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Resource use efficiency of wheat production in Tikamgarh district of Madhya Pradesh

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Abstract

The main objective of this study was to examine the resources use efficiency of wheat production in Tikamgarh district of Madhya Pradesh. Cobb-Douglas production function model has been fitted to work out the efficiency of various factors employed in the production process. The study covered three villages of Tikamgarh district and 75 sample farmers (25 from each village) were interviewed from three villages of Tikamgarh block of Tikamgarh district (M.P.) Data was analyzed and revealed that the average net cultivated area was found 5.45 hectare per farm and Wheat occupied 2.82 hectare area per farm in rabi season. The data portrays that on an average cost of cultivation per hectare of wheat crop was found to Rs.18817 (Cost A1), Rs.18928 (Cost B1), Rs.23928 (Cost B2) respectively and the overall gross income (main product + by product) of this crop was found to Rs.49488 per hectare.

Keywords: Resource use efficiency, cobb-douglas production function, wheat

Introduction

Madhya Pradesh is one of the important states in India producing near about 10% of total wheat production in the country. It is adaptable to different soils, climates and elevation. After the green revolution the yield per hectare of wheat in India increased from 14.1 quintal per hectare to 25.80 quintal per hectare on the farm of major wheat growing states as well as on the progressive farm of Madhya Pradesh also. The production level of Wheat in India had a quantum jump from 6.46 million tonnes from an area of 9.75 million hectare in 1950-51 to near about 95 million tonnes from an area of about 32 million hectares during 2014-15. Madhya Pradesh is an equally important wheat growing states of India. Madhya Pradesh occupied about 5002.0 thousand hectares under wheat in 2014-15. The total production of wheat was 13132.0 thousand tonnes in same year. The average yield of wheat in the State, in that year was about 26 quintal per hectare. It is well known fact that agricultural growth, among others factors, depends upon the manner of utilization of resources by the farming community and it is true also in wheat cultivation. In this respect, the agricultural economists want to know that if the farmers are already allocating their resources optimally, no additional income can result from reallocation of farm resources and we will have to look to other sources for agricultural growth. If, on the other hand, the farmers are not allocating their resources optimally, there exists an inexpensive source of agricultural growth –through reallocation of resources. Thus, a study on the resource use efficiency of wheat growers acquires special importance.

Material and methods

Tikamgarh district of Madhya Pradesh was selected for the purpose of this study. In the study, multi stage sampling technique was used for drawing the sample. At first stage, Tikamgarh block of Tikamgarh district was selected purposively because of the important area of wheat production. At second stage of selection, three villages namely Nimora, Chorpua and Nimkhera were selected randomly for the study and at the third stage of the selection a list of wheat growing cultivators of each village was prepared. From the list 25 farmers were selected from each village through random basis. thus, total 75 farmers were sampled for the study. The data on different aspects was collected through pre-tested interview schedule. The data was collected using survey method. All the collected primary data was related to the agriculture year 2015-16 rabi season.

Analytical procedure for estimation of resources use efficiency

Cobb-Douglas production functions were used for the estimation of resource use efficiency in cultivation of wheat, it is widely used by various research workers for studying resource use efficiency and they obtain precise results.

$$Y = a x_1^{b_1} \cdot x_2^{b_2} \cdot x_3^{b_3} \dots \dots \dots X_k^{b_k}$$

It is converted in to logarithmic form, so that it can be solved by the least square method. The logarithmic form of the Cobb-Douglas function is express as under:

$$\log y = \log a + b_1 \log x_1 + b_2 \log x_2 \dots \dots \dots + b_k \log x_k.$$

Where: y = Dependent variable

(Gross income)

A = Constant or intercept value

b_1 to b_k = are regression coefficients of X_1 to X_k variables and

X_1 to X_k = are variables.

General description of farmers

The average size of holding represents to 5.57 hectare per farm with wheat growers. The data also clearly shows that the average net cultivated area was found to 5.45 hectare per farm (97.85% to size of holding). Wheat is one of the important rabi crop area dominated in the season accounted on an average area of 2.82 hectare per farm which is 50.63 per cent of total size of holding. The average productivity of wheat on sample holding was found to 24.11 quintal per hectare.

Result and Discussion

The production function analysis was carried out to examine the resources use efficiency in wheat production. The resource use efficiency has been determine by using Cobb–Douglas production function with the help of least square technique and coefficients of elasticities of major resources along with value of R^2 and F ratio which has been presented in table 1.

Table 1: Production function coefficient of wheat crop on the sample farm.

s.no.	Production variables	Regression value	Standard errors [^]
1.	Human Labour (X1)	0.665**	0.423
2.	Seed (X2)	0.316**	1.952
3.	Manure & fertilizer (X3)	-0.028 NS	0.894
4.	Plant protection (X4)	0.344**	1.509
5.	Irrigation (X5)	0.001 NS	3.136
6.	Coefficient of multiple determinations (%) (R^2)	99.10	
7.	F- Ratio	1449.219	

Note: [^]Standard errors of respective co-efficient.

* Significant at 0.05 per cent level of probability

** Significant at 0.01 per cent level of probability

* R^2 Coefficient of multiple determinations

The R^2 coefficient of multiple determinations clearly indicated that fitted function 99.10 per cent explainable good. This showed that 99.10 per cent variations in gross income of wheat cultivation were due to the included variables. The F-ratio for fitted function was found to high i.e. 1449.219 indicated that fitted Cobb-Douglas production model is more useful and best fitted to the data.

Bal *et al.* (1983) ^[1], Lalitha and Raju (1992) ^[3], Raghuvanshi *et al.* (1999) ^[4], also used the cob-Douglas production function for assessing the resource use efficiency

The production function analysis explain that on overall average holding except expenditure on fertilizer the other expenditure like human labour, seed, plant protection and irrigation influenced gross income of wheat crop towards positive. This showed that the utilization of resources pattern except fertilizer are being utilized properly.

Hence, it is concluded that wheat growers used their inputs more efficiently except fertilizer. The regression values of all the inputs (independent variables) have been shown positive contribution on gross return of wheat cultivation.

The detail of production function analysis shows that variable like expenses on human labour determined the regression value (0.665**) followed by expenses on seed (0.316**) and expenses on plant protection (0.344*) shown their positive and significant contribution on gross income of wheat production. On the other hand, the expenditure on irrigation determined the regression value (0.001 N.S), shown their positive and non significant contribution on gross income of wheat production.

In nut shell, it is clear from the study that the expenditure on human labour, seed, plant protection and irrigation would contribute, significantly / non significantly in explaining variation in gross income of wheat production.

Study also depicted that the expenditure on fertilizer and manure determined the negative regression value (-0.028 N.S), shown their negative and non-significant contribution on gross income of wheat production. Hence, it is indication that farmers used injudicious level of fertilizer in wheat production.

In last, it is concluded that the elasticity's of production of each input on all the sample wheat farms are less than one, indicating diminishing returns to each variable input except fertilizer. It can be say that if we increase each input (except fertilizer) by one per cent the gross income from wheat will increase by less than one per cent (with diminishing return). The expenditure on human labour, seed, plant protection measure and irrigation were found to have significant / non-significant influence in explaining the variability in gross income, it means, the gross income from wheat increases significantly if expenditure on these inputs increases. (Same reported by Kherwa, 2009) ^[2] The one per cent increases in the value of human labour would have brought 0.665 per cent in gross income of wheat followed by one per cent increase in expenditure on seed would have brought about 0.316 per cent increases in gross income from the wheat crop, one per cent increase in expenditure on manure and fertilizer would have decrease 0.028 per cent in gross income from the wheat, one per cent increase in expenditure on plant protection would have brought about 0.344 per cent increase in gross income of wheat and one per cent increase in expenditure of irrigation would increase gross income by 0.001 per cent on gross income of wheat respectively. In study the return to scale denoted $\sum b = 1.298$, which clearly indicated that with increase in the size of holding might be influence positive direction by 0.298 per cent.

Conclusion

On the basis of study it can be concluded that the use of resources like human labour, seeds, plant protection measure and irrigation can be increased to optimize the resource use and get maximum returns in wheat cultivation at farm level. Hence, it is suggested that these inputs should be utilized higher to findout the optimum productivity and to realizing higher profit.

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