Resource use productivity and efficiency

1Shedge Renuka Vilas, 2Jagtap Savita A., 3Perne Sujata M.
1Assistant Professor, 2Assistant Professor, 3Assistant Professor
1College of agriculture sonai

Abstract - **Indian is one of the important brinjal producing country in the world having second rank after China in brinjal production. Brinjal is the fruit vegetable having multipurpose use. It is mainly used for eating purpose as vegetable. Medicinal properties and nutritive value are also highly being observed in brinjal. So there is a need to increase its production and productivity also. And it could get possible through efficient utilization of required resources only. For that purpose this study was undertaken. Materials and methods: The related study was conducted in six villages of Ahmednagar district of Maharashtra to study the resource use productivity and efficiency of brinjal cultivation. Present study was carried out on the basis of primary data of 90 brinjal growers for the year 2016-17. Total 15 growers consisting of 5 from each size group viz., small, medium and large from each selected village were selected randomly. Results: through Cobb-Douglus analysis among all nine resources seven resources wew found significant and Marginal value product to marginal cost ratio of the same seven resources was greter than one. Conclusion: The resources viz., human labour, bullock labour, machine labour, manures, nitrogen, potassium fertilizers and irrigation were seen efficiently utilized while it was also observed that there was a need to improve efficiency of utilization of plant protection measures**

keywords - **resources, productivity, efficiency, significant, maximized output**

INTRODUCTION

The study of resource use productivity and efficiency helps to judge the ability of resources to produce output and suitability of the method or the manner in which considered resources have been utilized. This type of study shows the direction to improve the production technique and to earn maximum possible output with available resources by promoting it's optimum utilization.

The production and consumption of vegetables has expanded dramatically in recent years, with the global growth in the production of more than 50% in the last decade. The rate of increasing is much higher than for other plant commodities. Vegetables constitute important part of varied and healthy diet and provides significant amount of vitamin, antioxidants and other substances that prevent diseases and contribute to an improvement in the quality of life. As a consequence, it is expected that in the coming years, vegetable crop production will continue its expansion. Brinjal is also have nutritive value and medicinal properties. This fruit (unripe) is primarily consumed as cooked vegetable in various ways and dried shoots are used as fuel in rural areas. It is low in calories and fats, contains mostly water, some protein, fibre and carbohydrates. It is a good source of minerals and vitamins and is rich in total water soluble sugars, free reducing sugars, amide proteins among other nutrients. (http//en.m.wikipedia.org).

India ranks second in the world in case of brinjal production after China. India's share in world's brinjal production was about 27 per cent and area, production and productivity were 6.690 lakh ha, 124.010 lakh tones and 18.5 tonnes per ha respectively during year 2016-17. (Horticultural Statistics at a Glance, 2017) Ahmednagar is one of the important district producing brinjal crop. Rahuri and Sangmner are leading tehsils in brinjal production in Ahmednagar district. Hence these tehsils were purposively selected for the study. The present study was carried out to study resource use productivity and resource use efficiency of brinjal.

The study was done on the basis of primary data collected. For collection of required data the random sampling method was utilized. The district, tehsils and villages were selected on the basis of having maximum area under brinjal crop. Three villages from each selected tehsil means a total six were selected. From each selected village 15 Brinjal growers were selected randomly for an interview. Required data was collected through personal interviews of a total 90 brinjal growers by using specially prepared interview schedules.

MATERIALS AND METHODS

***Functional Analysis*:** with the help of following statistical tools analysis was done.

Resource use productivity: For estimation of resource use productivity Cobb-Douglas production function was found suitable. The functional analysis of data was carried out by using the following Cobb-Douglas type of production function,

$$Y = aX_1^{b1}X_2^{b2}X_3^{b3}X_4^{b4}\ldots\ldots X_9^{b9}e^{u}$$

When expressed in logarithmic terms this function transfer into linear function of the following type,

$$\log Y = \log a + b_1 \log X_1 + b_2 \log X_2 + \ldots\ldots\ldots + b_9 \log X_9 + u \log e$$

Where,

Y = Output of main produce (q/ha)

a = Intercept

X_1 = Human labour (man days/ha)
X_2 = Bullock labour (pair days/ha)
X_3 = Machine power (hours/ha)
X_4 = Manures (q/ha)
X_5 = Nitrogen (kg/ha)
X_6 = Phosphorus (kg/ha)
X_7 = Potash (kg/ha)
X_8 = Plant protection charges (₹/ha)
X_9 = Irrigation charges (₹/ha)
bi's = Elasticities of production of respective factors
e^u = Error term

Resource Use Efficiency: The resource use efficiency was obtained by computing the ratio of marginal value products of the resources to its marginal cost. The marginal value product (MVP) of factor taken at their prevailing market prices of opportunity cost indicates the efficiency of resource use i.e. MVPXi / PXi. MVPs that are higher than the opportunity or market cost indicate the scope of raising output profitability through the increased use of resources concerned. Whereas those less than the opportunity or market costs, depict non profitable nature of resources use. Any factor is considered to be most efficiently used, if MVP of resources equals the marginal cost (MC = MR).

Estimation of marginal value product: The marginal value products (MVPs) of the individual resources were estimated and compares with the marginal cost (MC). The MVP of individual resources were estimated by using the following formula,

Marginal value product of Xi = bi (Y/X) Py

Where,

bi = Elasticity of production of i^{th} input
Y = Geometric mean of output
Xi = Geometric mean of i^{th} input
Py = Per unit price of output

RESULTS AND DISCUSSION

Resource use productivity- Resource use productivity explains the ability of resource to produce output. While taking decision about which resources should use and what should be their quantity, it is very important to estimate the productivity of resources. To get maximum output per unit use of resource one should use more productive resources.

To examine the resource use productivity, Cobb-Douglas type of production function was found suitable to the data and the results of analysis are presented in Table 1. It indicates the elasticities of production, standard errors of the regression coefficients, their significance and co-efficient of multiple determination (R^2).

It can be revealed from the above table that at the value of co-efficient of multiple determinations was estimated 86 per cent. This value indicated that the nine resource variables together jointly explained 86 per cent variation in the output of brinjal.

The regression co-efficient of X_1, X_4, X_7 and X_9 (human labour, manures, potassium and irrigation charges) were positive as well as significant at 1 per cent level of significance. The regression coefficient of X_2 and X_5 (bullock labour and nitrogen) were positive and significant at 5 per cent level where as machine labour was significant at 10 per cent level of significance. This indicates that production can be increased through the increase in the level of these resources use.

Table 1. Results of Cobb-Douglus production function

Sr. No.	Particular	Overall
1	Constant (a)	1.0258 (-0.1467)
2	Human Labour (X_1)	0.3337*** (0.0583)-
3	Bullock Labour (X_2)	0.0424** (0.0161)
4	Machine Labour (X_3)	0.0495* (0.0270)
5	Manures (X_4)	0.1617*** (0.0508)
6	Nitrogen (X_5)	0.1506** (0.0580)
7	Phosphorus (X_6)	0.0025^{NS} (0.0221)
8	Potassium (X_7)	0.1209*** (0.0285)
9	Plant Protection (X_8)	0.0207^{NS} (0.0254)
10	Irrigation Charges (X_9)	0.0105***

		(0.0035)
11	R^2	0.86
12	D.F.	80

(Figures in parentheses are standard errors of respective regression coefficients)
*, ** and *** indicates significance level at 10, 5 and 1 percent level, respectively

At the overall level, it is indicated that, one per cent increase in the use of human labour, bullock labour, machine labour, manures, nitrogen, potassium and irrigation would increase the yield by 0.33, 0.04, 0.04, 0.16, 0.15, 0.12 and 0.01 per cent, respectively. The values of coefficients of multiple determinations were estimated 0.77, 0.82 and 0.91 for all size group of holdings viz small, medium and large respectively.

Resource Use Efficiency- An efficiency of resource use for brinjal production on the sample farms was analyzed with the help of MVP/MC ratio and the results are presented in the Table 2.

It can be seen from the table 2. that at an overall level the MVP/MC ratio for the variables Phosphorus fertilizer (X_6) and plant protection (X_8) was less than one. It shows that optimum resource use level was not achieved while in case of variables viz., human labour (X_1), bullock labour (X_2), machine power (X_3), manures (X_4), nitrogen fertilizers (X_5), potassium fertilizers (X_7) and irrigation charges (X_9) were greater than unity. This implied that these resource variables were utilized with higher efficiency. The foregoing analysis revealed that profitability of brinjal production could be maximized by increasing the use of human labour, bullock labour, machine labour, manures, nitrogen, potassium fertilizers and irrigation.

Table 2- Estimation of resource use efficiency

Sr.No.	Particulars	Units	MVP	MC	MVP/MC
1	Human labour (X_1)	Days	422.12	213.9	1.97
2	Bullock labour (X_2)	pair days	9904.79	579.59	17.09
3	Machine power (X_3)	hrs.	317.34	180	1.76
4	Manures (X_4)	Kg.	1383.56	537.25	2.58
5	N (X_5)	Kg.	407.31	21.17	19.24
6	P (X_6)	Kg.	14.24	25.71	0.55
7	K (X_7)	Kg.	574.21	15.42	37.24
8	Plant protection (X_8)		0.7	1	0.7
9	Irrigation (X_9)		1.42	1	1.42

CONCLUSION

Brinjal is the important profit earning crop in study area. The present investigation was intended to study the resource use productivity of brinjal and also its resource use efficiency in Ahmednagar district. Following conclusions are drawn from the study.

Among all utilized resources for brinjal crop human labour, bullock labour, machine labour, manures, nitrogen, potassium fertilizers and irrigation were proved as significant. Hence it can be said that profitability of brinjal production could be maximized by increasing the use of these resources.

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