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Resource Use Efficiency in Gram Production of Amravati Division

KEYWORDS: Resource use efficiency, Gram production

Ganeshkumar D. Rede	Dr. S. J. Kakde	Vanita Khobarkar
M.Sc. student, Department of Agricultural Economics and Statistics, Dr. PDKV, Akola (MS)	Associate Professor, Department of Agricultural Economics and Statistics, Dr. PDKV, Akola (MS)	Assistant Professor, Department of Agricultural Economics and Statistics, Dr. PDKV, Akola (MS)

ABSTRACT *This study was designed to measure resource use efficiency in gram production of Amravati division of Vidharbha region of Maharashtra state. In present investigation we use the double log type Cobb-Douglas type of production function. The sample of 75 Gram farmers were selected from which input-output data collected based on 2011-12 rabi cropping season. Functional analysis of gram crop revealed that Seed rate, Human Labour, Machine Labour, Bullock labour and Phosphorous Fertilizers, had the elasticity of 0.54, 0.059, 0.044, 0.055 and 0.14 respectively and was statistically significant. The value of MVP in respect of Seed rate (4.39) and phosphorus fertilizer (1.29) ,were more than unity level and the MVP value of human labour (0.43), Machine labour (0.37), Bullock labour (0.87) and Nitrogen fertilizer (-3.57) were found to be less than unity level.*

INTRODUCTION

Role of pulses in Indian agriculture needs hardly any emphasis. India is a premier pulse growing country. The pulses are an integral part of the cropping system of the farmers all over the country because these crops fit in well in the crop rotation and crop mixtures followed by them. In Maharashtra, during 2010-11 the area under chickpea was 13.95 lakh hectare whereas the production was 13.01 lakh tons. In Vidarbha during 2010-11 the area under chickpea was 3.65 lakh hectare and the production was 3.55 lakh tons. India grows a variety of pulse crop under a wide range of agro-climatic conditions and has a pride of being the world's largest producer of pulses. Major pulse crop grown in the country are chickpea, Pigeon pea. Urdbean, mug bean, lentil, field pea, lathyrus, moth bean and horse gram. Unique characteristics like high protein content (2-3 times more than cereals), nitrogen fixing ability, soil ameliorative properties and ability to thrive better under harsh conditions make pulses and integral component of sustainable agriculture particularly in dry land area. The most important pulse crop in the country is gram (gram), which accounts for (38 %) production followed by Pigeon pea (16 %), Mung bean (12%).

In Vidarbha Akola, Amravati, Yavatmal, Buldhana, Nagpur and Washim are the major districts which growing chickpea on large area The present investigation aims to examine resource use efficiency of various resources used in the production process of wheat. In view of above investigation entitled "Resource Use Efficiency in Gram Production of Amravati Division" was undertaken with following objective.

To estimate the Resource use efficiency in Gram production.

MATERIALS AND METHODS

The present study was carried out in Amravati division of Vidarbha region of Maharashtra state where Gram is the commonly grown as rabi season crop by the farmers. Amravati division comprises of five districts namely Akola, Amravati, Washim, Buldhana and Yavatmal. The data of 75 cultivators were collected and compiled from Agriculture Price Cell scheme of the Agricultural Economics and Statistics, Dr PDKV,Akola for the year 2011-12.

The selected farmers from the Amravati division are as bellow,

Table 1 district wise selected gram growers in Amravati division.

Sr.no.	District	No. of Gram growers
1	Buldhana	14
2	Akola	18
3	Amravati	16
4	Yavatmal	13
5	Washim	14
6	Total (Amravati division)	75

Resource Use Efficiency –

In present investigation we use the fallowing double log type Cobb-Douglas type of production function -

a) Cobb-Douglas Production Function:

In today's world problems, both economical and social, resource and the resource efficiency play a vital role. The investors have been concerned with increasing productivity of resources by introduction of new ones that lie higher technologies. By replacing the existing production function by new ones that lie higher in output, plane, it is hoped that, this investment leads to production of more output from the same quantity of inputs, or to the same outputs from few inputs (there by releasing resource for other economic activities).

The Cobb-Douglas type of Production Function was used and is usually defined as follows.

$$Y = a\ X_1^{b1}\ X_2^{b2}\ X_3^{b3}\ X_4^{b4}\ X_5^{b5}\ X_6^{b6} e^{u} \quad \ldots\ldots (1)$$

Where,

Y = Output of wheat crop including main crop and by products (qts./ha).

a = Constant term, the efficiency parameters.

X_1= Human labour, including family labour and hired human labour (days/ha).

X_2= Bullock labour including owned and hired bullock labour (days/ha).

X_3= Machine labour including owned and hired machine labour (hrs/ha)

X_4= Seeds including owned and purchased for sowing of crops in (kg/ha)

X_5= Nitrogen fertilizers applied in the farm in (kg/ha)

X_6= Phosphorous fertilizers applied in the farm (kg/ha)

u = is random variable satisfying necessary assumptions required for the principles of ordinary least squares.

The function given in eq.^{n} (1) can be expressed as,

log y = log a + b1 log x1 + b2 log x2….bn log xn + u ……. (2).

b) Marginal Value Productivity (MVP):
The estimated production function underlying crop-production enables us to evaluate the efficiency of prevalent factor proportions.

The MVP was computed by the multiplying the coefficients of the given resource with ratio of the geometric means of the output to the geometric mean of the given resource. For example, the MVP of X_i would be,

$$MVP(X_i) = b_i \frac{Y(G.M.)}{X_i(G.M.)} \quad \text{……. (3)}$$

Where,

G.M = Geometric Mean.

MVP= Marginal Value Productivity.

b_i= is the corresponding elasticity $X_{i.}$

Xi (G.M.) = is the geometric mean of i^{th} resources.

Y (G.M.) = is the computed value of Y at Geometric mean levels of resources.

By comparing the respective input prices with their marginal values, fanners can decide as to whether they should increase or decrease the level of use of that, particular input of products.

c) Returns to Scale:
The returns to scale can be easily estimated from this type of production function.

Thus,

Returns to Scale = $a_1+a_2+…. +a_n$ .... (4)

$$= \sum_i a_i = 1, 2, \dots \dots n$$

Therefore, the summation of the powers of all the input variables provided us directly with a ready estimate of the returns to scale as also the degree of homogeneity of the production function. The returns to scale are deceasing, constant or increasing, depending on whether a, is less than, equal to or greater than one.

RESULTS AND DISCUSSION
Without having the functional analysis and estimating the marginal value productivity (MVPs) the existing levels of inputs, one cannot come to the conclusion that whether the input is being overused or underused in production and also the contribution of different resources in the production of crop. For this purpose, as mention earlier, the Cobb-Douglas type of production function was fitted to the data and the estimates elasticity's of different inputs are obtained at the same are presented in Table 2

It can be observed from the above Table 2 that seed rate, human labour, machine labour, bullock labour and phosphorous fertilizers, had the elasticity of 0.54, 0.059, 0.044, 0.055, and 0.14 respectively and were statistically significant. This means that one per cent increase in investment on these resources would contribute that percentage increase in gram yield. The values of the elasticity's of these variables reveal further scope for utilization of these inputs.

The coefficient of nitrogen fertilizer (-0.31) was negative and statistically significant and indicated that an increase in nitrogen fertilizer will not significantly effect the gram yield.

The return to scale was less than unity (0.52) indicating decreasing returns to scale. The coefficient of determination (R^2) gives an idea about the proportion of the total variation in yield explained by the selected variables. For Gram crop the value of R^2 was 0.70 this has indicated that the selected variables contribute to the extent of 70 per cent of the total variation in gross returns.

Table 2: Coefficient of different input use in Gram Production

Sr. No.	Input	Coefficient
1	Constant	-3.81
2	Seed rate	0.54**
3	Human labour	0.05*
4	Machine labour	0.04*
5	Bullock labour	0.05*
6	Nitrogen Fertilizer	-0.31**
7	Phosphorous Fertilizer	0.14**
8	R^2	0.70**
9	Returns to Scale	0.52(sum of elasticity's)

**** Significant at 1 per cent level**
*** Significant at 5 per cent level**

Geometric mean level and Marginal Value Product (MVP):

The result of production function analysis in terms of Geometric mean level and Marginal Value Product are presented in table 3

Table 3: Geometric mean level and Marginal Value Product

Sr. No.	Inputs	Geometric mean level	MVP
1	Seed rate	1.93	4.39
2	Human labour	1.82	0.43
3	Machine labour	1.69	0.37
4	Bullock labour	0.90	0.87
5	Nitrogen Fertilizer	1.36	-3.57
6	Phosphorous Fertilizer	1.70	1.29

CONCLUSIONS
1. The MVPs of the seed rate and phosphorus fertilizer implies the profitable economic returns on investments on these resources.
2. The economic efficiency of selected Gram growers was 74 per cent .It reveals that there is a considerable scope to increase the productivity

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3. The average allocative efficiency of the selected Gram growers was 90 percent.
4. The study implied that the output of average farmers could be increased by adopting the allocation of resources fallowed by the best practiced farmers.

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