RESOURCE USE EFFICIENCY IN REDGRAM PRODUCTION

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Abstract

The objective of the present study was to examine the resource use efficiency in redgram production. The study covered three mandals and six villages. A sample of 90 farmers was selected at random from the six villages. The primary data for the year 2010-2011 were collected through a pretested schedule by survey method. The Cobb-Douglas type of production function was used to study the resource productivities. The results indicated that the regression co-efficients with respect to human labour ($X_{1}$) and cattle labour ($X_{2}$) were found to be positive and significant but the other variables viz., tractor power ($X_{3}$) and manures ($X_{4}$) were positively related but found non-significant.

Key words: Cobb-Douglas production, resource use efficiency, Redgram

Introduction

Redgram is an important oilseed crop in India and is regarded as the king of oilseeds. India stands first in the production of redgram with 40.6 per cent of the world area and 30 per cent of world production. India is rated as the third largest producer of redgram in the world with annual production of over 4-5 million tonnes. Gujarat, Andhra Pradesh, Tamil Nadu and Karnataka are the leading producers in the country and accounts for nearly 75 per cent of the total output. Redgram contributes to nearly 25 per cent of total oil seed production in the country. Nearly 75 per cent of output is produced in June-September and the rest during November-March during kharif and rabi seasons respectively. It has been reported that in India, the area under redgram was 4.37 million hectares with a production of 2.86 million tonnes and productivity of 1410.5 kgs per hectare during 2010-11 and in Andhra Pradesh, the area was 0.64 million hectares with a production of 0.27 million tonnes and productivity of 422 kgs per hectare. The present study was undertaken to examine how the scarce farm resources are used in redgram production.

Materials and Methods

Anantapur district was purposively selected as it ranked first in redgram production in Andhra Pradesh. Out of 64 mandals of Anantapur district, Kalyanadurgam, Garladinne and Putlur mandals with maximum acreage under redgram were selected. From the selected three mandals, a list of villages under redgram crop were arranged in the descending order of their acreage.

The first two villages from each of the mandal with highest area under redgram crop were selected for a detailed study. The selected villages were Mallapuram, Palvai, Obulapuram, Marthadu, Amidyala and Rayampalli for redgram crop. From each of the selected village, 15 farmers were selected at random. Thus, 30 farmers in each mandal constituted the sample of the study for the selected crop. The total number of farmers selected for the purpose of study was 90.

The primary data were collected by the survey method through well designed schedule for the agricultural year 2010-2011.

The Cobb-Douglas production function is specified in the following power form for redgram (Reddy et al., 2006).

\[ Y = a x_1^{b_1} x_2^{b_2} x_3^{b_3} x_4^{b_4} \cdots e^\mu \]

$Y$ = Yield in quintals

$X_1$: Human labour in mandays

$X_2$: Cattle labour in cattlepair days

$X_3$: Tractor power in hours

$X_4$: Manure in tonnes

$a$ : Intercept

$\mu$ : Stochastic disturbance term

$e$ : Napier base

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b₁ to b₄: Partial elasticity co-efficients of X₁ to X₄ inputs.

It can be presented in logarithmic form as

\[ \ln Y = \ln a + b_1 \ln x_1 + b_2 \ln x_2 + b_3 \ln x_3 + b_4 \ln x_4 + \mu \]

The results of the analysis were subjected to test by the co-efficient of multiple determination and the relevant ‘t’ tests (Damodar, 2004).

Equality of marginal value product to factor cost is the basic condition that must be satisfied to assess resource use efficiency. In Cobb-Douglas production function, marginal physical product of xⱼ, the jᵗʰ input factor is given by the following equation.

\[ Y_i = A x_1^{b_1} x_2^{b_2} \ldots x_j^{b_j} e^{\mu i} \]

For i = 1 to n farms

j = 1 to k inputs

\[ \text{MPP of } x_j \text{ input } = \frac{b_j Y}{X_j} \]

Where,

\[ \text{MPP} = \text{Marginal physical product of } j^{th} \text{ input.} \]

\[ b_j = \text{Partial elasticity coefficient of } j^{th} \text{ input.} \]

\[ Y = \text{Output of the crop at its geometric mean level.} \]

\[ X_j = \text{j}^{th} \text{ independent variable at its geometric mean level.} \]

The marginal value product for each factor is obtained by multiplying the MPP of each factor with unit price of output i.e.

\[ \text{MVP} = \text{MPP} \times P_y \]

Marginal value productivities are compared with acquisition costs in order to study the resource use efficiency. An input is said to be efficiently used when its MVP = MFC.

**Results and Discussion**

Farmers have limited inputs and their goal is to maximize farm income from the resources available with them. Hence, in order to operate the farm business at an optimum level, they make some adjustments in the allocation of their resources. The question that arises is whether the farmers belonging to different size groups respond equally to economic opportunities and make rational use of resources. Keeping this in mind, the present study was carried out to examine the input-output relationship and the resource use efficiency in the production of redgram crop. The Cobb-Douglas production function, which gave best fit was selected to establish the input-output relationship. The regression co-efficients of different inputs used in the production function were estimated and the results are presented in table 1.

### Resource productivity in redgram cultivation

As observed from the table that out of four variables included in the function, the variables human labour (X₁) and cattle labour (X₂) were positively significant at 5 per cent level revealing that one per cent increase in human labour (X₁) and cattle labour (X₂) keeping others constant would increase the redgram yield by 0.2943 per cent and 2.8963 per cent respectively. The other variables viz., tractor power (X₃) and manures (X₄) were positively related but found non-significant indicating that the change in the level of these resources did not affect the yield. The adjusted coefficient of multiple determination (R²) was 0.8379 indicating that the variables included in the function explained about 83.79 per cent of variation in redgram yields.

### Table 1: Production elasticities of input factors in redgram.

<table>
<thead>
<tr>
<th>S. no.</th>
<th>Particulars</th>
<th>Redgram</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No. of farmers</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>Constant</td>
<td>-0.3694</td>
</tr>
<tr>
<td>3</td>
<td>Human labour in mandays (X₁)</td>
<td>0.2943** (-1.7365)</td>
</tr>
<tr>
<td>4</td>
<td>Cattle labour in cattlepair days (X₂)</td>
<td>2.8963** (2.1526)</td>
</tr>
<tr>
<td>5</td>
<td>Tractor power in hours (X₃)</td>
<td>0.3845NS (0.3060)</td>
</tr>
<tr>
<td>6</td>
<td>Manures in tonnes (X₄)</td>
<td>0.7321NS (0.3762)</td>
</tr>
<tr>
<td>7</td>
<td>Adjusted coefficient of multiple determination (R²)</td>
<td>0.8379</td>
</tr>
</tbody>
</table>

Note: Figures in parentheses indicate ‘t’ values.

NS : Non Significant.

** : Significant at 0.05 level of probability.

### Table 2: Comparison of marginal value products with their factor costs in redgram production.

<table>
<thead>
<tr>
<th>S. no.</th>
<th>Particulars</th>
<th>MVP</th>
<th>MFC</th>
<th>MVP/MFC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Human labour (X₁)</td>
<td>23.22</td>
<td>100</td>
<td>0.23</td>
</tr>
<tr>
<td>2</td>
<td>Cattle labour (X₂)</td>
<td>1505.21</td>
<td>350</td>
<td>4.30</td>
</tr>
<tr>
<td>3</td>
<td>Tractor power (X₃)</td>
<td>NS</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Manures (X₄)</td>
<td>NS</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Note:

MVP : Marginal Value Product (Rs.)
MFC : Marginal Factor Cost
NS : Non-significant
To examine the economic efficiency of resources use, the marginal value product (MVP) of each factor was compared with acquisition cost. MVP/MFC ratios indicate potentiality of inputs for further use. The negative ratio indicates over use of the input and suggests reduction in the present level of input use. The resource is said to be allocated efficiently if the MVP=MFC. The ratios of MVP to their acquisition cost were calculated only for the significant resources in the production of redgram crop and are presented in table 2.

**Allocative efficiency in redgram production**

It is seen from table 2 the MVP/MFC ratio of more than unity was noticed for cattle labour, which implied that one more rupee of investment on cattle labour would add Rs. 4.30 to the gross income. The MVP/MFC ratio for human labour was less than unity, which implied that use of human labour should be reduced.

These findings are in concurrence with the findings of Atibudhi (1993), Pan (2010), Pant (2005) and Shukla (1992).

**Summary and Conclusion**

- The functional analysis revealed that human labour and cattle labour were highly significant in redgram production. This clearly showed that production of redgram could be increased by the increased use of these inputs in the study area.
- The MVP to MFC ratio was greater than unity for cattle labour in redgram indicating greater potentiality for further use.

**References**


