Asian Journal of Agriculture and Rural Development

journal homepage: http://aessweb.com/journal-detail.php?id=5005

# Effects of Paddy Price Support Withdrawal on Malaysian Rice Sector: Time Series Econometric Approach

**Umar Haruna Suleiman**
Department of Agribusiness and Information System; Faculty of Agriculture, University Putra Malaysia, Serdang Selangor, Malaysia and Department of Agricultural Economics and Extension; Faculty of Agriculture, Nasarawa State University, Keffi (Lafia Campus), Nigeria

**Amin Mahir Abdullah, Mad Nasir Shamsudin and Zainal Abidin Mohamed**
Department of Agribusiness and Information System; Faculty of Agriculture, University Putra Malaysia, Serdang Selangor, Malaysia

**Abstract**

The study simulated effects of paddy price support withdrawal, as an alternative policy, on key variables namely domestic rice supply, domestic rice demand, net import of rice, area planted to paddy and paddy producer price. Time series data (1980-2012) were collected and analyzed using Autoregressive Distributed lag (ARDL). The long run coefficients or elasticities generated were used in scenarios simulation through appropriate simulation technique. The results show that, on the average, paddy price support withdrawal would affect the rice sector by 2020 in the following ways: 13% decline in domestic rice production; 23% increase in net rice import; area planted to paddy decrease in size by 13%; and, paddy producer price reduce by 20%. However, there was no effect on aggregate rice consumption. Since the country is concern about raising farm income and ensuring rice food security, sustaining the paddy support price is worthwhile policy in order to avoid a decline in paddy producer price (income) and surge in import bills.

**Keywords:** Paddy price support withdrawal, simulation, food security, rice sector

## Introduction

Rice sector in Malaysia is, at the moment, heavily supported and protected because of its socio-political and economic importance. The country has a long history of government intervention in rice sub-sector. The global instability in rice prices experienced in early 1970 and middle of 1980 reinforced the necessity for the state intervention. Three main objectives for the formulation and implementation of various policies on rice through the decades by the government included: (i) ensuring food security; (ii) raising farm income and productivity; and, (iii) ensuring food supply to consumers at reasonable cost.

The government supports for the rice sector has been consistently maintained and reflected in both National Agricultural Plans (NAPs) and Malaysia Plans. In 1980s, the government intervention in rice market was reinvigorated through different policies like monopoly on imports, paddy price support and fertilizer subsidy. The government also provides investments in building drainage and irrigation facilities and funded research and development in rice sector.

Corresponding author’s
Name: Umar, Haruna Suleiman
Email address: umarhsuleiman@yahoo.com

Over the years, the Malaysian government interventions in rice industry, in the form of paddy price support, guarantee minimum price, fertilizer and agro-chemical subsidy and monopoly on import, have earned different levels of self-sufficiency in rice production. The country usually resorts to importation of rice to augment deficit in demand-supply gap. Though the country current rice import policy supports the nation's self-sufficiency policy in that the import volume depends on the production of local rice. *BERNAS* (a state owned company with monopoly right of rice import) imports about 35% to 40% of Malaysia's domestic rice demand annually (GAIN Report, 2011). Malaysia has entered "Agreement on Agriculture" (AoA) of WTO and the "Common Effective Preferential Tariff" (CEPT) of AFTA. These agreements called for the liberalization of agricultural sector by removing all forms of trade barriers including production subsidy (such as paddy price support) by all member countries. Though at the moment, there had been different levels of compliance to the agreement's obligations among member countries, some major changes in rice production and market has been witnessed by some member countries as a result of enforcement of the agreements. For instance, market-driven rice production in Vietnam has resulted in surplus production and making the country to be the second largest rice producer in the world. The country large rural population produces rice, so the positive impacts of increased export was largely dispersed. According to Minot and Gulotti (2000), overall poverty incidence of Vietnam has decreased significantly following liberalization policy of rice sector. In China, market-orientation has induced a shift towards production of high quality rice.

Contrary to the support and protection of rice sector by Malaysian government, the country membership in the WTO and AFTA makes it mandatory to open up agricultural sector in terms of adopting liberalization and market-driven policy option. The full implementation of the agreements connotes removal of trade barriers and production subsidy (paddy price support). While some economist analysts believe that adopting such policy option would make the country agricultural sector more competitive. However, according to Arshad *et al.* (2005), the price support scheme of Malaysian rice sector was able to increase output by 65.8% and contribute to a 38.6% change in income. The fertilizer and price support components of production subsidy constitute 58% of total farm income. Other studies have also lent credence to the above reports: Ahmed and Tawang (1999) observed that Malaysian paddy rice subsidy alone constituted almost 50% of the farm income, and that a situation where all subsidies were to be withdrawn, the farm profitability would decline by 57%. Thus, this significant decline in income is believed to have an economic injury on the wellbeing of small size farmers who constitute the majority of rice farmers in the country.

Hence, the government's efforts toward striking a balance between the goal of protecting smallholder paddy producers (by proving paddy price support) and pursuing food security for the nation on the one hand, and the need to honour her bilateral agreements by making agricultural sector a market driven (which implies the removal of all forms of subsidies and protections from rice sector) on the other hand, certainly depend on knowledge garner from empirical analysis of implications of such policy on domestic rice production, paddy producer price (income) and net import of rice.

Previously, few studies have attempted to analyze the impact of Malaysian liberalization policy on rice sector (Ramli *et al.,* (2012); Daviga *et al.* (2011); Ahmad and Tawang, (1999); Mustapha (1998)). Ramli *et al.* (2012) research is limited in scope to income effect of paddy price support withdrawal, no mentioned was made about effects on domestic production level, paddy farm price, import level etc. The system dynamic (through cross sectional data) was used as against time series econometrics. The dynamic information which time series data convey could be useful in determining the direction of future development. Deviga *et al.* (2011) observed large net welfare gains and a significant reduction in government expenditures if all forms of government interventions were removed and a free market allowed in agricultural sector. In this study, elasticity of demand and supply were obtained from different secondary sources as the model used (SPEM) lack the capacity to estimate them. Importing elasticity from different sources could affect both authenticity of the final results and inferences made from the results. The study effect of trade liberalization on agriculture in Malaysia (rice sector in-focus), using time series econometrics, Ahmad and Tawang (1999) observed all-round efficiency and welfare gains from the policy. However, no mentioned was made about subjecting the econometric estimation of supply function to validation tests which is necessary for valid inference. The authors' imported elasticity of demand from secondary sources could affect the final results; and due to the old nature of the research (1999), this result might not adequately apply to current situation in the sector. Mustapha (1998) observed that the imposition of price control favoured consumers at the expense of producers .The policy instrument under analysis in this research was Guaranteed Minimum Price (GMP) and their relationship to the self-sufficiency level in rice production. No mentioned was made regarding other policy instrument such as paddy support price and GMP policy is no longer applicable in rice sector of the country.

In view of the above shortcomings observed in the previous research on the subject matter, assessing the effect of alternative policy (paddy price support withdrawal) on major variables, such as Domestic Rice Production (DRPP), Rice Net Import (RNIM), Rice Total Consumption (RTCN), Area Planted to Paddy (APAP) and Paddy Producer Price (PPPR), using up-to-date time series data, has becomes imperative to policy makers in the country. Hence, the objective of this study is to simulate the effects of alternative rice sector policy (that is paddy price support withdrawal policy) on the nation rice output, consumption level, paddy farm price and rice import quantity in the country. Simulation of the selected variables was based on estimated elasticity from appropriate time series econometric method.

Besides introduction, the paper is subdivided into methodology, empirical result findings, conclusion and recommendations, and references.

## Methodology

Time series data for the periods of 1980 to 2012 were collected from the Paddy Statistics Unit, Ministry of Agriculture and Agro-based Industry, Malaysia; and, Food and Agricultural Organization (FAO) website. Data were collected and measured on the following variables: $APAP_t$ = Paddy Area Planted (Ha) in period t; $APYD_t$ = Paddy Yield (Kg/Ha) in period t; $PPPR_t$ = Paddy Producer Price (RM/T) in period t; $PFPR_t$ = Paddy Farm Price (RM/T) in period t; $RRPR_t$ = Rice Retail Price (RM/T) in period t; $WRPR_t$ = Wheat Retail Price (RM/T) in period t; $FESUB_t$ = Fertilizer Subsidy (RM/annum) in period t; $TECH_t$ = Technological progress (Trend); $PPRS_t$ = Paddy Price Support (RM/T) in period t; $RPCN_t$ = Rice Consumption per Capita (Kg) in period t; $PCY_t$ = Income per Capita (RM) in period t; $RTCN_t$ = Rice Total Consumption (T) in period t; $POP_t$ = Country Population (Number of people) in period t; $RNIM_t$ = Rice Net Import (T) in period t; $DRPP_t$= Domestic Rice Production (T) in period t; DAPAP= Dummy (1= period of global crisis in rice market; 0= Any other period); CV= Conversion factor for paddy into rice grain.

The functional form of time series econometric model which explains the behaviour of actors or players in rice market in Malaysia consists of four components namely; domestic rice producers, the consumers, importing agency and agency in charge of policy formulation concerning price support to paddy producer and other production subsidy. In this model, the rice/paddy production (supply side) is disaggregated into area planted and yield, while rice demand market is represented by demand equation. Thus, the model consists of three structural or behavioural equations and five identity equations. The behavioural equations were equations of area planted and yield, and domestic demand. While identity equations involved total domestic production, total consumption, import demand, paddy producer price and price transmission equation.

**Area planted**

The area planted equation is the Nerlovian type where the paddy area planted ($PAP_t$) is written as a function of the lagged dependent variable, $PAP_{t-1}$, lagged paddy producer price, $PPPR_{t-i}$, and, dummy that captured the effect of global shock periods on area planted to paddy (DAPAP). The lagged of area planted is included to reflect the partial adjustment of cropland towards the desired level. It should be noted that the area planted equation is a restricted equation mainly due to heavy support and subsidy enjoy by paddy farmers in the country. The equation is specified as follows:

$$LAPAP_t = \alpha_0 + \alpha_1 LAPAP_{t-1} + \alpha_2 LPPPR_{t-i} + \alpha_3 DAPAP_t + \mu_t \quad \ldots\ldots \quad 1$$

**Yield**

The paddy rice yield is assumed to be determined by technology, $TECH_t$, (improved seed and management practices), and amount of fertilizer applied (which depend on fertilizer subsidy), $FESUB_t$. Thus, the paddy rice yield is function of technological development, and fertilizer subsidy. Again, yield equation was specified as a restricted equation in view of protectionist policy on the supply-side of rice sector.

$$LPYD_t = \lambda_0 + \lambda_1 LFESUB_t + \lambda_2 TECH_t + \mu_t \quad \ldots\ldots \quad 2$$

L= Natural Log in respective equation; t= Time period in respective equation; α and λ = Constants and coefficients for respective variables; $\mu_t$ =White-noise error term in the respective equations; $DAPAP_t$= Dummy that captured effect of shock periods on Paddy Area Planted.

**Domestic demand**

The demand equation was given as a function of own price, ($RRPR_t$), the price of substitute crop (wheat), ($WRPR_t$), and income per capita, ($PCY_t$). Hence, the rice consumption per capita equation was specified as follows:

$$LRPCN_t = \gamma_0 - \gamma_1 LRRPR_{1t} + \gamma_2 LWRPR_{2t} + \gamma_3 LPCY_{3t} + \mu_t \quad \ldots\ldots \quad 3$$

L= Natural Log; γ = Constant and coefficients of respective variable; $\mu_t$= Error term.

**Import demand**

The import demand is considered as an excess demand over the country total rice production. It is therefore considered as a difference between total rice consumption and domestic production. The identity equation is expressed as follows:

$$RNIM_t = RTCN_t - DRP_t \quad \ldots\ldots \quad 4$$

Other identity equations were specified as follows:

$$RTCN_t = RPCN_t * POP_t \quad \ldots\ldots \quad 5$$

$$DRPP_t = (PAP_t * PYD_t) * 0.644785983(CV) \quad \ldots\ldots \quad 6$$

$$PPPR_t = PFPR_t + PPRS_t \quad \ldots\ldots \quad 7$$

The market clearing condition is given below:

Market Equilibrium (ME) = $DRPP_t + RNIM_t - RTCN_t$

**Price**

The paddy farm price is considered as a function of retail price of rice or the price consumers willingly paid for rice demanded. The price transmission equation is specified as follows:

$PFPR_t = f(RRPR_t)$ ……………………. 8

The estimation of structural equations containing non-stationary variables, but their linear combinations are stationary, were done using Auto Regressive Distributed lag (ARDL) particularly as combining variables are integrated of order (0) and (1). Engle and Granger (1987) observed that the presence of co-integration implied the existence of a corresponding error-correction representation. So, Error Correction Model (ECM) was also estimated from long-run coefficients but not provided here because of non-applicability to the main objective of the study. The ARDL is specified as follows:

$$Y_t = \alpha_0 + \sum_{i=1}^{K} \propto_{1i} Y_{t-i} + \sum_{i=0}^{K} \propto_{2i} x_{1t-i} + \sum_{i=0}^{K} \propto_{3i} x_{2t-i} + \mathcal{E}_t \quad \text{………9}$$

$Y_t$ = Vector for dependent variable; $Y_{t-1}$ = Vector for lag-dependent variables; $X_t$ = Vector for exogenous variables; K = Lag length; α = Coefficients for the variables; and $\mathcal{E}_t$ = Error term in respective equations.

According to Labys and Pollak (1984) policy decision making can be simulated by changing the values of the exogenous policy variables and observe their impact on variables Y (endogenous variables). Arshad *et al.* (2012) specified the equations for simulation and forecasting as applied to estimated model with elasticity. It is stated as follows:

$$Y_t = Y_{t-1} + Y_{t-1}(\Delta Y) \quad \text{……………. ….10}$$

Where;

$$\Delta Y_t = \alpha_1 * \Delta X_1 + \alpha_2 * \Delta X_2 + \alpha_3 * \Delta X_3 + \ldots\ldots + \alpha_n * \Delta X_n \quad \text{………………. 11}$$

$$\Delta Y = (Y_t - Y_{t-1})/Y_{t-1} \quad \text{................................ 12}$$

Y = Variable of interest to be projected; $Y_{t-1}$ = One period lag value of the affected variable; $\Delta Y_t$ = Annual growth rate for the variable of interest either endogenously determined (equation 11) or exogenously determined (equation 12); $\alpha_1$ = estimated coefficient; ΔX = percentage change in exogenous variables. Note: Solver Tool in excel was used to solve simultaneously the results generated from equations 10-12.

Unit root and co-integration tests were done using appropriate methods. The popular test of stationary (or non-stationary) adopted for this study was the unit root test using Augmented Dickey-fuller (ADF) and Phillips-Perron (PP) tests. Autoregressive Distributed lag (Bounds) testing approach to co-integration, using joint test or F-test statistics, was used for determining the existence of a long run relationship among the variables. Given the relatively small size sample for this study (33 observations), the critical value for small size sample generated by Narayan (2005) was used. The lag length selections for each equation was determined through Hendry's general to specific procedure with minimum value of SIC (Schwarz Information Criterion). The maximum lag in each case was two.

Model validation and diagnostic tests were done to validate the predictive ability of the model to ensure valid inferences about the estimated coefficients. The estimated equations were validated using Root Mean Square Percentage Error (RMSPE) and Theil Inequality Coefficient (U). The estimated coefficients were subjected to the following diagnostic tests: Autocorrelation (LM); and, Structural Stability (CUSUM of Square).

**Empirical result findings**

The unit root tests were based on the methods of intercept with trend for variables at level, and only intercept for variables at first difference test. The Schwarz Information Criterion (SIC) was used in choosing the optimum lag length. The results of these tests are presented in Table

1. The results show that both ADF and PP concurred in classifying the following variables as I(1)-that is they are non-stationary at level but become stationary after first differencing: LPPPR, LPFPR, LFESUB, LRPCN, LWRPR and LPCY.

The variables-LRRPR and TECH were confirmed to be stationary at level, I(0), as indicated by their critical values which are both significant at 5% level (Table 1). However, for LAPAP, the results from the two methods-ADF and PP were conflicting. Hence LAPAP is treated as and I (1) variable.

The equations of LAPAP and LRPCN were confirmed to be co-integrated which implies that they have long-run relationship (Table 2). The remaining equation namely LAPYD was having inconclusive Bound test results. But further confirmation tests such the dynamic stability tests and the sign of error correction terms (which must be negative) obtained from the equation suggested treating LAPYD as co-integrated equation.

**Table 1: Result of unit root tests**

| Variables | Level | | First differencing | |
|---|---|---|---|---|
| | ADF | PP | ADF | PP |
| LAPAP | -3.56** | -3.54 | -4.622*** | -6.73*** |
| LAPYD | -3.43 | -3.26 | -6.25*** | -7.22*** |
| LPPPR | -1.36 | -1.48 | -4.04*** | -4.04*** |
| LPFPR | -1.10 | -1.20 | -4.04*** | -4.04*** |
| LFESUB | -1.03 | -1.22 | -4.59*** | -4.59*** |
| TECH | - | -15.40*** | | |
| LRPCN | -3.37 | -3.24 | -7.34*** | -7.35*** |
| LRRPR | -4.03** | -3.96** | - | - |
| LWRPR | -3.53 | -3.53 | -9.93*** | -9.76*** |
| LPCY | -1.30 | -1.71 | -4.40*** | -4.40*** |

**Table 2: Co-integration test results**

| Dep. Variables (Represent each Equation) | K | SIC (Minimum Value) | F-Statistic | Narayan (2005) CV at 5% | | Remark |
|---|---|---|---|---|---|---|
| | | | | I(0) | I(1) | |
| $\Delta LAPAP_t$ | 1 | -4.611 | 6.409*** | 5.393 | 6.350 | Yes |
| $\Delta LAPYD_t$ | 2 | -2.716 | 4.965** | 4.269 | 5.473 | Inc. |
| $\Delta LRPCN_t$ | 3 | -2.718 | 6.977*** | 3.710 | 5.018 | Yes |

**Note:** (**) and (***) denote significant at 5% and 1% respectively. K = exogenous variables in each equation; SIC = Schwarz Information Criterion (Minimum value in each equation); CV = Critical Values at 5% level of significant.

**Estimated long-run coefficients**

The long-run coefficients were obtained by estimation of equation 9. In each of the respective equations, the long-run coefficients for exogenous variables were obtained after normalizing on the lag dependent variables (Narayan, 2004). The estimated long-run level equations were made to pass autocorrelation test and structural stability test for all the equations. The estimated equations appear stable as CUSUM test statistics did not exceed the bounds at 5% level of significant (Narayan, 2004).

**Note**: The actual graphs for CUSUM test are not included here but can be provided if considered necessary. Full discussion on the statistical and economic property of estimated coefficients is deliberately avoided since our interest is only focusing on estimated elasticity to be used for simulation. As earlier stated, short run coefficients were not included too.

**Estimated long-run coefficients for $LAPAP_t$-Equation**

The partial adjustment of area planted toward the desire level captured by change in the lag dependent variable has expected positive sign and significant at 1% level. The long run elasticity of paddy producer price (PPPR) has expected positive sign but shows no significant influence on area planted (APAP) to paddy (Table 3). The dummy variable (DAPAP) shows significantly influence on area planted to paddy in the country.

**Table 3: $LAPAP_t$-estimated long-run coefficients**

| Variable | Coefficient | Std. Error | T-Statistic |
|---|---|---|---|
| C | 2.741367 | 1.283853 | 2.135266** |
| $LAPAP_{t-1}$ | 0.793249 | 0.095807 | 8.279621*** |
| $LPPPR_{t-1}$ | 0.002096 | 0.008936 | 0.234596 |
| DAPAP | 0.033557 | 0.004896 | 6.853828*** |
| Normalized Long-run Relation | | | |
| C | 13.25926 | 0.292495 | 45.33162*** |
| $LPPPR_t$ | 0.010140 | 0.043088 | 0.235325 |
| DAPAP | 0.034722 | 0.005242 | 6.623836*** |
| $R^2$ =0.75 | | | |
| DW=2.13 | | | |
| LM=5.03 | | | |

**Note:** (**) and (***) denote significant level of 5% and 1% respectively.

**Estimated long-run coefficients for $LAPYD_t$-equation**

The long run coefficient for the trend variable ($TECH_t$) which capture the rice related technological advancement has expected positive sign and statistically significant at 1% level; an indication of appreciable technological driven improvement in paddy production. The long-run elasticity of fertilizer subsidy variable ($FESUB_t$) has expected positive sign but insignificantly influencing the paddy yield (Table 4).

**Table 4: $LAPYD_t$-estimated long-run coefficients**

| Variable | Coefficient | Std. Error | T-Statistic |
|---|---|---|---|
| C | -1.713506 | 3.048768 | -0.562032 |
| $LAPYD_{t-1}$ | 0.671893 | 0.124725 | 5.386993*** |
| $LFESUB_t$ | 0.225093 | 0.177601 | 1.267403 |
| $TECH_t$ | 0.046734 | 0.018438 | 2.534630** |
| Normalized Long run Relation | | | |
| C | -5.222397 | 9.222433 | -0.566271 |
| $LFESUB_t$ | 0.686034 | 0.492667 | 1.392490 |
| $TECH_t$ | 0.142434 | 0.042971 | 3.314619*** |
| $R^2$ =0.85 | | | |
| DW= 2.06 | | | |
| LM=2.639912 | | | |

**Note:** (**) and (***) denote significant level of 5% and 1% respectively.

**Estimated long-run coefficients for $LRPCN_t$-Equation**

The owned price elasticity of rice demand has expected negative sign but statistically insignificant in the long run (Table 5). The long run coefficient for wheat with expected positive sign and statistically significant at 1% level, implies that wheat is a substitute to rice commodity in consumption even in the long run. The coefficient for income was negative, inelastic and significant at 10% level (Table 5). This result implies that rice is an inferior good in Malaysia.

**Estimated price transmission equation for LPFPR**

The estimate of price linkage equation is necessary to identify the relationship between the rice retail price and paddy farm price. The elasticity of RRPR (rice retail price) with respect to paddy farm price is 0.22 and is statistically significant at 5% level (Table 6). This means that a 1% increase in retail price would result in 0.22% increase in the paddy farm price. The result also suggests that any movement in the retail price in response to global price changes would affect the domestic paddy farm price in the same direction of the movement.

**Table 5: $LRPCN_t$-estimated long-run coefficients**

| Variable | Coefficient | Std. Error | T-Statistic |
|---|---|---|---|
| C | 5.443459 | 1.110779 | 4.900577*** |
| $LRPCN_{t-1}$ | -0.214619 | 0.208336 | -1.030157 |
| $LRPCN_{t-2}$ | -0.072065 | 0.165232 | -0.436143 |
| $LRRPR_t$ | -0.023796 | 0.151709 | -0.156853 |
| $LWRPR_t$ | 0.094531 | 0.048315 | 1.956570* |
| $LWRPR_{t-1}$ | 0.158022 | 0.049989 | 3.161155*** |
| $LPCY_{t-1}$ | 0.259050 | 0.086823 | 2.983657*** |
| $LPCY_{t-4}$ | -0.390882 | 0.094790 | -4.123667*** |
| Normalized Long-run Relation | | | |
| C | 4.764291 | 1.311576 | 3.632493*** |
| $LRRPR_t$ | -0.020827 | 0.130806 | -0.159220 |
| $LWRPR_t$ | 0.221043 | 0.068889 | 3.208699*** |
| $LPCY_t$ | -0.115383 | 0.066622 | -1.731902* |
| $R^2$ =0.69 | | | |
| DW=1.97 | | | |
| LM=4.598489 | | | |

**Note:** (*), (***) denote significant level of 10% and 1% respectively.

**Table 6: $LPFPR_t$- Price transmission equation estimate**

| Variable | Coefficient | Std. Error | T-Statistic |
|---|---|---|---|
| C | -0.981149 | 0.341391 | -2.873980*** |
| $LPFPR_{t-1}$ | 0.912534 | 0.061899 | 14.74231*** |
| $LRRPR_t$ | 0.221581 | 0.080591 | 2.749448** |
| $R^2$ =0.97 | | | |
| RW=1.49 | | | |
| LM=2.526508 | | | |
| RESET=0.730160 | | | |

**Note:** (**) and (***) signify significant level of 5% and 1% respectively.

**The model *ex post* prediction power (validation) tests results**

The estimated equations of APAP, APYD, RPCN and PFPR were validated through the sample periods to examine how closely they could track the path of the actual observation. This is described as estimated equations predictive power. They were measured by Root Mean Square Percentage Error (RMSPE) and Theil's Inequality Coefficient (U). The values of RMSPE were generally low (less than 2%) for all the dependent variables. Also, the calculated values of U of all the endogenous variables were less than one (Table 7). The results imply that predictive error associated with estimated equations in tracking the actual data (*ex-post* prediction) were very low and insignificant, hence could be used for *ex-ante* projection with high projection validity.

**Table 7: Model ex-post prediction power (validation) tests**

| Dependent variables | Root mean square percentage error (RMSPE) | Theil's inequality coefficient (U) |
|---|---|---|
| LAPAP | 0.03 | 0.0007 |
| LAPYD | 0.24 | 0.0012 |
| LRPCN | 1.60 | 0.0080 |
| LPFPR | 0.70 | 0.0040 |

(C) The effect of paddy price support withdrawal policy alternative was simulated on selected variables namely; PPPR (paddy producer price), APAP (area planted to paddy), DRPP (domestic rice production), RTCN (rice total consumption), and RNIM (rice net import). The policy scenario simulated was (i) SN 1: removing paddy price support while retaining any other production subsidy-fertilizer subsidy and (ii) BL: The baseline scenario represents current government policy in rice sector (that is provision of production subsidy in the form of paddy price support and fertilizer subsidy). The variables for simulation were estimated using equations 11, 12 and 13 respectively as implemented by Arshad *et al.* (2012). In order to determine the rate of change (%) in the exogenous policy variables for 2013, seven years aggregate mean of 'change rate' (between 2006 and 2012) were calculated for each of the variables. The projection of the endogenous variables from 2013 to 2020 was made with 2012 data as base year. In determining the price at market clearing, the estimated variables from equation 11 to 13 were solved simultaneously using solver tool in excel window. The effect of SN1 scenario was compared with the baseline, and both were projected to 2020 from 2013.

Generally, the projected baseline values grow steadily up and until 2016 after which it started declining and with fluctuated growth henceforth. This is due to price transmission mechanism as price at market clearing was lower than the prevailing market price which by effect forces the paddy farm price lower than the actual prevailing price.

**Paddy producer price (PPPR)**

The paddy producer price is made up of paddy farm-gate price and paddy support price. If government decided to adopt alternative policy of SN1 on rice sector, then paddy producer price would decline by 20%, on the average, by 2020 (Table 8). Such decline could affect the paddy farmers' income greatly and may serve as an incentive for paddy land contraction and subsequently leading to decline in the rice output. The graphical representation of effect is also given below (Figure 1).

**Table 8: Effect of on PPPR**

| Variable | Scenario | Year | | | | | | | | Ave. % |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | Δ |
| PPPR | Baseline | 1,408 | 1,422 | 1,434 | 1,444 | 1,425 | 1,304 | 1,782 | 1,743 | |
| (RM) | SN 1 | 1,206 | 1,215 | 1,222 | 1,232 | 1,212 | 1,061 | 1,110 | 1,239 | -20 |

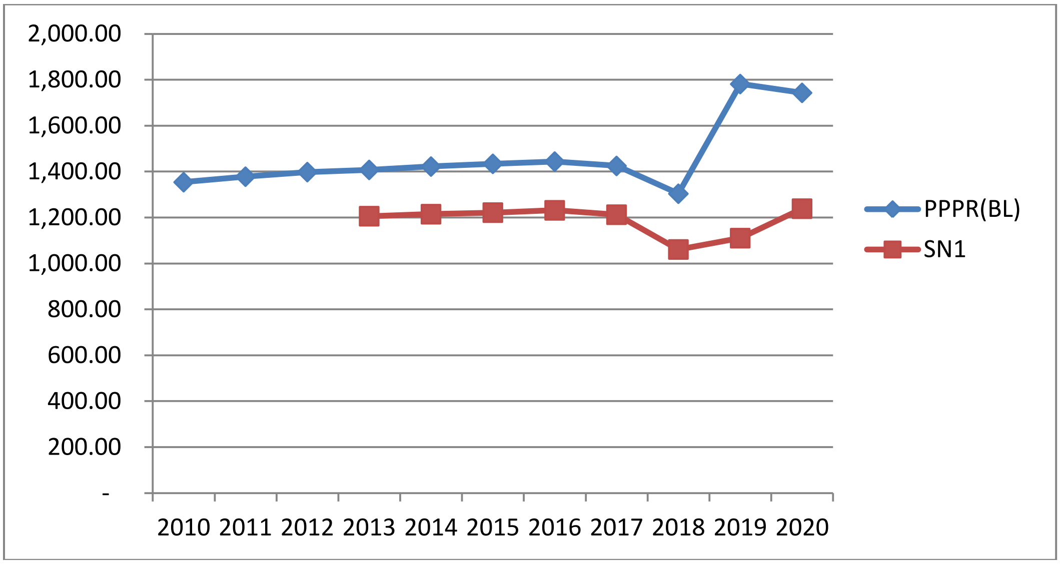


**Figure 1: Graphical illustration of SN1 effects on PPPR**

**Area planted (APAP) to paddy**

The implementation of SN1 alternative policy (that is removal of paddy price support while retaining other production subsidy namely fertilizer subsidy) would result in total reduction of area planted to paddy by 13%, on the average, by the year 2020 (Table 9). This finding implies that removal of paddy price support would result in contracting the land under paddy production, as farmers might decide to substitute paddy farming for other crops because of decline in income. See Figure 2.

**Table 9: Effect of SN1 policy on APAP**

| Variable | Scenario | Year | | | | | | | | Ave. % Δ |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | |
| APAP ('000'Ha) | Baseline | 689.2 | 697 | 702.5 | 707.3 | 698 | 638 | 875 | 856 | |
| | SN 1 | 589.2 | 594 | 597 | 602 | 592.4 | 517.4 | 838.4 | 803 | -13 |

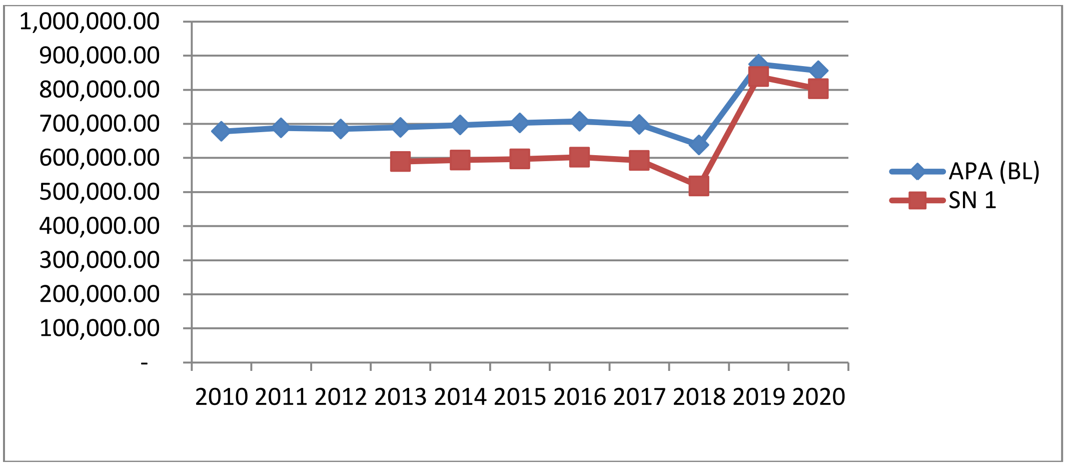


**Figure 2: Graphical illustration of SN1, SN2 and SN 3 effects on APAP**

**Domestic rice production (DRPP)**

The removal of paddy price support while retaining other production subsidy to paddy farmers (SN1) would result to decline of 13% (on the average) of domestic rice production, when compare with baseline projection, by 2020 (Table 10). The amount is less than 24% reduction (from 1.61million tonnes to 1.22million tonnes for 2015) reported by Ramli *et al.* (2012) as a simulated effect of fertilizer subsidy removal on domestic rice production in the country. This implies that the effect of paddy price support withdrawal on domestic rice production is less when compare to situation where fertilizer subsidy is removed. The decline of domestic rice production is represented graphically by Figure 3.

**Table 10: Effect of paddy price support withdrawal on domestic rice production**

| Variable | Scenario | Year 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | Ave. % Δ |
|---|---|---|---|---|---|---|---|---|---|---|
| DRPP (‘000’T) | Baseline | 1,735 | 1,762 | 1,786 | 1,807 | 1,792 | 1,645 | 2,268 | 2,229 | -13 |
| | SN 1 | 1,483 | 1,501 | 1,517 | 1,538 | 1,521 | 1,335 | 2,174 | 2,092 | |

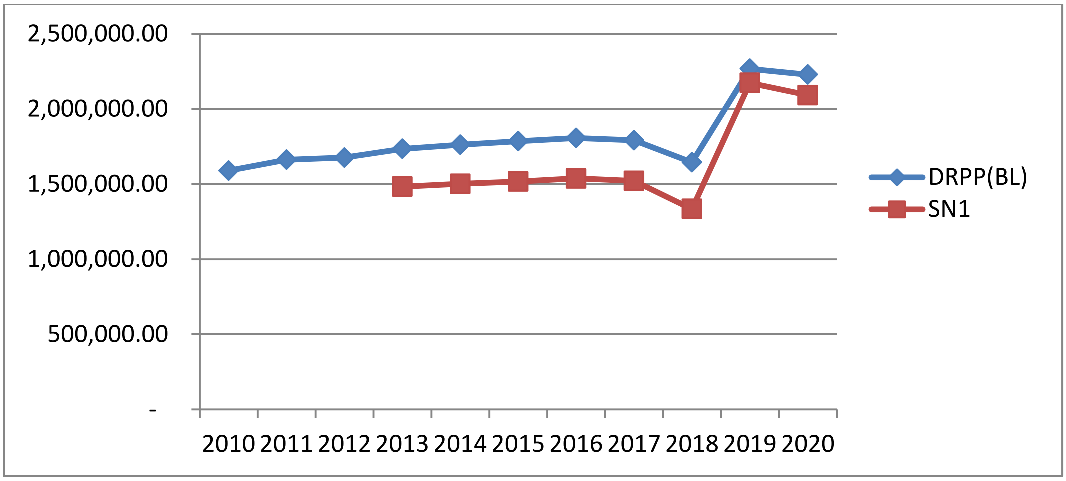


**Figure 3: Graphical illustration of SN1 effects on DRPP**

**Rice total consumption (RTCN)**

The simulated scenario has little or no effect on the rice total consumption because any shortfall in domestic production is usually filled from importation. The importation to fill the demand supply gap would stabilize the domestic retail price thereby necessitating stable demand. The seemingly 0.6% reduction was cause by projected increase in income per capita for the periods of 2013 to 2020. As income increases, total demand for rice decreases-inferior commodity characteristic.

**Table 11: Effect of SN1 on RTCN**

| Variable | Scenario | Year 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | Ave. % Δ |
|---|---|---|---|---|---|---|---|---|---|---|
| DRPP (‘000’T) | Baseline | 2,479 | 2,577 | 2,681 | 2,788 | 2,907 | 3,055 | 3,048 | 3,180 | -0.6 |
| | SN 1 | 2,470 | 2,569 | 2,673 | 2,781 | 2,899 | 3,052 | 2,998 | 3,133 | |

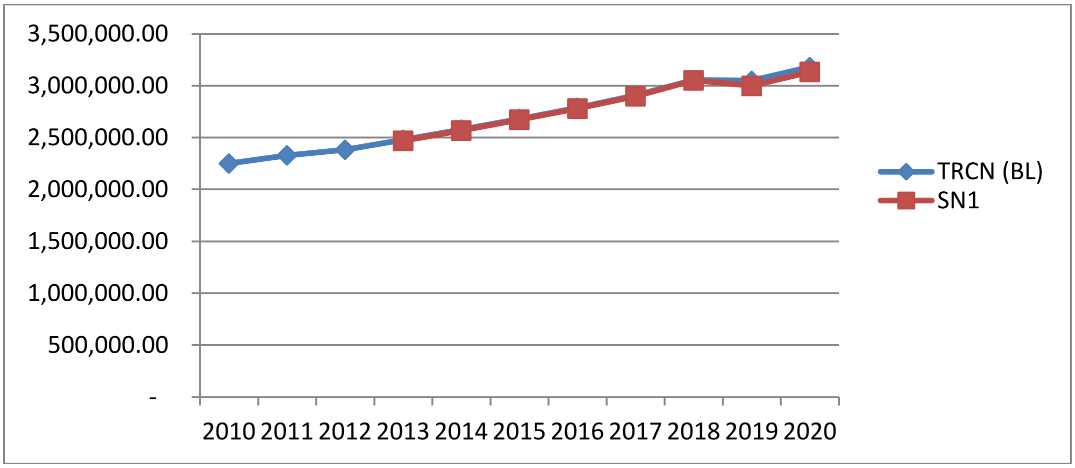


**Figure 4: Graphical illustration of SN1 effects on TRCN**

**Rice net import (RNIM)**

The country normally resorts to rice importation to fill in the demand-supply gap. The implementation of SN1 policy option would boost quantity of rice import by 23%, on the average, by the year 2020 (Table 12). Such increases will exert pressure on the country's hard earned foreign reserve.

**Table 12: Effect of SN1 policy on RNIM**

| Variable | Scenario | Year 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | Ave. % Δ |
|---|---|---|---|---|---|---|---|---|---|---|
| RNIM | Baseline | 744 | 815 | 895 | 981 | 1,115 | 1,409 | 1,480 | 1,451 | 23 |
| ('000'T) | SN 1 | 986 | 1,068 | 1,156 | 1,243 | 1,378 | 1,717 | 1,625 | 1,541 | |

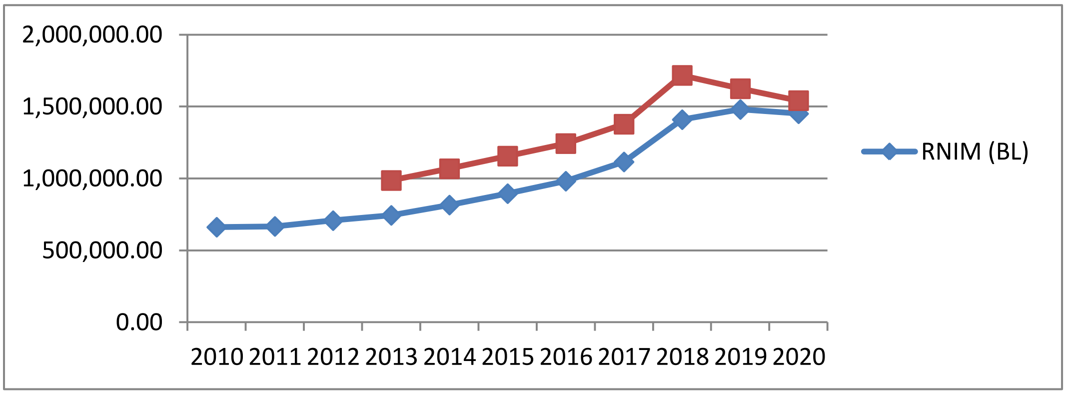


**Figure 5: Graphical illustration of SN1 effects on RNIM**

## Conclusion and recommendation

The simulated effects of alternative policy of paddy price support withdrawal while retaining other production subsidy, namely fertilizer subsidy, show that paddy producer price (PPPR) would decline by 20%, on average, when compare with baseline by 2020. The area planted to paddy (APAP) would reduce in size up to 13%, on average, by 2020. As a result of contraction in area planted to paddy, the domestic rice production in the country would reduce by same amount. With two percent increase in population annually, the paddy price withdrawal would cause increase in net rice import by 23%, on the average, before the end of 2020. However, withdrawal of paddy price support would not affect domestic retail price of rice as shortfall in supply would be augmented by import thereby stabilizing domestic rice demand.

Therefore as country that is concern about raising farm income and ensuring rice food security, retaining the paddy support price is worthwhile policy in order to avoid a decline in paddy producer price (income) and increase in import (surge in import bills) by 20% and 23% respectively.

## References


Arshad, F. M., Shamsudin, M. N., Mohd, N. K., Abdulrahim, K., Mohd, Z. A., Ismail, M. M., & Sadique, S. F. A. (2012). *Malaysian Agricultural Policy Analysis Model (MAgPA): User Guide*. Institut Kajian Dasar Pertanian dan Makanan (IKDPM), Universiti Putra Malaysia. P. 51.

Arshad, F. M., Shamsudin, M. N., & Rosli, S. (2005). Food security in Malaysia. *In Public sector intervention in the rice industry in Malaysia*, by E. C. Dano, and E. D. Samonte. www.zef.de/module/register/media/2692. Accessed 23-01-2014.

Ahmed, T. M. A., & Tawang, A. (1999). *Effect of trade liberalization on agriculture in Malaysia: commodity aspects*. The CGPRT Center Working Paper Series no. 46.

Deviga, V., Harris, M., & Macaulay, G. (2011). *Malaysian rice trade and government interventions*. Paper presented to the 55th annual conference of the Austrian agricultural and resource economics society, Melbourne. 8-11th Feb.

Engle, R. F., & Granger, C. W. J. (1987). Cointegration and error correction: representation estimation, and testing. *Econometrica*, 55, 251-276.

Global Agricultural Information Network (GAIN) report (2011). *Grain and feed annual report for Malaysia*. USDA Foreign Agricultural Service. *www.gain.fas.usda.gov*.

Labys, W. C., & Pollak, P. K. (1984). *Commodity models for forecasting and policy analysis.* Nicholas publishing company New York, USA. P. 209.

Minot, N., & Goletti, F. (2000). *Rice market liberalization and poverty in Viet Nam.* Research Report 114. Washington, DC: IFPRI

Mustapha, N. H. (1998). Welfare gains and losses under the Malaysian rice pricing policy and their relationships to the self-sufficiency level. *Journal Ekonomi Malaysia*, 32, 75-96.

Narayan, P. K. (2005). The saving and investment nexus for China: evidence from cointegration tests. *Applied Economics*, 37, 1979-1990.

Narayan, P. K. (2004). *Reformulating critical values for the bounds F-statistics approach to cointegration: an application to the tourism demand model for Fiji*. A discussion papers. Depatment of Economics, Monash University, Australia. www.arrow.monash.edu.au:2167. Accessed 20-02-2014.

Ramli, N. N., Shamsudin, M. N., Mohamed, Z. A., & Radam, A. (2012). *Impact of price support policy on Malaysian rice industry*. Paper presented at UMT 11th international annual symposium on sustainable science and management. 09-11th July, Terengganu, Malaysia.