Bulletin of Environment, Pharmacology and Life Sciences
Bull. Env. Pharmacol. Life Sci., Vol 7 [8] July 2018 : 83-85

Online ISSN 2277-1808
Journal's URL:http://www.bepls.com
CODEN: BEPLAD
Global Impact Factor 0.876
Universal Impact Factor 0.9804
NAAS Rating 4.95

ORIGINAL ARTICLE **OPEN ACCESS**

Study of Resource Productivity and Resource Use Efficiency Of chickpea In Buldhana district of Maharashtra State

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ABSTRACT
The study examined resource use efficiency of Chickpea in Buldhana district of Maharashtra state.It was observed that, the major resources viz., organic manure, potash, plant protection, machine labour and bullock labour used in Chickpea cultivation showed a positive relationship in case of Chickpea Production. Human labour and Nitrogen showed a negative relationship. The result revealed that, coefficient of multiple determinations (R^2) was 0.93 which indicated 93.00 per cent effect of all independent variables together in chickpea production. F-value was 88.99 which were highly significant. Return to scale was 0.595 which indicated increasing return to scale. Among the individual independent variables, partial regression coefficient of area under chickpea was 0.057 which was positive. Partial regression coefficient of manure was positive and significant at 1 per cent level it was 0.154 for manures.
Keywords*: MVP, MVP to price ratio*

Received 11.04.2018 Revised 23.06.2018 Accepted 04.07.2018

INTRODUCTION

Chickpea (*Cicer arietinum L*) is one of the major pulse crops grown in India. Chickpea has the richest, cheapest and easiest source of best quality proteins and fats. It has a vast multiplicity of uses as food and industrial products. There is a need to cultivate the crop in the irrigated area as against only in the marginal land. The domestic demand and consumption, however, are much higher than production, mainly because, chickpea is a major source of protein for a large section of the vegetarian population in the country. Chickpea account for around 19.00 per cent of the gross cropped area and less than 8.00 per cent of the total food grain production of the country. Maharashtra Accounts for 17.74 Lakh hectare of area, 15.07 Lakh tonnes of Chickpea Production and 850 kg/ha yield of Chickpea Crop In 2016-17. In Maharashtra, Amravati, Akola, Buldhana, Latur, Ahmeadnagar, Sangli, Dhule, Jalgaon and Solapur are major Chickpea growing Districts in Maharashtra[1-3]. In Buldhana district, area under chickpea was 70,100 hectares with production of 78,400 tonnes and productivity of 1118 kg/ha .during the year 2016-17. To study resource productivity and resource use efficiency of Chickpea.

MATERIAL AND METHODS

The multistage sampling design was used for selection of district, tehsils, villages and chickpea growers. In all 90 chickpea growers were selected to collect the data on production cost, return, marketing channel, marketing cost, etc. The data were collected for the year 2016-17. At first stage the Buldhana district was purposefully selected for the present study.In second stage, two tehsils Mehkar and Lonar from Buldhana district were selected on the basis of maximum area under the chickpea production.In third stage, three villages viz. Aaregaon, Dadulgvhan and Chincholi Bore were selected from Mehkartehsil; similarly, Anjanikd, Dhanora and Vadgaon Tejan were selected from Lonar tehsil having the highest area under Chickpea production. In all 6 villages were considered for the study. In the fourth stage 15 chickpea growers will be randomly selected from each selected villages. Thus from 6 villages, 90 growers were selected.

Functional analysis

The resource productivity and resource use efficiency was achieved by application of functional analysis. In the functional analysis linear and Cobb-Douglas production functions were used for data. On the basis of goodness of fit (R^2) Cobb-Douglas production function (non-linear) was used to determine the resource productivity in wheat production. The data were therefore, subjected to functional analysis by using the following form of equation [4-5].

$$Y = aX_1^{b1} . X_2^{b2} . X_3^{b3} \ldots\ldots\ldots X_n^{bn} . e^{u}$$

The equation fitted was of the following formula.

$$\hat{Y} = aX_1^{b1}.X_2^{b2}.X_3^{b3}.X_4^{b4}.X_5^{b5}.X_6^{b6}.X_7^{b7}.X_8^{b8}$$

Where,

$\hat{Y}$ = Estimated yield of wheat in quintals per farm,
a = Intercept of production function
bi = Partial regression coefficients of the respective resource variable (I = 1,2,3....8)
X1 = Area of the crop in hectares
X2 = Machine labour in hours per farm
X3 = Nitrogen in kg per farm
X4 = Potash in kg per farm
X5 = Seed in kg per farm
X6 = Plant protection in Rs per farm
X7 = Human labour in man days per farm

The marginal value of productivity of resource indicates the addition of gross value of farm production for a unit increase in the 'i'th resources with all resources fixed at their geometric mean levels. The MVP of various inputs is worked out by the following formula.

$$MVP = b_i P_y \frac{\overline{Y}}{\overline{X}}$$

Where,

B = Regression coefficient of particular independent variable
X = Geometric mean of particular independent variable
Y = Geometric mean of dependent variable
P_y = Price of dependent variable
$\sum$ bi = Returns to scale

RESULTS AND DISCUSSION

Resource Productivity and Resource Use Efficiency

The result revealed that, coefficient of multiple determinations (R^2) was 0.93 which indicated 93.00 per cent effect of all independent variables together in chickpea production. F-value was 88.99 which were highly significant. Return to scale was 0.595 which indicated increasing return to scale. Among the individual independent variables, partial regression coefficient of area under chickpea was 0.057 which was positive. Partial regression coefficient of manure was positive and significant at 1 per cent level it was 0.154 for manures.

It was observed that marginal product with respect to Phosphorous was 3.89 which means that in addition of one kg of Phosphorous to geometric mean which is gives production of chickpea by 3.89 quintals. Marginal product of Plant Protection was 1.14 it indicated that when there was addition use of one lit of plant protection which caused to gives addition of product of chickpea by 1.14 quintals. Marginal product of area under chickpea was 0.84 which means that when there was addition of one ha. of land it give additional product by 0.84 quintals. Marginal product of seed was 0.032 which means that when there was addition of one kg of seed it give additional product by 0.032 quintals.

Results revealed that, marginal value product (MVP) of area under chickpea was found to be Rs. 4208.37 and marginal input cost of land under chickpea was Rs. 12860 hence MVP to marginal input cost ratio was 0.33. MVP to marginal input cost ratio of Plant Protection was found to be 6.351 which was highest followed by Manure (2.55), seed (1.62), machine (1.30) , Phosphorus (0.506), bullock (0.190). hired labour (-0.122), Nitrogen (-0.185) and family labour (-0.740).It was cleared that, higher the MVP marginal input cost ratio there was greater chance to increase these resources. So the results inferred that there was greater chance to increase Phosphorus, manure, plant protection, machine and bullock labour utilization.

Table 1. Estimates of Cobb-Douglas production function in chickpea production

	Independent Variable	Regression coefficient (b_i)	Standard error bi (SE)	't' value	Geometric mean of input (x_i)	Marginal product (q)	Marginal value product (Rs)	Marginal input cost (Rs)	MVP to marginal input ratio
1	Area under chickpea (ha/farm)	**0.057**	**0.069**	**0.825**	**0.77**	**0.84**	**4208.37**	**12860.00**	**0.33**
2	Hired labour (man day / farm))	**-0.011**	**-0.103**	**-0.110**	**-25.48**	**-4.90**	**-24.54**	**-200**	**-0.122**
3	Family labour (day/farm)	**-0.053**	**-0.061**	**-0.803**	**-20.34**	**-0.029**	**-148.13**	**-200**	**-0.740**
4	Bullock (day/farm)	**0.007**	**0.003**	**2.492***	**2.09**	**0.038**	**190.40**	**1000**	**0.190**
5	Machine labour (per hr)	**0.076**	**0.027**	**2.808****	**5.50**	**0.15**	**785.56**	**600**	**1.30**
6	Seed rate (kg/farm)	**0.167**	**0.062**	**2.694****	**58.26**	**0.032**	**162.95**	**100**	**1.62**
7	Manures (q/farm)	**0.154**	**0.040**	**3.774****	**17.11**	**0.102**	**511.68**	**200**	**2.55**
8	Nitrogen (kg / farm)	**-0.0008**	**-0.083**	**-0.009**	**-18.72**	**-4.85**	**-2.42**	**-13.04**	**-0.185**
9	Phosphorus (kg / farm)	**0.016**	**0.046**	**0.343**	**46.68**	**3.89**	**19.48**	**38.43**	**0.506**
10	Plant protection (Rs/farm)	**0.183**	**0.039**	**4.608****	**1.82**	**1.14**	**5716.2**	**900**	**6.351**

Note: Geometric mean (Y) of chickpea production was 11.37q/ha per farm and price was Rs. 5000/q.

Intercept (log a) ---------- 1.015

F value ---------- 88.99

R^2 ---------- 0.93

Return to scale (Σb_i) ---------- 0.5952

*** Significant at 5 per cent level**

**** Significant at 1 per cent level**

CONCLUSION

The resource productivity and resource use efficiency of chickpea production. The coefficient of multiple determinations (R2) was 0.93. F-value was 88.99 which were highly significant. Return to scale was 0.595 which indicated increasing return to scale. MVP to marginal input ratios of these variables were large and away from unity. Thus, it was obvious that, the expenditure on area under chickpea, manures and Machine labour can be increased. These resources were found to be underutilization in chickpea production.

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CITATION OF THIS ARTICLE

Dalvi S. P.,Deshmukh K. V. , Pathade K.L.Study of Resource Productivity and Resource Use Efficiency Of chickpea In Buldhana district of Maharashtra State. Bull. Env. Pharmacol. Life Sci., Vol 7 [8] July 2018 : 83-85