An Analysis of Labour Requirements, Area Harvested and Imports in Malaysia’s Paddy Production.

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Abstract

Paddy planting is a local culture and the way of life for many Malaysians especially for villagers. The cultivation of paddy is also the main traditional livelihood in Southeast Asia. Recently, a collective effort to increase paddy yield in Malaysia has been launched between the Muda Agriculture Development Authority (MADA), Malaysian Agricultural Research and Development Institute (MARDI) and the Agriculture Department in the effort to decrease the need to import rice. This paper analyses three factors affecting paddy production in Malaysia starting from the year 1986 to 2011. In this empirical analysis, a model consists of three independent variables; area harvested, labour and value of imports, has been constructed to show which determinant has more influence on paddy production. The Cobb – Douglas Production Function was used to determine the relationships between these variables and paddy production. The analysis was conducted using E-Views 6 based on several tests such as the Unit Root Test and Diagnostic Test to examine the regression problem and establish the relationships between the variables as mentioned. The findings show that labour has a negative relationship with paddy production while area harvested and imports were positively with paddy production. In assessing the stability of the data in the model, it was found that there is no multicollinearity and no existence of autocorrelation. Based on these results, it has been concluded that the most contributing factor is area harvested which has major effect towards paddy production in Malaysia.

Keywords: area harvested, paddy production, local culture
Introduction

Paddy production in Malaysia needs to be increased due to its growing population. Unfortunately, paddy in Malaysia is produced mainly by farmers with an average farm size of about 1.06 hectares. In 2009, there were only about 116,000 full time paddy farmers from a total of 296,000 paddy farmers across Malaysia. More than 50% of these farmers have farms of less than 1 hectare while only 4% have more than 3 hectares. In order to increase the production of paddy, the Malaysian government has chosen 8 granary areas as permanent paddy producing areas in the Third National Agricultural Policy. Its aim is to realize a minimum self-sufficiency level (SSL) of 65% for rice whereby the SSL was increased to 90% in the year 2010.

Recently, based on a report from The Star newspaper published in October 2011, Malaysia was ranked among the top 10 highest rice consuming nations in the world. Malaysians consume between 2.2 million and 2.3 million tons of rice annually because rice is considered as a daily staple. However, paddy production in Malaysia is not enough to fulfill the aggregate demand because Malaysia only produces about 70% of its total rice needs. The other 30% has to be imported from major rice exporting countries which consist of Thailand, Vietnam and India. In order to establish self-sufficiency and maintain the stability of the price of rice in the market especially during food crisis, Malaysian farmers need to increase the amount of paddy production. Thus, this research was carried out in order to investigate the three main determinants of paddy production in Malaysia which are labour requirements, area harvested and value of imports.

Research Objectives

General Objective:
To analyze labour requirements, area harvested and imports which will affect Malaysia’s paddy production.

Specific objectives:
I. To analyze the relationships between the three stated determinants of Malaysia’s paddy production and the actual yields of paddy (ton/hectare).
II. To determine which variable is the most contributing factor which has major effect towards paddy production in Malaysia.
Literature Review

A study on the evaluation of global rice production by Nguu Van Nguyen, Secretary of International Rice Commission, found that there is a significant and positive relationship between farm yard and number of yield. The scope of the study spanned from 1961 to 2006. This shows that global rice production increases due to the increase in harvested area.

Another analysis on technical efficiency of paddy production in China was conducted by Juan Xiao and Dongmei Li (2011). Based on their findings by using Data Development Analysis (DEA), they have indicated that area harvested was positively related to paddy production. Their results showed that the production of paddy was low from 1990 to 2008. This instability in the number of yield was affected by the decreasing area of paddy field in that country.

In another case study, Kwinarajit Sachchamarga and Gary W. Williams (2004) attempted to explore the economic factors that are affecting rice production in Thailand. By using an econometric model, the results suggested that by increasing area harvested and reducing labour shortage in rural areas, rice production in Thailand will increase. These results again supported earlier findings that show that the acreage of planted rice and increasing labour would have positive relationships with paddy production output.

Suardi Tarumun (2004) studied the relationship between human resources with the output of paddy production by using the Policy Analysis Matrix Method (PAM). His research showed that there is a significant and positive relationship between human resources with the output of paddy production. A similar research, carried out by A. Suresh and T. R. Keshava Reddy (2006) using the Cobb-Douglas Production Function, also found that there is a positive and significant relationship between human resources with output of paddy production.

Chuma Ezedinma (2004) has studied the impact of trade on domestic rice production and the challenge of self – sufficiency in Nigeria. The objective was to examine the effect of rice import on domestic rice production. The result showed that the market for domestic rice was shrinking due to the availability of imported rice. This result is supported by M.I.M. Rafeek and P.A. Samaratunga (2000) in their research of trade liberalization and its impact on the rice sector of Sri Lanka. Their research showed that liberalization would result in the
decrease of area cultivated and yield. On the other hand, the demand for rice will increase as a result of the reduced retail price.

Research Methodology

This research is a causal study because it attempts to analyze the relationships between actual yields of paddy with the independent variables which are area harvested, labour and value of imports over a 25-year period starting from 1986 to 2011. All data have been gathered from the Department of Statistics Malaysia, Department of Agriculture Malaysia and various journals. These data were secondary data and they were time-series data. In this research, the Cobb – Douglas Production Function was used to estimate the relationships between these variables with paddy production. The researcher conducted the analysis by using E-Views 6.0. It is based on several tests such as Unit Root Test and Diagnostic Test to examine the regression problem and find the relationships of those variables mentioned.

Model Specification

The model for this study will be estimated using the Multiple Regression Model. The Cobb Douglas Production Function will be carried out in order to examine the relationships of the variables in the model.

\[ P = \beta_0 + \beta_1 H + \beta_2 L + \beta_3 M + \mu \]

where 
- \( P \) = production of paddy
- \( H \) = area harvested
- \( L \) = labour
- \( M \) = value of imports
- \( \mu \) = error term

Findings

By using Augmented Dickey-Fuller Unit Root Test, it is established that all these time series indices are stationary at first difference. This means the statistical properties such as mean, variance, autocorrelation, etc. are all constant over time. A Normality test was also
conducted and it showed that the data was normal since the Jarque-Bera value was < 5.99. Normal distribution means that the data is not biased and acceptable.

In assessing the stability of the data in the model, it was found that the model did not have serious collinearity problem since the value of Variance Inflation Factor (VIF) for all the independent variables are less than 5. VIFs are considered ‘bad’ if they exceed 10. There is also no existence of positive autocorrelation since the computed Critical Value for the Durbin-Watson Statistic (d) is 1.65, this value of d is greater than dU which is 1.54. The value of 4-d is 2.35, this value is also greater than dU which is 1.54. Thus, it can be concluded that there is no statistical evidence that the error terms are negatively autocorrelated.

From the Multiple Regression Analysis, the result of the linear form is as follows:

\[ P = -298.8515 + 0.006515 H - 0.804474 L + 0.000615 M + \mu \]

\[ (-0.219855) \quad (3.610761) \quad (-3.980010) \quad (5.076214) \]

*T-statistics are in parentheses

The coefficients for area harvested and value of imports exhibited positive signs. The interpretation of the coefficients for area harvested would be that a one hectare increase of area harvested will cause the paddy production to increase by 0.006515 tonne. As for the value of imports, an increase of MYR 1 in import will increase the paddy production by 0.000615 tonne. On the other hand, as for labour requirements, it is shown that a decrease of one labour will lead to an increase of 0.804474 tonne of paddy production. This means that less labour-intensive paddy production will increase the yields of paddy. From the result, area harvested was determined as the most contributing factor which gives major effect towards paddy production in Malaysia.

The value of \( R^2 \) from the estimated equation was 0.899033. This value implied that about 90% of the variations in the dependent variable (paddy production) can be explained by the independent variables included in the model (area harvested, labour, value of imports). The
remaining 10% may be explained by other variables that have not been included in the model such as weather conditions, good water management and fertilizer subsidy.

Discussions

The table below shows the sign of the coefficients and significance level of the independent variables. From the results, it is clear that paddy production has positive relationships with area harvested and value of imports but it has a negative relationship with labour.

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>t-Statistic</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-298.8518</td>
<td>1359.315</td>
<td>-0.219855</td>
<td>0.8277</td>
</tr>
<tr>
<td>Area harvested</td>
<td>0.006515</td>
<td>0.001804</td>
<td>3.610761</td>
<td>0.0013</td>
</tr>
<tr>
<td>Labour</td>
<td>-0.804474</td>
<td>0.202129</td>
<td>-3.980010</td>
<td>0.0005</td>
</tr>
<tr>
<td>Import</td>
<td>0.000615</td>
<td>0.000121</td>
<td>5.076214</td>
<td>0.0000</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.899033</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>0.887383</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S.E. of regression</td>
<td>121.6106</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sum Squared Resid</td>
<td>384517.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log likelihood</td>
<td>-184.4464</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F-statistic</td>
<td>77.17026</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prob (F-statistic)</td>
<td>0.000000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The probability value for area harvested is 0.0013 which is less than 0.05 significant levels. This means that area harvested has a significant relationship with paddy production. From the coefficient, it shows that area harvested has a positive relationship with paddy production. This finding is supported by a research conducted by Juan Xiao and Dongmei Li (2011). They found that paddy production in China was low and unstable from the year 1990 to 2008 due to decreasing number of area harvested. The results from the table above also show that value of imports and paddy production has a positive relationship. The probability value for value of imports is 0.0000 which is less than 0.05 significant levels. Therefore, value of imports has a significant relationship with paddy production. This finding shows that while Malaysia is trying to increase its domestic paddy production to become more self-sufficient,
at the same time, we are still importing rice to fulfill increasing domestic demand. As for the third variable which is labour, the probability value is 0.0005 which is less than 0.05 significant levels. This shows that labour has a significant negative relationship with paddy production since it has a negative coefficient. This finding is supported by a research conducted by Thi Thanh Van Ngo (2010) who indicated that a less labour-intensive production system is expected to be more effective, for example, high-technology farming.

Conclusion and Recommendations

As a conclusion, we can say that all the independent variables have significant relationships with paddy production. Other than these three variables, there are other variables such as fertilizer and innovative farming methods that should also be taken into consideration as determinants of paddy production in Malaysia. We need to fully embrace innovative farming method as what have been practiced in Vietnam in order to have better yields and higher quality rice. The farmers in Vietnam use a System of Rice Intensification (SRI) method to increase their income. SRI is a package of good agricultural practices for hand-planted rice that leads to increased yields. In 2007, the Ministry of Agriculture and Rural Development in Vietnam acknowledged SRI and directed other government agencies to promote and spread this innovation to farmers. It was a successful promotional campaign and the use of SRI methods in the Ha Tay province increased its paddy production from 3,000 ha in 2007 to 33,000 ha in 2008.

Malaysia started implementing the SRI method later than other Asian countries. In 2011, an MOU was signed between Indonesia and Malaysia to further develop SRI in Malaysia. Even though interests in SRI have increase among governments, universities and private sectors but there are some skepticism regarding this method. Therefore, SRI practices should be widely promoted to farmers and other organizations in Malaysia so that they fully understand how to use this method to increase paddy production. For example, Malaysia’s 1st National SRI Conference held in Putrajaya in July 2011 had provided the public a good opportunity to learn more about its practices and reduce doubt in using this method.

Other than planting method, fertilizer is important too. A research carried out by Nurul Nadia bt. Ramli et al. (2012) showed that fertilizer subsidy does have a significant impact on the
Malaysian paddy and rice industry. It increases paddy production and the self sufficiency level (SSL). By using a System Dynamics Approach, their study has showed that fertilizer helps to maintain the productivity of the paddy farm. On the other hand, the removal of fertilizer subsidy will decrease the paddy production in Malaysia. According to Plant Safe founder Mr Ng Hock Lin, we cannot change the weather conditions or soil type, but we can change the practices of fertilizer to achieve better yields. According to him, feeding the right nutrients is the fastest way to improve yields. (The Star, Business Section, 6 February 2013).

References


