RESOURCE USE EFFICIENCY IN COWPEA PRODUCTION IN SEMI-ARID REGION OF RAJASTHAN

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ABSTRACT

The results indicated that human labour and seed were the chief components which significantly contributed in the gross income of large farms. While land, human labour, seed and bullock labour were underutilised and manure was over-utilised in respect of farmers having small holding. Further results indicated that reallocation of resources like human labour and seed and withdrawal of other resources like manure and machine labour will greatly increase the gross income of the farmers in cowpea cultivation. The study of returns to scale suggested that all farms should increase the gross income by reallocation of independent variables like machine labour and manure. Marginal value productivity suggested that farmers should increase the land, seed and human labour and minimise certain resources like manure and machine in cowpea cultivation. The average variation in gross income found in the study was 77.87 and 88.42 per cent for small and large farms, respectively.

INTRODUCTION

Pulses constitute one of the most important components of human diet because it is a major source of protein particularly for vegetarian population. The per capita availability of pulses in India has been declining since 1951, when it was 61 g per capita per day which declined to 40 g per capita per day in 1989. This is against the minimum requirement of 85 g per capita per day which has been recommended by the food scientists (Barmon, 1997). The two factors responsible for this declining availability of pulses in the country are low production of pulses and increase in human population.

The present situation warrents to find out how the farmers are using their resources at present in cowpea production. If resource use is inefficient, making adjustments in the use of factors of production in the optimal direction can increase production.

Rajasthan is one of the important kharif pulse growing states in the country and constituting 18.70 per cent (19.6 lakh ha) of area and 11.26 per cent (5.46 lakh tonnes) of production. While in rabi, it accounts for 13.17 per cent (16.6 lakh ha) of area and 15.32 per cent (14.20 lakh tonnes) of production in the country (Anonymous, 1997-98).

Transitional plain of inland drainage of Rajasthan, also known as agro-climatic zone II-A covers four districts namely Sikar, Jhunjhunu, Nagaur and eastern parts of Churu district. This zone includes the important cowpea growing areas and ranks first in area and production in the state accounting for 76.47 per cent area and 82.16 per cent of production (Anonymous, 1997-98). An attempt was, therefore, made to study the resource use efficiency in cowpea growing farms with the main objectives of the study as (i) to evaluate the resource use efficiency in different categories of cowpea farms; and (ii) to suggest the shift of resources from one category to another category.

MATERIAL AND METHODS

The study was undertaken in Sikar district, which is the most important cowpea growing district of zone II-A occupying an area of 44.2 thousand hectares (48.10. per cent) and producing 18.3 thousand tonnes seed annually (51.58 per cent). Sikar and Laxmangrah tehsils were randomly selected from this district. From each of these two tehsils,
four villages and from each village, 10 cultivators were selected at random. Thus in all 80 cultivators were included for the purpose of the study.

The primary data were collected through direct personal interviews with the respondents which included inputs use in cowpea cultivation using pretest schedules. Whole data were collected by survey method pertaining to the year 1995-96. The post classification of the sample cowpea growers was done into two groups viz., small farmers having below 4 hectares land holding and large farmers having 4 hectares and above on their cultivable land.

The data, thus collected were subjected to tabular analysis and Cobb-Douglas production function was fitted to the input output data so as to estimate the resource productivity, which is as follows:

$$Y = a x_1^{b_1} x_2^{b_2} x_3^{b_3} x_4^{b_4} x_5^{b_5} x_6^{b_6} e^u$$

On the logarithmic scale the function takes a linear form:

$$\log Y = \log a + b_1 \log x_1 + b_2 \log x_2 + b_3 \log x_3 + b_4 \log x_4 + b_5 \log x_5 + b_6 \log x_6 + u \log e$$

Where,

- $Y$ = Gross income (rupees)
- $x_1$ = Land (hectares)
- $x_2$ = Value of human labour (rupees)
- $x_3$ = Value of bullock labour (rupees)
- $x_4$ = Value of machine labour (rupees)
- $x_5$ = Value of seeds (rupees)
- $x_6$ = Value of manure (rupees)
- $a$ = Constant
- $u$ = Random variable
- $b_1$ to $b_6$ are elasticity coefficients of respective inputs.

The marginal value products (MVP) was calculated at the geometric mean level of the variables by using the following equation:

$$\text{MVP of } X_i = \frac{b_i \text{ geometric mean of } Y}{\text{Geometric mean of } X_i}$$

$$b_i = \text{Elasticity coefficient of } i^{th} \text{ variable}$$

$Y$ = Gross income

$X_i$ = $i^{th}$ independent variable

After computation of marginal value product of a variable, it was compared with its fixed factor cost since the variable in the production function is taken in rupees terms, fixed factor cost of unit being that input will be one rupee.

**RESULTS AND DISCUSSION**

The regression coefficients of the variables of the production function for small farmers, large farmers and all farmers are presented in Table 1. The results indicate that 84.73 per cent of the total variation in the gross income of cowpea production of all farmers was explained by the independent variables used. It is observed from the Table 1 that human labour and seed had the regression coefficient of 0.6576 and 0.3443, respectively and were statistically significant at one per cent level of significance. This means that with one per cent increase in human labour and seed, the gross income can be increased by 0.6567 per cent and 0.3443 per cent, respectively. The regression coefficients of land (0.0632) and bullock labour (0.0115) were through positive but statistically non-significant while those of machine labour and manures the
Table 1. Regression coefficient and MVP to MFC ratio of cowpea enterprise in respect of small, large and all farms

<table>
<thead>
<tr>
<th>Size group</th>
<th>Intercept (natural log)</th>
<th>Land (ha)</th>
<th>Human labour (Rs.)</th>
<th>Bullock labour (Rs.)</th>
<th>Machine labour (Rs.)</th>
<th>Cost of seed (Rs.)</th>
<th>Value of manure (Rs.)</th>
<th>MVP : MFC</th>
<th>Sum of R2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small farms</td>
<td>3.8107</td>
<td>0.3698</td>
<td>0.4033</td>
<td>0.0564</td>
<td>0.0068</td>
<td>0.2738</td>
<td>-0.0202</td>
<td>1.0898</td>
<td>0.7787</td>
</tr>
<tr>
<td></td>
<td>(0.2332)</td>
<td>(0.3106)</td>
<td>(0.0440)</td>
<td>(0.0349)</td>
<td>(0.2020)</td>
<td>(0.0680)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large farms</td>
<td>0.5072</td>
<td>-0.1116</td>
<td>0.8695</td>
<td>-0.0122</td>
<td>-0.0368</td>
<td>0.3694</td>
<td>-0.0363</td>
<td>1.0420</td>
<td>0.8842</td>
</tr>
<tr>
<td></td>
<td>(0.2049)</td>
<td>(0.2875)</td>
<td>(0.0380)</td>
<td>(0.0435)</td>
<td>(0.1664)</td>
<td>(0.0431)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All farms</td>
<td>1.9240</td>
<td>0.0632</td>
<td>0.6576</td>
<td>0.0115</td>
<td>-0.0194</td>
<td>0.3443</td>
<td>-0.0128</td>
<td>1.0444</td>
<td>0.8473</td>
</tr>
<tr>
<td></td>
<td>(0.1416)</td>
<td>(0.1940)</td>
<td>(0.0275)</td>
<td>(0.0250)</td>
<td>(0.1153)</td>
<td>(0.0324)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MVP : MFC</td>
<td>236.54</td>
<td>2.03</td>
<td>1.29</td>
<td>-0.48</td>
<td>8.24</td>
<td>-15.88</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** Significant at 1 per cent level;  
* Significant at 5 per cent level;  
R² = Coefficient of multiple determination;  
MFC = Marginal factor cost;  
MVP = Marginal value product;  
Note: Figures in parentheses indicate the respective standard error.

Values of regression coefficients were negative and non-significant. This indicated that increase in expenditure by one per cent in machine labour and manure can be 0.0194 per cent 0.0128 per cent decrease in gross income, respectively. These figures suggest that at present machine labour and farmers are excessively using manures in cowpea enterprise than required. Further, it could be seen from the ratio of marginal value product (MVP) to marginal factor cost (MFC) in terms of all farmers for land (236.54), seed (8.24), human labour (2.03) and bullock labour (1.29) that there are possibilities for increasing the use of each of these inputs to realise high gross income. The negative MVP to MFC ratio of manure (-15.88) indicated that each additional rupee spent on manure would result in a loss of Rs. 15.88. Similarly the ratio of MVP to MFC in terms of machine labour (-0.48) would result in a loss of Rs. 0.48 on every one rupee spent. The sum of elasticities was 1.0444 which being very near to one indicated constant return to scale.

In case of small farmer group, it was observed that the regression coefficient values were positive for human labour (0.4033), land (0.3698), seed (0.2738), bullock labour (0.0564) and machine labour (0.0068) while negative for manure (-0.0202). However, all these values were statistically non-significant. Similarly for the group of large farmers, the regression coefficient values were positive and significant at 1 per cent level for human labour (0.8695) and at 5 per cent for seed (0.3694).

In case of small farmer group, the ratio of MVP to MFC in respect of land (1338.43), seed (7.00), bullock labour (4.60) and human labour (1.21) was greater than one. This indicated that at their average levels these resources were under used and there was scope for using higher levels of these inputs to maximise returns. For other variables like machine labour and manure, it was less than one indicating their excessive use in the production process.

The MVP to MFC ratio was greater
than one for seed (8.54) and human labour (2.74) in case of large group of farmers, which indicated the scope for further increase in usage of these inputs to increase the gross income. The negative MVP to MFC ratio of land (-428.84), manure (-38.20), bullock labour (-1.78) and machine labour (-0.55) reflected that each additional rupee spent on land, manure, bullock labour and machine labour would result in loss of Rs. 428.84, Rs. 38.20, Rs. 1.78 and Rs. 0.55, respectively. The regression coefficients were negative and non-significant for land (-0.1116), bullock labour (-0.0122), machine labour (-0.0368) and manure (-0.0363) indicating excessive use of all these inputs in production process by the farmers.

The return to scale was near constant for small (1.0898) and large farmers (1.0420) which showed that if the use of all the factors (independent variables) are increased by one per cent, the gross return would also increase by one per cent.

The coefficient of multiple determination ($R^2$) was 0.7787 and 0.8842 for small and large farmer groups, respectively. These values indicated that the variables selected for the study significantly explained 77.87 per cent and 88.42 per cent of the variation in total gross income for small and large farmers, respectively.

REFERENCES