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Original Research Article

Resource Use Efficiencies of Okra in Deoria District of U.P.

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Keywords

Input, Independent variable, Medium farms, Return to scale

A B S T R A C T

The functional relationship between input factors namely independent variables like manures & fertilizers (X_1), seed (X_2), human labour (X_3), irrigation charges (X_4) and plant protection (X_5) and dependent variable as okra production (yield) was estimated by Cobb-Douglas type production function. The co-efficient of multiple on all size group of farms was 0.92, 0.94 and 0.93 respectively, indicating that 92%, 94% and 93% of the variation in the yield is explained by independent factors like manures & fertilizers (X_1), seed (X_2), human labour (X_3), irrigation charges (X_4) and plant protection (X_5). Returns to scale was less than 1 indicating that decreasing returns to scale. Only in case of medium farms, optimum level of human labour was used, reflects optimum allocation. Irrigation charges were used excessively in all size group of farms.

Introduction

In the world, India is the second largest producer of vegetables with a production of 168.30 million tonnes from 9.5 million hectares of land area with productivity of 17.64 MT/ha during 2014-15 (HSD, DoA & co-operation). The production of vegetable in India is inadequate to meet the needs of the country (Gangwar and Chikara, 1973; Verma, 2007). The consumption of vegetables are about one-third of the dieticians-based recommended level. It is therefore, necessary to enhance the production of vegetables by way of expanding the acreage and stepping up the productivity of vegetables. In the vegetable kingdom, malvaceous vegetable crops are of pivotal importance. In the malvaceous vegetable group, the okra is considerably an important vegetable crop cultivated widely across seasons and space. Okra has a relatively good nutritional value and is a good complement. It is a good source of vitamin-A, B, C and it is also rich in protein, carbohydrates, fats, minerals, iron and iodine (Srivastava and Chand, 1977; Kumar *et al*., 2016). It is presently commercially grown in many countries viz India, Japan, Turkey, Iran, Pakistan etc. In India, total area of okra crops was 507 thousand ha production of 5853 MT and productivity 11.5 MT/ha in 2014-15 (HSD, DAC&FW). In U.P. area of okra crops grown was 14.18 thousand ha with annual production of 181.66 MT and productivity was 12.81 MT/ha in 2014-15 (HSD, DAC&FW). Seeing the economic and nutritional importance of okra, the present study entitled resource use efficiency of okra was undertaken.

Materials and Methods

The multistage stratified purposive random sampling method was applied to select block, villages and farmers. Out of 16 blocks in district Deoria, one block (Desahi Deoria) was selected purposively. A list of all the villages of this block was prepared along with their area and production under vegetables, only 5 villages *viz* Barawa meer chhapar, Desahi Deoria, Shampur, Pipara madan gopal and Shishwa were selected randomly for the investigation. A total of 100 okra growers (42 marginal, 38 small and 20 medium) were selected randomly from the universe of five selected villages on the proportion of farmers falling in each village under different size group of farms. These farmers were grouped according to size of holding they possess, that marginal (<1ha), small (1-2ha) and medium (2-4ha). The major vegetables were okra taken for the study and analysis on the basis of more area and production at different size group of farms. The enquiry was conducted by survey method. The data were collected by personal interview with selected vegetable growers on well prepared schedules. The period of inquiry pertained to the agricultural year 2015-16.

Functional analysis

To study the response of various independent variables on the output, various forms of production function have been dealt. However Cobb-Douglas production function was found most suitable and best fit to the data. Thus Cobb-Douglas production function was used for measuring resource use efficiency.

The mathematical form of Cobb-Douglas production functions are:

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

Where,
Y = per hectare output (Rs./ha)
X_1 = per hectare cost of manures and fertilizers (Rs./ha)
X_2 = per hectare cost of seeds (Rs./ha)
X_3 = per hectare cost of human labour days (Rs./ha)
X_4 = per hectare cost of irrigation charges (Rs./ha)
X_5 = per hectare cost of plant protection measures (Rs./ha)
e^u = error term
b_1, b_2, b_3, b_4 and b_5 are production elasticities of the respective independent variables.

M.V.P. - The marginal value product of input was estimated by following formula.

$$\mathbf{MVP_{Xj}} = \frac{b_j \bar{Y}}{\bar{X}_j}$$

Where,
MVP_{xj} = Marginal value product of j input
b_j = Production elasticity with respect to X_j
$\bar{Y}$ = Geometric mean of the dependent variable Y
$\bar{X}_j$ = Geometric mean of the independent variable X_j

After estimating the MVP, the resource use efficiency of different resources were judged with MVP =1 Optimum use of resources
MVP<1 Excess utilization of resources
MVP>1 Underutilization of resources

Results and Discussion

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads:

Distribution of sample okra cultivors

The selected okra growers were grouped according to their size of total holding of

land. The cultivars were classified into three categories *viz* Marginal farmers (<1ha), Small farmers (1-2ha) and Medium (2-4ha). The distribution of sample farmers were given in table 1. The area under okra cultivation was 0.45ha in marginal, 1.46ha in small and 2.94ha in medium category with an overall average area under okra cultivation was 1.34ha.

Input utilization

Per hectare quantities of different input and their values are given in table 2. It was observed that family labour was maximum on marginal farms 12.88% followed by small farms 10.27% and medium farms 5.40% along with overall average 10.23%. Hired labour maximum was on medium farms 13.66% followed by small farms 8.49% and marginal farms 6.40% along with overall average.

Total overall expenditure incurred on seed was 7.64% which was maximum on medium farmers 8.88% followed by marginal 7.47% and medium 7.1%. Expenditure incurred by the marginal, small and medium fermers on manures & fertilizers was 10.79%, 11.46% and 12.73% respectively, with overall average 11.47%. This indicated that expenditure incurred on manures and fertilizers was highest on medium farmers followed by small and marginal farmers. Irrigation charges was maximum on small farmers 29.15% followed by medium 27.94% and marginal 26.12% with overall average 27.69%. Plant protection charges was also maximum on small farmers 1.88% followed by medium 1.79% and marginal 1.78% with overall average 1.82%.

Resource use efficiency

The Cobb-Douglas production function was used to study the resource use efficiency for different size group of farms. Elasticity of production, Returns to scale and Coefficient of multiple determination (R^2) for cultivation of okra on different size group of farms were worked and displayed in **table.3.**

It could be seen from the table that five input-factors, namely, manures & fertilizers, seed, human labour, irrigation charges and plant protection were considered as independent factors in fitting the Cobb-Douglas production function to the gross income data separately for marginal, small and medium farms. Significance of test to the factor elasticities of production was applied.

Table.1 Distribution of sample okra cultivars

S. No.	Size group of farms	No. of sample farms	Net cultivated area (ha)	Average size of land holding (ha)
1.	Marginal (below - 1 ha)	42	18.90 (14.16)	0.45
2.	Small (1-2 ha)	38	55.66 (41.70)	1.46
3.	Medium (2-4 ha)	20	58.90 (44.13)	2.94
4.	**Total overall average**	**100**	**133.46 (100.00)**	**1.34**

(Figures in the parentheses indicate percentages to the total)

Table.2 Per hectare input used for okra cultivation

S. No.	Particulars	Size group of sample farms			Overall average
		Marginal	Small	Medium	
1.	Family Labour	9050.00 (12.88)	7800.00 (10.27)	4450.00 (5.40)	7655.00 (10.23)
2.	Hired Labour	4500.00 (6.40)	6450.00 (8.49)	11250.00 (13.66)	6591.00 (8.81)
3.	Total Human Labour	13550.00 (19.28)	14250.00 (18.77)	15700.00 (19.07)	14246.00 (19.04)
4.	Tractor power	6647.00 (9.46)	6313.00 (8.31)	6217.00 (7.55)	6434.08 (8.59)
5.	Seed cost	5250.00 (7.47)	5400.00 (7.11)	7311.00 (8.88)	5719.20 (7.64)
6.	Manures & fertilizers	7580.00 (10.79)	8700.00 (11.46)	10480.00 (12.73)	8585.60 (11.47)
7.	Irrigation charges	18360.00 (26.12)	22131.00 (29.15)	23009.00 (27.94)	20722.78 (27.69)
8.	Plant protection	1250.00 (1.78)	1430.00 (1.88)	1480.00 (1.79)	1364.40 (1.82)

(Figures in the parentheses indicate percentages to the total)

Table.3 Resource use efficiency estimators of okra on different type group of farms in the study area

Size of sample farm	Production elasticities					Sum of elasticities	R^2
	X_1	X_2	X_3	X_4	X_5		
Marginal (below-1 ha)	0.1875* (0.0794)	0.4421** (0.0518)	0.0953 (0.0792)	0.0725 (0.0185)	0.0314 (0.0188)	0.82	0.92
Small (1-2ha)	0.1958* (0.0804)	0.3543** (0.0514)	0.1581 (0.0792)	0.0303 (0.0185)	0.0619 (0.0460)	0.80	0.94
Medium (2-4ha)	0.2668* (0.1040)	0.3930** (0.0778)	0.0690 (0.0792)	0.0806 (0.0185)	0.0203 (0.0289)	0.82	0.93

Figures in parentheses reflect the standard error.

* and ** denote statistically significant at 5% and 1% probability level

Table.4 MVP of included factors in production of okra in the study areas

Size of sample of farms	**MVP**				
Independent variables	**X_1**	**X_2**	**X_3**	**X_4**	**X_5**
Marginal (below-1)	2.930	16.025	1.470	0.938	4.313
Small (1-2 ha)	3.608	14.141	2.663	0.472	10.976
Medium (2-4 ha)	4.656	13.007	1.000	0.948	3.062

The statistically significant variables were manures & fertilizers and seed for each size group of farms. In all case of farms manures and fertilizers were statistically significant at 5% probability level and seed was statistically significant at 1% probability level. And other variables were found non-significant on all size group of farms. Same results were observed by Godambe *et al*. (2015).

Returns to scale in all case of marginal, small and medium farms were found o.82, 0.80 and 0.82, respectively which was less than one. It is therefore, interpreted that cultivation of okra crop is characterized by decreasing return to scale on each size group of farms. It is, therefore, inferred that increasing all the factors by 1 per cent simultaneously results in increase of the returns by less than 1 per cent on each crop situations.

In case of marginal, small and medium farms co-efficient of multiple determination was found to be 0.92, 0.94 and 0.93 respectively, indicating that 92%, 94% and 93% variation in the yield is explained by independent factors such as manures & fertilizers (X_1), seed (X_2), human labour (X_3), irrigation charges (X_4) and plant protection (X_5).

Marginal value productivity

MVP of included factors in production of okra in the study area is given in table.4. It could be seen from the table that in case of marginal, small and medium farms marginal value productivity of each included factors except irrigation charges and in case of medium farms except human labour in the fitted function was more than one, indicating further scope of investment on these factors to realize returns, more than the costs.

In case of medium farms, MVP value of human labour factor was found 1, reflects optimum allocation of this factor. In case of marginal, small and medium farms only MVP of irrigation charges was less than unity indicating excessive use of inputs resulting in additional returns less than the additional cost.

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