

# Analysis of Resource Use Efficiency in Wheat Cultivation in Etah District of U.P.

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## Abstract

Wheat is an important food grain crop of north India of winter season and provides staple food to its population. With respect to area and total production, Uttar Pradesh occupies the first position in both area and production of wheat in nation. In Uttar Pradesh, Etah is one of prominent wheat producing district in Uttar Pradesh and is situated in the north-east of the Agra and bounded by Aligarh and Mainpuri districts. A two stage stratified random sampling was used in the study for the selection of villages and wheat farmers. Cobb-Douglas production function model has been fitted to work out the efficiency of various factors employed in the production process. It was found that in all farm categories, the regression co-efficient for human labour was observed highest followed by that of seed, irrigation and manures and fertilisers and that indicated the highest response for per unit increase in Human labour on output and lesser for other variables. The sum of the regression co-efficients ( $\Sigma b_i$ ) was more than one showing an increasing return to scale on all categories of farm.

**Keywords:** Resource use efficiency, Regression co-efficient, Cobb-Douglas production function, Return to scale, Wheat, Farm category

Indo-Gangatic plains form the most important wheat growing area of north India. The cool winters and the hot summers are very conducive to a good crop of wheat in Uttar Pradesh. Well drained loams and clayey loams are considered to be good for wheat. Etah district is situated in the north-east of the Agra and bounded by Aligarh and Mainpuri districts. The district is located at the height of 146.3 meters from mean sea level. The Aliganj block is the part of Aliganj tehsil of the district Etah. Thus, it is clear that wheat plays a vital role in the agricultural economy

and is staple commodity in the diet of the people if the good marketing support is available (Singh, B.B *et al.*, 1998). Thus, the study of cost and return is highly essential to determine the relative profitability and economic viability of one enterprise over the others.

## MATERIALS AND METHODS

A two-stage stratified random sampling technique was applied for conducting the present study. Aliganj block of Etah district (U.P) was selected purposively. In the first, five villages were selected at

random. In the second stage, a complete enumeration of the holdings in the each sample village was made. The holdings were then stratified into 3 size groups i.e., marginal (0-1 hectare), small (1-2 hectares) and large (more than 2 hectares). From among the list of different categories, a sample of 40 marginal, 25 small and 20 large farmers were selected at random. A total of 85 respondents were selected from the sample villages for the study. The data were pertained to 1999-2000. The information about the sample villages, the respondents, market functionaries were obtained through a set of well thought-out and pretested questionnaires prepared before in conformity with specific objectives. General information regarding the sample villages were obtained from secondary sources such as block office, Tehsil office, VLWs and Census report. The Household was taken as the unit of investigation and the head of the family as the respondent. The price of wheat grain was taken as ₹ 560 per quintal and for straw as ₹ 80 per quintal. Cobb-Douglas production function model has been fitted to work out the efficiency of various factors employed in the production process. The regression co-efficient ( $b_i$ ), Standard error (SE), Return to scale ( $\Sigma b_i$ ) were worked out for different categories of wheat growers in the study area. Simple co-relation matrices for all the independent variables like seed, human labour, bullock labour, manures and fertilizers, plant protection chemicals and irrigation were worked out for testing the existence of multicollinearity.

### General Description of sample farmers

It is necessary to present a brief account of the sample farmers before entering into detail study of wheat economics. Among the sample farmers, the average size of operational holding was 0.75 ha in case of marginal farmers, 1.55 hectares for small and 3.12 hectares for large farmers. It was found that there was no summer crop except the kharif and Rabi Crops. Paddy and Wheat occupies the key positions in cropping pattern (Singh, G.S. 1994). The cropping intensity was 192.0 %, in case of marginal farmers, 197.41 % in case of small and 199.67 % in case of large farmers.

## RESULTS AND DISCUSSION

The study of cost and return is highly essential to determine the relative profitability and economic

viability of on enterprise over the other. Keeping this in view, the analysis was carried out on costs and returns of wheat as grown by sample farmers. The per hectare analysis of cost a return of wheat under different categories of sample farmers is shown in Table below.

**Table 1: Production function coefficients for wheat in different farms categories**

Parameters for Inputs		Marginal farm category	Small farm category	Large farm category
Seed ( $X_1$ )	$b_1$	0.214*	0.198*	0.202*
	SE	0.097	0.091	0.87
	t	2.206	2.175	2.321
Human labour ( $X_2$ )	$b_2$	0.262*	0.235*	0.246**
	SE	0.115	0.105	0.079
	t	2.278	2.238	3.113
Bullock labour ( $X_3$ )	$b_3$	0.065	0.102*	0.112
	SE	0.035	0.047	0.055
	t	1.857	2.170	2.036
Manures and fertilizers ( $X_4$ )	$b_4$	0.197*	0.204*	0.218**
	SE	0.083	0.086	0.069
	t	2.373	2.372	3.159
Plant protection chemicals ( $X_5$ )	$b_5$	0.083	0.092	0.114*
	SE	0.050	0.048	0.051
	t	1.66	1.916	2.235
Irrigation ( $X_6$ )	$b_6$	0.208*	0.214*	0.193*
	SE	0.097	0.080	0.082
	t	2.144	2.675	2.353
Return to scale	( $\Sigma b_i$ )	1.029	1.045	1.085
Co-efficient of multiple determination	( $R^2$ )	0.923	0.907	0.895

\* Significant at 5% level of probability.

\*\* Significant at 1% level of probability.

Cobb-Douglas production function model has been fitted to work out the efficiency of various factors employed in the production process. The regression co-efficient ( $b_i$ ), Standard error (SE), Return to scale ( $\Sigma b_i$ ) was worked out for different categories of wheat growers in the study area (Table

1). Simple co-relation matrices for all the independent variables like seed, human labour, bullock labour, manures and fertilizers, plant protection chemicals and irrigation were worked out for testing the existence of multicollinearity. Since the problem of multicollinearity was not observed, then the steps were taken for the regression analysis. It was found that in case of marginal farm category, the regression co-efficient associated with seed, human labour, bullock labour, manures and fertilizers, plant protection chemicals and irrigation was 0.214, 0.262, 0.065, 0.197, 0.083 and 0.208 respectively. The regression co-efficient of seed, human labour, manures and fertilizers and irrigation were found significant at 5 percent level of probability indicating positive impact of these independent variables over the level of production.

The sum of the regression coefficients ( $\sum b_i$ ) was 1.029 showing an increasing return to scale. The co-efficient for multiple determination ( $R^2$ ) was 0.923 which would imply that 92.3 percent variation in the income from wheat cultivation was explained by the independent variables like seed, human labour, bullock labour, manures, fertilizers, plant protection chemicals and irrigation.

In case of small farms, the regression co-efficient associated with seed, human labour, bullock labour, manures and fertilizers, plant protection chemicals and irrigation was 0.198, 0.235, 0.102, 0.204, 0.092 and 0.214 respectively. The regression co-efficient of seed, human labour, bullock labour, manures and fertilizers and irrigation were found statistically significant at 5 percent level of probability. The sum of production elasticities was 1.045 indicating an increasing return to scale. The value of  $R^2$  being 0.907 indicated that 90.7 percent variation in dependent variable, i.e., gross return from wheat was explained by the independent variables like seed, human labour, manures and fertilizers, plant protection chemicals and irrigation.

The magnitude of regression co-efficient of seed, human labour, bullock labour, manures and fertilizers, plant protection chemicals and irrigation was 0.202, 0.246, 0.112, 0.218, 0.114 and 0.193 respectively in case of large farms. In this class, the

regression coefficient associated with seed, plant protection chemicals and irrigation were statistically significant at 5 percent level of probability where as in case of human labour and manures and fertilizers, the co-efficient were highly significant at 1% level of probability indicating positive impact of these independent variables towards the level of production. The sum of regression coefficients was 1.085 indicating increasing return to scale. The co-efficient of multiple determination ( $R^2$ ) was 0.895 in this category of farms.

The highest productivity was found for human labour followed by seed, irrigation and manures and fertilizers in all categories of farm. The return to scale was also above one, which indicated that there is increasing return to scale in all categories of farm and it was found highest in large category of farms (1.085). The Co-efficient of multiple determination under marginal, small and large farms was found as 0.923, 0.907, 0.895 indicated that 92.3 percent, 90.7 percent and 89.5 percent variation in dependent variable, i.e., gross return from wheat was explained by the independent variables like seed, human labour, manures and fertilizers, plant protection chemicals and irrigation (Jain, KK. 1993).

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