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Research Article

# Resource productivity and resource use efficiency in ber production

M.V. THORAT AND R.D. SHELKE

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**SUMMARY :** Investigation was carried out during the year 2010-2011 in order to study resource productivity and resource use efficiency in ber production. The results revealed that regression co-efficient of area (0.521), was highly significant at 1 per cent level. The regression co-efficient of hired human labour (0.156), bullock labour (0.051), manure (0.016), and irrigation (0.047) were highly significant at 5 per cent level. Thus, it was inferred that these resources were underutilized and there was scope to increase them in ber production.

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KEY WORDS :
Ber, Production function, Regression coefficient, Resource use efficiency, Marginal value product

Author for correspondence :
**M.V. THORAT**
Department of Agricultural Economics, College of Agriculture, LATUR (M.S.) INDIA
See end of the article for authors' affiliations

## BACKGROUND AND OBJECTIVES

Ber (*Ziziphus mauritiana*) is cultivated all over the drier parts of the Indian subcontinent for its fresh fruits. The ber are mostly eaten fresh but the other forms, such as dried, candied, pickled are also be prepared and used.

The ber growers in Maharashtra are able to harvest good yield, however, the net return obtained are fluctuating due to uncertainty of prices. The literature indicated that ber growers are not able to keep consistency in productivity, cost and return structure. The cultivation of ber can become economically profitable provided that, the production of the ber is done efficiently, for which adequate management of resources as well as to increase per unit resource use efficiency are necessary. It can also help to reduce the cost of production. By keeping in view its importance, the study was carried to know resource productivity and resource use efficiency in ber production.

## RESOURCES AND METHODS

Multistage sampling design was adopted in selection of district, tehsils, villages and ber growers. At first stage, Beed district was purposely selected on the basis of availability of ber garden. At second stage, two tehsils of Beed district were selected on the basis of highest area under sole fruit crop of ber. The selected tehsils were Kaij and Beed. At third stage, from each selected tehsil six village clusters was selected on the basis of availability of ber garden. In the fourth stage separate list of ber growers was taken from each village cluster and from that list, four ber growers were selected randomly. The cross sectional data were collected from fourty eight growers. The cross sectional data were collected in relation to production of ber and use of resources namely, area, hired human labour, bullock labour, machine labour, manure nitrogen, phosphorus, potash, irrigation and family human labour. With the help of correlation matrix of above variables, independent variables which were significant with respect to dependent variables were taken into consideration.

In functional analysis, Cob-Douglas production function were used for data. On the basis of goodness of fit($R^2$), Cob-Douglas production function (non-linear) was used to determine the resource productivity in ber production. The data were, therefore, subjected to functional analysis by using the following form of equation:

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

In this functional form 'Y' is dependent variable, 'Xi' 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 elasticity of production, which remain constant throughout the relevant ranges of inputs. The sum of coefficients that is 'bi' indicates the nature of returns to scale. This function can easily be transformed into a linear form by logarithmic transformation. After logarithmic transformation it becomes,

$$\text{Log } Y = \log_a + b_1 \log x_1 + b_2 \log x_2 + \ldots\ldots b_n \log x_n + u \log e$$

The main consequences of multicollinerity are (a) the sampling variances of the estimate co-efficients increases as the degree of co linearity increases between the explanatory variables (b) estimated co-efficients may become very sensitive to small charges in data that is addition or deletion of a few observations produce a drastic changes in some of the estimates of the co-efficients. These results in non-significance of regression coefficients are significant but the value of $R^2$ is very high. The equation fitted was of the following formula.

$$Y = aX_1^{b1}.X_2^{b2}.X_3^{b3}.X_4^{b4}.X_5^{b5}.X_6^{b6}.X_7^{b7}.X_8^{b8}$$

where,

y = Estimated yield of the crop in quintals per farm,

a = Intercept of production function

bi = Partial regression co-efficients of the respective resource variable (I = 1,2,3, ….8)

$X_1$ = Area of the crop in hectares

$X_2$ = Human labour in man days per farm

$X_3$ = Machine labour in hours per farm

$X_4$ = Nitrogen in kg per farm

$X_6$ = Phosphorus in kg per farm

$X_7$ = Potash in kg per farm

$X_8$ = Family labour in man days per farm

The marginal value of productivity of resource indicates the addition of gross value of farm production for a unit increase in the 'i'th resources with all resources fixed at their geometric mean levels. The MVP of various input factors worked out by the following formula.

$$\text{MVP} = \frac{\bar{Y}}{\bar{X}}$$

where,

bi = 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

## OBSERVATIONS AND ANALYSIS

Regression co-efficient with respect to various

**Table 1 : Estimates of Cobb-Douglas production function in ber production**

| Sr. No. | Independent variable | Regression co-efficient (bi) | Standard error bi (SE) | 't' value | Geometric mean of input (xi) | Marginal product (q) | Marginal value product (Rs.) | Price of input (Rs.) | MVP to price ratio | Optimum resource use |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Area under ber(ha/farm) | 0.521 | 0.132 | 3.307** | 0.60 | 50.36 | 32,734 | 15,637.09 | 2.09 | 1.254 |
| 2. | Hired human labour (man day / farm) | 0.156 | 0.064 | 2.375* | 7.23 | 1.25 | 812.5 | 100 | 8.12 | 58.70 |
| 3. | Bullock labour (pair day / farm) | 0.051 | 0.016 | 2.932* | 0.68 | 4.35 | 2872.5 | 250 | 11.31 | 7.69 |
| 4. | Machine labour (hours / farm) | -0.031 | 0.005 | -1.464 | 0.41 | -4.38 | -2847 | 100 | -28.47 | - |
| 5. | Manure (q / farm) | 0.016 | 0.004 | 2.573* | 2.76 | 0.33 | 214.5 | 50 | 4.29 | 11.84 |
| 6. | Nitrogen (kg / farm) | -0.030 | 0.006 | -2.926* | 7.50 | -0.23 | -149.5 | 12.7 | -11.78 | - |
| 7. | Phosphorus (kg / farm) | -0.005 | 0.003 | -2.665* | 2.50 | -0.11 | -71.5 | 22.25 | -3.21 | - |
| 8. | Potash (kg / farm) | -0.004 | 0.001 | -2.465* | 2.71 | -0.08 | -52 | 8.33 | -6.24 | - |
| 9. | Irrigation ($m^3$/farm) | 0.047 | 0.017 | 2.793* | 135.30 | 0.02 | 13 | 1.0 | 13 | 1758.9 |
| 10. | Family human labour (man day / farm) | 0.096 | 0.301 | 0.378 | 6.98 | 1.23 | 739.5 | 100 | 7.99 | 55.78 |
| Intercept (log a) | 2.93 | | | | | | | | | |
| F value | 20.50 ** | | | | | | | | | |
| $R^2$ | 0.829 | | | | | | | | | |
| Return to scale (Σbi) | 0.817 | | | | | | | | | |

Note: Geometric mean(Y) of ber production was 58 q per farm and price was Rs. 650/q

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

explanatory variables was calculated and is presented in Table 1. Regression co-efficient of area under ber was 0.521 which was positive and highly significant at 1 per cent level. Similarly, regression co-efficient of manure was 0.016 which was also positive and highly significant at 1 per cent level. In the next order, regression co-efficients of hired human labour, bullock labour, irrigation and family human labour were 0.156, 0.051, 0.047 and 0.096, respectively which were positively and significant at 5 per cent level. . Co-efficient of determination was 0.829 which showed that there was a effect of all independent variable together with 82.90 per cent on production of ber.

Resource productivity with respect to various explanatory variables was estimated and is presented in Table 1. It was observed that, marginal product of area under ber was found to be 50.36 quintals followed by that of hired human labour (1.25), bullock labour (4.35) manure (0.33) and family human labour (1.23). It inferred that if area under ber production was increased by one hectare at its geometric mean level, it would lead to increase production of ber with 50.36 quintals. Similarly, per unit of hired human labour, bullock labour, manure and family human labour if increased it would cause to increase the production of ber by 1.25, 4.35, 0.33, and 1.23, respectively.

In regard to resource use efficiency, it was also evident from the table that use of manure in ber production indicated MVP to price ratio with respect to manure was (4.29) while that of for irrigation was(13), area (2.09), family human labour (7.99), hired human labour (8.12) and bullock labour (11.31). It inferred that expenditure of area under ber was efficiently used as compared to that of family human labour, hired human labour and bullock labour. In other words expenditure on bullock labour was mostly inefficient. Hence, priority could be given to the expenditure on bullock labour in ber production. On the contrary, there was excess expenditure on potash followed by nitrogen, machine labour and phosphorus. Hence, there could be need to reduce the expenditure on these resources. Chinnappa and Rammana (1997) made an economic analysis of guava production whereas Naikawadi *et al.* (2004) conducted same type of study on economics of production and marketing of fig in Pune district.

Authors' affiliations :

**R.D. SHELKE**, Department of Agricultural Economics, College of Agriculture, LATUR (M.S.) INDIA

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