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Research Article

RESOURCE USE EFFICIENCY IN POMEGRANATE (*PUNICAGRANATUM* L.) PRODUCTION IN MAHARASHTRA

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ABSTRACT

Investigation was carried out during the year 2017 in Maharashtra state with an aim to find out resource use efficiency in pomegranate production. The study utilized the primary data collected from a sample of 80 pomegranate growers spread across 16 villages of two tehsil of each Aurangabad and Jalna districts. These districts were selected purposively because these are well known districts of pomegranate cultivation. Tabular analysis and Cobb-Douglas production function were used for data analysis. Analysis of Cobb-Douglas production for Aurangabad and Jalna districts revealed that sum of regression coefficient found to be 1.44 and 1.33 respectively, indicating increasing return to scale. The selected model explained 41.30 and 32.69 per cent variation in pomegranate production in Aurangabad and Jalna districts, respectively. The result revealed that, expenditure on irrigation charges was 1.360 followed by fertilizers (0.174), plant protection chemicals (0.148) and manures (0.100) were found positive and significant indicating there is scope to increase the use of these resources to increase the output. On the contrary, regression coefficient of labour was (-0.339) negative and non-significant. The ratio MVP/FC found more than unity in case of plant protection chemicals, irrigation, manures and fertilizers. It revealed that use of plant protection chemicals, irrigation, manures and fertilizers needs to increase for optimum level of output. The expenditure on labour need to be curtail.

INTRODUCTION

Pomegranate (*Punicagranatum*) is grown in tropical and subtropical regions of the world. India is known as fruit and vegetable basket of the world. Pomegranate cultivation was started since ancient time. The fruit is native of Iran and extensively cultivated in Mediterranean countries like Spain, Egypt, Iran, Burma, China and India. The total area under cultivation of pomegranate in India is 107.00 thousand hectare and production is around 743.00 thousand tonnes. Maharashtra is the leading producer of pomegranate followed by Karnataka, Andhra Pradesh, Gujarat and Tamil Nadu. Ganesh, Bhagwa, Ruby, Arakta and Mridula are the different varieties of pomegranates produced in Maharashtra. The leading fruit growing state is Maharashtra which accounts for 16.0 per cent of production. Pomegranate is important fruit crop of Maharashtra. Cultivation of pomegranate in rural area is one of the fastest growing segments. In the recent years farmers turned towards pomegranate production due to its high returns. The deep loamy or alluvial soils are ideal for its cultivation. The fruit tree grows well in semi-arid climate where cool winter and hot dry summer prevail. The tree requires hot and dry climate during the period of fruit development and ripening. The optimum temperature for fruit development is 38°C. farmers have adopted a spacing of 2.5 m X 4.5m. Pomegranate plants flower and provide fruits throughout the year in central and southern India. flowering can be induced during June-July (mrigbahar), September-October (hasthbahar) and January-February (ambebahar). Pomegranate being a non-climacteric fruit should be picked when fully ripe. Pomegranate plants take 4-5 years to come into bearing. The fruits become ready for picking 120-130 days after fruit set. The economic life of pomegranate is 25 years. In production process some of the resources are either over utilized or under-utilized. By keeping in view the above aspects, the present study was under taken in order to determine the optimum utilization of resources in pomegranate production.

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MATERIALS AND METHODS

Multistage sampling method was used for selection of sample. The stages of sample selection are districts, talukas, villages and pomegranate growers. In first stage, two talukas from each Aurangabad district and Jalna district were selected. Each district was selected purposively considering the area under pomegranate crop. In second stage, two talukas from each district were selected because these are well known pocket of pomegranate. With the same reason in third stage, four villages from each talukas were selected and at the final stage five pomegranate fruit growers were selected randomly from the selected villages. Thus, finally 80 pomegranate growers were selected for the purpose of the study.

Cross sectional data were collected from the sample pomegranate growers by personal interview method with the help of the well prepared questionnaires during February to March 2017.

Cobb-Douglas product

ion function was fitted to the data to estimate resource use efficiency in pomegranate production with respect to each of the explanatory variables. The fitted equation is as under:

$$\mathbf{Y = a.\ x_1^{b1}.\ x_2^{b2}.\ x_3^{b3}.\ x_4^{b4}.\ x_5^{b5}.\ e^u}$$

In this functional form 'Y' is dependent variable, 'X' are independent resource variables, 'a' is the constant representing intercept of the production function and 'bi' are the regression coefficients of the respective resource variables. The regression coefficient obtained from this function directly represent the elasticities of production, which remain constant throughout the relevant ranges of inputs. The sum of coefficient that is 'bi' indicates the nature to return of scale. This function can easily be transformed into a linear form by making logarithmic transformation. After logarithmic transformation, the function was:

$\text{Log } Y = \text{Log } a + b_1 \text{ Log } x_1 + b_2 \text{ Log } x_2 + b_3 \text{ Log } x_3 + b_4 \text{ Log } x_4 + b_5 \text{ Log } x_5 + u \text{ Log } e$

Where,

Y = Yield of pomegranate in quintal per ha.
a = Intercept
b_i= Regression coefficient of the independent variables.
x_1= Expenditure on labour (Rs/ha)
x_2 = Expenditure on plant protection chemicals (Rs/ha)
x_3= Irrigation charges (Rs/ha)
x_4= Expenditure on manure (Rs/ha)
x_5= Fertilizer expenditure. (Rs/ha)
e = Error term

Estimation of marginal value product

The marginal value products (MPVs) of the individual resources were estimated and compared with their marginal cost (MC). The MVP of individual resources were estimated by using the following formula,

$$\mathbf{MPV} = \boldsymbol{X_i = b_i \frac{\overline{Y}}{\overline{X}} P_y}$$

Where,

bi = Elasticity of production of i^{th} input
Y = Geometric mean of output
Xi = Geometric mean of i^{th} input
Py = Per unit price of output

The elasticities were tested with 't' test for their significance. The results of the estimated production for pomegranate have been discussed in result and discussion section.

RESULTS AND DISCUSSION

The results obtained from analysis of the data have been presented under the following heads.

Elasticities in pomegranate production

The details of production estimates are presented in Table 1 and Table 2 for Aurangabad and Jalna districts, respectively. It could be seen from the table that all the selected variables included in the production function for pomegranate have jointly explained about 41.31 and 32.69 per cent variation in Aurangabad and Jalna districts, respectively. Thus, in Aurangabad district it was observed from that regression coefficient of expenditure on irrigation charges was 1.360 which was positive and highly significant at one per cent level. It implies that when 1 per cent increased in expenditure on irrigation charges over its geometric mean, it would lead to increase pomegranate production of 1.360 by per cent. Regression coefficient of expenditure on fertilizers was 0.173 which was positive and significant at one per cent level. It inferred that when 1 per cent increased in expenditure on fertilizers over its geometric mean, it would lead to increase pomegranate production of 0.173 by per cent. Regression coefficient plant protection chemicals and manures were also positive and significant. When use of plant protection chemicals and manures were increased by one per cent, it would lead to increase pomegranate production of 0.148 and 0.100 by per cent. On the contrary, that regression coefficient of expenditure labour was (-0.339) negative and non-significant. The sum of the elasticities was greater than unity i.e. 1.44 in Aurangabad district. which meant that farmers were working in the first irrational zone of production function i.e. increasing marginal productivity. On the whole, for optimizing the gross returns and increasing resource use efficiency, extensive use of inputs viz., plant protection chemicals, irrigation, manure and fertilizers are the necessary conditions.

In case of Jalna district, the elasticities of output with respect fertilizer was found positive and highly significant at one per cent level of significant. It implies that when 1 per cent increased in expenditure on irrigation charges over its geometric mean, it would lead to increase pomegranate production of 0.254 by per cent. Regression coefficient manures, plant protection chemicals and irrigation charges were also positive and significant. When use of manures, plant protection chemicals and irrigation charges were increased by one per cent, it would lead to increase pomegranate production of 0.848, 0.486 and 0.485 by per cent. On the contrary, that regression coefficient of expenditure labour was (-0.736) negative and non- significant. The sum of the elasticities was greater than unity i.e. 1.33 in Jalna district. which meant that farmers were working in the first irrational zone of production function i.e. increasing marginal productivity. On the whole, for optimizing the gross returns and increasing resource use efficiency, extensive use of inputs viz., plant protection chemicals, irrigation, manure and fertilizers are the necessary conditions.

Economic resource use efficiency in pomegranate production

In order to evaluate the economic efficiency of pomegranate growers, marginal product in monetary terms were estimated at the geometric mean levels of inputs. It was indicated in both the districts from the Table 1 and Table 2 that the ratio of MPVs to factor cost for plant protection chemicals, manure, irrigation and fertilizers were found greater than unity which indicated that there is bright scope of raising income through intensive use of these factor inputs. The ratio of MVP to its factor cost for labour use was found to be negative suggesting the over utilization of this input. This implied that the cost of this inputs incurred by the farmers was higher than their contribution to gross returns and consequently the income from pomegranate orchard could be raised through reduction of this cost.

Table 1 Estimates and production function for pomegranate crop in Aurangabad district

Sr.No.	Particulars	Parameters	Coefficients	Ratio of MVP to factor price
1	Constant		8.002* (2.076)	
2	Labour	X_1	-0.339 (0.573)	-4.54027
3	Plant protection chemicals	X_2	0.148* (0.044)	3.005273
4	Irrigation charges	X_3	1.360* (0.437)	3.704832
5	Manure	X_4	0.100** (0.045)	65.51001
6	Fertilizers	X_5	0.173** (0.066)	2.488797
7	R^2		41.30	
8	Sum of elasticity of coefficients		1.44	
9	N		40	

* Indicates 1 per cent level of significance
* * Indicates 5 per cent level of significance

Figures in the parentheses indicate the standard error of regression coefficients.

Table 2 Estimates and production function for pomegranate crop in Jalna district

Sr. No.	Particulars	Parameters	Coefficients	Ratio of MVP to factor price
1	Constant		7.786* (2.445)	
2	Labour	X_1	-0.736 (0.570)	-8.2965
3	Plant protection chemical	X_2	0.486** (0.229)	16.9117
4	Irrigation charges	X_3	0.485** (0.240)	9.3714
5	Manure	X_4	0.848** (0.384)	14.3357
6	Fertilizer	X_5	0.254* (0.063)	2.6720
7	R^2		32.69	
8	Sum of elasticity of coefficients		1.33	
9	N		28	

* Indicates 1 per cent level of significance
* * Indicates 5 per cent level of significance

Figures in the parentheses indicate the standard error of regression coefficients.

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