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Adoption Of External Inputs And Agricultural Productivity In Prithivi Narayan Municipality Of Gorkha District

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INTRODUCTION

Nepal is a low income subsistence farming nation with over forty percent of GDP contributed by and over eighty percent of the population employed in agricultural sector. It earns a considerably higher proportion of foreign exchange through agricultural exports. Therefore, it is apparent that agriculture must act as the engine of growth for overall evelopment to occur (APP 1995). Recently the National Development Council explicitly stated that poverty alleviation and employment promotion can be met only if the agricultural sector is taken up as a leading sector and other sectors are developed as complimentary to it.

In Nepal eight development plans are completed. Since the inception of the planning top priority is given to agricultural sector, except in first plan. Government intervened to transform traditional agricultural system by encouraging the adoption of modern varieties of crops and modern breeds of livestock, together with associated packages of external inputs, such as fertiliser, pesticides, antibiotics, credit, machinery, necessary to make these productive. In addition, they have supplied new infrastructure, such as irrigation scheme, roads and markets and price subsidies as well as a ranges of other policies. But no significant progress has been realised. Now technology development for the production of cereal crops on the hill slope has so far been a sinking struggle for the survival of the Npalese people. It has turn them from net food exporters to net food importers in a period of four decades in which agricultural development received top priority.

Today, there is a need to increase food production to meet the needs of growing population. Therefore, productivity of agriculture sector has to be increased by many folds. Productivity in agriculture is an index of agricultural development. Higher productivity, i.e. higher production per

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unit of land, is always desired to end the shortage of food. Here problem is that most modern package programmes are supplied from research station, where scientists experienced quite different conditions to those experienced by farmers. Some elements of the package are always missing, either the seed delivery system fails or the fertiliser arrives late, or there is insufficient irrigation water, or high yielding seed may not be much better than those of traditional varieties. Therefore, it is gradually being recognised that packages are not appropriate to the complexities of rural life. In Nepal, many agricultural scientists as well as social scientists have made various studies regarding the effectiveness of agricultural inputs. However, the present study is significantly different than those of previous studies in methodology and objectives. This study intends to find out the productivity of package of external inputs like high yielding varieties of seeds (HYVs), chemical fertiliser and pesticide in western hill district Gorkha.

MEHODOLOGY

Selection of Study Area

Ward No. 6,7 and 8 of the Prithivi Narayan Municipality area of Gorkha District have been purposively selected as study area for this study. These wards of the municipality area are intensively advantageous from all government and non-government agricultural extension programmes and are easily accessible. Also, these wards cover large parts of rural life.

Nature And Source Of Data

This study is mainly based on primary data. Field survey has been conducted for the collection of primary data. Secondary data have been also used from different sources.

Sampling Procedure And Sample Size

Simple random sampling has been used for field survey. Three wards, 6,7 and 8, of the Prithivi Narayan Municipality area, comprises 1178 farm households. The farm households have been included as sampling units, then 10 percent farm households have been selected randomly out of total farm households using three digit random table from each wards. Thus, 118 farm households have surveyed for this study (Tabl 1).

Table 1

Distribution Of Sample Households

Ward	Total Households	Sample Households
6	313	31
7	338	34
8	527	53
Total	1178	118

Source : P.N. Municipality, Gorkha.

Specification Of The Model

To find out the productivity of external inputs the renowned Cobb-Douglas Production Function in its log-linear form has been deployed. The unrestricted Cobb-Douglas form, that is, an equation linear in the logarithm of the variables has been chosen for its ease of manipulation. Due to its theoretical fitness to agriculture and its computational manageability, almost all production function studied in agriculture have used this function. The unrestricted form of Cobb-Douglsas function is:

$$L_nY_i=L_nB_1+B_2L_n+X_{i2}+B_2L_nX_{i3}+B_4L_nX_{i4}+B_5L_nX_{i5}$$

Where, Y_i = Value of output.

X_{i2} = Chemical fertiliser.

X_{i3} = HYVs

X_{i4} = Pesticides (The subscript 'i' refers to cross sectional data)

Here, the above equation is used to estimate production function in total terms. Though the economic theory suggest that the estimation of equation by using data in per unit term yields a comparatively better estimation of coefficients then its estimation in total terms which produces upward bias, the computational difficulties have precluded the inclusion of all the inputs used in agriculture which provide a better estimate of sum of all coefficients. But in this study only three varialbles namely chemical fertilizer, HYVs and pesticide have been estimated in total term.

First, three equation from farm households of each 6,7 and 8 ward of the muncipality have been estimated. Then, a single equation have been estimated for all the 118 sampled farm households.

Measurement Of The Variables

The included variables in the model and their measurement are as follows:

Dependent Variable

Output : In the present study the dependent variable is the total output which includes the value of five main crops, viz, paddy, early and late, wheat, maize, potato and oil seeds valued at their respective local market prices. All these five crops were valued separately and then aggregated.

Independent Variables

The independent variables chosen in the present study are externally supplied agricultural inputs in the farms. They are:

Chemical Fertiliser : In the study area farmers have used mainly three types of chemical fertilisers, like, Urea, DAP & Potas. Firtst, the quantity use of fertiliser has been collected through the questionnaire in Kg, then it has, been converted into value term by multiplying with respective market prices.

HYVs : High yielding varieties of seeds include improved seeds of rice, maize, wheat, potato and oil seeds. First, the quantity used of HYVs is collected in Kg. term then multiplied by their market prices.

Pesticide : In the study area, farmers have used mainly two types of pesticides liquid and dust they are Metacid and DDT, Malathin. First the quantity used is collected in Kg. and Ml. units then multiplied by respective market price to convert into value term.

RESULTS AND INTERPRETATION

For the finding out the productivity of external inputs log linear Cobb-Douglas production function has been estimated by OLS method for three sets of sample data from three wards of P.N. Municipality. The estimated equations and relevent statistics are presented in table 9.

Table 9

Results On Estimation Of Cobb-Douglas Production Function

Variables and Statistics	Over all	Ward No. 6	Ward No. 7	Ward No. 8
Intercepts	3160.75 (0.738)	16209.20 (1.44)	-2347.33 (-0.497)	4464.69 (0.811)
Fertiliser (X_1)	8.01 (4.66)#	7.95 (2.24) ##	0.96 (0.239)	10.92 (4.53)###
Improved Seeds (X_2)	13.29 (1.84)##	18.07 (1.09)	14.26 (2.08)#	-5.96 (-0.54)
Pesticides (X_3)	15.69 (0.953)	-21.87 (-0.48)	71.39 (3.89)###	18.68 (1.175)
R^2	0.485	0.458	0.775	0.548
R^{-2}	0.456	0.323	0.723	0.486
F statistics	17.24###	3.38#	14.92###	8.89###
N	118	32	34	52

#Significant at 5 percent.

Significant at 10 percent.

Significant at all level.

Figures in parentheses are t values.

The regression coefficients of estimated production function in case of fertiliser is significant in ward no. 6 and 8 and insignificant in ward no. 7 with positive sign but in over all it is significant at 5 percent probability level. The coefficients of fertiliser are greater than unity except in ward no. 7, which indicates that the marginal productivity of fertiliser is increasing. It means by increasing fertiliser at a rate of 1 percent holding all other inputs constant at their geometric mean level, the overall gross output increases by 8 percent. This is equivalent to the Eight Five Plan document (1992-1997), which has categorically stated that fertiliser (nutrient) application and increased food production ratio would be 1:8. It is noteworthy that fertiliser is the most important influential input which boosts agricultural production.

In the case of improved seeds, the coefficient is only significant in ward no. 7 and it is insignificant in ward no. 6 with positive sign and in ward no. 8 with negtive sign. But in overall it is significant at 10 percent probability level. The negative sign in ward no. 8 is due to the large fluctuations of data of improved seeds used among different farms in the study area. Majority of farmers do not purchase improved seeds and use their own seeds in production: The coefficients of improved seeds is greater than unity indicates that the marginal productivity of improved seeds is increasing. The overall coefficient of improved seeds is 13.

The production elasticities of pesticides are found insignificant in ward no 6 with negative sign and positive sign in ward no. 8. In ward no. 7 it is found significant at all level of significance. But in overall it is insignificant. Therefore, we can say that the importance of pesticides in the production process in the study area is insignificant.

The value of R^2 and F is very low in ward no. 6. It is 0.45 and 3.38 respectively. This indictes that there is no goodness of fit between dependent variable and explanatory varialbes. The R^2 of ward no. 6 shows that the explanatory variables explain only 45 percent in the variation in depedent variable. The remaining 55 percent variation in dependent variable is not explained by three variables taken in this study and it regarded as an error. The performance in this ward may be due to the small size of observation.

In ward no. 7 and both R^2 and F statistics are higher indicating a fair goodness of fit of models. In ward no. 7 and 8 explanatory variables explain 77 percent and 54 percent variation in production respectively. In overall the value of R^2 is 48 and F is significant at all level of significance. In average, variables taken in the study explain 48 percent variation in dependent ariable and remaining amount of unexplained variation may be due to the variations in the techniques of production used by different farms, capital and labour used and other climatic and natural factors, or variables not included in the analysis.

CONCLUSION

From the analysis of Cobb-Douglas production function, it is found that the agricultural productivity increases with the increase in external inputs except in case of pesticide. In overall the regression coefficient of pesticide in not significant. This is because of low and no use of pesticide

in the study area. From the analysis among the external inputs, chemical fertiliser is found an important explanatory variable of output. In overall the coefficient of fertiliser is found 8.01 and it is significant at 5 percent probability level. Then, seed is found second influencing variable next to the fertiliser in the study area. In overall the three variables, chemical fertiliser improved seeds and pesticides explain 48 percent variation in output. Therefore, in conclusion we can say that if there is increase in chemical fertiliser and improved seeds agricultural productivity increases with holding other inputs constant at their geometric mean level.

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