

Estimates of Demand Elasticities for Rice in Nepal

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1.0 Introduction:

This paper aims at understanding the demand structure of rice in Nepal. It is of paramount importance in light of the rapidly growing population situation, nutritional requirements and a moderate income growth. There has been a dearth of knowledge regarding the factors influencing demand for rice. This presents limitation in appropriate policy formulation in relation to rice requirements and its prices. Both consumers and producers suffer at the lack of appropriate food policies developed.

Rice is considered the staple diet of the Nepalese and its production occupies the first position followed by maize and wheat outputs. In brief, rice covers more than 60 percent of land under cultivation, accounts for the highest output among agricultural crops, and provides employment opportunities for the majority of the farm people. It accounts for more than 60 percent of the total value of exports, and thus serves as an important source of government revenue and foreign exchange.

The paddy production for the last thirteen year period (1964/65-1975/76) provides 1.32 percent growth of paddy output a year. This growth was mainly due to the increase in acreage of 1.15 percent a year. The yield did not increase significantly. It was stagnated at 0.16 percent a year which was not statistically different from zero. The population explosion problem

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is a pressing one. The population growth which is estimated at around 2.07 percent a year anticipates a greater population growth rate from 1980-81 possibly because of a high level of illiteracy and a subsistence level economy. The growing population needs an increasing food supply. Also, the country is unable to export rice abroad to earn its valuable foreign exchange. This study intends to investigate the important variables influencing domestic demand situations for rice. This may facilitate the country to identify and define some future policy options with respect to rice on a long term basis.

2.0 RESEARCH PROCEDURE/METHODOLOGY

2.1 Data Source and Limitation:

The data used in this study are secondary data gathered from various sources. The study uses fifteen year annual data series (1961-75). The different data sources are: His Majesty's Government, Department of Food and Agricultural Marketing Services (HMG, DFAMS), **Agricultural Statistics of Nepal**, Kathmandu, Nepal, 1977; HMG, DFAMS, **Report on Trade Flow Survey of Agricultural Commodities, Particularly Cereal Grains in Nepal, 1971/72**, Kathmandu, Nepal; HMG, DFAMS **A Feasibility Study on Growing Superfine Rice**, Kathmandu, Nepal, 1974 **FAO Production Yearbooks**, Vol. 16 (1962), Vol. 19 (1965) Vol. 23 (1969), Vol. 21 (1971) and Vol. 31 (1977); and **FAO Trade Yearbooks**, Vol. 17 (1963), Vol. 22 (1968), Vol. 25 (1971), Vol. 30 (1976).

The data on consumer price index for the complete fifteen year period (1961-75) was not available. Due to this problem, the retail prices used in the analysis are not deflated and thus, they are current prices. The per capita disposable income for the entire period is not available, and the total national gross domestic products are used as proxy variables for the income variables. The export data in some years are inconsistent in various sources. In such cases, the averaged mean values are used in the analysis.

2.1 Economic and Analytic Procedure::

Domestic rice consumption is equated to total supply (production) minus exports. The quantities in other disposition categories are not available and considered negligible. Thus, total utilization is total domestic consumption plus total exports in a given year. This necessitates two demand functions—domestic and export to give a clear specification of the demand structure

for rice in Nepal. The two quantities—domestic consumption and exports are considered jointly determined which means that the domestic consumption may affect exports, and vice versa. The domestic rice price may affect both domestic consumption and export of rice, and vice versa. There are thus, three jointly dependent variables, and any one can cause a change in the others. In such a situation, a single equation model will not adequately specify the actual demand structure. A single equation model will be appropriate where the line of causation is clear, and one variable (the dependent variable) is unilaterally determined by the others (the independent variables).

Thus, the study uses simultaneous equations to estimate the demand structure of rice in the model.

The statistical model is presented as follows :

$$\text{I } QCDN_t = f(YN_t, PRN_t) \text{ Domestic Demand Function}$$

$$\text{II } QDEN_t = f(PRN_t, IRP_t) \text{ Export Demand Function}$$

$$\text{III } QTU_t = QCDN_t + QDEN_t \text{ Total Utilization Identity}$$

The general forms of the above simultaneous three equational system can be written up as follows :

$$\text{I } QCDN_t = \alpha_0 + \alpha_1 YN_t + \alpha_2 PRN_t + \alpha_3 PMN_t + U_1$$

$$\text{II } QDEN_t = \beta_0 + \beta_1 PRN_t + \beta_2 IRC_t + U_2$$

$$\text{III } QTU_t = QCON_t + QDEN_t$$

Where

d_1 B = structural coefficients to be estimated

$QCDN_t$ = total domestic consumption of rice in year t (in 1,000 metric tons)

$QDEN_t$ = total domestic export of rice in year t (in 1,000 metric tons)

QTU_t = total utilization of rice in year t (in 1,000 metric tons)

YN_t = total national gross domestic product in year t (as a proxy variable of aggregate income in million Rupees)

PRN_t = retail price of rice in year t (in Rupees/Kilogram)

PMT_t = retail price of maize in year t (in Rupees/Kilogram)

IRP_t = total rice production in India (in 1,000 metric tons)

U_i = disturbance term ($i = 1, 2, \dots, n$)

There are three endogenous variables, $QCON_t$, $QDEN_t$ and PRN_t . Endogenous variables are those variables whose values are to be explained by the model. They are the variables within the system. There are three variables which are considered to be predetermined, that is, completely determined outside the system under consideration. They contribute to providing an explanation in the model. There are three equations: Equation I is domestic demand for rice; Equation II is export demand for rice; and Equation III is total rice utilization identity.

All three equations in the model are overidentified. Therefore, a two stage least squares estimation procedure is applied in this study. Two-stage least squares (2SLS) provides a very useful estimation procedure for obtaining the value of structural parameters in over identified equations. Two stage least squares estimates are consistent. The double log function (natural log) is employed to estimate the coefficients of the parameters in the model. The procedure is based on the following statistical assumptions:

1. Normality: the disturbance term (E_i) is distributed according to the normal distribution.
2. Zero mean: the average disturbance is zero, $E(E_i) = 0$
3. Homoskedasticity: the variance of each disturbance term is considered equal for all observations. It means there is a constant variance for all observations $E(E_i) = O^2$
4. Nonautoregression: it is assumed that within the model the disturbance occurring at one point of observation is not correlated with any other disturbance. It means that when observations are made over time, the effect of the disturbance occurring in one period does not carry over into another period.

$$E(E_i E_j) = 0, i \neq j.$$

5. The independent variables are measured without error; and there is not an exactly linear relationship between any set of predetermined (independent) variables.

The estimated structural coefficients (elasticities) of Demand Functions for Rice in Nepal.

Demand Function	Intercept	PRN_t	PMN_t	YN_t	IRP_t	D-W
I. $QCDN_t$	3.902	0.165* (0.148)	0.080 (0.142)	0.373*** (0.171)		2.83
II. $QDEN_t$	4.675	-0.187 (0.256)			0.875** (0.728)	1.38

The numbers in parentheses are standard errors.

* Significant at 85 percent confidence level.

** Significant at 90 percent confidence level.

*** Significant at 95 percent confidence level.

D-W = Durbin - Watson

3.0 Interpretation of the Results, and Conclusion

The estimated coefficients in the demand model are less than one. This implies that they are low elasticities. The low income elasticity for rice indicates that a rise in income does not lead to a substantial upward shift of demand for rice. The price elasticity of demand is very inelastic indicating that the quantity demanded for rice is very unresponsive to the percentage changes in prices. This also implies that improvements in productivity of rice could result in a reduction in total revenue of the farmers if supply increases faster than demand. The combined effect of low income and price elasticity of rice explains to some extent that the income of agricultural sector is lower than the other sectors of the economy. The relatively high elasticity of rice production in India in the export demand equation reveals that increasing rice production in India will reduce Nepalese rice export considerably unless some foreign outlets for rice exports are identified and materialized if the supply of rice increases faster than domestic demand.

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