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Factor Productivity of Rice Cultivation in Karnataka

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Abstract

Rice is one of the staple food crops of India and Karnataka is one of the major rice producing states in India. The inefficient use of the farm resources affects the productivity of crops. Hence this study was undertaken to examine the factor productivity and economic profitability of rice cultivation in Raichur district of Karnataka. The study indicated that the cultivation of rice is economical with a BC ratio of 1.4. The ratio of marginal value product to factor cost is higher in manures, seeds, fertilizers and human labour used in rice cultivation in the study area. Hence, there is scope for more effective utilization of resources.
Key words : Rice, Factor productivity, Net income, Cobb-Douglas production function.

Rice is one of the most important staple food crops grown in India, occupying 43 million hectares with a production of 93 million tones. Karnataka is one of the major rice producing states in India. Though the average productivity of Karnataka was highest (3.868 t/ha) during 2005-06 in India, nearly half of the rice growing districts recorded productivity of less than 2.5 t/ha. Raichur district occupied an area of 174,434 hectares under irrigated rice, with an average productivity of 2.5 t/ha during 2005-06. The available evidence suggests that farmers in the developing countries fail to exploit full potential of a technology and or make allocative errors (1—5). The inefficient use of the farm resources undoubtedly affects the productivity of crops, resulting in an unfavorable cost/returns structure. To avoid such a situation, the existing resource use patterns on individual holdings needs to be organized through appropriate farm management decisions. The contribution of each factor in increasing productivity helps in convincing the farmer about the judicious use of that input. Efficient use of available resources is a key for enhancing the productivity of paddy. Hence this study was undertaken to examine the factor productivity and economic profitability of paddy cultivation in Raichur district of Karnataka.

Methods

The study was conducted in Raichur district of Karnataka. Four villages were selected randomly from Raichur district. From each village twenty farmers were selected randomly. Thus, the study constituted a total of 80 sample farmers. The data on various aspects of rice cultivation were collected through pre-structured questionnaires. The data thus collected was subjected to statistical analysis. The data pertains to the agricultural year 2007-08. The collected data were used compute cost of paddy cultivaton, cost A, cost B, and cost C and economic profitability and resource use efficiency of paddy cultivation in Raichur district of Karnataka.

The frontier production function is defined as the relationship that describes the maximum possible output for a given combination of inputs (6). The empirical production functions are linear, Cobb-Douglas type production function (CD), constant elasticity of substitution production function (CES), Lieontief production function (LPF) and linear programming production (LPPF). The Cobb-Douglas type production function (CD) is convenient for the comparison of the partial elasticity coefficients. It is a multiplicative type and is non-linear in its general form. The marginal productivity of factors, marginal rate of substitution, factor intensity and the efficiency of production can be calculated from the parameters in Cobb-Douglas type production (CD) function. Hence, to examine the factors affecting the resource productivity of rice, the Cobb-Douglas type production (CD) function of the following form was fitted :

Table 1. Costs and farm income measures in rice cultivation (Rs/ha).

Particulars	(Rs/ha)
Cost A	21,222.86
Cost B	31,123.11
Cost C	34,637.77
Gross returns	44,228.75
Gross returns–Cost C	9,590.98
Farm Business income	23,751.65
Family Labor income	13,105.64
Net income	12,692.58
Benefit-cost ratio	1.4

$$Y = A \text{ II } X_i^{bi} e^u$$

Where Y = Realized potential farm yield (t/ha), X_1 = Seed (kg/ha), X_2 = Manures (t/ha), X_3 = Fertilizers (kg/ha), X_4 = Plant protection chemicals (Rs/ha), X_5 = Irrigation costs (Rs/ha), X_6 = Machine labor (Rs/ha), X_7 = Human labor (mandays/ha), X_8 = Age of the farmer (years), X_9 = Experience in cultivation of rice (years), X_{10} = Education (no. of years of schooling), X_{11} = Land (hectares), u = Random disturbance term, bl.....b11 = Regression coefficients.

Marginal value productivity (MVP) of an input factor is defined as the change in output from a change in the input factor, keeping all other factors constant. Marginal value productivity (MVP) of a factor is measured from the following formula :

$$MVP\,(Xi) = bi\,(\overline{Y} / \overline{Xi})$$

Where, $\overline{Y}$ = Arithmetic mean level of yield of rice, $\overline{Xi}$ = Arithmetic mean level of ith independent variable, bi = The regrEssion coefficient of ith independent variable.

Results and Discussion

The cost concepts approach to farm costing is widely used in India. These cost concepts include Cost A, Cost B, and Cost C. Various cost concepts involved in the cultivation of rice are presented in Table 1. Cost A which includes all actual cash expenses incurred in cash and kind in production process and also the rent paid for leased in land, worked out to be Rs 21,222.86 per hectare. Cost B which includes Cost A and rental value of own land and rent paid for leased in land, was Rs 31,123.11 per hectare. Cost C which includes Cost B and imputed value of family labor and also costs accounted for managerial services of the farmers worked out to be Rs 34,637.77 per hectare. Farmers in the study area could realize gross returns of Rs 44,228.75 per hectare. Net income accrued was Rs 12,692.58 with a benefit-cost ratio of 1.4.

Table 2. Production elasticities of inputs in rice cultivation. **Significant at 1% level, *Significant at 5% level, R^2 is coefficient of determination.

Item	Coefficients	Standard Error	t Stat
Intercept	11.0142	1.0866	10.1361
Seed	0.0497	0.0244	2.0378**
Manures	0.4753	0.0969	4.9071*
Fertilizers	0.0108	0.0029	3.7360*
Pesticides	0.0015	0.0009	1.6643
Irrigation	0.0010	0.001	0.8744
Machine labor	0.0001	0.0002	0.9258
Human labor	0.0433	0.0256	1.6923
Age	0.0095	0.0087	1.0897
Experience	0.0018	0.0089	0.2069
Education	0.0090	0.0231	0.3888
Land	0.0095	0.0220	0.4326
R^2	0.9		

The estimated results of regression model for production elasticities of inputs in rice cultivation are given in Table 2. Table 2 shows that the explanatory variables included in the model showed greater variation in yields of rice.

The coefficient of multiple determination is 0.9 indicating 90% variation in mean yield of rice associated with variables included in the model. The regression coefficients of variables namely seeds, manures, and fertilizers are significant at 1 and 5% levels of significance. The regression coefficients of pesticides, irrigation, machine labor, human labor, age, experience and education of the farmer and the size of the land holding are positive but are found to be non-significant.

Resource use efficiency is the ratio of marginal value product (MVP) of an input factor to the price of that input, that is marginal factor cost (MFC). Optimum resource use efficiency of a particular input is obtained at a point wherer MVP and factor cost are equal (MVP/MFC = 1). The inequality of marginal value product (MVP) and marginal factor cost (MPC)

Table 3. Ratio of marginal value product to factor cost (FC).

Variables	Ratio of MVP to MFC
Seed	0.76
Manures	3.64
Fertilizers	0.15
Pesticides	0.02
Irrigation	0.04
Machine labor	0.01
Human labor	0.8

indicates extent of inefficiency in resource use. If the ratio of MVP/MFC greater than one and the regression coefficient is significant the resource input is said to be underutilized. Similarly, if the coefficients are negative and significant the input factor is said to be over utilized.

Table 3 shows that all the independent variables considered have positive coefficients and the ratios of MVP to MFC in respect of resource inputs namely seeds, manures, fertilizers, and human labor are 0.76, 3.64, 0.15 and 0.8 respectively. These ratios indicate that for every additional rupee spent on these variables yield levels of rice could be increased by 0.76, 3.64, 0.15 and 0.8 respectively. Further, it could be inferred that these resources are underutilized.

The study indicated that the cultivation of rice is economical with a BC ratio of 1.4. The ratio of marginal value product to factor cost is higher in manures, seeds, fertilizers and human labor used in rice cultivation in the study area. It may be concluded from the analysis that the inputs namely seeds, manures, fertilizers and human labor are underutilized in rice cultivation. There is scope for more effective utilization of resources since there exists unexploitable economic margin in the cultivation of rice. To increase the production and profitability from rice cultivation, suitable measures should be propounded. There is also an urgent need to offer a remunerative price to the rice growers. Efforts should be directed towards ensuring a wider adoption of modern methods of cultivation. These suggestions if implemented are expected to result in enhancing the factor productivity, thus enabling realization of higher yields and better returns from rice cultivation to the farmers in the study area.

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