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The Fuelwood Consumption Pattern in Nepal: A Case of Nepalgunj Nagar Panchayat

BINOD B. SIJAPATI*

Introduction

Energy consumption in Nepal is estimated at three million tons of oil equivalent (TOE) of which 2.8 million TOE (94 per cent) is fuelwood Overall energy consumption in Nepal is heavily oriented towards the basic cooking and heating needs of the household and the household share of total energy consumption was 94 per cent in 1981-82. It is estimated that the households accounted for 98 per cent of fuelwood consumption and 22 per cent of commercial fuel demand.

The Problem in Nepal

Available information indicates that almost 85 per cent of the wood consumed in this country consists of fuelwood and about 97 per cent of this is used for non-commercial purpose. The main reason for higher dependence of people on fuelwood can be attributed to the unavailability of other types of fuel at reasonable price.

The demand for fuelwood is increasing with the growth of population, placing severe stress upon the existing fragile environment and the economy. Recorded information shows that the forest land decreased by almost 25 per cent within a decade (1965–75). Nepal can not afford to waste its scare forest resources in the future. For steep mountain slope and the hill sides where majority of cultivated land lies the productive function of forest can hardly be over-emphasized.

Fuelwood is an indispensible item of consumption for Nepalese citizens, but it is becoming increasingly scarce in many parts of the country. The shortage oi fuelwood has forced many rural villagers to burn either livestock fodder or animal dung to meet their heating and cooking requirements. In a country like Nepal, where farmyard manure is the main source of nutrients for crops, the loss of production resulting from this practice is great.

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* *Mr. Sijapati is an Economist at the Agricultural Projects Services Centre (APROSC), Kathmandu.*

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Problem in Urban Nepal

The fuelwood crisis is not only a problem in rural Nepal, it is even greater problem in urban areas. The demand for fuelwood in these areas are increasing at a faster rate mainly because of shortage of fuelwood substitutes and rapidly increasing population and this trend is expected to continue in future decades to come. The high and increasing level of income of urban people provides them with better purchasing power than rural villagers. This process has led to draw fuelwood from nearby forests resulting in rapid depletion of forest surrounding urban centers. This process must be effectively checked if the benefits derived from forest are to be reserved.

The major task facing Nepalese policy makers is to ensure an efficient use of fuelwood and thus to reduce over-burden on the ecology caused by its over use. For which it is essential to obtain knowledge on factors affecting the consumption of fuelwood. This type of knowledge could help in developing various strategies for policy intervention.

Objectives

This paper has two major objectives. The first is to analyze the factors affecting fuelwood consumption in a rapidly expanding urban center and secondly to suggest policy measures which can help to reduce the existing level of consumption.

Methodology

In order to analyze various factors affecting the fuelwood consumption pattern a standard demand equation of the following type can be estimated.

$$Q = f(P_f, Y, F, P_{s1}, P_{s2} \ldots\ldots P_{sn})$$

where: Q = quantity of fuelwood demanded

P_f = price of fuelwood

Y = annual income of the family

F = size of family

$P_{s1}, P_{s2} \cdots\cdots P_{sn}$ = Price of substitutes of fuelwood.

The dependent variable (Q) was specified as a log linear function of the explanatory variables and estimation was done by ordinary least square (*OLS*) method mainly to make this study more simple. To incorporate qualitative binary variables such as caste, educational background, and occupational strata, dummy variables were added to the demand equation.

The demand equation had to be modified by replacing the prices of substitues consumed by their quantity since their prices are controlled price. Even inclusion of transaction cost could not bring about greater variation in their prices, so quality was preferred. The final model thus developed was of the following type :

$$L_nQ = B_0L_nY + B_2L_nF + B_3L_nP_f + B_4L_nK + B_5L_nE_c + B_6C_1 + B_7C_2 + B_8H_1 + B_9H_2 + B_{10}E_1 + B_{11}E_2 + B_{12}O_1 + B_{13}O_2 + B_{14} + B_{14}O_3$$

where : L_n = natural logarithm
Q = fuelwood demand
Y = family income
P_f = per quintal price of fuelwood
F = family size
K = litre of kerosene consumed
E_c = units of electricity consumed
C_1 = Brahmin and Chhetri caste groups
C_2 = Newar caste group
H_1 = house owner
H_2 = rented house
E_1 = household having at least one of the members with graduate level education
E_2 = household having no member with graduate level education
O_1 = household with agriculture as major occupation
O_2 = household with service as major occupation
O_3 = household having trade, commerce and industries as their major occupation

Variables, $C_1, C_2 \cdots\cdots O_2$ and O_3 are qualitative(dummy) variables. These variables take value of 1 in the presence of characteristic and O otherwise. B_0 is a constant term whereas $B_1, B_2 \cdots\cdots B_5$ are the elasticities of fuelwood demand with respect to these variables, and B_6, $B_7 \cdots\cdots B_{15}$ reflects the differences in consumption levels associated with qualitative differences in the households.

Sample Design

This paper is based on a *Feasibility Study on the Provision of Fuelwood for Urban Areas of Nepal* conducted by Agricultural Projects Services Centre (APROSC) in 1982. Nepalgunj town panchayat was one of the selected town panchayats for the study.

There are altogether 5,586 households in Nepalgunj town panchayat, out of which 50 households were randomly selected for the present study. However, due to problems associated with unreliability of data 2 questionnaires had to be rejected.

Summary of the Result

The regression result of this town panchayat is presented below:

$$L_nQ = 0.45 + 0.36\ I_nY^{***} - 0.03\ I_nP_f^{***} + 0.32F^{**} - 0.01\ I_nL$$
$$(2.71) \qquad (-4.53) \qquad (2.31) \qquad (-0.281)$$
$$+ 0.07I_nE^{**} + 0.57C_1^{***} + 0.13C_2 - 0.11t_1$$
$$(2.2487) \quad (3.23) \qquad (0.59) \quad (-058)$$
$$-0.45E_1^{***} \quad + 0.18\ O_1 \quad - 0.18\ O_2$$
$$(-3.04) \qquad (0.98) \qquad (-0.94)$$

$R^2 = 0.70$ $F = 9.82^{***}$ SEE = 0.41 and $N = 48$

Note : Figures in the parentheses reflect respective t-values.
*** indicates significant at 1 percent level.
** indicates significant at 5 percent level.

The overall fit of model is good in terms of R^2 and F-values. Indeed,70 per cent of the variance of dependent variable is explained by the model. The higher F-value at one per cent level of signficant is adequate to explain that the model exerts significant influence on the dependent variable at an accepted level of statistical signficance.

Result Discussion

The estimated regression reveals that household income, price of fuelwood, family size and electricity are the most important quantitative explanatory variables of the model. Among the qualitative variables, caste groups-Brahmin/Chhettri and educational background turned out to be significant.

The coefficient of family income is 0.36 at one per cent significant level which clearly shows that the demand for fuelwood would increase with an increase in the income. In fact, ten percent increase in income would cause for 3.6 per cent increase in the level of fuelwood consumption. The income elasticity coefficient being greater than zero but less than one reveals that fuelwood is an essential commodity. The coefficient of price being negative indicates that the damand for fuelwood would decrease with a rise in the price. In other words, ten per cent increase in the price of fuelwood would cause no reduction in the demand by almost one per cent The coefficient of family size being significant at 5 per cent level shows that with the increase in the family size by 10 per cent,which indicates that the demand pattern is dominated by the scale of economies.

In the case of major substitutes of fuelwood viz., electricity and kerosene both turned out to be insignificant. Indeed, kerosene can be considered as a substitute of fuelwood (which is shown by the negative sign of the coefficient). However, in this town panchayat no body was found to have used electricity instead of fuelwood. People were found to have used electricity for lighting purposes whereas fuelwood for cooking. Thus, the positive sign of the coefficient of electricity can be justified as a complementary item rather than a substitute.

In the case of qualitative binary variables, the Brahmin/Chhettri caste came up with a positive sign at one per cent level of significance which clearly shows that these caste groups were using more fuelwood than the others.

Efficiency in the use of fuelwood by the household with graduate level of education is indicated by the negative sign of the coefficient which shows that the household with graduate level educated family member would use lesser fuelwood almost by 0.5 qt than the household without them. This relationship is very strong since the coefficient is significant at one per cent level. The other dummies are not significant in affecting the model.

Implications

From the analysis it is clear that it is extremely difficult to design various policy interventions to reduce fuelwood consumption. In the Nepalese context, however, it is high time to formulate policies for implementation in order to reduce the pressure on existing fragile economy.

The analysis shows that the rise in income has a positive impact on the level of consumption of fuelwood. Or in other words, with an increase in the income, people have a tendency to use more fuelwood. The main reason for this kind of affair is that the substitute of fuelwood are not available. Because of uncertainty in the availability of electricity, unavailability of cooking gas and relatively higher price of kerosene people are forced to depend on fuelwood. Thus, it is but natural for richer people to use more fuelwood in comparison to the poorer. Indeed at present electricity has been used as a complementary item rather than the substitute. However, an expansion as well as certainty of electricity in Nepalgunj can reduce the demand for fuelwood from at least those who can afford. This type of shift may take time yet it is essential to make electricity and other substitutes available and certain to reduce the demand. Such an arrangement would definitely reduce the over-burden on fuelwood consumption. Similarly, the price being one of the important factor affecting consumption, if we want to reduce the demand then there is no need to supply fuelwood by a government corporation at a subsidized price. Indeed, price determined by the market might play a significant role in the efficient use of the fuelwood.

The efficiency in the fuelwood consumption pattern being possible in larger family clearly indicates the benefits of joint family system. Mass education is another important factor which could enhance the process of efficient use of fuelwood.

Conclusion

The analysis shows that the demand pattern is affected by some important variables such as family income, price, family size together with other qualitative variables like caste and educational background. Relationship between the demand and some of the variables (like higher income leading to higher demand for fuelwood) are difficult to explain. One justification for such a situation is due to absence or the unavailability of the substitutes. When people do not have any option probably the better off could afford to demand more.

Similarly, it is extremely difficult to prescribe any easy suggestions to reduce the demand pattern. Thus, it seems a wiser policy decision would be to disseminate technology which promises a higher degree of efficiency in the use. One of the natural and obvious reason for higher pressure on fuelwood has been caused by the rapidly growing population. Thus a policy which can reduce the higher rate of growth would automatically result into reducing the pressure. This can be done by implementing an effective family planning program.

Selected Readings

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