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Resource Productivity and Allocative Efficiency of Bengalgram in Prakasam District of Andhra Pradesh

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ABSTRACT

Three stage stratified random sampling procedure was adopted for selection of primary sampling units. The primary data was collected from 120 farmers from 3 mandals,and 6 villages of the district during 2007-08. The Cobb-Douglas production function model was chosen to estimate the resource productivity and returns to scale Diminishing return to scale prevailed in the study area, MVP to OC ratio was less than unity for machine labour, manures and fertilizers, and plant protection chemicals indicating excessive use indicating a tremendous scope for reorganization of resources for obtaining maximum profits.

Key words : Allocative efficiency, Bengalgarm, Productivity.

Bengalgram is the highest consumed pulse crop of India. It is widely appreciated as healthy food. It is a protein rich supplement to cereal based diets, especially to the poor in developing countries, where people are vegetarians or cannot afford animal protein. India is the largest chickpea producing country with a share of 64 per cent in world production. Bengalgram is a cool season crop, it requires cooler and longer winter season and more suited to northern India. However, a major shift took place in gram area from northern India to central and southern India. Earlier Andhra Pradesh was not considered suitable for bengalgram cultivation because of mild and short winter season. However, a yellow revolution has taken place in pulses *i.e.,* availability of short duration varieties and suitable for warmer short season environment production technology. In southern region of India, Maharashtra, Andhra Pradesh, Karnataka are the major bengalgram producing states. Andhra Pradesh has secured the highest chickpea yield (1065 kg ha^{-1}) in the country and it is almost double than the national average (569 kg ha^{-1}) in the year 2007-08. Kurnool, Prakasam and Anantapur are the major bengalgram producing districts in Andhra Pradesh. Prakasam district occupies second place in bengalgram cultivation in the state both in terms of area (104500 hectares) and production (203580 tonnes) in the year 2007-08. In the district the crop was grown under un-irrigated conditions by utilizing the residual moisture. The present study was carried out to study the resource use efficiency of bengalgram in Prakasam district of Andhra Pradesh.

MATERIAL AND METHODS

Prakasam district was purposively selected for the study, as Bengalgram occupies a pride of place in area and production of the state. All the bengalgram growing mandals of Prakasam district were arranged in a descending order based on area under bengalgram cultivation and top three mandals *viz.*, Naguluppalapadu, Parchur, Inkollu were selected similarly all the villages cultivating bengalgram were arranged in a descending order and top two villages from each mandal were selected The bengalgram growers of the selected villages were listed along with their operational holdings in descending order. Then they were stratified into two groups *i.e.,* less than 2 ha (Group I farms) 2 and above 2 ha (Group II farms), and 60 farmers from Group I and 60 from Group II were selected at randomly to make the total sample 120. The present study related to the agricultural year 2007-08. To estimate resource productivity, returns to scale and resource use efficiency, Cobb-Douglas production function was adopted for its flexibility and suitability to the heterogeneous data and to know the nature of returns to scale. The usual form of this function was….

$Y = a\, x_1^{b1} x_2^{b2} \ldots\ldots\ldots\ldots\ldots x_5^{b5}.u$

The function in the double logarithmic form would be

$\text{Log } Y = \log a + b_1 \log x_1 + b_2 \log x_2 \ldots . b_5 \log x_5 + \log u$

Where

Y = Gross returns in rupees, X_1 = Human labour expenses in rupees, X_2 = Machine labour expenses in rupees, X_3 = Seed expenses in rupees, X_4 = Manures and fertilizer expenses in rupees, and X_5 = Plant protection expenses in rupees

RESULTS AND DISCUSSION

Resource productivity and allocative efficiency of bengalgram of different size groups were illustrated below.

Group I farms:

It can be observed from Table 1 that the coefficient of multiple determination (R^2) was 0.69 indicating that 69 per cent variation in yield was explained by the selected input variables. The R^2 value showed that goodness of fit of the Cobb-Douglas production function.

The coefficient of human labour (x_1), machine labour (x_2) and manures and fertilizers(x_4) were positive and non significant. The coefficient of seed (x_3) was positive and significant at five per cent use of seed level. It can be inferred that for every increase in one per cent the gross value of output would increase by 0.207 per cent. The elasticity coefficient for the plant protection chemicals (x_5) was positive and significant at one per cent level. It indicates that for every increase in one per cent, the gross value of output would increase by 0.11 per cent.

Group II farms:

The Table 1 showed that the coefficient of multiple determination (R^2) was 0.819, which indicated 81 per cent variation in yield and was explained by the selected input variables. The coefficient of human labour (x_1) was positive and non significant, indicating that this input did not significantly contribute to increase in the value of output. The coefficient of machine labour (x_2) was found negative and significant. This indicates that for every increase in one per cent increase of machine labour, the gross returns of output decrease by 0.191 per cent. The coefficient of seed (x_3) was found to be positive and significant at one per cent level. This implies that for every increase in one per cent of use of seed, the gross returns would increase by 0.614 per cent. The coefficient of manures and fertilizers (x_4) was found to be positive and significant at five per cent level indicating for every increase in one per cent of this input increases the gross returns by 0.451 per cent. The coefficient of plant protection chemicals (x_5) was negative and significant at five per cent level indicating that for every increase in one per cent of input the gross returns decrease by 0.144 per cent.

Pooled farms:

It can be noticed from Table 1 that the coefficient of multiple determination (R^2) was 0.751 indicating that 75 per cent variation in yield was explained by the selected input variables. The coefficient of human labour (x_1) and plant protection chemicals (x_5) were positive and non significant and indicating that these variables were not significantly contribute to increase the value of output. The coefficient of machine labour (x_2) was negative and significant at five per cent level indicate that for every increase in one per cent of this input, the gross returns decreases by 0.159 per cent. The coefficient of seed (x_3) was positive and significant at five per cent level implies that for every increase in one per cent of this input the gross returns increase by 0.352 per cent. The coefficient of manures and fertilizers (x_4) was positive and significant at one per cent level indicating that for every increase in one per cent of this input the gross returns increases by 0.387 per cent These results are in Collaberation with the results of Barman *et al.,* (2002), Pawar N D 2006 and Srivastava *et al.,* (2007).

Resource use efficiency:

The ratio of the marginal value product to marginal factor cost of the individual resources was used to judge the resource use efficiency. The computed marginal value product was compared with the marginal factor cost or opportunity cost of the resources to draw the inferences. A resource is said to be optimally allocated when its MVP = MFC.

The marginal value product were calculated at the geometric mean levels of the variables using the formula.

$$\text{MVP of a resource } x_{i = bi} \cdot \frac{\overline{Y}}{\overline{Xi}}$$

$\overline{Y}$ = Geometric mean of the gross return

$\overline{Xi}$ = Geometric mean of the i th resource

$_{bi}$ = Elasticity of production of the i th resource.

The marginal factor cost was taken as unity since the X and Y variables were defined in monetary items.

The marginal value products (MVP) opportunity costs (OC) and their ratios are presented in the Table 2

Table 1. Production elasticities of inputs, return to scale and coefficient of multiple determination of different size groups of bengalgram.

S.No.	Variables	Regression coefficients		
		Group I	Group II	Pooled
	Y			
1.	x_1	0.288	0.075	0.079
		(0.546)	(0.092)	(0.113)
2.	x_2	0.175	-0.191**	-0.159*
		(0.144)	(0.058)	(0.063)
3.	x_3	0.207*	0.614**	0.352*
		(0.091)	(0.095)	(0.161)
4.	x_4	0.052	0.451*	0.387**
		(0.044)	(0.176)	(0.097)
5.	x_5	0.110**	-0.114*	0.119
		(0.036)	(0.053)	(0.086)
	Intercept (a)	2.491	2.332	2.803
	Returns to scale (Σb_i)	0.832	0.835	0.778
	Coefficient of multiple determination (R^2)	0.69	0.81	0.75
	No. of observations	60	60	120

Figures in parenthesis indicates standard error of variables

** Significant at 1% level

* Significant at 5% level

Table 2. Marginal value product to opportunity cost of different size groups of bengalgram.

S.No.	Particulars	GROUP I				GROUP II				GROUP III			
		MVP	OC	MVP/ OC	Resource use efficiency	MVP	OC	MVP/ OC	Resource use efficiency	MVP	OC	MVP/ OC	Resource use efficiency
1.	Human labour	1.46	1.00	1.46	Under utilization	1.53	1.00	1.53	Under utilization	3.28	1.00	3.28	Under utilization
2.	Machine labour	0.98	1.00	0.98	Excessive utilization	-1.71	1.00	-1.71	Excessive utilization	-1.34	1.00	-1.34	Excess utilization
3.	Seed	1.70	1.00	1.70	Under utilization	2.79	1.00	2.79	Under utilization	2.73	1.00	2.73	Under utilization
4.	Manures and fertilizers	1.23	1.00	1.23	Under utilization	0.68	1.00	0.68	Excessive utilization	0.78	1.00	0.78	Excess utilization
5.	Plant protection chemicals	0.68	1.00	0.68	Excessive utilization	-1.72	1.00	-1.72	Excessive utilization	0.63	1.00	0.63	Excess utilization

It is observed from the table 2 that the group I farms the ratio of marginal value product to opportunity cost was found to be higher than unity for seed and human labour indicating that there would be every scope of increase these inputs for push up the gross returns. Where as in group II seed and human labour more than unity indicating that increase in the use of these inputs with secure higher returns and profits. In pooled farms seeds and human labour more than unity indicating, scope to increase the use of these inputs to get the higher returns and profits. These results are in collaberation with the results of Raghuwanshi *et al.,* (1998) .

The present study concluded that the diminishing returns to scale in bengalgram cultivation. In bengalgram the use of seed and application of fertilizers are to be increased for enhancing higher production and profits. MVP to OC ratio for machine labour, manures and fertilizers and plant protection chemical inputs were less than unity which indicates the excess utilization of recourses indicating tremendous scope for reorganization of resources for obtaining maximum profits.

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