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An Econometric Analysis of Wheat Production in Nepal : A Case Study of Saptari District

D. N. Sutihar.*

Introduction

This paper aims at finding out the significance of various inputs in wheat production in Nepal by using econometric techniques It does not, however, aim at evaluating the total national production and factors affecting it but tries to generalize the national situation on the basis of a case study of Saptari District.

In Nepal wheat is the second major staple after paddy and accounts for 13.77 percent of the total foodgrains production where as Saptari produced 2 per cent wheat of Nepal in 1979—80

The production function seems to have been first used in Nepal in the 1960's. A study was made jointly by the Ministry of Economic Planning and the Departments of Economics and Commerce, T. U. Nepal to see the characteristics of

* *Mr. Sutihar is a Research Assistant at the Centre for Economic Development and Administration (CEDA), Kirtipur, Kathmandu. This paper is based on his thesis submitted to the Institute of Humanities and Social Sciences, Tribhuvan University, in partial fulfilment of the requirements for the Degree in Economics (M. A) in 1981.*

physical input—output relationships of cereal grain production in 1965–66. The data were cross sectional and the sample size was 1,000 households selected randomly from 50 different districts of Nepal. A Cobb—Douglas production function was fitted to the data for the analysis. The results, thus, obtained were unacceptable becuase all the input coefficient were insignificiant and unrealistic. A few degree theses in Economics submitted to T. U. Nepal, have analysed and fitted the production functions for maize, wheat, paddy etc. All have fitted Cobb—Douglas production functions and all the coefficients of multiple correlation are found to be quite high indicating a strong relationship between output and inputs.

In the present study a general linear form of production function is used because it gives more significant test than other forms and easy to compute. The production function is

$$Y = b_0 + b_1 FYM + b_2 CF + b_3 HL + b_4 BL + u$$

Where all the variables are measured in physical units:

Y = Output of wheat in Mds./Bigha
FYM = Farm yard manure in Carts/Bigha
CF = Chemical fertilizer in Kg/Bigha
HL = Human Labour input in man— days/Bigha
BL = Bullock labour input in bullock— days/Bigha
b_i = Parameters to be estimated, i = O, 1, 2, 3, 4.
U = Disturbance term.

Methodology

a. *Data Source and limitation*

This study is based upon cross—sectional data collected from Bisahariya Village Panchayat of Saptari district in 1980. The data were coollected by primary field survey using struetured questionnaire covering various aspe-

cts of the household economy. Ten households from each ward were randomly selected and interviewed. Altogether the sample consists of 90 households.

The concluding analysis of this study may not be generalized in the context of national aggregate level because of following limitations:

i. The sample used here is taken from a single village panchayat. Bisahariya of saptari district which cannot be said as a representative of the country. The pattern of soil, techniques of farming, socio-economic conditions and modern know-how of wheat farming differ from region to region of the country.

ii. The variables used in this study are few in number. To estimate a realistic production function all the relevent inputs should be included. Here, some inputs are excluded due to various reasons, mainly because of unavailability of data and problems of computation. However, the conclusions drawn from the analysis of the present study can be helpful in policy making and recommendations of the area concerned.

b. *Analytical frame work*

Here only four inputs have been considered. The main hypothesis is that there is stgnificant siatistical relationship between inputs FYM, CF, HL & BL and output of wheat.

Alternatively the various hypotheses can be expressed as follows:

Null	Alternative
$b_0 = 0$	$b_0 \neq 0$
$b_1 = 0$	$b_1 \neq 0$
$b_2 = 0$	$b_2 \neq 0$
$b_3 = 0$	$b_3 \neq 0$
$b_4 = 0$	$b_4 \neq 0$

Results and Interpretations

Eight different types of models have been considered and estimates of the coefficients are shown in the table 1.

In the model (a) all the independent variables are considered and all the coefficients are highly significant at 0.01 level. It may be, however, noted that the coefficient of BL is negative and highly significant at 0.01 level. It means that all variables except BL affect the output positively. The value of R^2 is 0.845 which means the variables of the model explain about 85 percent of the total variation in output.

In the models (b) and (c) BL and HL are deleted respectively due to high collinearity between them (the correlation matrix is given in table 4. In the model (b) all the coefficient are positive and highly significant at 0.01 level showing the increment in inputs having positive effect in output. The value of R^2 is 0.591 which means the variables of this model explain about 59 per cent of the total variation in output. In model (c) the coefficients of FYM and CF are positive and highly significant at 0.01 level and BL at 0.05 level. All variables have positive effect in output. The R^2 value is 0.787 which means about 79 per cent of the total variation explained in output by the variation in inputs.

In the models (d) and (e) CF and FYM are deleted respectively to see the effects of these variables on output by deletion. In the model (d) all the coefficients are highly significant at 0.01 level. In this model, the increment in FYM and HL increase the output positively but BL increases negatively. R^2 is 0.858 which means the variables of this model explain about 86 percent of the total variation in output. In the model (e) all the coefficients are insignificant but the coefficient of CF is positive and significant at 0.05 level. Here the value of R^2 is low (0.426) which reflects the variables of this model explain only about 43 per cent of the total variation in output. It may be, however, noted that if we

delete the FYM variable from the model (a), then explanatory power becomes very low. Hence, the FYM can not be deleted.

In the models (f) and (g) only experienced farmers have been taken and BL and HL are deleted respectively due to high multicollinearity between them. All the coefficients are insignificant even at 0.05 level showing the insignificant effect of inputs in output. R^2 values are 0.986 and 0.975 in the models respectively, which show that the variables of these models explain about 98 per cent of the total variation in output.

In the model (h) we have taken only irrigated observations. All the coefficients are insignificant and R^2 value is very low (0.22). This means that in the case of irrigated land the variables included in the model have no significant effect in output.

Here the explanatory power of some models is high and that of others is low but the F—Statistics is highly significant at 0.01 level in all models, therefore, we accept the alternative hypothesis $B_i \neq 0$ (where $i = 0, 1, 2, 3$ and 4) showing statistically significant relationship between output and inputs. The sums of the mean elasticities (table 5) are either positive or negative showing increasing or decreasing returns to scale in the wheat farming in this particular panchayat. The marginal physical products of inputs is in the table 2 and average output and inputs are given in the table 3.

Recommendations

The conclusions drawn from the analysis will be helpful in policy making in the area covered by the study. Some recommendations can be made as follows :

a. The elasticity of chemical fertilizer is positive and correlation coefficient with output is also higher than other, There is less use of chemical fertilizer in wheat production but the use of it will definitely increase the production. Hence, the

farmers are suggested to use greater amount of chemical fertilizers. The concerning departments and agencies should facilitate the farmers in desired time.

b. The bullock labour is negatively related with output in some models. This might be because of excess supply of bullock labour in wheat production. So, bullock labour should be diversified from wheat production to other crops.

c. The average production in irrigated model is higher than that of the general model. Hence the farms should be irrigated.

d. The average production in the model (concerning) with experienced farmers is higher than that in any other models. So the use of chemical fertilizer and FYM should be made under the guidance of experienced farmers.

e. The effect of FYM has significant and positive relation with output. It is because FYM has a long-term effect upon the soil. It has been used from the very beginning. In FYM, we get the natural nutrient, humus and organic matter required for the crop. So it is effective. But the method of making FYM is yet traditional. The appropriate recommendation in this regard is that scientific methods of compost-making should be taught to farmers by the Department of Agriculture through J. T. and J. T. A's. It can have positive effeet upon output of wheat.

f. There is disguised unemployment of human labour in the wheat cultivation. Most of the farmers have used their family labour to grow wheat. So the agriculture sector, should be mechanised and modern tools, like tractor pumpset should be made available by the Agricultural Development Bank and pressure of labour should be transferred from wheat production to another job.

g. Most of the farmers are poor. They don't use chemical fertilizer, improved seeds, pesticides, modern tools, and as such, they must be financed or loaned by either ADB or AIC of Nepal.

Table 1

Summary Table of the Regression Results

Model	R^2	F	Coefficienss				N
			Intercept	FYM	CF	HL	BL	
a.	0.845	116.031	11.817	0.754**	0.054**	0.048**	-0.069**	90
				(0.050)	(0.008)	(0.007)	(0.009)	
b.	0.591	41.558	11.583	0.097**	0.123**	0.340**		90
				(0.025)	(0.013)	(0.008)		
c.	0.787	105.976	11.759	0.677**	0.058**		0.029*	90
				(0.059)	(0.010)		(0.010)	
d.	0.858	173.460	12.113	0.975**		0.109**	-0.180**	90
				(0.450)		(0.007)	(0.013)	
e.	0.426	22.400	15.924		0.105*	0.024	-0.012	
					(0.014)	(0.013)	(0.014)	
f.	0.976	395.262	30.831	-0.063	0.022	0.017		33
				(0.040	(0.020)	(0.010)		
g.	0.975	380.402	33.435	0.075	0.010		-0.010	33
				(0.129)	(0.029)		(0.020)	
h.	0.220	2.885	21.965	0.138	0.039	0.041	-0.043	46
				(0.181)	(0.037)	(0.015)	(0.031)	

** significant at .01 level.

* significant at .05 level.

Standard Errors are bracketed.

Table 2

Marginal Physical Products (Mds./Bhigha)

Model	FYM	CF	HL	BL
a.	0.754	0.054	0.048	-0.069
b.	0.094	0.123	0.340	
c.	0 677	0.058		0.029
d.	0.975		0.109	-0.180
e.		0.105	0.024	-0.012
f.	-0.063	0.022	0.017	
g.	0.075	0.010		-0.010

Table 3

Averege Production and Inputs

(Physical Units per Bigha)

Model	Y (in md.)	FYM (in cart.)	CF (in kg.)	HL (in man-day)	BL (in Bullock-day)
a.	23.87	10.17	51.21	144·16	77.47
b.	23.87	10.17	51.21	144.16	
c.	23.87	10.17	51.21		77.46
d.	23.87	10.17		144.16	77.46
e.	23.87		51.21	144.16	77.46
f.	34.5	16.6	84.5	163.5	
g.	34.5	14.6	85.5		89.3
h.	29.4	14.0	86.6	142.5	85.1

Table 4

Coefficient of Correlation (r)

	FYM	CF	HL	BL	Y
FYM	1.0				
CF	0.42	1.0			
HL	-0.123	-0.042	1.0		
BL	0.023	-2.034	0.71	1.0	
Y	0.42	0.62	0 204	0.16	1.0

Table 5

The Sums of the Mean Elasticities

Model	FYM	CF	HL	BL	SUMS
a.	1.77	0.025	0.008	-0.021	1.782
b.	0.228	0.057	0.006		0.291
c.	1.59	0.027		0.009	1.626
d.	2 289		0.018	-0.055	2.252
e.		0.049	0.004	-0.004	0.049
f.	-0.15	0.009	0.003		-0.138
g	0.177	0.004		-0.004	0.177
h.	0.289	0.014	0.008	-0.015	0.296

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Book Review

Pant, Raghab D. *Interest Rate Policy of Nepal*, Kathmandu: IDRC, March 1983 pp. 128, Appendices, Rs 90/—

The book studies different aspects of the recent changes in interest rate in Nepal, in the light of modern monetary theory and policy. There is an annex of 12 pages about the elasticity and buoyancy of the tax system, with some estimates for Nepal. This annex is connceted with the tax on loans to private sector by commercial banks and it has been noticed that increase in tax rate did not increase revenue.

There are ten sections or chapters in this book. Starting with a very brief review of morden monetary theory in the first chapter, the book contains the result of investigation into the effects of recent change in interest rate in Nepal in the context of real money strategy. Simple models have been used to explain the transmission process from interest rate change to savings mobilisation. With the help of the estimates of the parameters of the model, it is concluded that the influence of rate of interest on money demand function is insignificant and "real money" strategy does not apply to the Nepalese economy The increase in interst rate led to an increase in time deposits, thereby raising the lending power of the commrcial banks, but the demand for credit did not grow at the same pace, and the interest rate change generated only a small influence on capital formation.

As regards money supply it has been shown that the major factors for the variation of base money are Nepal 's balance of payments and goverment budgetary position and for that reason, though money multiplier is almcst constant, money supply prediction is not likely to be accurate. It is also noticed that the margin between deposit and lending rates increased after the increase in interest on deposit but net profit of commercial banks showed a decline due to excess reserves.

Emperical studies with the help of regression analysis has been made with whatever data were available. The book is useful to bankers and policy makers

and also to students for their part of monetary studies on Nepalese economy.

While going to the other side, it can be pointed out that printing errors occur in many places. Use of symbols have not been appropriate in some cases. As for example, in page 5, $\left(\frac{1}{p}\ \frac{dp}{dt}\right)e$ standing for expected rate of inflation may, at first reading, look like price change to the power e ; in page 26 in equation (3) small c's are interchanged for capital C's ; in page 26 eqation (b), y and Y are used without discrimination; in the equations of table 1 (a) in page 27, income and expenditure variables are used without any distinction; in page 30, the symbol $\left(\frac{Y^{b}1}{P}\right)$ is used in place of $\left(\frac{Y}{P}\right)^{b1}$. The title of section, namely V, Velocity of Money in Nepal, does not stand for the discussion that followed.

Dept. of Economics
Tribhuvan University, Kirtipur.

Dr. T. P. Chaudhari
Professor of Economics