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Resource use efficiency of wheat cultivation in U.P.

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Abstract

*Amongst cereals, wheat (*Triticum aestivum L.*) is the most important widely cultivated crop of the world and is usually accorded a premier place among cereals because of the vast acreage devoted to its cultivation. It is claimed that if rice is the staple food of half of the world, wheat is the chief sustenance of other half. The study is based on the data collected by comprehensive scheme on cost of cultivation for principal crops, RBS College, Agra (U.P.) for the year 2009-2010 to work out the cost & return of wheat cultivation in U.P.. The impact of input factors viz. human labour, cost of machine labour, seed cost & value of fertilizer on total output in Rupees per hectare were estimated. It was observed that per hectare variable cost and return for wheat were Rs. 21161.16and the return over per rupee of variable cost was 1.918. The change in return was 94.77 % explained by five independent variables viz. family labour, casual labour, machine labour, seed cost and cost of manures and fertilizer. The resource productivity for the inputs viz. family labour, casual labour, machine labour, seed and fertilizer, were Rs.0.98, Rs.1.27, Rs. 0.01, Rs. 0.04 and Rs.3.43 respectively. All the resources found significant at 5 per cent level of significant except machine labour and seed.*

Key words: Cereals, variable cost, family labour, productivity

Introduction

Wheat is staple food of approximately 23 per cent population of the world. Twenty per cent energy is achieved through wheat at global level. Among food grains wheat is the richest source of protein and its stands at second place after pulses. Achieving food security and self-reliance has been the overriding goal of agricultural policy in India. Rapid spread of modern varieties has resulted in steady growth in agricultural output. Public investment in irrigation, rural infrastructure, and research and extension, along with improved crop husbandry has significantly contributed to the expansion in the production of food and non-food commodities. The concern now is that earlier gains achieved through technological change have attained ceiling levels and returns to further investments in such strategies are declining (Kumar and Rosegrant, 1994).

The seed and fertilizer revolution associated with the irrigation is concerned to be appreciating to the resource endowment of most of the developing countries, with scarce capital and land ratio. Now important and more general acceptance of the fact that agriculture can be dynamic and progressive in countries like India, where traditional agriculture has been a way of life for many generations. Higher agricultural productivity is a key element in economic development. The most impressive difference between the agriculture of developing countries like India in caparison to developed countries is to raise the productivity of agriculture. The most important pre-requisite to achieve this objective is efficient allocation and utilization of resources on the farms.

During 2000-01 to 2011-12, although growth in area under wheat was 1.22 per cent, growth in production and yield was 2.37 per cent and 1.14 per cent respectively. This clearly reflects that in wheat crop the growth rate in yield level is plateauing and there is need for renewed research efforts to boost production and productivity. Both public and private-sector investment in research and development (R&D) in this crop needs to be encouraged. (*Economic Survey of India, 2011-12*).

Productivity between farmers are not explained by differences in access to technology or inputs, but rather by differences in land quality (especially distance from irrigation canals) and differences in farmers' technical knowledge (human resources). These are structural differences that cannot be easily bridged in the short and medium term. The yield gap between farmers is not profitably exploitable and further yield growth will need to come through a shift in the technological yield frontier. Both expected yield increments and probabilities of success are highest for research on the irrigated wheat environment. The most

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promising approaches in these environments are changes in plant architecture and the exploitation of hybrid vigor, which could improve wheat yield potential by 25 per cent within the next five to ten years. Achievement of relatively high levels of fertilizer use in Asia has shifted the focus of concern to that of improving the efficiency of fertilizer use. Further work needs to be done on location specific research. The increasing importance of efficiency in input use compared to input and crop variety promotion will place greater demands on the extension service.

An attempt is made in this paper to examine the cost of cultivation & returns on wheat farms in U. P.

Research Methodology

For the present study the data collected by comprehensive scheme on cost of cultivation for principal crops, RBS College, Agra (U.P.) for the year 2009-2010 to work out the cost & return of wheat cultivation in U.P. were used. Simple tabular and functional analysis was done for working out cost & returns for the present study. As major portion of cost comes to the cost as rental value of land hence variable cost is considered for the study.

Functional analysis

The functional analysis was followed by estimation of zero order correlation coefficient to test multi-colinearity. Cobb-Douglas type of production function was fitted to work out the factor productivity.

$Y=a.X1b1.X2b2.X3b3.X4b4.X5b5.X6b6$

Where,

Y= value of output of crop in Rs. / hectare

X_1= area of crops in hectare

X_2= value of family labour in Rs./hectare

X_3= value casual human labour in Rs. / hectare

X_4= cost of machine labour in Rs. /hectare

X_5= cost of seed in Rs. / hectare

X_6= value of manures and fertilisers in Rs. /hectare

a= constant

b_1, b_2, b_3, b_4, b_5 and b_6 are the partial regression coefficients of the respective explanatory variables. The function was estimated by the method of ordinary least squares applied to the logarithmically transformed data.

The log linear form of the equation for the above function can be expressed as:

$$\text{Log } Y = \text{Log } a + b_1 \text{Log} X_1 + b_2 \text{Log} X_2 + b_3 \text{Log} X_3 + b_4 \text{Log} X_4 + b_5 \text{Log} X_5 + b_6 \text{Log} X_6 + e$$

Where

e = being the randomly disturbed term.

Results and Discussion

The cost and return estimated and summarized in table 1. It is clear from the Table 1, that the total cost of cultivation for family labour, casual human labour, irrigation, machine labour, fertilizer, seed and manure. It also shows that value of grain and straw of wheat is Rs.33946.50 and Rs.6653.99 respectively. Gross return per hectare from wheat crop on overall farms was come out to be Rs.40600.50. Net return per hectare on variable cost is Rs.19439.30. input-output ratio on variable cost worked out to be 1.918, which in dictates that investment of one rupee as variable cost in wheat cultivation gives Rs.1.918 as gross return.

Table 1: Cost and returns for wheat crop (Rs./ha).

Items	Value (in Rs.)
Family labour	2131.70(5.13)
Casual labour	2755.77(6.64)
Animal labour	183.58(0.44)
Machine labour	12789.13(30.80)
Seed	2366.24(5.70)
Manure and fertilisers	2250.27(5.42)
Plant protection	152.40(0.37)
Irrigation	47.44(0.11)
Interest on working cost	616.34(1.48)
Total Variable Cost	21161.16(50.96)
Value of grain	33946.50
Value of straw	6653.99
Gross Return	40600.50
Net return over variable cost	19439.30
Input – output ratio on variable cost	1 : 1.918

(Figure in parenthesis shows percentage of total cost).

Table 2: Resource productivity for wheat on small farms

Items	Resource Productivity(Rs.)
Land area (X_1)	1.127
Family labour(X_2)	0.98
Casual abour (X_3)	1.27
Machine Labour (X_4)	-0.01
Seed (X_5)	0.04
Fertilizer (X_6)	3.43

Table 2 reveals that the opportunity cost of land may be estimated as its annual rental value. Comparing with the rental value of the land the marginal value product is greater than the rental value. Thus, there is

a scope of more land to be put under wheat on small farms.

The scope of casual labour input can be verified by the MVP. The MVP of casual labour found out to be Rs.1.27 shows further use of this input. The machine labour input is estimated in value terms, which is non-significantly affecting the production process. MVP is come out to be less than unity in which is negative shows that the every additional rupee of input is expected to give a loss in the return while keeping all other variables fixed at their respective geometric means, which also indicate cut down in the use of this input. Resource productivity of fertilizer has come out to be Rs. 3.43, keeping other factors fixed at their respective geometric mean levels. Thus, there is a scope of further utilization of fertilizer in the wheat crop.

Table 3: Least square estimates of regression coefficient, standard error and coefficient of multiple determination

Items	Value
No. of observations	60
Constant (a)	428.465
Area (X_1)	0.2068* (0.04337)
Family labour (X_2)	0.1090* (0.0391)
Casual abour (X_3)	0.1314* (0.0627)
Machine Labour (X_4)	0.1931(0.0294)
Seed (X_5)	0.1432 (0.0711)
Manure and Fertilizer (X_6)	0.1642* (0.0731)
F test value	32.4679
Coefficient of multiple determination (R^2)	0.9476

Figures in parenthesis show standard error
*Significant at 5% level of significance

The production function is estimated and compiled in Table 3. The 'F' value has been found to be highly significant at 1% level of significance, which shows the goodness of fit. The coefficient of determination R^2 gives an estimate of the variation in the total output as explained by the inputs under consideration viz. land, family labour, casual human labour, machine labour, seed and fertilizer. The inputs under observation explained 94.77 per cent of the variation in the output which also shows that the major variation in the output is explained y the observed input variables.

The elasticity of land, family labour, casual human labour and manure and fertilizer come out to be 0.2066, .1090, 0.1314 and 0.1642 which significant at 5% level of significance. The elasticity of seed and machine labour come out to be 0.1432 and 0.1931, which non-significant at 5% level of significance.

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