milled rice at THB 15,000 tonne[-1] (USD 482.60) which represented a 50% premium on the current market rate. In addition, the supply of Thai rice was limited for two reasons: Thailand lost about 20% of its main crop due to flooding in 2011 and secondly, another 25% of its harvest was procured by the government scheme. Thailand has long been the world's biggest rice exporter, but most experts concluded it had lost that title in 2012, in large part because of the government's procurement program had pushed Thai rice prices above international levels. This resulted in Thailand being only the third highest rice exporter behind Vietnam and India. Thai rice exports from January through mid December decreased 40 % in volume and 25% in value year-on-year. In 2012, the January-November export volume reached 6.4 million tones and it valued at Bt135 billion, compared to 10.1 million tonnes at Baht178 billion during the comparable period in 2011(Thai Rice Exporters Association, 2013). India toppled Thailand for the first time in three decades to emerge as the top rice exporter.

According to the US Department of Agriculture's, India exported 9.75 million tonnes rice in 2012, beating Thailand, which could ship only 6.5 million tonnes, being to the third exports after Vietnam(The Economic Times, 2013).

Table 1 and figure 1 show Thailand's export rice market share in 2011 (when it was the largest rice exporter) was 28.79%, followed by Vietnam, Pakistan and the USA.

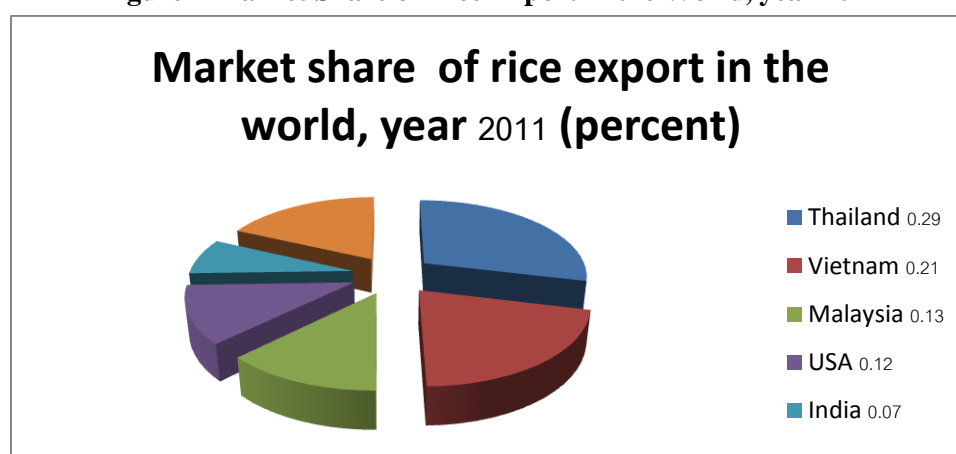**Table 1: World Rice Export, during the Period 2006-2011**

Unit: million tonnes

Country	2006	2007	2008	2009	2010	2011	Market share in 2011(%)
China	1.216	1.340	0.969	0.783	0.600	0,900	2.97
India	4.537	6.301	3.383	2.123	2.200	2.500	7.45
Pakistan	3.579	2.696	3.050	3.187	3.800	2.650	12.87
Vietnam	4.705	4.522	4.649	5.950	6.200	5.800	21.00
U.S.	3.260	3.003	3.219	2.983	3.525	3.550	11.85
Thailand	7.494	9.193	10.210	8.620	8.500	9.000	28.79
Total	29.098	31.851	29.749	29.219	29.526	30.280	

Source: 1) World Grain Situation and Outlook, USDA, November 2010.
      2) Office of Agricultural Economics and Department of Custom Thailand

Most economist and stakeholders (except politicians and farmers) know that if Thailand and Vietnam market shares are combined, they amount to about 50% of world rice exports. There are many rice export countries such as Pakistan, the USA, India, China, and Indonesia. Thailand as the first rice exporter, however, may not have much power to control price and supply since there are many rice-exporting countries and these countries can grow more rice to compete with increased Thailand prices. Moreover, rice can degrade after being stockpiled for some period. The pledging scheme, by increasing the domestic price, may not induce higher export prices. Other exporters, for example Vietnam, may gain a greater market share of Thailand's rice exports. Table 2 shows the volume of Thai rice export during the period 2011-2012. It is found that the volume of Thai rice export declined from year 2011 to year 2012. Table 3 shows the domestic demand and supply of Thai rice during the period 2006−2012. Domestic demand mainly was for seed, consumption, feed industry and other.

Figure 1 Market Share of Rice Export in the World, year 2011

Source: 1) World Grain Situation and Outlook, USDA, November 2010.
      2) Office of Agricultural Economic and Department of Custom Thailand

Table 2: Volume of Thai Rice Export during the Period 2011-2012

Unit: 1,000 tonnes

	2011	2012	Growth rate
January	920.79	439.58	-0.52
February	970.5	616.13	-0.36
March	1,123.37	593.65	-0.47
April	947.42	591.08	-0.37
May	1,194.91	684.21	-0.42
June	1,168.68	516.74	-0.55
July	989.06	499.2	-0.49
August	867.49	508.25	-0.41
September	824.43	549.62	-0.33
October	603.75	740.13	0.22
November	469.59	640.67	0.36
Total	10,080.03	6,379.29	-0.36

Source: www.thairicemillers.com

Table 3: Domestic Demand and Supply of Thai Rice from 2006 to 2012

Unit: million tonnes

	Un-milled rice production	Un-milled rice demand	Export(Un-milled rice)	Export(rice)
2006	30.29	15.91	11.35	7.49
2007	29.64	16.26	13.92	9.19
2008	32.09	16.81	15.47	10.21
2009	31.65	17.07	13.06	8.62
2010	32.11	18.36	13.54	8.94
2011	34.48	18.30	15.98	10.55
2012	31.04	19.96	12.87	8.50

Source: Estimated by Office of Agricultural Economics in December 2011, rate of transform by 1:0.66.

The income guarantee scheme set up a reference price of un-milled rice every week. If farmers sold their rice for less than that reference price they would receive compensation equal to the price difference. Based on the rice pledging scheme, the government set up a pledging price, which was higher than the market price. Under the new scheme, farmers are encouraged to use rice as collateral against loans from the state-owned Bank for Agriculture and Agricultural Cooperatives (BAAC). In fact, because the received price under the scheme was higher than the market price, no farmer would withdraw from the government scheme. One of the fundamental differences between the two schemes is that under the old scheme, farmers were guaranteed a minimum income based on the amount of rice they normally produced, even if their crop underperformed because of floods or any disease or even if farmers consumed all their rice without selling any. With the pledging scheme, farmers need to deliver un-milled rice before they get paid any money.

The pledging scheme has been implemented since October 2011. This research studied the different rice policies for their effects and impacts on cooperatives and exporters. Two agricultural cooperatives and two exporters were interviewed to obtain their views on the two different schemes: the income guarantee scheme and the pledging scheme. The results provide stakeholders with feedback on the policy implementation of each scheme. The research conducted co-integration analysis on prices at the farmer, wholesale and free on board (FOB) price levels.

Objectives

The objectives of this study were to:

1) compare the perceptions of agricultural cooperatives and exporters regarding the different rice schemes
2) calculate the return on rice production
3) analyze co-integration of rice prices

2. Literature Review

Nkang N.M. et al. (2006) examined rice production, imports and food security in Nigeria by analyzing the determinants of rice import demand from 1970 to 2002. They applied an estimation procedure that made use of co-integration and the error correction model (ECM). They showed that short-run changes in domestic rice production, the level of external reserves and total imports value remarkably shaped rice import behavior in Nigeria. Campche L. Jody et al. (2006) applied co-integration to investigate the cost price squeeze in agriculture and to determine the level of inflation passed through agricultural prices. They found that the null hypothesis of co-integration between price paid and price received could not be rejected in the long run. After accounting for technology improvements and efficiency gains, the price paid and price received moved together in a one-to-one ratio in the long run. Rodrigo Saens N. et al. (2008) estimated the causality relationships that governed the product, employment and salaries in the Chilean silviculture-agricultural-livestock sector using a co-integration approach. Quarterly data from 1996 to 2005 were used to estimate agricultural labor demand. They found that demand for agricultural labor has long run employment product and employment salary elasticities of 0.38 and -0.88, respectively. Okoroafor et al. (2010) estimated demand for fertilizer in Nigeria using an application of co-integration and error correction modeling. They found the demand for fertilizer exhibits a stable long run equilibrium relationship with its relative price and other explanatory variables. Fertilizer demand adjusts to the long run equilibrium path slowly following disturbance and shocks. Kalmarzi et al. (2011) applied Granger causality and a co-integration test for fertilizer consumption and agricultural value added growth in G8 countries. Their results showed that agricultural value-added growth did not cause increased fertilizer consumption, and fertilizer consumption did not cause agricultural value-added growth at the 10% significance level. A long run relationship existed between fertilizer consumption and agricultural value-added growth. Poramacom N. (2013) applied co-integration analysis on maize in Thailand. She found that the farm price was affected positively by the wholesale price and the farm price was also affected positively by the FOB price. The estimated coefficients associated with the explanatory variable agreed with a priori expectations and were statistically significant. The current study used the method of Nkang N.M. et al. (2006), Campche L. Jody et al.(2006), Rodrigo Saens N. et al.(2008) and Kalmarzi et al.(2011) for co-integration analysis. Similar to the Poramacom N. (2012) study, the current study applied monthly data from 2007 to 2011.

3. Methodology

Data

In depth interviews were conducted with two agricultural cooperatives and two exporter opinions on the income guarantee scheme and the pledging scheme. Monthly data on farm price, wholesale price and FOB prices from 2007 to 2011 were used in the analysis. Prices were expressed in current terms on a common unit basis of 1,000 kilograms for 5% white rice and 100 kilogram for jasmine rice. These rice types were selected because of their high export values. The data were taken from various publications and websites of the Department of Agricultural Economics of Thailand, the Department of Interior Trade of Thailand and the Department of Customs.

Analysis

The research compared the perceptions of cooperative and exporter representatives regarding the different schemes. The performance of the rice income guarantee scheme was examined for the period 2009–2011. The study estimated the price transmission from different points of sale using unit root and co-integration methods.

Modeling

Co-Integration Tests

The first step involved determining which variables are stationary and non-stationary at the different sale levels. The Augmented Dickey and Fuller test (ADF) developed by Dickey and Fuller (1979 and 1981) was used for a unit root test on all variables. The null hypothesis of a unit root is rejected if the variable is stationary. To determine the long-term relationship between the farm price and the wholesale price and the farm price and the FOB price, the two step procedure of Engle and Granger (1987) was employed. First, a simple linear model was estimated using ordinary least squares analysis and then the residues were tested for the stationary condition. Then, the Johansen co-integration test, based on the Dickey-Fuller procedure, was used to determine the number of co-integration equations. Co-integration methods are useful when time series data are non-stationary and a conventional model would encounter the problem of spurious regression (Harris, 1995).

Long Run Co-Integration

$$P_{fi} = a + bP_{wi} + e_{ii} \qquad (1)$$
$$P_{fi} = c + dP_{fobi} + e_{ii} \qquad (2)$$

Short run co-integration

$$\Delta P_{fi} = f + g\Delta P_{wi} + h\varepsilon_{it-1} \qquad (3)$$
$$\Delta P_{fi} = j + k\Delta P_{fob2} + l\varepsilon_{it-1} \qquad (4)$$

Where P_{fi} = farm price

P_{wi} = wholesale price

P_{fobi} = FOB price

i refers to either 5% white rice or 100% grade 2 jasmine rice.

4. Results and Discussion

In depth interviews with members from the two agricultural cooperatives were undertaken in January 2012 in Suphan Buri province. The agricultural cooperative in Mueang district had not joined the pledging scheme in 2012 because most farmers were still involved with the income guarantee scheme. Thus, the cooperative was operating according to its usual business practices. The agricultural cooperative in Don Chedi district had joined the pledging scheme. This cooperative had un-milled rice purchasing capacity of 1,000 tonnes. The vice president of the cooperative believed that an un-milled rice pledging price of USD 500 for white rice was too high. Generally, approximately USD 300 was considered reasonable for trade. He suggested using the government's pledging scheme should sell all its rice within one year. In depth interviews were conducted with one exporter each in Suphan Buri and Patum Thani provinces for both the income guarantee and pledging schemes. Exporters in Patum Thani province believed the income guarantee scheme should be better than the pledging scheme because the pledging prices were higher than the market price it would induce illegal un-milled rice from neighboring countries to be added to the program. The management process is complicated. For example, each farmer has to transport un-milled rice to the rice mill and then obtain a ticket from the rice mill and present this to the BAAC bank. The rice mills have to process the un-milled rice into rice and deliver it to the storage location. Then, the government has to stock the rice for some years at a large storage cost and because of the long storage time, the rice becomes degraded and thus can only be sold for a low price. Generally, the government could lose about USD 3,000 million each year. Throughout the pledging process, many people can act in a misleading manner that may lead to corruption. On the other hand, exporters in Suphan Buri province believed that the income guarantee scheme let all stakeholders participate fairly in rice trade. A higher export price for Thai rice may lead to a loss of world market competitiveness. However, the exporters believed that the income guarantee scheme has some weaknesses; for example, the exporters could offer a lower price than the market price since the government would pay the difference to farmers anyway. Moreover, the pledging scheme can absorb the un-milled rice supply from the market and induce a higher price. Furthermore, if the government sells rice using a government-to-government technique, then the rice may be sold more quickly or be used in exchange for vehicles, airplanes or weapon etc.

Table 4 shows that 3,128,000 farmers were involved in the income guarantee scheme for rice during the period 2010-2011 of which 2,035,000 were in northeast Thailand. The total government budget for the policy used USD 1,197.40 million and each farmer received a payment of approximately USD 382.8.

Figure 2 shows the monthly price for 5% Thai white rice between 2007 and 2012. Prices peaked in 2008 due to the world food crisis at that time. The farm price of un-milled rice reached THB 15,000 tonne[-1] in September 2011 and then declined to THB 10,000. The wholesale and FOB process remained similar in 2010 and 2011. In 2012, all prices increased slightly due to the pledging scheme.

Table 4: Performance of Income Guarantee Scheme for Rice between 2010 and 2011

Region	Number of farmer (thousand)	Amount (USD million)	Average (USD person⁻¹)
North	611	306.50	541.60
Northeast	2,035	619.60	304.40
Central	371	245.40	661.40
South	110	25.80	234.50
Total	3,128	1,197.40	382.80

Source: Bank for Agriculture and Agricultural Cooperatives.

Figure 2 Price of 5% Thai White Rice, during the period 2007-2012
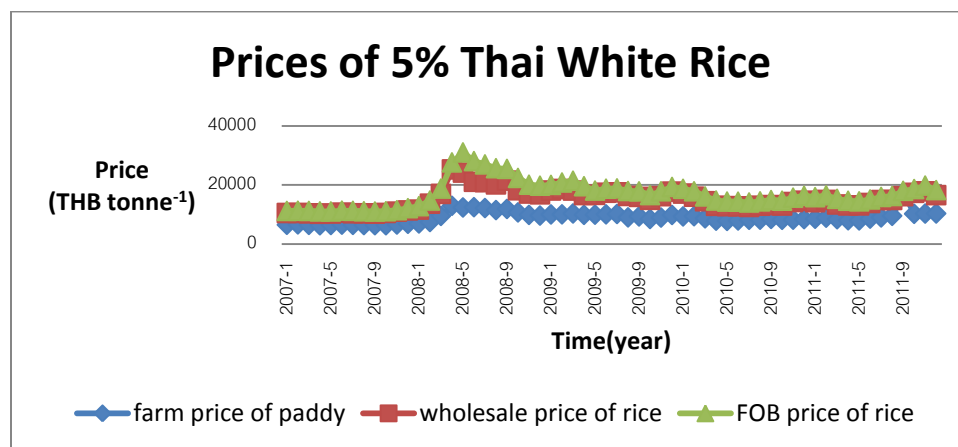
Source: Office of Agricultural Economics, Department of Interior Trade and Department of Custom, various issues.

Figure 3 shows the monthly price of 100% grade 2 Thai jasmine rice during 2007−2012. Prices peaked in December 2011 when the farm price of un-milled rice reached THB 15,000 tonne^{-1}. Wholesale and FOB prices had remained quite high since 2008 because jasmine rice is a premium export grade. The wholesale prices approximately ranged from THB 20,000 to 30,000 tonne^{-1} and the FOB prices approximately ranged from THB 20,000 to 40,000 tonne^{-1}. Similarly, in 2012, prices for 5% white rice increased slightly due to the pledging scheme. However, the export volume had declined from 10,080 thousand tonnes in 2011 to 6,379.29 thousand tonnes in 2012.

Figure 3: Price of 100% Grade 2 Thai Jasmine Rice, during the period 2007-2012
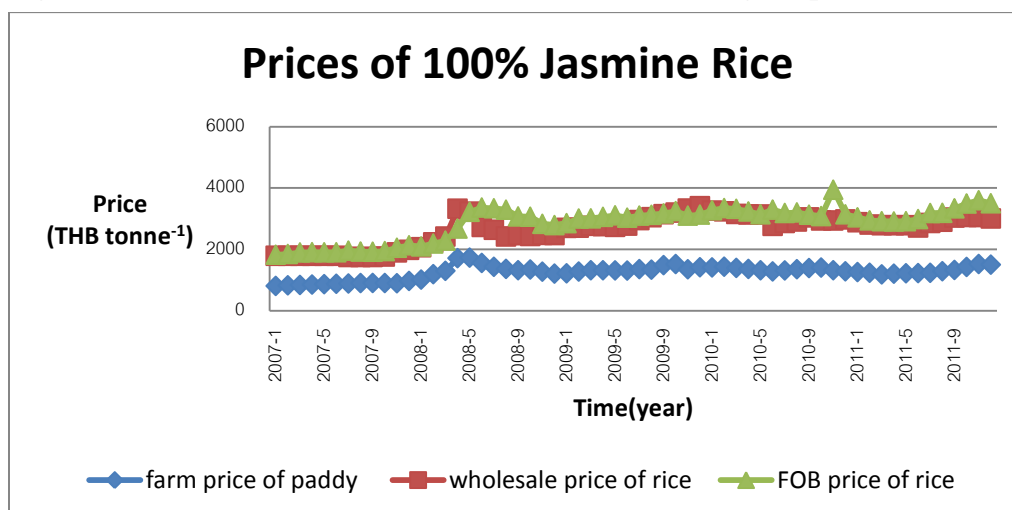
Source: Office of Agricultural Economics, Department of Interior Trade and Department of Custom, various issues.

Return Analysis

The fixed cost for main crop rice in the period 1997/98-2011/12 increased slightly but the variable cost increased from USD 196.38 hectare[-1] in 1997/98 to USD 689.91 hectare[-1] in 2011/12. The growth rate in the total cost was fairly steady at about 19% since 2001/2002 until it climbed to 54% in 2008/09 before returning to the former level of 19% in 2011/12. This corresponded to the fact that Thai farmers depended more on machinery, herbicides and hired labor than in the past (Table 5). For the second rice crop rice period of 1997/98-2011/12, the fixed cost hectare[-1] increased slightly but the variable cost hectare[-1] increased from USD 42.64 in 1998 to USD 125.25 in 2011. The second crop growth rate in total cost increased from 16% in 2001 and reached 54% in 2007 and then declined to 13% in 2011. Tables 5 and 6 show the growth rate in the total cost increased for both the main crop and the second crop.

Table 5: Variable Cost, Fixed Cost and Growth Rate of Main Crop

		Unit: USD hectare[-1]		
year	variable cost	fixed cost	total cost	growth rate of total cost
1997/98	196.38	36.01	232.39	
2000/01	240.78	36.01	276.79	0.19
2003/04	285.06	38.02	323.08	0.17
2006/07	402.08	41.66	443.74	0.37
2008/09	609.96	75.32	685.28	0.54
2011/12	689.91	124.59	814.50	0.19

Source: Office of Agricultural Economics and calculated, 2011.

Table 6: Variable Cost, Fixed Cost and Growth Rate of Second Crop

		Unit: USD hectare[-1]		
Year	variable cost	fixed cost	total cost	Growth rate of total cost
1998	266.51	54.16	320.67	
2001	312.33	59.53	371.86	0.16
2003	351.73	68.40	420.13	0.13
2007	573.86	74.62	648.48	0.54
2008	755.49	98.29	853.78	0.32
2011	782.86	185.88	968.74	0.13

Source: Office of Agricultural Economics and calculated, 2011.

Table 7: Yield, Cost and Return of Main Crop

	2002	2004	2006	2008
Yield(kilogram/hectare)	2650.00	2637.50	2668.75	2668.75
Variable cost(USD tonne[-1])	86.68	102.62	144.75	219.58
Fixed cost(USD tonne[-1])	12.96	13.68	15.00	27.11
Total cost(USDtonne[-1])	99.64	116.30	159.75	246.69
Farm price(USD tonne[-1])	179.19	217.45	238.51	310.06
Net return(USD tonne[-1])	79.55	101.15	78.76	63.37

Source: Office of Agricultural Economics and calculated, 2011.

In 2002, the variable and fixed costs were USD 86.68 and USD 12.96 tonne[-1], respectively, and these costs increased to USD 119.58.62 and USD 27.11, respectively, in 2008. The yield increased slightly from 2650.00 kilograms hectare[-1] in 2002 to 2668.75 kilograms hectare[-1] in 2008. Table 7 shows Thai rice production between 2002 and 2008 when farmers received a positive net return.

Co-Integration Analysis

Farm price was affected positively by the wholesale price and the FOB price. The estimated coefficients associated with the explanatory variable agreed with a priori expectations, and were statistically significant at levels ranging from 1%, to 5 % to 10 %. The signs of all estimated coefficients agreed with expectations and were statistically significant (Table 9).

Table 8: Unit Root Test

Variable	I(0) Test-statistic With constant and trend	At first different: I(1) With constant and trend
5% white rice		
P_f	-2.4452	-6.6534***
P_w	-2.4487	-5.2499***
P_{FOB}	-2.7022	-4.7495***
100% grade 2 jasmine rice		
P_f	-2.6143	-4.5350***
P_w	-2.3154	-5.2984***
P_{FOB}	-2.1194	-5.3330***

***Denote statistically significant estimates at $p < 0.01$ level.

5% white rice

Long Run Co-Integration

The long run coefficient of the farm price and wholesale price and the long run coefficient of the farm price and FOB price was 0.4868 and 0.360, respectively, which indicated that if the wholesale price of 5% white rice changed by THB 1, then the farm price would change by THB 0.4868 in the same direction. Similarly, if the FOB price of 5% white rice changed by THB 1, then the farm price would change by THB 0.3601 in the same direction.

Short Run Co-Integration

For 5% white rice, the short run coefficient of the farm price and wholesale price and the short run coefficient of the farm price and FOB price was 0.4400 and 0.3587, respectively, which indicated that if the wholesale price of 5% white rice changed by THB 1, then the farm price would change by THB 0.4400 in the same direction. The ECM coefficient suggests that the speed of adjustment of the model was -84.23%. The negative sign implies that the adjustment would cause the system to gradually convert to equilibrium. Similarly, if the FOB price of 5% white rice changed by THB 1, then farm price would change by THB 0.3587 in the same direction. The ECM coefficient suggests that the speed of adjustment of the model was -77.30%. The negative sign implies that the adjustment would cause the system to gradually convert to equilibrium.

100% Grade 2 Jasmine Rice

Long Run Co-Integration

The long run coefficient of the farm price and wholesale price and the long run coefficient of the farm price and FOB price was 0.3876 and 0.3450, respectively, which indicated that if the wholesale price of 100% grade 2 jasmine rice changed by THB 1, then the farm price would change by THB.0.3876 in the same direction. Similarly, if the FOB price of 100% grade 2 jasmine rice changed by THB 1, then the farm price would change by THB 0.3450 in the same direction.

Short Run Co-Integration

For 100% grade 2 jasmine rice, the short run coefficient of the farm price and wholesale price and the short run coefficient of the farm price and FOB price was 0.3565 and 0.1120, respectively, which indicated if the FOB price of 100% grade 2 jasmine rice changed by THB 1 then farm price would change by THB 0.3565 in the same direction. The ECM coefficient suggested that the speed of adjustment of the model was -16.32%. The negative sign implied that the adjustment would cause the system to gradually convert to equilibrium.

Similarly if the FOB price of 100% grade 2 jasmine rice changed by THB 1, then the farm price would change by THB 0.1120 in the same direction. The ECM coefficient suggested that the speed of adjustment of the model was -18.27%. The negative sign implied that the adjustment would cause the system to gradually convert to equilibrium.

Table 9: Long Run Coefficient and Short Run Coefficient

	Long run coefficient	R^2	Short run coefficient	R^2
5% white rice				
Farm price and wholesale price	0.4868***	0.7149	0.4400**	0.5103
T statistic from Augmented Dickey-Fuller test	-4.7091***	0.4231		
ECM coefficient			-0.8423***	
Farm price and FOB price	0.3601***	0.6933	0.3587***	0.4742
T statistic from Augmented Dickey-Fuller test	-4.1629***	0.3866		
ECM coefficient			-0.7730***	
100% grade 2 jasmine rice				
Farm price and wholesale price	0.3876***	0.7900	0.3565***	0.5673
T statistic from Augmented Dickey-Fuller test	-2.2427**	0.0810		
ECM coefficient			-0.1632**	
Farm price and FOB price	0.3450***		0.1120**	0.1104
T statistic from Augmented Dickey-Fuller test	-3.2321***	0.1664		
ECM coefficient			-0.1827*	

*$p < 0.1$
**$p < 0.05$
***$p < 0.01$

5. Conclusion and Recommendations

Two agricultural cooperatives and two exporters interviewed pointed out some weak points of the pledging scheme; for example, the tendency for Thailand to lose its position as the top rice exporter in the world, and the problems of rice stock management and selling. This study applied co-integration analysis to 5% white rice and 100% grade 2 jasmine rice in Thailand using the farm price and wholesale price, and using the farm price and FOB price. The farm price was affected positively by the wholesale price and the farm price was also affected positively by the FOB price. The estimated coefficients associated with the explanatory variable agreed with a priori expectations and were statistically significant. The signs of all estimated coefficients agreed with expectations and were statistically significant. The coefficients of the farm price with wholesale price and of the farm price with FOB price were both higher for 5% white rice than for 100% grade 2 jasmine rice, indicated that the price transmission in the case of 5% white rice was more efficient than for 100% grade 2 jasmine rice.

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