

## RICE MARKET INTEGRATION AND POLICY SIMULATION ANALYSIS TO ACHIEVE FOOD SECURITY IN GLOBALIZED MARKET

By:  
Fanny Widadie

Agribusiness – Socio Economic Department  
Agriculture Faculty  
University of Sebelas Maret Surakarta  
e-mail: [fannywidadie@gmail.com](mailto:fannywidadie@gmail.com) and [fanny@uns.ac.id](mailto:fanny@uns.ac.id)

### ABSTRACT

The government has published rice policies which are production, distribution, import and price control. All the policies are aimed to achieve food security. Now, Indonesia have the problem to rice development such as high dependence of rice consumption (139 kg/kap/year), global warming, degradation of area productivity, field conversion and decline of rice source content. The obstacle challenge from outside is trade liberalization (GATT/WTO agreement that will be deleted import rate) that will make integration between domestic rice market and world rice market in globalization. Because rise is mainly foods that have strategic and important value to increase food security, so this research will analysis rice economic phenomena with making of rice economic model that are include supply, demand, rice price and market integration also policy simulation to achieve rice development in globalised market.

Data analysis is using inferential with econometric approach. First step are used statistic model test (stationer and autocorrelation). Market integration analyses are use cointegration-test which are Johansen-Juselius (JJ) test, Engel-Granger approach and Error Correction Model (ECM). To identify the effect of government policy to rice price fluctuation are used simulations with history data for scenario of areal increase policy 10% and 20%, technology increase 10% and 20%, fertilize price increase 10% and 20% and rate of exchange increase 10% and 20%.

Research result shows that (1) there are integration between domestic rice prices with world rice price. It was showed from cointegration-Johanes test  $r > 1$ . The result of Error Correction Model (ECM) was explained that the level of integration is weak; the world price is getting low effect toward domestic price fluctuation in long and short time. (2) Factors those influencing rice productions are harvest area and technology level. Rice imports are influenced significantly by production and rice demand. Demands of rice are influenced by amount of people and income level. And the last, price rice is influenced by rate of exchange and price rice of a year before. (3) The result of government policy effect toward rice price fluctuation in domestic there are: (a) harvest-area increase policy as 10% and 20% will make decrease rice price amount of 0.149% and 0.451%. (b) Technology increase policy as 10% and 20% will make increase rice price amount of 0.136% and 0.274%. (c) Fertilize increase policy as 10% and 20% will make increase rice price amount of 0.0107% and 0.0249%. (d). Decrease rate of exchange policy as 10% and 20% will make increase price rice amount of 2.5517% and 4.9754%.

Suggestion of this research is the governments have to make the policy of rice improvement to face globalised market. The policies to increase rice production are use harvest-area and productivity of rice improvement. Besides it, diversification of food consumption policy are purposed to decrease rice demand. The government have to increase food technology no rice. The policy of rice price is use optimal supply sector, which are increasing of harvest-area, technology, fertilize subsidy and monetary stability-rate of exchange to dollar.

*Key word: rice, market integration, policy, simulation, food security*

## I. INTRODUCTION

Rice is strategic and important food for Indonesian people. Among food commodities, rice is the most important food product contributing to employment, rural livelihoods and rural development. Rice is main food for Indonesian; almost 90 % Indonesian people is eating it. In household expenditure almost 63% are used for food especially rice consume. Rice is contributor for calorie as 56% and protein as 49%. Rice industries is engage 18 million farmer that most of them are small farmers and labour that include in input and produce factor, market and process (Saifullah, 2005). Because it the rice have strong correlation to develop economic and non-economic. The history have proved that instability of food supply in rice have triggered criminal and riot in early reformation period. So that how important the role and mix government to guard rice supply for all years, average distribution and stabile price.

Recently the rice production is increasing fast in 2007-2008; the rice production is increase about 5 percent. This increasing is the same condition in 1979-1984. The increasing of rice produce are caused by the policy of national rice increasing in 2007. The policy is focus in five main programs, there are seed subsidy, water micro management, rehabilitation of farm cultivation, make new rice field, pest-management, grow up of credit for small farmer and the effective of price policy.

Now the obstacle that will face of rice production is defend increase production as 4-5 percent and moreover will be rice exporter country. But if we looks the reality now, it is difficult to achieve. With the high population growth (1,3% a year) and the rice consume Indonesian people that the highest in the world (139 kg/kap/th), are main problem to maintain food security (Khudori, 2009). The high level of rice consume in Indonesia is make the depended of import will increase. In 2010-2011 the level of import rice is increasing fast until 1.33 million ton, it is caused by the demand of rice price is higher than production.

Other challenges of rice production also comes from the input factors, which include climate change, global warming that makes the rainy season uncertainty; degradation of land productivity both fertility and seed varieties; conversion of agricultural land into non agricultural; and decreased the yield of rice (Khudori, 2009). Challenge of increasing rice production also came from outside. The imposition of import tariffs take under pressure from developed countries through a multilateral framework agreement (ex: Agreement on Agriculture, GATT/WTO), arguing the tariff would violate free trade agreements that have been agreed upon previously (Eden et al 2008). Therefore, since 1999, the government adopted a policy that frees all parties to import rice (Arifin, 2004). With the private parties in allowing the import and export of rice activity will make the market structure of domestic rice integration with word market.

Rice market in Indonesia is left entirely to market mechanisms; the price of rice in Indonesia will be more volatile. If previously the factors that cause fluctuations in the price of rice is mainly derived from domestic factors that affecting supply and demand for domestic rice, it caused the government or Bulog isolate domestic prices from international price uncertainty. However now, the monopoly if rice import by bulog is deleting so it makes the increasing complexity of factors affecting domestic rice prices.

The complex problems of rice in Indonesia economy both from domestic and international conditions is change the condition of rice policy dynamic. The rice economic conditions that include supply demand and price of rice is continuing fluctuations that caused change occurring phenomenon. Because the rice is important food commodity, so in this research we need to be reviewed aspects of the phenomenon of supply, demand, price of rice into an economic model. In order to this research get quantitatively the rice economic model that involves market structure (market integration), supply, demand, price of rice and simulation of the government policies impact to the rice price.

## II. METHODOLOGY

### 1. Research Method

The type of this research is use quantitative descriptive method. The purposes of quantitative descriptive method are description, systematic, factual and accurate about facts, and relationship between phenomena that investigated based on numerical analysis (Nazir, 2003).

### 2. Data Collection Method

The type of data which used in this research is time series data, and it is collected by documentary method. Data is obtained by taking a secondary data from various data that have been published by national and international institutions like the Central Bureau of Statistic (BPS), Indonesian Bank (BI), Bulog, The Ministry of Agriculture, Food and Agriculture Organization (FAO) and International Rice Research Institute (IRRI). This study uses two types of data that are monthly and yearly. Monthly data (2005-2010) is used to analyze the condition of market integration between domestic markets with world markets. While the annual (1980-2010) describe the econometric model of rice.

### 3. Formulation of Rice Economy Model

#### a. Model of Rice Market Integration

Market integration is an attachment or integration between markets. Two products will be called an integrated market if there is trade between the products, the market price in import is same with the export market coupled with transportation costs and other transfer cost in an effort to move product between two markets (Irawan, 2007). The model of market integration that used in this research is use linkage between the domestic rice prices (medium quality) with the world rice price (Thailand-Broken 20 percent) which applicable in the world market. And each price is deflated by the price index of rice in the world market and the consumer price index in that year.

The analysis of market integration is used co integration test and error correction model. The model equations are:

$$PB_t = \mu + \alpha_1 PW_{t-1} + \alpha_k PW_{tk-1} + \epsilon_t \dots\dots\dots (1)$$

The result of VAR order to parameterize the equation above can be carried back and formulated into a form or error correction model as follows:

$$PB_t = \mu + \alpha_1 PW_{t-p} + \alpha_2 PW_{t-1} + \alpha_3 PW_{t-2} + \dots + \alpha_{p-1} PB_{t-p+1} + e_t \dots\dots\dots (2)$$

$$PB_t = PB_t - PB_{t-1} \dots\dots\dots (3)$$

$$PW_t = PW_t - PW_{t-1} \dots\dots\dots (4)$$

Note:

$PB_t$  = Riil domestic rice price vector (px1) in t time

$PB_{t-1}$  = Domestic price rice in t before

$Pw_t$  = World rice price in t time

$Pw_{t-1}$  = World rice price in t before

$\mu$  = Intercept of vector (px1)

$\alpha_1$  = Coefisient of short-time

$\alpha_{p-1}$  = Coefisient of the previous period

$e$  = Coefisient of ECT (*Error Correction Model*)

$k$  = Number of Lag

= Vector Error-Sized (px1) with properties equal to zero mean and variance-covariance matrix,  $e_t = 0$

### b. Model of Rice Economic

The model of rice economic in this research is using simulation equation system as follows:

1. Rice production equation in Indonesia

$$PROD_t = \alpha_0 + \alpha_1 PB_t + \alpha_2 PJ_t + \alpha_3 LA_t + \alpha_4 TEKN_t + \alpha_5 PPK_t + \alpha_6 PROD_{t-1} + e_t \dots\dots\dots (5)$$

2. Rice import equation in Indonesia

$$MT_t = \alpha_0 + \alpha_1 PROD_t + \alpha_2 D_t + \alpha_3 Pw_t + \alpha_4 MT_{t-1} + e_t \dots\dots\dots (6)$$

3. Rice demand equation in Indonesia

$$DT_t = c_0 + c_1 PB_t + c_2 MGD_t + c_3 POPT + c_4 IN_t + c_5 DT_{t-1} + e_t \dots\dots\dots (7)$$

4. Domestic rice price equation

$$PB_t = d_0 + d_1 PROD_t + d_2 MT_t + d_3 D_t + d_4 Pw_t + d_5 ER_t + d_6 PB_{t-1} + e_t \dots\dots\dots (8)$$

There is market clearing in rice economic model that  $QST_t = QDT_t$ , where  $QST_t = PROD_t + MT_t$

**Note:**

Endogen Variables:

$PROD_t$  = Amount of rice production (ton)

$MT_t$  = Rice import (ton)

$DT_t$  = Amount of rice demand (ton)

$PB_t$  = Rice price (Rp/kg)

Endogen Lag Variables:

$PROD_{t-1}$  = Amount of rice production a previous year (ton)

$MT_{t-1}$  = Rice Import a previous year (ton)

$DT_{t-1}$  = Amount of rice demand a previous year (ton)

$PB_{t-1}$  = Rice price a previous year (Rp/Kg)

Eksogen Variables:

$PJ_t$  = Corn Price (Rp/kg)

$LA_t$  = Rice harvest-area (ha)

$TEKN_t$  = Technology (ton/ha)

- $PPK_t$  = UREA fertilizer price (Rp/kg)  
 $MGD_t$  = Amount of flour import (ton)  
 $POP_t$  = Amount of citizen (people)  
 $IN_t$  = Consume Income (Rp)  
 $PW_t$  = World Rice Price (US\$/ton)  
 $ER_t$  = Rate of exchange rupiah to USD (Rp)  
 $S_t$  = Amount of rice supply (ton)  
 $a_0, a_1, c_0, d_0$  = Intercept  
 $a_{1-6}, a_{1-4}, c_{1-5}, d_{1-6}$  = Regression Coefficient  
 $e_t$  = Disturb variable

#### 4. Analysis Method

The analysis is using co integration model approach and error correction model. After the model have data stationer in the same degree and then doing Johansen Test co integration. But if the data is not stationer in the same level so the test can be continuing because ECM can be analysed with non stationer in same level. The next test is use Engel Granger test or it is famous with Error Correction Model (ECM) to see the affect in long-term. The relation in short-time can be sawn with Granger Causality Test, that the number can be analysed with Error Correction Model equation.

##### a. Co Integration Test

Market integration level can be known by Co Integration test, which two methods there are Johansen Juselius (JJ) and Engel-Granger.

##### a. Johansen Juselius (JJ) Method

The integration between domestic rice price with world rice price is use Johansen and Juselius (JJ) approach to see the amount of co integration. JJ method have mind map to estimate and test the co integration correlation in VAR Error Correction Model (Gujarati, 2003). Two tests that used to identify amount of co integration vector (r) use trace test and maximum *eigenvalue* test. The first step is use deep test (trace test,  $\lambda_{trace}$ ), that is a likelihood ratio test to see the much way of co integration vector (r), with use rank of matrices co integration that was expressed:

$$\lambda_{trace}(r) = T \sum_{i=r+1}^p \ln(1 - \lambda_i) \dots\dots\dots (9)$$

The second step is the maximum *eigenvalue* test (Max Eigen Test), which the test is relevance with column in r +1 in (Bouras, 2010). The equation follows:

$$\lambda_{max}(r) = -T \ln(1 - \lambda_{r+1}) \dots\dots\dots (10)$$

Note,

T = Total time of observation

$\lambda_i$  = Eigenvalue Estimated (characteristic root of the allegations) are generated from the estimated matrix  $\Phi$

r = rank of the vector indicates the number of co integration

Max Eigen hypothesis are:

1. If the Max Eigen statistic  $>$  5% critical value, will reject  $H_0$ , which means that data has a number of co integration for  $k > r$  (alternative);

2. If the Max Eigen statistic > 5% critical value, will accept  $H_0$ , which means that data has a number of co integration – null.

Trace hypothesis are:

1. If the Trace statistic > 5% critical value, will reject  $H_0$ , which means that data has a number of co integration for  $k > r$  (alternative);
2. If the Trace statistic < 5% critical value, will accept  $H_0$ , which means that data has a number of co integration – null.

### b. Engel-Granger Methods

Using this test have to prove that the model approach have integration degree in same level. If two variables or more have different integration degree, example X variable is integration in first degree, but Y variable is integration in second degree, so the two of that variable are not integration condition (Ravallion, 1986). So that, it is needed root test (ADF) seeing that PB variable and PW are integration in the same of degrees. After doing unit root, two of variable is regressed with this equation:

$$PB_t = \mu + \beta_1 PW_t + \epsilon_t \dots\dots\dots (11)$$

Note:

$PB_t$  = Variable of domestic rice price

$PW_t$  = Variable of world rice price

$\mu$  = Intercept

$\beta_1$  = Coefficient

$\epsilon_t$  = disturbance

Then it is considered that  $\hat{\epsilon}_t = Y_t - \mu - \hat{\beta}_1 PW_t$ , and is used root test unit to test u. If  $PB_t$  and  $Pw_t$  is not integration so  $\hat{\epsilon}_t = Y_t - \mu - \hat{\beta}_1 PW_t$  will be co integration in I (1) which hypothesis test:

$H_0$  :  $\epsilon_t$  not stationer ( $PB_t$  and  $Pw$  is not co integration)

$H_1$  :  $\epsilon_t$  stationer ( $PB_t$  and  $Pw$  co integration)

Co integration describes the long term relation, balance and relation with other variables. That dynamic condition is explained by Error Correction Model (ECM) (Idris, 2002). The equation of ECM explains the relation long-term and short-term both free variable ( $Pw$ ) with tried variable ( $PB$ ). The ECM equation:

$$PB_t = \mu + \beta_1 Pw_{1t} + \beta_2 Pw_{1t-1} + \beta_3 ECT \dots\dots\dots (12)$$

$$PB_t = PB_t - PB_{t-1} \dots\dots\dots (13)$$

$$PW_t = PW_t - PW_{t-1} \dots\dots\dots (14)$$

Note:

$PB_t$  = Vector of Real Domestic Rice Price (px1) in the time t

$PB_{t-1}$  = Domestic Rice Price in a previous time

$PW_t$  = World Rice Price in the Time t

$PW_{t-1}$  = World Rice Price in a previous time

$\mu$  = Vector (px1) of Intercept

$\beta_1$  = Short-time Periodic Coefficient

$\beta_2$  = Periodic Coefficient in a previous time

$\beta_3$  = ECT (*Error Correction Model*) Coefficient

= ( $PW_{1t-1} - PB_{t-1}$ )

In the above equation, the coefficient value of ECT is  $0 < \alpha_3 < 1$ , in short-term coefficient from ECM model equation is represented by the coefficient  $\alpha_1$ . Long-term coefficient is estimated by entering equation (12) into equation (15):

$$PBT = a + b PW1 \dots\dots\dots (15)$$

The Coefficients a and b were obtained from the following formula:

$$a = \frac{\mu}{\alpha_3} \qquad b = \frac{\alpha_2 + \alpha_3}{\alpha_3}$$

Note:

PBT = Price of Domestic Rice

PW1 = Price of World Rice

a = Intercept

b = Coefficient of Long-term

$\mu$  = Intercept (from equation ECM)

$\alpha_2$  = Coefficient of The Previous Period

$\alpha_3$  = coefficient of ECT (*Error Correction Model*)

### c. Equation Analysis and Policy Simulation

Model that used in this research is use rice economic model with simulation equation system. From the identification result and model hypothesis are gotten that rice economic model (production, demand and supply of rice) is based on order condition. All the structural equation model are over identified, so the model hypothesis use Two Stage Least Square (2 SLS).

And to evaluate the affecting external economic factor to price rice in Indonesia is using simulation analysis to measure the respond of model which are anticipated to the exchange of endogen variable. Before doing simulation analysis, the first step simulation is validation model. The purpose of model validation is to see how the models can proxy in the real world. One of the criteria that used econometric model validation is Theil's Inequality Coefficient (Pindyck and Rubinfeld, 1991).

The simulation analysis procedure is used by time series data in 1980-2010 with SAS program. History policy simulation in 1980-2010 period is applied to increase policy of harvest-area policy as 10% and 20%, technology as 10% and 20%, fertilizer price as 10% and 20% and the rate exchange rupiah to US\$ as 10% and 20%.

## III. RESULT AND DISCUSSION

### 1. Co integration Domestic Price Rice and World Price

Co integration test is use Johansen Test analysis with to see trace statistic value and max-Eigen statistic. In Table 1 is showing that comparison max-Eigen statistic in first hypothesis with critical value 95% is describing that hypothesis is not real because the Eigen statistic value (9.69) is smaller than critical value 15.41; it means that fail to refuse hypothesis 1 where is amount of co integration as nol ( $r=0$ ). The result is different with trace test where first hypothesis is show the real value which trace statistic (15.945) is higher than critical value (15.41). But second hypothesis in trust

value level 95%, the both test max-Eigen and trace test that have value (6.25) is higher than critical value (3.76), so it can be conclude that refusing null hypothesis  $r > 0$  and accepting alternative hypothesis  $r > 1$  or it can be conclude that there are two co integration relation which are included world rice price and domestic rice price ( $r=2$ ). So from the co integration test result can be conclude that there are integration between domestic price rice and world rice price or it have integrated between domestic rice price and world rice price.

**Table 1 Test Result of Johansen Co Integration**

Hypothesis		Max-Eigen Statistic	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
$H_0$	$H_a$				
$r = 0$	$r > 0$	9.695603	15.94590	15.41	20.04
<b><math>r = 1</math></b>	<b><math>r &gt; 1</math></b>	<b>6.250299</b>	<b>6.250299</b>	<b>3.76</b>	<b>6.65</b>

Source: Own Analysis (2011)

## 2. The Influence of World Rice Price to Indonesian Rice Price

To measure the value of influence is explained as error correction model (ECM) equation. The variables that researched are co integration so it makes next analysis with ECM. Table 2 is showing the ECM result, that if it made in result equation:

$$D(\text{HBD}) = 18.67480 + 0.964668 D(\text{HD}) + 0.714465 D(\text{HD}(-1)) + 0.207357 \text{ECT}$$

That ECM equation is showed that coefficient probability value in world rice price  $D(\text{HD})$  is 0.307 or more than 0.1 in trust level 90 percent. But with the probability is near 0.1 that indicate world price rice is still giving the influence of Indonesia (domestic) rice price but it is small or is not significant. From the ECM equation can be interpreted that if the world price is increase one dollar, the Indonesian (domestic) rice price will increase as Rp0.9646/kg in short-time period.

**Table 2 Error Correction Model (ECM) Test**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
<b>C</b>	18.67480	18.16286	1.028186	0.3076
<b>D(HD)</b>	0.964668	0.990521	0.973900	0.3336
<b>D(HD(-1))</b>	0.714465	0.994203	0.718631	0.4749
<b>ECT</b>	0.207357	0.057426	3.610840	0.0006*

Source: Own Analysis (2011)

**Note:**

$D(\text{HD}(-1))$  : Variable of World Rice Price in a Previous Period

ECT : Residue / Error Correction Term

C : Constanta

$D(\text{HD})$  : Variable of World Rice Price

\*) Significant at 90% Confidence Level

While in long-term period from Error Correction Model (ECM) equation can be known that if the world rice price is increase one dollar, it will increase Indonesian rice price as Rp4.44557/Kg in long-time period. For all the test result can be interpreted that world rice price is influencing Indonesian rice price in short-time and long-time period. It



happen because Indonesian have done international trade, so it make a law in one price or the world rice price will influence the domestic (Indonesian) rice price. There are import-export policy, globalised international trade as the consequence of WTO, and the change of national food institution and other trade regulation that caused the more integrated Indonesian (domestic) rice price and world price.

### 3. The Factors That Affecting to Indonesian Rice

#### a. Influential Factors of Rice Production

Form t test statistic was found that the total area-harvest (LA) and the level of technology (Tech) is real or significant effect on rice production in Indonesia at 99 percent confidence level. And the other variables such as rice price (HB), corn rice (PJ) and rice production a previous before (PRODT) are not significant affect to rice production. The model evaluation which based on simultaneous test (F test) is showing good result, as shown by the statistic F with 99 percent confidence level (Prob> F: 0.0001).

This indicates that all exogenous variables were analyzed, which include price of rice (PB), price of corn (PJ), the total harvest-are (LA), technology (TEKN), price of fertilizer (PPK) and the production of rice the previous year (PRODT) is effecting together toward rice production in Indonesia. R-square value 0.9912 indicates that 99.12 percent of rice production in Indonesia can be explained by all exogenous variables in that model, while the rest is affected by other variable which is not include in the model.

**Table 3 Results Analysis of Influential Factors to Rice Production**

Variable	DF	Parameter Estimate	Standard Error	T for HO Parameter = 0	Prob ITI
Intercept	1	-1656527	3222549	-5.140	0.0001
Rice Price (PB)	1	1043.259057	765.688613	1.363	0.1875
Corn Price (PJ)	1	930.722896	1019.852357	0.913	0.3718
Harvest-Area (LA)	1	2.006002	0.321005	6.249	0.0001**
Technology (TEKN)	1	46986	11479	4.093	0.0005**
Fertilizer Price (PPK)	1	-2056.278709	1634.027991	-1.258	0.2221
Rice Production a Previous Year (PRODT)	1	0.139133	0.101677	1.368	0.1857

Source : Own Analysis (2011)

Note: \*\*) Significant at 99% Confidence Level

F test: 395.841; Prob>F: 0.0001; T table: 2.47 ( $\alpha=0.01$ )

R<sup>2</sup>: 0.9912; Adj.R-SQ: 0.9887; Durbin Watson test: 1.926;

#### b. Influential Factors of Rice Import

All the model evaluation which based in simultaneous test (F test) show that good result, as it is showed by the high F statistic with 99 percent evidence level. R-square 0.6169 show that 61.69 percent rice import (MT) in Indonesian can be explained or influenced by rice production (PROD), rice demand (DT), rice world price (PW) and import in a previous year (MTT). While the rest 38.31 percent is affected other factors that is not include in that model. From t statistic test is gotten that rice production and

demand are affecting real or significant rice import. Other variables like world rice price and import a previous year are not affecting by rice import significantly.

**Table 4 Result Analysis of Influential Factors to Rice Import**

Variable	DF	Parameter Estimate	Standard Error	T for HO Parameter = 0	Prob  T
Intercept	1	-5465223	1549784	-3.526	0.0018
Rice Production (PROD)	1	-0.474513	0.109156	-4.347	0.0002**
Rice Demand (DT)	1	0.717530	0.146455	4.899	0.0001**
World Rice Price (PW)	1	4916.250385	4294.843401	1.145	0.2641
Import a Previous Year (MTT)	1	-0.090770	0.171690	-0.529	0.6021

Note: \*\*) Significant at 99% Confidence Level

F test: 9.259; Prob > F : 0.0001; T table: 2.47 ( $\alpha=0.01$ )

R<sup>2</sup>: 0.6169; Adj R-SQ: 0.5503; Durbin Watson test: 1.999;

#### c. Influential Factors of Rice Demand

The result of statistical t-test was founded that the number of population and income significantly affect for rice demand at 99 percent confidence level (Table 5). As other variables such rice price (PB), wheat import (MGD) and rice demand in a previous year (DTT) is not affect the rice demand partially.

**Table 5 Results Analysis of Influential Factors to Rice Demand**

Variable	DF	Parameter Estimate	Standard Error	T for HO Parameter = 0	Prob  T
Intercept	1	-1333619	5370864	-0.248	0.8062
Rice Price (PB)	1	2299.317558	1706.348558	1.348	0.1915
Wheat Import (MGD)	1	-0.568358	0.413539	-1.374	0.1832
Amount of Population (POP)	1	0.128311	0.049075	2.615	0.0158**
Income (IN)	1	-1.175597	0.377780	-3.112	0.0051**
Rice Demand a Previous year (DTT)	1	0.126126	0.197949	0.637	0.5306

Note: \*\*) Significant at 99% Confidence Level

F test: 50.180 ; Prob > F : 0.0001; T table: 2.47 ( $\alpha=0.01$ )

R<sup>2</sup>: 0.9194; Adj R-SQ: 0.9011; Durbin Watson test: 2.056;

#### d. Influential Factors of Rice Price

The result of statistical t-test was founded that the exchange rate (ER) and rice price in a previous year (PBT) are affect rice demand at 99 percent confidence level (Table 6.). As for other variables such as rice supply (ST), rice demand (DT) and world rice price (PW) are not affect the rice price significantly.

**Table 6 Result Analysis of Influential Factors to Rice Price**

Variable	DF	Parameter Estimate	Standard Error	T for HO Parameter = 0	Prob ITI
Intercept	1	-183.409938	266.310307	-0.689	0.4985
Rice Production (PROD)	1	-0.000020928	0.000017624	1.187	0.2483
Rice Import (MT)	1	-0.000031938	0.000028920	1.104	0.2819
Rice Demand (DT)	1	0.000011055	0.000022679	-0.487	0.6310
World Rice Price (PW)	1	0.149930	0.506659	0.296	0.7702
Exchange Rate (ER)	1	0.047629	0.14001	3.402	0.0027**
Rice Price a Previous Year (PBT)	1	0.574238	0.130601	4.397	0.0003**

Note: \*\*) Significant at 99% Confidence Level

F test: 158.972; Prob > F : 0.0001; T table: 2.47 ( $\alpha=0.01$ )

R<sup>2</sup>: 0.9785; Adj R-SQ: 0.9723; Durbin Watson test: 1.712;

### 3. The Effect of Government Policies to Domestic Rice Price

Government policies which are used as an indicator are the improvement policy of harvest-area, technology, fertilizer price and exchange rate. From the results of policy simulation shows that the increase policy of harvest-area and technology will make to change rice price fell on average as 0.1 to 0.4 percent. While the increase policy of fertilizer price will make the rice price increasingly as 0.0107 and 0.024 percent, and the increase policy of exchange rate will make the rice price increased sharply as 2.55 to 4.97 percent (Table 7).

**Table 7 Simulation of Government Policy to Price Change**

Government Policy	Percentage	Price Based	Price Change	Price Change (%)
<b>1. Increasing Harvest-Area</b>	10 Percent	869.81	868.51	0.149 (Down)
	20 Percent		865.90	0.451 (Down)
<b>2. Increasing Technology</b>	10 Percent	869.81	868.62	0.136 (Down)
	20 Percent		867.43	0.274 (Down)
<b>3. Increasing Fertilizer Price (The Decrease of Fertilizer Subsidy)</b>	10 Percent	869.81	869.90	0.0107 (Up)
	20 Percent		870.03	0.02499 (Up)
<b>4. Increasing Exchange Rate (The Decrease of Exchange Rate)</b>	10 Percent	869.81	892.59	2.5517 (Up)
	20 Percent		915.35	4.9754 (Up)

Source: Own Analysis

### 4. Policy Implication

Rice economic aspects such as supply demand and rice price should be made common strategy to effecting national rice policy. These four aspects of the rice economy (production, import, demand and rice price) directly or indirectly influence its policies. Therefore, based on the results of research is carried out concrete steps to develop rice policy more effective. These are rice policy strategy formulation:

#### A. Production of Policy Effectiveness

Domestic rice production provides enough influence on import and rice price, where the higher of domestic rice production will be able to reduce dependence on imports and rice prices stable. Therefore, it is need the strategy to increase rice production through to expand the planting area and to increase the productivity of rice farming. Both variables area and productivity are influencing significantly to national rice production.

#### B. Effectiveness of Import Policy

The analysis shows that rice demand are significantly and positively affect import. The higher of rice demand will increase import. To reduce rice dependence that is currently increasing as population growth, then the policy should be encouraged by diversification of food consumption. Not only the regulation of monetary policy to streamline the import policy but also the determination of tariff and non-tariff barriers.

#### C. Effectiveness of Rice Price Stabilization

The price stability should be maintained is the price level of rice producers (farmers) and consumers. Pricing policy instruments that are used to protect domestic farmers is the price of Government Purchasing (HPP). Meanwhile, the consumer prices stable level through the highest retail price (HET) policy. The government have to set a ceiling price for rice. That it was done in order to keep the staple food commodities are still within reach of the purchasing power of consumers, especially poor economic groups.

From the simulation results of government policy on price fluctuations shows that the increase in area of policy and technology will be able to minimize the price fluctuations of 0.1-0.4 percent. This suggests that an increase in domestic rice production through land expansion and technology will be able to lower the rice price in a given market equilibrium. While the increase in fertilizer prices will make the rice price increased by 0.01-0.02 percent. Therefore it is need government regulation to not reduce fertilizer input subsidy.

Then the others important policy in relation to price stability is the effort to make monetary stability-rate exchange of the rupiah to dollar. One of the most important in maintaining monetary stability is a way of increasing market confidence and creating economic, political and social security stability.

### **CONCLUSION**

1. Market integration occurs between domestic rice prices with world rice price. The level of integration is very small or weak. In the short term, influencing the world rice price to domestic rice price gives the coefficients of 0.96 and in the long run of 4.44.
2. Rice economic model that is used in this research has met the requirements of economics and statistics (it was indicated by the RMSPE and Theil's inequality Coefficient). Each of the model equations are described as follows:
  - a. Rice production was significantly and positively influenced by the harvest area and technology level.

- b. Rice imports were significantly influenced by the production of rice and rice demand.
  - c. Rice demand was significantly influenced by population and income levels.
  - d. Rice price was significantly and positively influenced by the exchange rate and rice price a previous year
3. The impact of government policies in increasing domestic (Indonesian) rice prices such as:
- a. The policy of increased harvest area as 10 and 20 percent would lead to lower average domestic rice price as 0.149 and 0.451 percent.
  - b. The policy of increased technology level as 10 and 20 percent would decline rice price as 0.136 and 0.274 percent.
  - c. The policy of reduction or increased in fertilizer price as 10 and 20 percent would increase domestic rice price as 0.0107 and 0.0249 percent.
  - d. The policy of increased exchange rate as 10 and 20 percent would increase domestic rice price as 2.5517 and 4.9754 percent.

### **SUGGESTION**

1. Food self-sufficiency of rice is very important to be realized for reduce the negative impact of fluctuations in market integration.
2. The government needs to streamline the regulatory strategy in the national rice policy. Implementation of policies that are expected to do such as:
  - a. The policies of increased rice production are doing by expanding the harvest area and increasing the producticity of rice farming. The efforts to reduce land conversion, improvement of irrigation, cultivation technology, postharvest, processing and marketing information through empowerment of farmers.
  - b. The policy of diversification food consumption is very important to be done and encouraged again by the governemnt in order to reduce dependence of rice demand. The steps that need to be done is to empower food processing technology for non rice comodity.
  - c. The determination of tarif and non-tariff barriers are to effective or tighten rice import.
  - d. Rice price stabilization policy in producer (farmers) is done by the implementation of cost purchase policy (HPP). Meanwhile, the consumer rice price stabilization in addition to implementing regulatory highest retail price (HET). The government needs to optimize the supply side (increasing price production) such as with the policy of land expansion, increase technology/productivity of rice, an increase in fertilizer subsidies and the need to input-monetary policy, exchange rate stability.
3. The study recommended to follow up this research is the economic model and simulation of variable policies need to be added other variables that are non-economic, so it will be gotten overview of complex rice model. Besides it, the historical differences between rice policies in the old order, new and reform can be used as variables in a study to comparing the effectiveness of the economic conditions of rice.

## REFERENCES

- Andi Irawan dan Dewi Rosmayanti. 2007. *Integration Analysis of Rice Market in Bengkulu*. Bengkulu University. *Agro-Economic Journal*. Volume 25 No.1, Mei 2007 : 37 – 54. Bengkulu.
- Bouras, David, Aloyce R. Kaliba, Adam Bouras, Abhirjun Dutta. 2010. *Testing For Market Power In The U.S Catfish Processing Industry: A Dynamic Error Correction Approach*. *Journal of Applied Economics and Policy*, Vol.29, Spring 2010.
- Gujarati, D. 2003. *Basic Econometric*. Mc. Grow Hill. London
- Idris, H.M. 2002. *Cross Commodity Price Likages: A Cointegration Analysis of Food Market in Java*. Dissertation. Departement of Agricultural and Consumer Economics. University of Illonois at Urbana-Champaign
- Khudori. 2009. *Reorientasi Kebijakan Perberasan*, *Majalah Pangan* Edisi No.53/XVIII/Januari-Maret/2009. Jakarta
- Lipsey, Richard. G. *et al*. Alih Bahasa oleh Yati Sumiharti 1992. *Pengantar Ekonomi Mikro*. Edisi 9. Penerbit Erlangga. Jakarta
- Nazir. 2003. *Metode Penelitian*. Salemba Empat. Jakarta
- Pindyck and Rubenfield. 1991. *Econometric Models and Economic Forecast*. Mc.Graw Hill.
- Ravallion, M. 1986. *Testing Market Integration*. *American Journal of Agricultural Economic*.
- Saifullah, Agus. 2002. *Badan Penyangga Kebijakan Pasar Hasil-Hasil Pertanian Dalam Usaha Menciptakan Ketahanan Pangan*. *Majalah Pangan* Edisi No. 53/XVIII/Januari-Maret 2002. Jakarta