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RESEARCH PAPER

Resource productivity and resource use efficiency in chickpea production on dryland farm

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ABSTRACT

Resource productivity and resource use efficiency of chickpea production have been computed using primary data collected from 48 dryland farm spread over two tehsils in Nanded district of Maharashtra. The study revealed that area under chickpea, human labour, bullock labour, machine labour, seed, nitrogen, phosphorus and potash and plant protection as resources. Cobb Douglas production function was fitted to the data. The results revealed that partial regression co-efficient of human labour was 0.455 followed by that area under chickpea was (0.173) positive at 1 per cent level and partial regression co-efficient of nitrogen and machine labour were positive but non-significant. Marginal product of area under chickpea was 2.286 quintals followed by that of bullock labour (0.187 q), plant protection (0.187q) and human labour (0.114q). MVP to price ratio with respect to potash was 9.69 followed by seed (6.87), human labour (2.60) and area under chickpea (1.91). Optimum use of area under chickpea was found to be 0.78 hectare and optimum use of human labour was 56.25 mandays.

KEY WORDS : Chickpea, Resource productivity, Resource use efficiency, Optimum resource

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Chickpea (*Cicer arietinum* L.) is one of the major pulses cultivated and consumed in India. It is a major and cheap source of protein. In the country, chickpea accounts for about 45 per cent of total pulses produced. Major chickpea producers include India, Pakistan, Mexico, Turkey, Canada and Australia. It makes up more than 20 per cent of world pulse production.Chickpea is most important pulse crop of India in terms of both area and production. India is the largest producer of chickpea in the world sharing 65.25 and 65.49 per cent of the total area (11.97 m ha) and production (10.89 mt). In India, chickpea cultivation was done on 5.91 million hectares with the production of 4.24 million tonnes of the grain yield during 2002-2003.

During 2010-11, chickpea production reached to record 8.25 million tonnes. Estimated area, production and productivity during 2011-12 is 9.01 m ha, 7.58 m tonnes and 841 kg/ha, respectively. Madhya Pradesh, Uttar Pradesh, Rajasthan, Maharashtra, Gujarat, Andhra Pradesh and Karnataka are the major chickpea

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producing states sharing over 95 per cent area.

METHODOLOGY

Sampling design :

Multistage sampling design was adopted for selection of district, tehsils, villagesand dryland farms. In the first stage, the Nanded district was purposively selected because of mostly existence of dryland farmings. In the second stage, Himayatnagar and Naigaon tehsils were selected on the basis of higher area under drylandfarms. In the third stage, eight villages were selected from the each of tehsils on the basis of higher area under dryland farms. From Himayatnagar tehsil villages were selected namely Borgadi, Dhanora, Jawalgaon, Karla, Pawan, Sarsum, Siranjani and Sonari while from Naigaon tehsil villages were selected namely Aluwadgaon, Balegaon, Benderi, Degaon, Lalwandi, Salegaon, Sangvi and Suilegaon. In the fourth stage, from each village, the list of dryland farmers along with their holding sizes was obtained. Three dryland farmers were randomly selected from each of the villages. In this way, from sixteen villages, 48 farmers were selected for the present study. The data were related to use of resources namely area under chickpea, human labour, bullock labour, machine labour, seed, fertilizers and plant protection. Cobb-Douglas production function was fitted to the data to estimate resource use efficiency with respect to each of the explanatory variables. The fitted equation was as follows.

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

In this functional form 'Y' is dependent variable, 'X_i' are independent resource variables, 'a' is the constant representing intercept of the production function and 'bi' are the regression co-efficients of the respective resource variables. The regression co-efficients obtained from this function directly represent the elasticities of production, which remain constant throughout the relevant ranges of inputs. The sum of co-efficients 'bi' indicates the nature to returns of scale. This function can easily be transformed into a linear form by making logarithmic transformation. After logarithmic transformation of this function is,

$$\text{Log } Y = \log_a + b_1 \log X_1 + b_2 \log X_2 + \ldots\ldots b_n \log X_n + u \log e$$

This results in non significance of regression co-efficients sometimes it so happens that more of the regression co-efficients are significant but the value of R^2 is very high. The equation fitted was of the following formula :

$$\hat{Y} = aX_1^{bi}.X_2^{b2}.X_3^{b3}.X_4^{b4}.X_5^{b5}.X_6^{b6}.X_7^{b7}.X_8^{b8}.X_9^{b9}$$

where,

$\hat{Y}$ = Estimated chickpea production in quintals per farm

a =Intercept of production function, bi = Partial regression co-efficient of the respective resource variable (i=1, 2,…,9), X_1 =area under chickpea in hectares per farm, X_2 = human labour in man days per farm, X_3 = bullock labour in pair days per farm, X_4 = machine labour in hour per farm, X_5 = seed in kg per farm, X_6=nitrogen in kg per farm, X_7= phosphorus in kg per farm, X_8 = potash in kg per farm and X_9= plant protection in lit. per farm.

Marginal value product (MVP) :

It refers to the product of MP and Py where, MP is marginal productivity and P_y is the price of produce per quintal. The MVP with respect to input factor is worked out by the following formula :

$$\text{MVP } Z \text{ bi} \frac{\bar{Y}}{\bar{X}} \text{Py}$$

where,

bi =Partial regression co-efficient of particular independent variable

$\bar{x}$ =Geometric mean of particular independent variable

$\bar{Y}$ = Geometric mean of dependent variable

P_y = Price of dependent variable.

ANALYSIS AND DISCUSSION

The findings with respect to elasticity of production, marginal production resource use efficiency and optimum resource use were obtained and are presented as follows.

Elasticity of chickpea production :

Regression co-efficients with respect to various explanatory variables were calculated and are presented in Table 1. It was observed from the table that partial regression co-efficient of area under chickpea was 0.173 which was positive and highly significant at one per cent level. It inferred that when one per cent increased in use of area under chickpea over its geometric mean, it would lead to increase

Table 1 : Estimates of Cobb-Douglas production function in chickpea production on dryland farm

Sr. No.	Independent variable	Partial regression co-efficient (bi)	Standard error (SE)	't' value	Geometric mean (Xi)	Marginal product (q)	Marginal value product (Rs.)	Price of input (Rs.)	MVP to price ratio	Optimum resource use (xi)
1.	Area under chickpea (ha/farm)	0.173	0.068	2.544**	0.41	2.286	8343.90	4357.20	1.91	0.78
2.	Human labour (manday/farm)	0.455	0.137	3.321**	21.45	0.114	416.10	160.00	2.60	56.25
3.	Bullock labour (pairday/farm)	0.153	0.131	1.167	4.43	0.187	682.55	390.00	1.75	5.44
4.	Machine labour(hours/farm)	-0.041	0.132	-0.310	2.67	-0.083	-302.95	470.00	-0.64	---
5.	Seed (kg/farm)	0.205	0.136	1.507	11.29	0.098	357.70	52.00	6.87	78.00
6.	Nitrogen (kg/farm)	-0.310	0.134	-2.313*	18.11	-0.092	-335.80	13.47	-24.92	---
7.	Phosphorus (kg/farm)	0.101	0.119	0.849	26.42	0.020	73.00	41.75	1.74	47.85
8.	Potash (kg/farm)	0.045	0.129	0.348	3.36	0.072	262.80	27.33	9.69	32.57
9.	Plant protection (lit/farm)	0.034	0.145	0.234	1.10	0.167	611.47	380.00	1.60	1.77

Intercept (log a) --------- 0.127 ; F value ------------- 3.35** ; R^2 ------------------- 0.920 ; Return to scale (Σbi)------ 0.815

Note: Geometric mean of ($\bar{Y}$) chickpea production was 5.42 q per farm and price was Rs. 3650/q

* and ** indicate significance of values at P=0.05 and 0.01, respectively

production of wheat by 0.173 per cent. Partial regression co-efficient of human labour was also positive and significant. When use of human labour was increased by one per cent, it would lead to increase chickpea production by 0.455 per cent. Partial regression co-efficients of bullock labour, seed, nitrogen and potash were positive but non-significant. On the contrary, partial regression co-efficient of nitrogen was negative and significant. Co-efficient of multiple determination (R^2) was 0.815, it means that there was 81.50 per cent effect of all independent variables together on chickpea production. Return to scale was found to be 0.920 which indicated that production of chickpea was found in decrease returns to scale.

Marginal productivity of chickpea :

Resource productivity with respect to various explanatory variables is also presented the in Table 1. It was obvious that the marginal productivity with respect to area under chickpea was the highest as 2.286 quintals foll owed by that of bullock labour (0.18 7q), plant protection (0.167q), human labour (0.114q) and seed (0.098q). It inferred that if area under chickpea.

Production was increased by one hectare at its geometric mean level, it would lead to increase production of chickpea with 2.286 quintals. Similarly, per unit of bullock labour, plant protection, human labour and seed could be increased then it would cause to increase production of chickpea by 0.187q, 0.167q, 0.114q and 0.098q, respectively.

Resource use efficiency in chickpea production :

In regards to resource efficiency, it was also evident from the Table 1 that use of potash in chickpea production indicated MVP to price ratio as 9.69 followed by seed (6.87), human labour (2.60), area under chickpea (2.61), phosphorus (1.74) and plant protection (1.60) which were greater than unity. It implied that there was scope to increase these resources in chickpea production. On the contrary, in regard to nitrogen, MVP to price ratio was negative. Use of nitrogen in chickpea production was excess.

Optimum resource use in chickpea production :

In regards to optimum resource use, it was observed that optimum use of area under chickpea was 0.78 hectare over its geometric mean followed by that of seed

(78.00 kg), human labour (56.25 mandays), phosphorus (47.85kg) and potash (32.57 kg).

Conclusion :

The resource productivity and resource use efficiency of chickpea production on dryland farm has been estimated by Cobb-Douglas production function. Results revealed that area under chickpea and human labour showed positive significant influence on chickpea production. On the contrary, nitrogen showed negative effect on chickpea production. Hence, area under chickpea and human labour can be increased while use of nitrogen can be reduce in chickpea production on dryland farm.

REFERENCES

Asmatoddin, M J.N., Ghulghule, S.V., Jawale and Tawale, J.B. (2009). Resource productivity and resource use efficiency in pulses production on medium farm in Marathwada. *Internat. J. Agric. Sci.*, **5**(2): 359-362.

Asmatoddin, M.S.V. Jawale and Perke, D.S. (2009). Economic anaylsis of pulses production on medium farm in Marathwada.*Agric. Update*,**4** (3&4) : 262-265.

Bahadur, T., Parhasarthy, P.B. and Reddy, K.S. (1988). Resources use efficiency in dry farming. *Agric. Situ. India*, **63** (1): 29-31.

Bhendi, M.J. and Kalirajan, K. P. (2007). Technical efficiency of major food and cash crops in Karnataka (India). *Indian J. Agric. Econ.*, **62**(2) : 176-192.

Chamak, J.S., Singh, A.J. and Sidhu, D.S. (1978). Resource use efficiency in Punjab. *Agric. Situ. India*, **34** (4): 211-216.

Kennedy, G.P., Raghuram, S.P.,Naidu, M.R. and Shreenivasula, R. (1990). Economics analysis of major pulses in Gujrat districts of Andhra Pradesh. *Agric. Situ. India* **65** (2) : 173-182.

Negi, R.S., Singh, L.R. and Moorti, T.V. (1972). Resources allocation efficiency on small farms in Nainetal Tarai. *Indian J. Agric. Econ.*, **27**(4): 167.