Resource use efficiency of major vegetables in Belgaum district in Karnataka

SAMEER LOKAPUR, G.N. KULKARNI, P.B. GAMANAGATTI AND RAVI GURIKAR

ABSTRACT: The study aimed to analyze the resource use efficiency of major vegetables in the Belgaum district which has high concentration of area under vegetables. The multi-stage random sampling procedure was adopted to choose 120 sample farmers. The results of the Cobb-Douglas production revealed that the regression coefficient for seeds was found to be significant in case of all the vegetable farmers and the co-efficient of multiple determination was $R^2$ 74 per cent, 86 per cent, 97 per cent and 96 per cent in case of onion, potato, green chilli and potato, respectively. In case of onion farmers the MVP and MFC ratio was found greater than unity, in case of potato farmers also the ratio was found greater than unity except in case of PPC. In case of green chilli farmers, the ratio for the bullock labour was found negative and in case of tomato farmers the ratio was more than 1 except for the human labour and fertilizers.

KEY WORDS: Seeds, MVP, MFC, Cobb-Douglas production


INTRODUCTION

India stands as the largest producer of vegetables in the world after China, it contributes over 13 per cent to the worlds vegetable production and occupies the first position in the production of cauliflowers, second position in onion and third in cabbage production. More than 40 kinds of vegetables from different groups such as the solanaceous, cucurbitaceous leguminous, cruciferous, root and leafy are gown in tropical, subtropical and temperate regions. Tomatoes, onion, brinjal, potato, cabbage, cauliflower, okra and pea are among the most important grown vegetables. Vegetables in India are mostly consumed as fresh, cooked and in preserved forms. The daily meal of a common man without vegetables is incomplete. The vegetable business provides an excellent opportunity for producers and consumers alike to diversify their business and to meet their tastes, respectively. The demand for fruits and vegetables is steadily increasing over the years. This trend may lead to gradual reduction in food grain exports. India has the unique distinction of being able to grow almost all fruits and vegetables under diverse production conditions. However, export-oriented production is still at the planning stage and most Indian producers are yet to adopt world standards of quality (Maini et al., 2000).

It is not enough just to produce a vegetable, it must be produced efficiently. It is necessary to improve the marketing system to accelerate the development for two reasons: firstly, if additional produce does not fetch the additional revenue in the market, it may work as a disincentive to increase production; secondly, if the market does not supply consumers with produce at reasonable prices and at the time and place needed, then increased production has no meaning in the welfare of the society. Increased production results in a greater percentage increase in the marketable surplus, accompanied by an increase in demand from the urban population and this makes production of vegetables more profitable. As a link between producer and consumer, marketing plays a very crucial role, not only in stimulating the production and consumption but also increasing the rate of economic development. In the light of above facts, the investigation aims to analyze the economics of vegetables...
production and their profitability.

**Materials and Methods**

The multi-stage random sampling procedure was adopted to choose the sample farmers. In the first stage, Belgaum district was selected based on the highest vegetable area and production. Four major vegetable crops having highest area under production were selected in the district. In second stage, two taluks namely, Savadatti and Belgaum with highest area under vegetables were selected. From these taluks, four major vegetables having highest area were identified namely, onion, potato, green chilli and tomato. Thirty sample farmers for each vegetable were selected from three selected villages.

The primary data on socio-economic characteristics, input utilization, productivity and resource use efficiency of selected major vegetables were collected from the sample farmers using pre-tested schedule. The data pertained to the cropping year 2012-13. The data were summarized with the aid of statistical tools like averages, percentages etc. and Cobb-Douglas production function was employed for the analysis of resource use efficiency.

The Cobb-Douglas type of production function was used to study the effect of various input costs on gross return of major vegetables. On account of its well known property of computational simplicity, justifies its wide application in analyzing production relations (Handerson and Quandt, 1971).

The form of Cobb-Douglas production function used in the present study is as follows.

\[ Y = aX_1^{b_1}X_2^{b_2}X_3^{b_3}X_4^{b_4}X_5^{b_5}e^u \]  

where,  
- \( Y \) = Gross returns in rupees  
- \( a \) = Intercept (efficiency) term  
- \( X_1 \) = Expenditure on seeds (Rs./ha).  
- \( X_2 \) = Expenditure on organic manure (Rs./ha).  
- \( X_3 \) = Human labour expenditure (Rs./ha).  
- \( X_4 \) = Expenditure on fertilizers (Rs./ha).  
- \( X_5 \) = Expenditure on PPC (Rs./ha).  
- \( e^u \) = Random error term

The estimated production parameters, in case of onion crop. In the case of potato crop, seed (0.336) and fertilizers co-efficient (0.056) was positive and non-significant with respect to seed (0.532) was significant at one per cent, while, human labour (0.281) and bullock labour (0.099). The co-efficient were significant at five per cent. However for fertilizers co-efficient (0.056) was positive and non-significant for onion crop. In the case of potato crop, seed (0.36) and human labour (0.406), the parameters were significant at one per cent.

The Cobb-Douglas production function was converted into log linear form and parameters (co-efficients) were estimated by employing Ordinary Least Square Technique (OLS) as given below:

\[ \log Y = \log a + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + b_5 \log X_5 + b_6 \log \log e \]  

The regression co-efficients (b’s) were tested using ‘t’ test at chosen level of significance.

**Results and Data Analysis**

The Cobb-Douglas production function choosing gross income realized from vegetables output as dependent variable while, expenditure made on seed (Rs.), fertilizers and organic manure (Rs.), labours (Rs.) and PPCs (Rs.) as independent variables was used to study the structural break and the resource use efficiency. The results are presented in Table 1, which revealed that the variables included in the function explained 74 per cent, 86 per cent, 97 per cent and 96 per cent variation in the dependent variable on onion, potato, green chilli and tomato crops, respectively. Decreasing returns to scale were observed for all the vegetable crops onion (0.99), potato (0.90) green chilli (0.50) and tomato (0.49).

The estimated production parameters, in case of onion crop with respect to seed (0.532) was significant at one per cent, while, human labour (0.281) and bullock labour (0.099). The co-efficient were significant at five per cent. However for fertilizers co-efficient (0.056) was positive and non-significant for onion crop. In the case of potato crop, seed (0.36) and human labour (0.406), the parameters were significant at one per cent.

**Table 1: Estimated co-efficients cobb-douglas production function**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Explanatory variables</th>
<th>Parameters</th>
<th>Onion (0.806)</th>
<th>Potato (0.512)</th>
<th>Green chilli (0.537)</th>
<th>Tomato (0.334)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Intercept</td>
<td>A</td>
<td>3.42</td>
<td>4.019</td>
<td>6.67</td>
<td>7.26</td>
</tr>
<tr>
<td>2</td>
<td>Seeds (Rs.)</td>
<td>b_1</td>
<td>0.532*** (0.086)</td>
<td>0.336*** (0.061)</td>
<td>0.201*** (0.0206)</td>
<td>0.211*** (0.029)</td>
</tr>
<tr>
<td>3</td>
<td>Organic manure (Rs.)</td>
<td>b_2</td>
<td>0.012 (0.021)</td>
<td>0.025 (0.018)</td>
<td>0.01 (0.008)</td>
<td>0.026* (0.016)</td>
</tr>
<tr>
<td>4</td>
<td>Human labour (Rs.)</td>
<td>b_3</td>
<td>0.281*** (0.116)</td>
<td>0.406*** (0.078)</td>
<td>0.131*** (0.031)</td>
<td>0.02 (0.018)</td>
</tr>
<tr>
<td>5</td>
<td>Bullock labour (Rs.)</td>
<td>b_4</td>
<td>0.099** (0.048)</td>
<td>0.031 (0.024)</td>
<td>-0.008 (0.085)</td>
<td>0.163 (0.052)</td>
</tr>
<tr>
<td>6</td>
<td>Fertilizer (Rs.)</td>
<td>b_5</td>
<td>0.056 (0.028)</td>
<td>0.086 (0.054)</td>
<td>0.116*** (0.038)</td>
<td>0.038** (0.018)</td>
</tr>
<tr>
<td>7</td>
<td>PPC (Rs.)</td>
<td>b_6</td>
<td>0.016 (0.014)</td>
<td>0.018 (0.016)</td>
<td>0.051*** (0.026)</td>
<td>0.036 (0.072)</td>
</tr>
<tr>
<td>8</td>
<td>Co-efficient of multiple determination (R^2)</td>
<td></td>
<td>0.74</td>
<td>0.86</td>
<td>0.97</td>
<td>0.96</td>
</tr>
<tr>
<td>9</td>
<td>F value</td>
<td></td>
<td>20.72</td>
<td>45.31</td>
<td>198.33</td>
<td>96.09</td>
</tr>
<tr>
<td>10</td>
<td>Returns to scale (2b)</td>
<td></td>
<td>0.99</td>
<td>0.90</td>
<td>0.50</td>
<td>0.49</td>
</tr>
</tbody>
</table>

**Note:** Figures in the parentheses indicate their respective standard errors  
***, ** and * indicate significance of value at P=0.01, P=0.05 and P=0.1, respectively.
per cent. In green chilli, the regression co-efficient for seed (0.201), fertilizer (0.116), human labour (0.131) and PPCs (0.051) were significant at one per cent whereas organic manure (0.010), bullock labour (-0.008) were found to be non-significant. In case of tomato, the regression co-efficient for seed (0.211) was significant at one per cent. Whereas, chemical fertilizers (0.038) was significant at five per cent and organic manures (0.026) was significant at ten per cent. The results obtained are in conformity with Singh (2004) where decreasing returns to scale was seen under vegetable crops such as potato, okra and brinjal.

The output elasticity of human labour and seeds were positive and significant, which implied the increased contribution of these inputs to the gross income. Since the vegetable crops are labour intensive and the operations such as ploughing, inter-cultivation, manures application, sowing, hand weeding, spraying of PPC chemicals, significantly contribute towards increased yield and thus the income.

Fertilizer utilization was seen relatively high in all the vegetables because of easy access to funds and also with availability of fertilizer on credits for crops like green chilli and tomato contributed systematically on their income. Lack of awareness of its exact requirement in the anxiety to get better yield be addressed for its efficient utilization.

The ratio of Marginal Value Product (MVP) to Marginal Factor Cost (MFC) ratio for seed was 19.06, 3.10, 12.53 and 7.49 for onion, potato, green chilli and tomato farmers, respectively.

In the case of onion farmers, the MVP to MFC ratio for all the resources were more than one indicating that still there is scope for higher utilization of these inputs and which in turn would increase the gross income and profit.

The ratio for bullock labour in case of green chilli suggest that there is a need to reduce expenditure on it as revealed by ratio less than zero (negative) indicated that the resource used was in excess.

Table 2: MVP to MFC ratios of resources in vegetables production

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Explanatory variable</th>
<th>Parameters</th>
<th>Onion</th>
<th>Potato</th>
<th>Green chilli</th>
<th>Tomato</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Seeds (Rs.)</td>
<td>$b_1$</td>
<td>19.06</td>
<td>3.10</td>
<td>12.53</td>
<td>7.49</td>
</tr>
<tr>
<td>2.</td>
<td>Farm yard manure (Rs.)</td>
<td>$b_2$</td>
<td>1.29</td>
<td>1.85</td>
<td>0.73</td>
<td>1.95</td>
</tr>
<tr>
<td>3.</td>
<td>Human labour (Rs.)</td>
<td>$b_3$</td>
<td>3.98</td>
<td>5.38</td>
<td>0.91</td>
<td>0.16</td>
</tr>
<tr>
<td>4.</td>
<td>Bullock labour (Rs.)</td>
<td>$b_4$</td>
<td>5.11</td>
<td>3.35</td>
<td>-0.27</td>
<td>6.85</td>
</tr>
<tr>
<td>5.</td>
<td>Fertilizer (Rs.)</td>
<td>$b_5$</td>
<td>1.90</td>
<td>2.42</td>
<td>1.59</td>
<td>0.56</td>
</tr>
<tr>
<td>6.</td>
<td>PPC (Rs.)</td>
<td>$b_6$</td>
<td>2.95</td>
<td>0.61</td>
<td>4.00</td>
<td>3.78</td>
</tr>
</tbody>
</table>

Note: MVP – Marginal value product, MFC – Marginal factor cost

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