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RESEARCH PAPER

Resource use Efficiency of Banana Production in Kushinagar District of Eastern Uttar Pradesh

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ABSTRACT

The present study was confined to the measure Resource use efficiency of banana production in Kushinagar district of eastern Uttar Pradesh. The total sample size of 50 banana farmers was selected. The sample farmers were randomly selected from each of the selected villages for getting required information. The banana production seed (suckers), manure (FYM), fertilizers, plant protection, irrigation was underused. Thus, need to increase its cost for optimum allocation. labour was overused and need to decrease their cost for its optimum allocation. The ratio of MVP (Marginal Value Product) to MFC (Marginal Factor Cost) was greater than the unity for all resources used in banana production except labour cost which was lesser than unity. The coefficient of multiple determinations (R2) was 0.961 for estimated production function. The high and significant F values indicated that the Cobb-Douglas production function was adequate in explaining 96 per cent of the variation in output of banana production.

HIGHLIGHTS

- To analyze the optimum allocation of resources used in the production process and functional relationship between input and output.
- Cobb-Douglas production function was used to estimate the contribution of specified factors for production of banana
- Regression coefficients of different production variables in cultivation of Banana

Keywords: Resource use efficiency, marginal value product, marginal costs, Cobb-Douglas production function

Banana (*Musa paradisiacal L.*) is one of the oldest and the world's most important fruit crops cultivated by man from pre-historic times. They are not only consumed raw, but are also used in making juices, sauces, baked goods and various dishes. Bananas are a rich source of Vitamin B6, Vitamin C, Manganese, Potassium, dietary fibers. India is the top country by bananas production in the world. As of 2019, bananas production in India was 30.5 million tonnes that accounts for 26.02 percent of the world's bananas production. Globally, the total production of bananas stands around 114 million tons presently. During last one year and half decade production the growth of bananas and plantains remained very significant. India occupies the top position as the largest producer of banana in the world, with a production of around 32 million tons, which is approximately world's one-fourth. The world's total bananas production was estimated at 117 million tonnes in 2019 (FAO, 2019). The highest production is 5003.07 Thousand MT in Andhra Pradesh fallowed by Gujarat 4472.32 Thousand MT and Maharashtra 4209.27 Thousand MT. It is highest

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area grown of banana in Karnataka. Banana is an important fruit crop grown in the state of Uttar Pradesh. The state ranks 5th in the country in terms of annual production of 3172.03 thousand metric tonne. It is being cultivated in an area of 69.380 ha. The productivity of banana is 45.72 tonne per ha which is for below then productivity of states like Madhya Pradesh (69.52 t/ha), Gujarat (65.60 t/ha), Andhra Pradesh (56.23 t/ha), and Maharashtra (52.04 t/ha). The major areas in Uttar Pradesh where banana is cultivated on a large scale are Siddharthnagar, Basti, SantKabeernagar, Maharajganj, Kushinagar, Faizabad, Barabanki, Sultanpur, Lucknow, Sitapur, Kaushambi, Allahabad.

Review on Resource Use Efficiency In Banana Production

Landge *et al*. (2010) assessed the resource use efficiency and optimum resource use in banana production. About 48 drip irrigated banana growers have been randomly selected for the research. Cobb-Douglas production function was fitted to the data. The results revealed that the regression coefficient of machine labor, irrigation and area under banana was 0.054, 0.203 and 0.213, respectively which were positive and significant. Marginal productivity with appreciate to area, bullock labor and machine labor was 51.29, 2.75 and 2.74 quintals, respectively. It inferred that if area is increased by one hectare, bullock labor increased by one pair and machine labor increased by one hour, it would lead to increase banana production by 51.29, 2.75 and 2.74 quintals, respectively. The sum of the production elasticities (Sigma bi) was 0.57 which indicated decreasing return to scale.

Umamaheswari and Verlmurugan (2010) studied the resource use efficiency in banana farms and suggest suitable policy measures. Primary data were collected from a sample of 80 farmers (40 each from wetland and garden land categories) in Karur district, Tamil Nadu, India. Production function analysis revealed increasing returns to scale from banana cultivation.

Thakur (2016) analyzed the resource use situation in banana farms of Padampur of Chitwan, Nepal. Primary data were obtained from a sample of total size 120 in which 60 banana farmers used the credit facility and 60 banana farmers have not used the credit facility. The result revealed that the cost incurred in suckers and labor were significant and have not optimally utilized in banana production. He found that the FYM cost, irrigation cost, and pesticide cost were positive but lower which stated that they were also over utilized and has to be utilized more efficient.

Thanki *et al*. (2019) to examined Resource use efficiency of banana cultivation in Bharuch District of South Gujarat. The analysis of Cobb-Douglas production function fitted and in case of small farmers revealed that among the selected variable of banana, human labour and irrigation were found positive and significant at 5 per cent level of significant. In case of PPC (Plant protection Chemical) and chemical fertilizer the regression coefficient was negative. The explanatory variable like tractor charge, human labour, FYM and irrigation were found positive and significant at 5 per cent level of significant in case of medium farms. In case of PPC (Plant protection Chemical) the regression coefficient was negative.

The specific objective of the study is to estimate the resource use efficiency of banana production.

MATERIALS AND METHODS

Kushinagar district was selected purposively. A list of all 14 Blocks was prepared on the basis of banana growing area. Two Blocks Namely Khadda and Dudahi were purposively selected for the study. From the selected development block, a list of the village was prepared and five villages were randomly selected using random table with replacement method. The total sample size of 50 banana farmers was selected. The sample farmers were randomly selected from each of the selected villages for getting required information on banana production using pre-tested and well-structured schedules.

Estimation of Resource Use Efficiency

We used Cobb-Douglas production function to assess resource use efficiency following the methods mentioned by Rahman and Lawal (2003).

$$Y = aX_1^{b1} X_2^{b2} X_3^{b3} X_4^{b4} X_5^{b5} X_6^{b6} e^{u}$$

Where,

Y = Total return from Banana production in ₹/ha.

X_1 = Total cost of suckers/seeds used in banana production in ₹/ha.

X_2 = Total cost of manure in ₹/ha.

X_3 = Total cost of fertilizers in ₹/ha

X_4 = Total cost of plant protection in ₹/ha.

X_5 = Total cost of labour charge in ₹/ha.

X_6 = Total cost of irrigation charge in ₹/ha.

a = Intercept

e^{μ} = Error term

$b1$, $b2$ ….. $b5$ are the regression coefficients to be estimated. Both dependent and explanatory variables were transformed to natural logarithm. The above equation was transformed to linear form for ease in computation.

The level of resource use efficiency was calculated using following formula:

$$r = \frac{MVP}{MFC},$$

Where,

r = Efficiency ratio

MVP = Marginal Value Product; which is the value of incremental unit of output resulting from the additional unit of inputs.

MFC = Marginal Factor Cost which is equal to one since both dependent and explanatory variables are converted to monetary value; and is defined as the increase in the cost of inputs due to purchase of additional unit of inputs.

$$\text{Now, } MVP = \frac{bi * \bar{Y}i}{\bar{X}i},$$

Where,

b_i = Estimated regression coefficient of input Xi

y_i = Geometric mean value of output.

x_i = Geometric mean value of i^{th} resources used

Decision rule:

r = 1; Efficient use of resource

r > 1; Underused of the resource

r < 1; Overused of the resource

Finally, the relative percentage change in MVP was calculated using following way:

$$D = (1 - MFC/MVP) \times 100$$

Or,

$$D = (1 - 1/r) \times 100$$

Where,

D = absolute value of percentage change in MVP of each resource (Mijindadi, 1980) for calculation of many parameters used in resource efficiency calculation values.

RESULTS AND DISCUSSION

Resource use efficiency of banana production

The major resources used in the process of Banana production were seed (suckers), manure (FYM), fertilizers, plant protection, labour and irrigation. Cobb-Douglas production function was used to analyze the efficiency of resources used in the production process where total return from banana was taken as dependent variable and other resources involved in production process as explanatory variables.

The ratio of MVP (Marginal Value Product) to MFC (Marginal Factor Cost) was greater than the unity for all resources used in banana production except labour cost which was lesser than unity. The coefficient of multiple determinations (R2) was 0.961 for estimated production function. The high and significant F values indicated that the Cobb-Douglas production function was adequate in explaining 96 per cent of the variation in output of banana production. The constant returns to scale were noticed in both the methods since sum of elasticity coefficients was nearly four. An examination of production parameters of Cobb-Douglas function for banana production indicated that output was positively and significantly conditioned.

The regression analysis showed that the coefficient of suckers (0.96), fertilizers (0.18) and labour (0.43) were found positive and significant at 5 per cent level of significant. The positive and significant coefficient indicated that one unit increase in the suckers, fertilizers and labour will increase the yield of banana by 0.96, 0.18 and 0.43 per cent respectively. In case of manure, PPC (Plant

Table 1: Estimate of resource use efficiency using cobb-Douglas production function

Sl. No.	Particulars	Regression coefficient	MVP	MFC	Ratio	D- value	Efficiency
1	Intercept	4.0419					
2	Ln_Suckers	0.965	1.157	1	1.157	13.56	Underused
3	Ln_Manure	-0.452	1.158	1	1.158	13.64	Underused
4	Ln_fertilizers	0.183	1.101	1	1.101	9.17	Underused
5	Ln_plant protection	-0.037	1.528	1	1.528	34.55	Underused
6	Ln_labour	0.433	0.617	1	0.617	-62.07	Overused
7	Ln_irrigation	-0.282	1.031	1	1.031	3.00	Underused
8	Σbi	0.808					
9	Coefficient of multiple determination (R)	0.980	—	—	—	—	—
10	Adjusted coefficient of multiple determination (R^2)	0.961	—	—	—	—	—
11	F value	37.96	—	—	—	—	—

Protection Chemical) and irrigation the regression coefficient was negative which indicates the use of one more unit manure, PPC (Plant Protection Chemical) and irrigation will minimize the yield by 0.45, 0.037 and 0.28 per cent respectively.

From the above discussion, it is concluded that, seed (suckers), manures, fertilizer, plant protection, labour and irrigation have positive and statistically significant relationship which indicate that an increase in the application of these inputs would lead to increase in the output of banana. All the variables except labour were found to be underutilized.

CONCLUSION

The finding show that sum of elasticity was found to be 0.808, which were less than unity, indicating that farmers had experienced decreasing returns to scale in banana production in the study area. The adjusted (R^2) value of the estimated model for banana production was 0.961. This means 96.1 percent of the variation is due to the explanatory variable used in the model. The MVP of seed (suckers), manures, fertilizer, plant protection and irrigation have positive and statistically significant relationship which indicate that an increase in the application of these inputs would lead to increase in the output of banana. Banana production of seed (suckers), manure (FYM), fertilizers, plant protection, and irrigation was underused. Thus, need to increase its cost for optimum allocation. All the variables except labour were found to be overused and need to decrease their cost for its optimum allocation.

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