https://dx.doi.org/10.22161/ijaems.66.8 *ISSN: 2454-1311*

Effects of Rice Liberalization Law on Rice Production, Farmers' Wages and Government Budgets

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Abstract— *This article estimated the effect of Rice Liberalization Law on rice production, farmers' wages, and government budgets in Nueva Ecija, Philippines. The quantitative research design was utilized in this study using the time series data. The results found out that the government budget has a significant role and a positive effect on Philippine rice productions. Finding also suggests that low rice production affects farmers' wages and income, tantamount to a high price of rice due to the demand and leads to high rice importation. Therefore,it is necessary to increase rice production at a lower cost that will give a positive effect on farmers ' wages and rice market prices. This could result in enticing the younger generation or unemployed citizens to be engaged in farming that will eventually result in to increase in rice production.*

Keywords— ***Export, Import, Green Revolution, Rice Liberalization Law, Trade Deficits, Tariffication.***

I. INTRODUCTION

In the statement of the World Bank in 2007 composed on rice production, the announcement stated that the rice total expenditures are 16% while 30% is from the poorest. In fact, the leading factor in food spending is rice. As a result, if the prices of rice increase the cost of Filipinos living will be increased that will lessen poverty.

According to the World Bank in 2007, the most harvested crop in every country is rice. They also added that the rice was planted in about 30% of the total agricultural area. Rice farming is the main source of almost two million families and half of the household income. There are millions of landless farm workers and thousands of merchants depend on rice for a living.

Consequently, the Philippines is an agrarian economy in which rice is its main crop, and rice production was hard to meet the needs of a growing population, rising at 2.5 percent yearly (Philrice 2011). It will never be easy for the government of the Philippines to increase the production of rice. The government has often in resorting to importation in securing the availability of rice in every household.

In this way, when there is an actual or projected shortage of rice as a result of a production shortfall, the government resorts to rice import.

However, Riza Bernabe of the Philippine Peasant Institute said that apart from the need to import rice to supply all Filipinos, importation of rice becomes mandatory in order to offer customers sole rights toward more affordable rice (Philrice, August 2011).

That is why the Government has declared the law on the Liberalization of Rice, entitled "An Act on the Liberalization of the Import, Export and Rice Trading, which removes quantitative restrictions on rice for the purposes, to be signed by President Rodrigo Roa Duterte on 14 February 2019.

It is also known as the Rice Liberalization Act or the Republic Act No. 11203, which reforms the Agricultural Tariffication Act of 1996 by enforcing a tariff on imports agricultural products except rice. In particular, the objective of the law is to remove the quantitative restriction (QR) on imports of rice and replace it with a general tariff.

It is in this regard that this research was conceptualized. It aimed to describe the effect of rice liberalization law on rice production, farmers' wages, and government budgets in Nueva Ecija, Philippines.

https://dx.doi.org/10.22161/ijaems.66.9 *ISSN: 2454-1311*

Statement of Assumptions and Hypotheses

Ho1: The Rice Liberalization Law has no significant effect on the current rice market situation of Nueva Ecija.

Ho2: The Rice Liberalization Law has a significant effect on the current rice market situation of Nueva Ecija.

II. RESEARCH METHODOLOGY

This study utilized descriptive-quantitative research design (Subia, et al., 2020). A quantitative research design is developed to enumerate, analyze differences and relationships of variables, and to develop results, suggestions, or generalizations that may contribute to the output(Leedy and Ormrod. 2001, p. 102).

The time-series data was used in the study and its annual frequency spanned the period of 2010-2019. Rice production, farmers' wages, and government budget were all taken from the Philippine Statistics Authority while El Niño and Rice Liberalization Law are taken from the news.

The paper covers the country's historical yearly economic performance, rice production, farmers' income, and Nueva Ecija government budget from the year 2010-2019.

III. RESULTS AND DISCUSSION

Trend and Growth Patterns

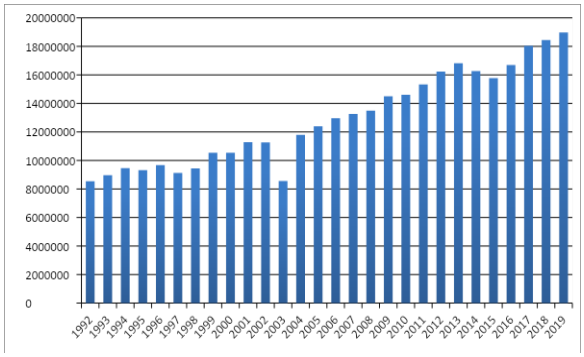

Fig.1.1: Performance of Rice Production

Source: Philippine Statistics Authority – Country Stat Philippines [5]

Figure 1.1 shows the performance of rice production in the Philippines for the year-on-year trend and growth pattern from 1992-2019. In the years 2001-2002 and 2005 it can be observed that there was a significant decrease and this is due to the El Niño and Rice Liberalization Law. On average, the 28-year period exhibits a positive growth with an average growth rate of 3.41. During the 2001-2002 El Niño and Rice Liberalization Law, the country suffered water and food shortages as 70 percent of the country experienced a severe drought. Reports said damage to agriculture reached P8.46 billion as nearly 74,000 hectares of agricultural land in 18 provinces were affected by the dry spell. Citing UN data, the Department of Agriculture said the country's rice and corn production during the first half of 1998 went down 27 percent and 44 percent, respectively. Back then, some 900,000 people in Central Visayas were affected by the prolonged drought. In Mindanao, 74 people died and more than 450,000 agricultural families faced severe food insecurity because of the drought (Philippine Daily Inquirer, 2015). While during 2009-2010 El Niño and Rice Liberalization Law 12,000,000 families or 14,000,000 persons were affected, and 57 provinces in at least 10 regions were gripped by drought. In a report by the National Disaster Risk Reduction and Management Council, 542,067 hectares of farmland were damaged. A total of 788,738 metric tons of palay, corn, and other crops worth Php12,107,125,788 billion were damaged. Another reason for the year 2009 because it was the year that typhoon Ondoy and Pepeng entered (CDRC, 2010).

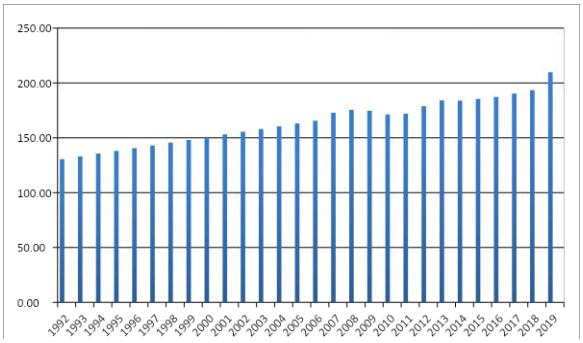

Fig.1.2: Farmers' Income Performance

Source: Philippine Statistics Authority – Country Stat Philippines [5]

Figure 1.2 shows the trend and growth patterns of farmers' wages for the period of 1992-2019. It can be observed that the behavior of farmer's wages exhibits a positive growth with an average growth rate of 1.79. However, because of the implementation of rice liberalization law, farmers' income was greatly affected. According to Agriculture Secretary William Dar said on Thursday the losses farmers incurred a year after Republic Act 11203, or the Rice Tariffication Law

https://dx.doi.org/10.22161/ijaems.66.9 *ISSN: 2454-1311*

was implemented amounted to P8.2 billion, refuting reports that they lost as much as P68 billion in profit(The Manila Times, 2020).

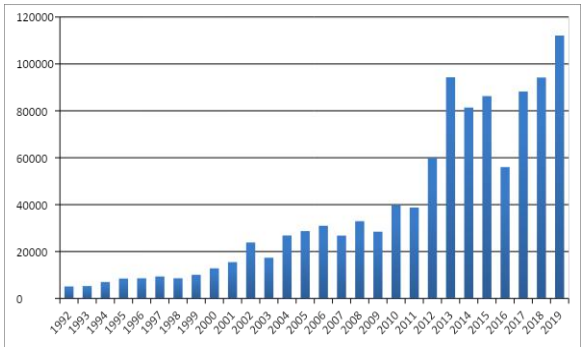

Fig.1.3: Government Budget Performances

Source: Philippine Statistics Authority – Country Stat Philippines [5]

Figure 1.3 shows the trend and growth patterns of the government budget for agriculture for the period of 1992-2019. It can be observed that the behavior of the government budget exhibits a positive growth with an average growth rate of 15.05. In fact, its budget in 2013 is P55.3 billion, up from its 2011 budget of P33 billion.The Department of Agriculture insists that, with enough commitment and funding, the target is attainable. (Briones and Galang, 2013).

Estimation Results

Econometric Model: Factors affecting rice production

Based on the statistical results using the ordinary least squares estimation procedure for parameters which inferences can be drawn through the model equation specified as:

$$RICEPRODUCTION = -4.84e + 06 + 1.01e + 05 * FARMERSWAGES + 38.6 * GOVTBUDGET - 1.38e + 06 * ELNINO$$ **(Equation 2.1)**

To measure the performance of the rice liberalization law in the Philippines' economic output, linear regression analysis was utilized. In order to measure and quantify the results for the analysis the researcher based on the econometric model provided above. F-Test is a measure of the overall significance of the estimated regression line. It is used to test multiple hypotheses about the parameters in an econometric model (Gujarati, 2013).

The model suggests that on average the growth of rice production in terms of annual performance (volume) decreased by **-4.84e+06** percentage points if all the independent variables specified herein remain unchanged. This infers that for Rice production annual performance (volume) to expand, it should be driven by strong farmers' wages growth, government budget growth, and decline of El Niño and Rice Liberalization.

Rice production annual performance (volume) will increase by 1.01e+05 percentage points for every percent change in the farmers' wages. Moreover, rice production will expand by 38.6 percentage points for every increase in the government budget. The El Niño and Rice Liberalization affect also the performance of rice production. Rice production annual performance (volume) will decrease by -1.38e+06 percentage points for every percent change in the El Niño and Rice Liberalization. "The production is increasing historically and generally because before we didn't raise hybrid rice. Hybrid seeds only began in 2005. But in 1998, there was an El Niño, so production dropped. In 2009, there was Typhoon Ondoy (Ketsana) so production was also low," Jacinta Estrada, Bureau of Agricultural Statistics (BAS) statistician, explained. (Danao, 2014)

Table 2.1 Factors Affecting Rice Production Econometric Model

Model 1: OLS, using observations 1987-2014 (T = 28)

Dependent variable: RICEPRODUCTION

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
Const	−4.8414e+06	2.48543e+06	−1.9479	0.0632	*
FARMERSWAGES	100534	17371	5.7875	<0.0001	***
GOVTBUDGET	38.5904	11.1319	3.4667	0.0020	***
ELNINO	−1.37712e+06	417060	−3.3020	0.0030	***

Mean dependent var	12937773	S.D. dependent var	3325498
Sum squared resid	1.37e+13	S.E. of regression	755630.9
R-squared	0.954106	Adjusted R-squared	0.948370
F(3, 24)	166.3157	P-value(F)	3.44e-16
Log-likelihood	−416.5608	Akaike criterion	841.1216
Schwarz criterion	846.4504	Hannan-Quinn	842.7507
rho	0.134713	Durbin-Watson	1.593463

The T-Test is the ratio of estimated regression coefficient divided by its standard error. It is used to test a single hypothesis about the parameters in an econometric model. It verifies the truth or falsity of the null hypothesis. The null hypothesis in this test is that the variable is not

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significant. T-test follows these conditions: If T computed lies in the critical region, the null hypothesis must be rejected. If T computed does not lie in the critical region, the null hypothesis must be accepted (Gujarati, 2004)

Table 2.1 presents the regression results for the factors affecting rice production from 1987 to 2014, for a total of 28 observations. The rice production series as illustrated in Figure 2.1 exhibited sustained moderate growth. To inspect if the series is stationary the unit root exercise the following results are obtained:

- Carrying out the unit root tests, we obtained the following statistics: **-0.028** (no intercept, no trend, one-lagged difference) and **-0.030** (intercept, one-lagged difference).
- Each of these statistics at a 5 percent confidence level, in absolute value, was less than the critical t-value confirming the graphical impression that the Rice production series is non-stationary.

In terms of the variability, Rice production growth pattern can be explained bythe movements of the variables by 94.84%. The computed Durbin -Watson value of the model lies between the upper and lower limit (1.181 1.59 1.65) that indicates no evidence of serial correlation. With a 95% degree of confidence, p-values indicate that all the variables are statistically significant.

This tends to lead to the approval of the alternative hypothesis Farmers' Incomes, Government Budget, and El Niño, Rice Liberalization are important and have an impact on the production volume of rice. To test if the non-linear combinations of the fitted values help to seek the outcome variable of the Ramsey Reset model.

Table 2.2 Ramsey Reset Test

Auxiliary regression for RESET specification testOLS, using observations 1987-2014 (T = 28)Dependent variable: RICEPRODUCTION

	coefficient	std. error	t-ratio	p-value	
const	3.31382e+07	2.45658e+07	1.349	0.1911	
FARMERSWAGES	-326790	269151	-1.214	0.2376	
GOVTBUDGET	-121.832	119.849	-1.017	0.3204	
ELNINO	4.28861e+06	3.98627e+06	1.076	0.2937	
yhat^2	3.32363e-07	1.96563e-07	1.691	0.1050	
yhat^3	0	0	-1.900	0.0706	*

Test statistic: F = 5.719069, with p-value = P(F(2,22) > 5.71907) = 0.01

Regression Specification Error Test or the RESET was used for the linear regression model wherein the said test is used to test different specification errors such as incorrect functional form, redundant, and omitted variables(Gujarati, 2004).

Table 2.2 presents the Ramsey Reset test result that indicates there is functional form misspecification since the results fail to reject the null hypothesis due to the P-value did not exceed the level of significance 5%.

To check whether residuals are normally distributed help explain the response variable of this model Normality Test of Residuals was utilized.

Table 2.3 Normality Test of Residuals

Frequency distribution for uhat1, obs 1-28

number of bins = 7, mean = -2.72744e-09, sd = 755631

interval			midpt	frequency	rel.	cum.	
	<	-1.521e+06	-1.79e+06	2	7.14%	7.14%	**
-1.521e+06	-	-9.909e+05	-1.26e+06	0	0.00%	7.14%	
-9.909e+05	-	-4.606e+05	-7.26e+05	5	17.86%	25.00%	******
-4.606e+05	-	6.967e+04	-1.96e+05	8	28.57%	53.57%	**********
6.967e+04	-	6.000e+05	3.348e+05	7	25.00%	78.57%	*********
6.000e+05	-	1.130e+06	8.651e+05	5	17.86%	96.43%	******
	>=	1.130e+06	11.4e+06	1	3.57%	100.00%	*

Test for the null hypothesis of the normal distribution:

Chi-square (2) = 2.772 with p-value 0.25011

The Jarque – Bera (JB) Test of Normality is considered as an asymptotic or large-sample test which is also based on the residuals of the Ordinary Least Squares (OLS). The test primarily computes the scenes and kurtosis measures of the OLS residuals (Gujarati, 2004).

Table 2.3 presents the Normality test of Residual result that indicates residuals are not normally distributed since the results reject the null hypothesis due to P-value exceeds the level of significance 5%.

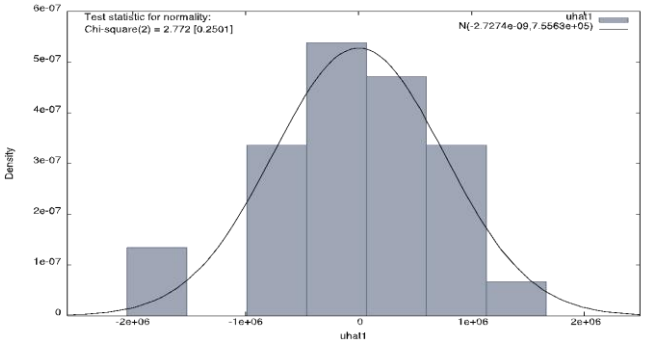

Fig.2.4: Test Statistics for Normality

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Figure 2.4 presents Test Statistics for Normality shows that the departure from normality is not too severe.

The Breusch-Pagan test was used to check whether the estimated variance of residues from regression is dependent on the values of the independent variables.

There is a presence of Heteroskedasticity if the variance of the error term is constant for all observations do not hold which is an assumption of the Ordinary Least Squares (OLS) (Salvatore & Reagle, 2002). The test of White – Heteroskedasticity was used to test if the regression residuals have unequal variances.

The general test of Heteroskedasticity as proposed by White does not rely on the normality assumption and is much easier to implement (Gujarati, 2004).

Table 2.4 Breusch-Pagan test for heteroskedasticity

OLS, using observations 1987-2014 (T = 28)

Dependent variable: scaled uhat^2

	Coefficient	std. error	t-ratio	p-value	
const	−7.26375	4.94124	−1.470	0.1545	
FARMERSWAGES	0.0546855	0.0345350	1.583	0.1264	
GOVTBUDGET	−2.54767e-05	2.21312e-05	−1.151	0.2610	
RICE LIBERALIZATION LAW	1.68869	0.829151	2.037	0.0529	*

The explained sum of squares = 16.4519

Test statistic: LM = 8.225938, with p-value = P(Chi-square(3) > 8.225938) = 0.041566

In other words, if the chi-square exceeds the critical chi-square value at the chosen level of significance, there is a presence of heteroskedasticity otherwise, there is no presenceof heteroskedasticity in the model (Gujarati, 2004).

Table 2.4 presents the Breusch-Pagan test result that indicates there is no presence of heteroskedasticity or it is homoscedastic since the results fail to reject the null hypothesis due to P-value does not exceed the level of significance 5%.

To check whether the coefficients in two linear regressions on different data sets are equal, the Chow test was utilized.

Table 2.5 Chow Test

Augmented regression for Chow test

OLS, using observations 1987-2014 (T = 28)

Dependent variable: RICE PRODUCTION

	coefficient	std. error	t-ratio	p-value	
Const	6.61860e+06	6.13141e+06	1.079	0.2932	
FARMERSWAGES	11700.3	46982.3	0.2490	0.8059	
GOVTBUDGET	147.864	68.0146	2.174	0.0419	**
RICE LIBERALIZATION LAW	−1.58799e+06	634662	−2.502	0.0211	**
splitdum	−6.99746e+06	8.34976e+06	−0.8380	0.4119	
sd_FARMERSWAGES	64947.4	58971.2	1.101	0.2838	
sd_GOVTBUDGET	−110.403	69.6477	−1.585	0.1286	
sd_RICE LIBERALIZATION LAW	685192	866838	0.7904	0.4385	

Mean dependent var	12937773	S.D. dependent var	3325498
Sum squared resid	9.58e+12	S.E. of regression	692206.0
R-squared	0.967906	Adjusted R-squared	0.956673
F(7, 20)	86.16712	P-value(F)	1.53e-13
Log-likelihood	−411.5536	Akaike criterion	839.1071
Schwarz criterion	849.7647	Hannan-Quinn	842.3653
Rho	0.277944	Durbin-Watson	1.390443

Chow test for a structural break at observation 2000

F(4, 20) = 2.1499 with p-value 0.1121

Structural changes possibly caused by differences in the intercept or the slope coefficient or both are characterized by the Chow Test (Gujarati, 2014). The model uses F-test in order to test which of the two regression is more efficient: single regression and two separate regressions which involve splitting the data into two sub-samples

Wherein, if the calculated f- ratio exceeds the critical value, the null hypothesis structural stability can be ruled out, otherwise, the null hypothesis is accepted.

Table 2.5 presents the Chow test result that indicates there is no structural break in data since the results fail to reject the null hypothesis due to the P-value exceeds the level of significance 5%.

Multicollinearity exists in multiple linear regression. The predictor variables are highly correlated. To find out to what extent that the regressand or outcome can be predicted by the regressors or independent variable is one of the purposes of regression. The R2 measures the strength of the prediction which is also known as variance explained wherein, multicollinearity increases the standard errors of the coefficients. (Ranjit, 2015) To measure the presence of

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multicollinearity, the variance inflation factor (VIF) wasutilized. Further; it assessed how much the variance of an estimated regression coefficient increases if your predictors are correlated. If no factors are correlated, the VIFs will all be 1.

To check if Multicollinearity is evident, that is when two or more independent variables have an existing linear relationship between or among them. The presence of Multicollinearity can be with the Variance-Inflating Factor:

VIF	
FARMERSWAGES	6.174
GOVTBUDGET	6.282
RICE LIBERALIZATION LAW	1.044

The Variable Inflation Factor (VIF) by each independent variable is substantially less than 10 and, as a rule of thumb, the independent variables are available from any autocorrelation problem problems.

Hypothesis Testing

Hypothesis 1: Farmers' wages have a significant impact on the rice production of the Philippines.

Conclusion: Accept

Hypothesis 2: Government budget has a significant impact on the rice production of the Philippines.

Conclusion: Accept

Hypothesis 3: Rice Liberalization Law has a significant impact on the rice production of the Philippines.

Conclusion: Accept

Hypothesis 4: Rice production in the Philippines exhibits a positive relationship with the Government budget.

Conclusion: Accept

Hypothesis 5: Government budget exhibits a positive relationship with farmers' wages.

Conclusion: Accept

Hypothesis 6: Rice production exhibits a positive relationship with farmers' wages.

Conclusion: Accept

Hypothesis 7: Rice Liberalization Law exhibits a positive relationship with farmers' wages.

Conclusion: Accept

Hypothesis 8: Rice Liberalization Law exhibits a positive relationship with the government budget.

Conclusion: Accept

Hypothesis 9: Rice Liberalization Law exhibits a positive relationship with rice production.

Conclusion: Accept

The estimated value of the coefficient in terms of the T-ratios exceeds two in magnitude leads us to conclude that all the parameters (macroeconomic indicators) are statistically significant at a 90 - 95 percent confidence level in explaining the variations of volume Rice Production. The regression results also indicated that the factors affecting the trend of the volume of Rice Production are of the expected signs, which lead us to accept hypotheses 1 to 5.

This means that the trend and growth patterns of the farmers' wages and government budget affect the annual performance of rice production. And with this, the researchers have drawn inferences to the 28 observations (annually time-series data) that are processed through the use of statistical tools for the descriptive and inferential analysis part of the study. The significant findings of the study only discussed the link between farmers' wages, government budget, and Nueva Ecija rice production.

Conclusions and Recommendations

Findings suggest that the government budget positively affects rice production in the Philippines. Therefore, the government budget is concerned and taking actions of the status quo. In 2013 it is reported that 96% of rice self-sufficiency was achieved when local farmers produced 18.44 million metric tons of rice, the country's highest rice production in history, and as of July 22, 2013, the country has exported premium and organic black rice varieties. But despite the media blitz from the DA, the country was still importing thousands of metric tons of rice from countries like Vietnam and Thailand. The country is still one of the top rice importers in the world due to typhoons, notably Super Typhoon Yolanda and the 2015 - 2016 El Niño that it is said to be worse than 1997-1998 El Niño.

It is suggested that the government must focus more on the agricultural sector and especially engage in the production of rice at a lower cost in order to improve rice production.With this in mind, the nation's farmers should see how they can consider applying effective strategies (Marcos,

https://dx.doi.org/10.22161/ijaems.66.9 *ISSN: 2454-1311*

Subia, Ermita, 2020) andtechniques used in the Nueva Ecija farm so that a Nueva Ecija farmer can succeed in meeting the challenge. Aside from this, there is a need to help farmers gain access to modernize machines like rice threshers, combine harvesters, rice transplanter and many more modernize technologies to improve rice production. Through this movement, rice self-sufficiency could be achieved at a lower price and the country can even start to export again and minimize imports.

Some farmers should seek to plant other crops in order to increase their profits. Perhaps there should be more trading centers around the country to enable farmers to sell directly on the market. Lastly, is to hire farmers by the government during planting season to provide more income.These actions are crucial for the country's economic growth and poverty reduction (Ignacio, et.al., 2019).

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