The Situation and Trend of Thai Rice Exporting to The United States of America from the Year 2019 - 2023

Somyos Avakiat

Business Administration Faculty, North Bangkok University, Bangkok, 10220, Thailand

Abstract

Research results found that the production situation of Thai rice and Thai rice exporting to The United Stated of America (USA.) according to objective 1, Thailand had a growing area of rice growing every year, but in the production year 2014-2015 with less arable land. The production decreased from the production year 2013 due to the effects of drought. But the production year 2016 - 2017, the area of cultivated land was increasing again and the decreased production also increased from the production year 2016. For the situation of Thai rice exporting to USA. USA had the third largest demand for rice from the world market in year 2019 and had been the number one rice exporter from Thailand. The purpose of this research is (1) to study the production situation and Thai rice exporting to the United States of America using the secondary data regarding production and exports, using descriptive statistics in data analysis (2) to analyze trends and forecast Thai rice exporting to USA. by using the time series export data quarterly from year 2009 – 2018. In the analysis of trends and forecasting Thai rice exporting to USA. in the next 5 years using power analysis by Decomposition method, quarterly export value data from year 2009 - 2018, a total of 40 quarters, and decomposition in terms of product multiplied by Trend, Seasonal Variation, Cyclical Variation, Irregular Variation and use the value received to forecast the export value in the year 2019 – 2023 for a long time with the most rice being imported from Thailand during year 2015 – 2019. The results according to objective 2: Forecasting the trend of Thai rice exporting to USA. found that the trend of Thai rice exporting to USA. had been increasing trend due to the increasing demand for consumption.

Keywords: Thai Rice Exporting, Trend, Decomposition Method,

Background and Statement of the problem

Thailand, the agricultural sector is considered to play a very important role in the economy and life of Thai people. Therefore, source of income and markets for other economic sectors, such as the production of raw materials for food and fiber to industrial factories, source of employment, source of income for people in rural areas, a source of income from exports and a product market of other economic sectors etc. From the above role, it can be seen that the agricultural sector can generate income both domestically and internationally. There are many types of agricultural market structure. The farmers themselves are usually the ones who take the price while the production quantity depends on external factors such as weather conditions. Prices of agricultural products will fluctuate all the time. In addition, the most of the farmers themselves have relatively low education, which often causes disadvantage, resulting in the state to intervene in both production and marketing in order to help reduce the problems through various plans such as Agricultural Development Plans or National Economic and Social Development plans and so all. The major obstacle to the expansion of the agricultural sector is the particular climate variation. Before year 2011, Thailand was one of the world's high-value rice exporters, but since year 2011 onwards, until year 2018, it was found that Thailand's major competitor is India. The world's number one rice exporter to replace Thailand make Thailand become the world's second-largest rice exporter, while Vietnam and Pakistan become the third and the fourth respectively which affect market share [1]. Due to domestic and external factors, the domestic factor comes from the change in rice policies along with the setting of demand targets in order to bring the whole rice supply into the system compiled by the government in order to stabilize the price level of rice. But to implement this policy, the government requires a large amount of budget to use and the cost of rice exports from Thailand is higher than other countries. Causing the price level of Thai rice exported to be higher than the competitors. However, even though Thailand has internal

and external problems, Thailand still has strengths in long-term international acceptance in the quality of Thai rice which reflects the capability of production, production process and the further development of knowledge in terms of processing. In addition, Thailand has increased the population at that time causing the amount of demand for rice to increase. In addition, the development of communication makes Thai food known and easily accessible because of the popularity of Thai rice. Important risk factors for Thai rice are production depends on weather conditions. An important production costs are fertilizer. If fertilizer prices increase, production costs must also increase also.

From the above reasons, it is both an opportunity and a risk in terms of Thai rice, therefore being an incentive to conduct research on Thai rice export to USA. At the same time, it is necessary to estimate the forecast of Thai rice exports to USA. in order to be used for forming the further strategies and developing production and export development plans of Thailand.

Objectives

1. To study the production situation and Thai rice exporting to USA.
2. To forecast Thai rice exporting to USA. on a quarterly basis using time series techniques by Decomposition method.

Expected benefits

1. For information on the planning and development of Thai rice exporting to the world market in the future.
2. For preliminary information on the decisions of Thai rice exporters in the future export strategies planning.

Conceptual Framework

Time Series Analysis is the study of the movement of a particular set of data according to a certain period of time. The time series analysis, such as the amount of rice production or the amount of rice exports each year during a certain period, may be a year 2007 - 2015, etc. These data found that when the time has changed, the data value would also change. It is the study of various variables that change with time or function and time. [2]

$$Y = f(t)$$

Where, Y is a Dependent Variable such as income, production, trade balance etc.
t is an independent variable (Time variable is year, quarter, month,…)

1. Time series components [3]

1.1 Trend (T)

Trend is the change in time series data in the long run. Whether there is a tendency to increase or decrease. The time period for which the trend can be seen is no less than 10 periods, in which the trend may be linear or nonlinear.

1.2 Seasonal Variation (S)

Seasonal variation is the change of time series data in the short term, not more than 1 year, may change convert each day, week, or month, with the change pattern occurring repeatedly.

1.3 Cyclical Variation (C)

Cyclical variation is the change in time series data that occurs in the long term, like trend values but the form style is not the same. Each cycle consists of 4 phases, namely the prosperous economy, contraction economy, downturn economy and recovery economy with circulation. Which will be similar to seasonal fluctuations, but from one cycle to another, the cycle will be longer and unpredictable, therefore difficult to predict.

1.4 Irregular Variation (I)

Irregular variation is the change of time series data that happened accidentally such as natural disaster or strikes, etc. In addition, the abnormal movement also includes any changes that cannot be classified as changes in all 3 parts above.

2. Time series model [4]

Data in that series can be written to show the four components. It can be in many forms but it is popularly in 2 types, which are; -

1) Additive Model

$$Y = T + S + C + I$$

2) Multiplicative Model

$$Y = T \times S \times C \times I$$

Where Y = The value of the time series at the point of time t
T = Trend value
S = Seasonal variation values
C = Cycle variation values
I = Irregular variation value

In this research chose the Multiplicative Model.

The differences between the two models are as follows

If the model is an additive model, the values of each component are independent of one another. But if it is like multiplicative model, the value of each component will affect. If the model is additive model, all 4 components will have units according to the data obtained. But if the model is in the form of multiples, only T will have the units according to the data obtained. S, C, I will be in percentage or index. C and I tend to go together. In economics or business commonly used in the multiplicative model, in which each component has an effect on each other since variables change when changing, they always affect other variables. Time series data in each set does not need to consist of all 4 components. Some data sets may only have 3 parts; T, S, C only.

Forecasting Technique by Decomposition Method

It is a technique used to separate components or movements from time series. In economics, it is used as Multiplicative Model.

Step 1: Analyze and separate the influence of each component.

From time series data Separating the influence of all 4 components; Trend (T), Seasonal variation (S), Cyclical variation (C), Irregular variation (I), which the most popular models are

$$Y = T \times S \times C \times I$$

Step 2: Forecasting

When able to separate and calculate the influence of each component of the data in the past. Can be forecasted for each component in the time period and the year that the forecast is needed Multiply those values together. But since I is the movement value which is unpredictable and therefore not used for future forecasting.

Separating each component of time series

- Calculation of trend values (Trend: T)

The trend value tells the direction of the data whether there is a tendency to increase or decrease in the long run. Analyzing trend values and therefore tend to use annual data from 10 years or more. To calculate trends First of all, must bring that time series data to write the graph first. With the vertical showing the serial data, the horizontal axis shows the duration. Then will give a broad overview of what the data looks like. If having a rather straight line appearance. The analysis will also replace Straight line equations and estimate the trend from that line equation and if there is no straight line feature. Analysis may be represented by different equations such as Linear, Logarithmic, Exponential, Cubic, Quadratic, Compound or Power etc.

- Calculation of seasonal variation (S)

Analyzing seasonal variation is as important as with the trend value. Calculation seasonal movement removes T, C, and I from the series, which, when organized by the influence of other changes, will receive seasonal movement. Most popularly displayed in percentage or index format which is called "Seasonal Index" (Seasonal Index).

- Calculation of cyclical variation (C)

From the Moving Average (MA) calculated during the seasonal variation means the components of trend values (T) and cyclical activity (C) or (T x C). Therefore, if you can find trend values, then it takes the trend divided by the moving average. The result is cyclic activity (C) as needed.

$$MA = T \times C$$

$$\frac{MA}{T} = \frac{TxC}{T} = C$$

- Calculation of Irregular Variation (I)

Calculation for unstable or irregular movement. To do so, by dividing T, S, and C values which calculated in the above steps to divide the time series data to get the I value as follows:

$$\frac{Y}{TxCxS} = \frac{TxCxSxI}{TxCxS} = \frac{SxI}{S} = I$$

After analyzing the influence of each component of time series data in the past. To predict future values, it is assumed that future events will be the same as in past events. This technique is achieved by substituting the predictive values of each component into a time series component model with no uncertain movement (I) included.

Research Methodology

To study the situation of production and Thai rice exporting using the data of production year 2009 - 2018 from the Office of Agricultural Economics and websites International Trade Center (ITC), including forecasting the trend of Thai rice exporting to USA. by using Time Series Analysis, which is analyzed from Secondary Data, quarterly statistics from the first quarter of 2009 to the fourth quarter of 2018, totaling 40 quarters or 10 years, collecting data from websites International Trade Center (ITC). The results from the analysis and forecasting will comes to a conclusion and discussion further.

In predicting the trend of Thai rice exporting to USA. from the year 2019 – 2023 with multiplicative model by decomposition method.

1. Time Series Analysis uses the data quarterly from the first quarter of year 2009 to the fourth quarter of year 2018 to analyze the trend of the value of Thai rice exporting to USA. by using component separation methods. Bring the value of rice exports quarterly year 2009 - 2018, collected from the analysis for T, S, C and I by separating components from time series data and finding the equation.

2. Analysis of the separation of components T, S, C and I from the value of Thai rice exporting to USA. with the following methods

2.1 Find the trend (T) by estimating for the coefficient of decision making and use the coefficient of decision-making as an option to find the equation that is most suitable for the data by using statistical software packages.

2.2 Statistical program will specify S, I and T x C values, therefore get S and I.

2.3 Find the trend (T) from the equation to get the trend (T).

2.4 Then, calculate cycle (C) by dividing the obtained T value by the derived T value divided by the T x C calculated with the program to get the C value. For the forecasting in this research, C and I have not been calculated because it will cause more uncertainty in forecasting.

Research Results

Rice is the main crop being cultivated in every region of the country and an important export economic crop of Thailand in terms of rice production. From year 2009 - 2018, Thailand has a growing area of rice continuously every year, but in the production year 2014 – 2015 with less arable land. The production decreased by 3.04% from the production year 2013 due to the effects of drought. Production year 2016 - 2017 increased planting area and the reduced output increased 5.05% from the production year 2016 [5].

The situation of Thai rice exporting to USA. The United States has the third largest demand for rice from the world market in year 2019 and has been the number one rice exporter from Thailand for a long time. In the last 5 years, Thai rice has been exported to the United States on average worth 513.039 thousand US dollars.

Table 1 show the USA.'s rice import value from the first five ranking countries year 2015 – 2019

Imported from	Rice Importing Value of USA. (Thousand US dollars)					
	2015	2016	2017	2018	2019[a]	Average
Thai	464,283	416,895	425,043	579,586	679,386	**513,039**
India	177,711	169,066	185,980	224,747	242,973	**200,095**
Pakisatan	40,386	30,466	29,336	33,642	40,811	**34,928**
China	6,009	4,841	9,627	29,219	23,598	**14,659**
Brasil	14,754	19,445	14,499	23,832	20,856	**18,677**

[a]Rough figure
Source: Calculating from International Trade Centre

The variation of Thai rice exporting value to the United States of America

Table 2 show Thai rice exporting value to The United States of America on quarterly from year 2009 - 2018

Units: Thousand US dollars

Year	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
2009	100,421	79,385	88,327	113,578	381,711
2010	97,973	97,407	93,069	161,747	445,196
2011	93,185	94,143	170,850	135,600	493,778
2012	91,449	93,680	101,126	120,964	404,219
2013	122,009	101,424	101.782	127,024	452,239
2014	104,989	109,673	102,713	127,642	445,017
2015	117,783	102,072	85,560	100,806	406,221
2016	106,978	90,769	106,657	120,614	425,018
2017	142,417	154,118	134,290	149,168	579,993
2018	171,090	166,102	157,984	184,210	679,386

Source: ITC calculations based on UN COMTRADE statistics until January, 2019

Using SPSS for windows program for time series analysis, extract T, S, C and I from the multiplicative model. $Y = T \times S \times C \times I$, which can separate the influence of the following results.

1. Trend

In this research, Power equations are used for analysis the trend of Thai rice exporting to USA. The equation can be shown as shown in Table 3.

Table 3 show the comparing of equation of Thai rice exporting to USA.

Equation	Model Summary					Parameter Estimates			
	R^2	F	df1	df2	Sig	Constant	b1	b2	b3
Linear	.009	1.456	1	38	.104	89,972.342	.683		
Logarithmic	.064	4.311	1	38	.072	98,967.121	.467		
Quadratic	.035	14.049	2	37	.068	65,672.321	12.421	-4.022	
Cubic	.041	9.618	3	36	.054	63,893.121	11.273	-8.335	.775
Compound	.037	16.327	1	38	.041	74,999.369	.061		
Power	.167	2.742	1	38	.016	101,950.400	.158		
Exponential	.018	10.034	1	38	.093	100,664.712	.003		

$$\hat{Y}_{USA.} = aX^{b1}$$

Calculating with Power equation, trend equation is

$\hat{Y}_{USA.} = 101{,}950.400 \text{ X } ^{0.158}$ (Started with 4th Quarter 4th of year 2008)

Whereas $\hat{Y}_{USA.}$ = Forecasting value of Thai rice exporting to USA.

X = Number of quarter

a = Constant
b = Coefficient

2. Seasonal variation

Seasonal variation is one element that makes a movement in time series data. The pattern of change will occur repeatedly in each quarter of every year between year 2009 - 2018 which cause of change may be from that quarter during a natural disaster etc. There are two types of seasonal changes: stable seasons and unstable seasons. From the analysis with SPSS program, it shows the Seasonal Index of the value of Thai rice exporting to USA. as in Table 4.

Table 4 show Seasonal variation of Thai rice exporting value to USA. on quarter of year 2009 – 2018

Year	Quarter 1	Quarter 2	Quarter 3	Quarter 4
2009 – 2018	1.01542	0.94618	0.93054	1.10786

Note: Unit in percentage, calculating from SPSS for windows

The forecasting value of Thai rice exporting to USA. on quarter from year 2019 – 2023

After calculating the seasonal index, the obtained value can be used to predict the value of Thai rice exports to USA. in the year 2019 - 2023 on a quarterly basis by assuming that future events will have the same format as the events received. Taking T and S to multiply based on following form of equation

$$Y = T \times S$$

In this research, only the trend and seasonal index values are used. Cyclical variation cannot be used for analysis since the duration of the study is only 5 years, which is not enough for 1 cycle of movement. Irregular variation is a value which is hard to predict and rather highly uncertain, so they do not used in the analysis. The forecasting value of Thai rice exporting to USA. from the year 2019 - 2023 quarterly form by showing as per Table 5 and Figure 1 respectively.

Table 5 show the forecasting value of Thai rice exporting to USA. on quarterly from year 2019 - 2023

Year	Quarter	Trend (T)	Seasonal Index (S)	Forecasting value of Thai rice exporting to USA. (Thousand US dollars)
2019	1	183,319.55	1.01542	186,146.34
	2	184,018.85	0.94618	174,114.96
	3	184,704.28	0.93054	171,874.72
	4	185,376.41	1.10786	205,371.10
2020	1	186,035.79	1.01542	188,904.47
	2	186,682.96	0.94618	176,635.68
	3	187,318.38	0.93054	174,307.25
	4	187,942.52	1.10786	208,214.00
2021	1	188,555.81	1.01542	191,463.34
	2	189,158.65	0.94618	178,978.13
	3	189,751.41	0.93054	176,571.28
	4	190,334.48	1.10786	210,863.95
2022	1	190,908.17	1.01542	193,851.98
	2	191,472.83	0.94618	181,167.76
	3	192,028.74	0.93054	178,690.43
	4	192,576.21	1.10786	213,347.48
2023	1	193,115.51	1.01542	196,093.35
	2	193,646.90	0.94618	183,224.83
	3	194,170.64	0.93054	180,683.54

4	194,686.95	1.10786	215,685.88

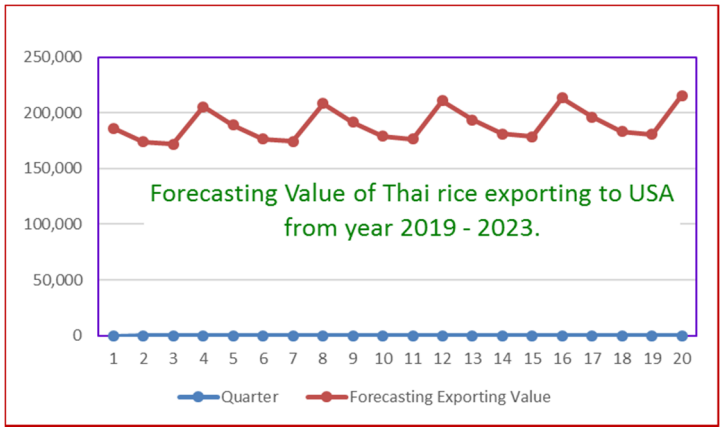

Figure 1 show the forecasting value of Thai rice exporting to USA. on quarterly from year 2019 - 2023

Note: Calculating from SPSS for windows

From the Figure 1 shows the quarterly forecast of the value of Thai rice exporting to USA. from year 2019 – 2023, it can be seen that the trend of the value of Thai rice exporting to USA. has a tendency to increase in the 4th quarter of every year of study and has a tendency decreasing in the 2nd quarter and 3rd quarter of every year too. Since the 4th quarter is the rice harvesting season, therefore, this period has more value and export volume than other quarters. It can be seen that every 4th quarter of year 2019 - 2023 is expected to be exported of Thai rice to USA. a lot. The highest is in the 4th quarter of 2023 with an expected export value of 215,685.88 thousand US. Dollars and there are few exports in the 3rd quarter of every year from 2019 – 2023. The least rice exports is in the 3rd quarter of 2019, with an expected export value of 171,874.72 thousand US. Dollars.

Summary of the Study

Rice is an important export economic crop of Thailand in terms of rice production from year 2009 – 2018, Thailand has a growing area of rice continuously every year. But in the production year 2014 - 2015 with less arable land, the production decreased from the production year 2013 due to the effect of drought, but the production year 2016 - 2017, the area of the plantations returned to increase. Therefore, the production also increased from the production year 2016. For the situation of Thai rice exports to the United States of America, USA. has the 3rd largest demand for rice from the world market in the year 2019 and has been the number one rice imports from Thailand for a long time during the year 2015 – 2019.

Summary of analysis and forecasting trend of Thai rice exporting to USA. From year 2019 - 2023

- Trend of Thai rice exporting value to USA. from the 1st quarter of year 2009 to the 4th quarter of year 2018 for a total of 40 quarters or 10 years, the United States increased at an increasing rate.
- Seasonal variation in the 1st and 4th quarters, the value of Thai rice exports to USA. is rather higher than the 2nd and 3rd quarters due to the rice harvest period, resulting in Thailand's rice production has increased, resulting in increased exports. Coupled with the government's policy to promote rice exports during this period, but the third quarter, the value of Thai rice exports to the United States will fall to the lowest since it's the planting period.
- Cyclical variation of the value of Thai rice export to USA. moves according to the economic cycle of the United States of America. One cycle will take a very long time but will occur repeatedly seasonal movement, in which 1 cycle consists of 4 phases, namely the prosperous economy, contraction economy, downturn economy and recovery economy with circulating.
- Irregular variation value of Thai rice exporting to USA. There are unusual movements all the time, which are high and low export values caused by unforeseen circumstances such as rainy weather or the demand for rice from the United States or the occurrence of an epidemic etc.

Discussions

From the study of production situation, Thai rice exporting to USA. found that according to the objective 1, Thailand had a growing area of rice continuously every year, but in the production year 2014 - 2015, there was a decrease in planting area. The decreased production from the production year 2013 was caused by the drought. But the production year 2016 - 2017, the area of the crop returned to increase and the production increased from the production year 2016 too. For the situation of Thai rice exporting to USA., The United States had the 3rd largest demand for rice from the world market in the year 2019 and had been the number one rice exporter from Thailand for a long time during the year 2015 – 2019. According to objective 2, predicting the trend of Thai rice exporting to USA. found that the above forecast, the trend of Thai rice exporting to USA. had the increasing tendency due to the increasing of consumption demand. From this research, both objectives are consistent with Wuthipong Khunpao's research [6] that studied the trend of Thai jasmine rice exports was the trend of Thai jasmine rice exports in the future for the next 5 years from the year 2013-2017, there would be a trend that would gradually increase in the 4th quarter of every year. Thanaporn Chaiyadej [7] studied about the trend of Thai rice exports to the EU was consistent with this research, namely, the production area and overall rice production in Thailand decreased. Thai rice exports had a higher value continuously including forecasting values of Thai rice exports to the EU in the year 2008 – 2010 was a rising trend also at that period of time. Chonticha Mulluangphet [8] studied on Forecasting monthly trends of Thai rice exports. There was a consistent production situation and the highest trade in Thai rice to foreign countries, then gradually decline. Future trends of Thai jasmine rice exports in the next 5 years and 2 months increased continuously and Warinan Chumprasert [9] also studied the export trend of Thai agricultural products with ASEAN after economic integration which was consistence that the value of Thai agricultural exports to ASEAN countries tends to increase which the trend was higher than before, including economic groups.

Moreover, it is also consistent with the research of Rungruthai Thananchai [10] which has conducted research on Forecasting trend of Thai rice exports to China and the United States of America from the year 2016 – 2020. The objective of this research were (1) to study the situation of production, marketing and export of Thai rice to China and the United States of America which was secondary data in collecting production, marketing and export data, descriptive statistics were used for data analysis. (2) to analyze trends and forecast Thai rice exports to China and the United States which was secondary data in collecting export statistics from the year 2007 – 2015 was an inferential analysis by using time series analysis. In the analysis of trends and forecasting exports milled rice and broken rice to China and the export of brown rice, milled rice and grits to the United States in the next 5 years, The trend of China would use Cubic analysis while the United States would use Power analysis was used for separating the components on quarterly from year 2007 - 2015 for a total of 36 quarters and separating components in the form of multiples through trend values. seasonal variation, cyclical variation and irregular variation Bring the value obtained to forecast the value of exports the year 2016-2020.

Recommendations

1. An important factor that affects the value of international exports product and causes movement to change easily which is exchange rate, so it should also be considered in further research.
2. There are many methods of time series forecasting beside of separating time series components. (Decomposition Method), which may have to do many methods and then compare that method to give more accuracy, then choose to predict by using that method.
3. Forecasting using quantitative methods is the prediction of numbers only. Forecasting data to plan or make decisions should be considered with other factors such as the situation of products in the market and the world situation, etc. It will be help planning and decision making more accuracy.

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