
DETERMINANTS OF FUTURE RICE DEMAND IN SRI LANKA

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Abstract

Information related to the impact of price and income changes on rice consumption is needed to address the current issues related to high rice prices and surplus of paddy production. Hence this study was carried out to estimate price and income elasticity of demand for rice in Sri Lanka by using the secondary data obtained from Household Income and Expenditure Survey - 2012/2013. The data were analyzed using double log demand function. The study found that the own price, cross price and income elasticity of demand for rice showed inelastic demand with respect to changes in rice price, wheat flour price and income. Due to the nature of price inelasticity of demand where seven percent decrease of rice supply result in one percent increase in rice price, increased rice prices result in increasing rice expenditure and inflation which adversely affect the rice consumers. Low income elasticity indicates that rice becomes an inferior commodity for high-end consumers who diversify food basket from grains to non-grain foods. Population, the only potential factor contributing to expansion of future rice consumption has become a limiting factor in the Sri Lankan context due to declining trend in population growth. Overall results suggest the need of supply management policies such as maintaining of a buffer stock and increasing storage at farm level to maintain price stability in rice market and planning of paddy production in line with market demand to reduce the surplus production. Apart from that agricultural policy should focus on the diversification of paddy fields during yala season in potential areas for increased farm incomes and employment.

Keywords: Cross Price Elasticity, Double Log Demand Function, Income Elasticity, Price elasticity

1. Introduction

Rice is the oldest crop on the Earth consumed by more than half of the world population (Anon, 2015). It is the staple food of Sri Lanka where people used to consume minimum two meals based on rice and curry. The per capita

consumption of rice is in the range of 105 -115 kg per year and there is no trend (Kelegama, 2006). On the other hand paddy production has increased significantly due to increased land extent and average yield (Ranaweera, 1998). As a result of increased paddy production rice imports declined sharply. Sri Lanka now imports only high quality rice such as Basmathi and normal rice imports are limited when a shortage of rice occurs due to declined domestic production as a result of bad weather condition.

With regard to paddy, the current major issue is marketing not the production. Farmers have now faced a lot of difficulties in selling paddy especially at harvest time. Millers who are involved in processing and releasing rice to the market purchase paddy at lower price due to weak competition in the paddy market (Rupasena, 2008). This is due to excess supply and slow growing demand for rice. In this context the government has to intervene by purchasing paddy to safeguard the paddy farmers, incurring huge losses. This was due to problems of disposing paddy at a higher price than the procurement price. It was reported that some paddy stocks had to be sold for animal feed due to lack of demand from processors. As an alternative, the government intends to export surplus rice and promote rice exports by establishing export rice zones (Ministry of Finance, 2012). Since Sri Lanka does not have competitive advantage over rice export and international rice market is thin this option does not seem the appropriate solution for paddy marketing problem (Samarathunga, 2011). Another option is diversification of suitable paddy fields especially during the *yala* season to non-paddy crops such as soya beans, groundnuts, big onions, vegetables and fruits which have market potentials. This was also not successful as expected.

Having considered all these aspects it is an urgent need to plan future rice production by addressing the present situation and future outlook in the rice market. The future growth in rice market is determined by factors affecting rice demand including price of rice, price of substitutes, consumer income, and population growth and consumer preference. The level of significance of these factors is often ascertained using economic concept of elasticity which reflects the extent of change in rice demand with respect to its determining factors.

Estimating the elasticity of consumer demand has been an important research issue in both marketing and applied economics. These estimates help better understand consumer behaviour and are frequently used to establish firm or industry level marketing strategies and to formulate appropriate government policies (Chung *et al.*, 2005). In Sri Lanka knowledge of price and income changes on rice consumption is lacking and such knowledge is important to address the

current problems of surplus of paddy production in the country. The Department of Census and Statistics conducts Household Income and Expenditure Survey (HIES) once in three years. In these surveys per capita rice consumption was calculated but there was no elasticity analysis to determine the factors affecting consumer demand. This gap can be fulfilled by estimating demand function using data available in HIES. Nirmali and Edirisinghe (2015) estimated demand function for the Western province. This study estimated the demand function for the entire country.

2. Methodology

Based on the imperial and theoretical reviews, it was assumed that rice consumption is determined by price of rice, price of wheat flour, household income, educational level of the household head, age of the household head and household size. In order to capture the rice variability by sector, dummy variable was added to the model. An attempt was made to reflect the rice variability between the estate sector and other sectors but the findings were statistically insignificant. Therefore dummy variable related to the estate sector was dropped from the model. The double log demand function was used since its parameters directly provide elasticity and easily interpreted as income and price elasticity of demand (Balarabe et al., 2007). The mode formulated in this study is expressed mathematically as below:

$$\ln Q_1 = C + \beta_1 \ln Y + \beta_2 \ln P_1 + \beta_3 \ln P_2 + \beta_4 \ln E + \beta_5 \ln A + \beta_6 \ln S + \beta_7 D + e$$

Where;

$\ln Q_1$ = Natural log of average monthly quantity of household rice consumption in kg

$\ln Y$ = Natural log of average monthly household income in Rs

$\ln P_1$ = Natural log of average price of different rice varieties in Rs/kg

$\ln P_2$ = Natural log of price of wheat flour in Rs/kg

$\ln E$ = Natural log of number of years of education of household head

$\ln A$ = Natural log of age of household head

$\ln S$ = Natural log of household size

D = Dummy variable for sector with the value of 'one' when a household resides in an urban area and otherwise zero

e = Error term

C = Constant

$\beta_1, \beta_2 \dots \beta_7$ = Coefficients of the parameters

The cross price term in the model is included to reduce biases in income and own price parameters as well as to elucidate trade off in the consumption of rice. Price of wheat flour was included in the model to capture the cross price impact on rice consumption. Price of bread was also included in the model but it was not significant hence dropped that variable. This can be justified because most households especially in urban areas consume bread as a convenient product. The vectors of other independent variables are included to prevent the income and price parameters from picking up effects that are in really attributable to household structure and other demographic characteristics. A few variables were included to achieve that task. First one is the age of household head. This variable compensates the effect of different treatment by different age groups of household head in rice consumption.

Education is another important variable, especially in the acquisition of knowledge and skills in different areas of human endeavour. Age of the household head may represent efficiency in home production, taste or the value of income. The other demographic variable in the model is dummy variable that takes the value one when a household resides in an urban area and zero otherwise. This enables the model to pick up household consumption patterns in urban areas.

Data were collected from Household Income and Expenditure Survey 2012/13 conducted by the Department of Census and Statistics. Two-stage stratified sampling method was used for the survey. The survey population was stratified into three: Urban, Rural and Estate. At the first stage a total of 2,500 census blocks was selected and 25,000 household units were chosen from the identified census blocks, ten from each block. Out of 25,000 household units only 20,540 units responded. The coefficients of the parameters were estimated using SAS statistical software. Significance of the variables was tested using *t* statistics.

3. Results and Discussion

The estimated regression results are presented in Table 1. All the coefficients of independent variables were significant at one percent level. As expected positive coefficient values were assigned for income, cross price, age of the household head and size of the household variables and negative coefficient values were assigned for the own price, education level of household head and dummy variable that was used to represent the urban sector. All the estimated elasticity values are less than one which reflects that none of the concerned variables have significant impact on rice consumption. In most of the developing countries

rice has an inelastic demand as rice is an essential good in Asia (Flordeliza *et.al.*, 2013). Results are analyzed in detail in the forthcoming sections.

Table 1: Estimated Coefficients of the Parameters

	Coefficients	Standard Error	T Stat	P-Value
Intercept	1.3425*	0.1201	11.1766	<.0001
LnY	0.0521*	0.0074	7.0782	<.0001
LnP₁	-0.7277*	0.0384	-18.9583	<.0001
LnP₂	0.3304*	0.0462	7.1446	<.0001
LnA	0.0984*	0.0206	4.7741	<.0001
LnE	-0.0779*	0.0104	-7.4927	<.0001
LnS	0.71386*	0.0142	50.2790	<.0001
D_{Urban}	-0.1011*	0.006	-16.6572	<.0001

* Significant at 1% level

The estimated own price elasticity for rice was -0.7276. This means that an increase in the price of rice will result in a decrease in the consumption of rice but not much as evident by less than one value of the coefficient in relation to the price of rice. According to the results, a 10 percent increase in the price of rice will lead to decrease only about seven percent in its consumption. These findings are consistent with previous studies (Rupasena, 1989; Nirmali and Edirisinghe, 2015) but the value of the own price elasticity of this study is somewhat higher compared to the earlier findings. This might be shifting consumers towards low price rice varieties when the price of interested variety increases with more availability of different grades in the same variety and various varieties of rice in the market than in the past. Further research is required to test this aspect.

Inelastic price demand indicates that increase in rice prices affects the rice consumers. Inverse of the price elasticity is the price flexibility with respect to the market supply at equilibrium level (Frederick, 1927). Since rice has a derived demand increased paddy production creates a negative impact on the paddy farmers when inelastic price demand for rice prevails in the market.

Cross price elasticity with respect to wheat flour was 0.3303 showing that a 10 percent increase in wheat flour price results in three percent increase in

household rice consumption. Rupasena (1989) found that cross price elasticity with respect to wheat flour was 0.08 reflecting low consumer responses to price of wheat flour. Low cross price elasticity of wheat flour reveals that if government increases price of wheat flour rice consumption could increase but not in large quantities. In other words, a substantial increase of wheat flour price is required to make an impact on rice market. Hence, government should pay special attention on adjusting wheat flour prices.

The income elasticity was (0.0521). It means that one percent increase in household income would lead to an increase in the consumption of rice by only about 0.05 percent. In other words, a 10 percent increase of household income will result in only 0.5 percent increase of rice consumption. Low value of income elasticity implies that most households consume adequate rice and shifts to non-rice crops when income increases. Literature reviews show declining trend in values of income elasticity in Sri Lanka. Rupasena (1989) estimated income elasticity which was 0.63 and Colombage (2011) estimated income elasticity which was 0.15 and attributed low response to per capita rice consumption to income increases.

The estimated results show that there is a positive relationship with age of household head and household rice demand as shown by elasticity of 0.0984. It indicates that a 10 percent increase in age of the household head will result in nearly one percent increase in the household rice consumption. This means that households headed by older people consume more rice than that of others. This may be due to the older people's perception of rice being a healthy food. It also is a fact that increase in age of the household head leads to increased household size especially for younger couples. However, behaviour of educated household heads differs from that of older household heads. Their trend is reduction of rice consumption as shown by the neagative elasticity of the coefficient (-0.0779). This value indicates that a 10 percent increase in the educational level of household head will lead to decrease 0.7 percent in its consumption. The reason for declined rice consumption of educated people might be their health consciousness thus, tend to consume less starchy foods.

As compared to the values of all the coefficients of the model, the coefficient in relation to the household size was the highest (0.7139). This finds that household size is the major determinant for future rice demand. The estimated household size elasticity for rice is positive and the value revealed that a 10 percent increase in household size will lead to increase about seven percent in rice consumption. Since household size could be considered a proxy variable for population one percent increase in population in the country's rice consumption

would increase by nearly one percent. Even this factor has no great impact on increasing the rice consumption in the country due to slow population growth and low value of elasticity which is less than one.

An attempt was made in the study to ascertain the relationship between urbanization and rice consumption since urbanization in Sri Lanka is on the rise. As expected, the estimated results show that household rice consumption will decrease with urbanization. This situation affects future rice consumption due to increasing urbanization in the country with economic development.

4. Conclusion and Recommendations

The study concludes that variables such as decreased rice prices, increased wheat flour prices, increased income, increased age of the household head and increased household size have a positive impact on rice consumption whereas increased rice price, reduced wheat price, education level and expansion of urbanization have a negative impact on rice consumption. However, none of the variables has a considerable impact on the rice market due to weak relationship with rice consumption.

Due to limited expansion in future rice market in Sri Lanka the agricultural policy of the country should focus on increasing the rice yield to meet the slow growing rice demand and promotion of diversification of potential paddy fields especially during the *yala* season with non- rice crops. Those have high market potential and added advantage such as increased food security, expansion of employment and enhancement of farm income. Due to the nature of inelastic price demand supply management policies such as maintaining of buffer stock and increasing storage at farm level is necessary to maintain price stabilization.

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