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Research Article

Resource productivity and resource use efficiency in custard apple production

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SUMMARY : Investigation was carried out during the year 2010-11. 60 custard apple growers were randomly selected from twelve villages of two tehsils of Aurangabad district. Cross sectional data were collected from custard apple growers with the help of pretested schedule by personal interview method. Data were related to custard apple output as well as inputs like area under custard apple garden, economic life of custard apple garden, human labour, bullock labour, manure, fertilizers and plant protection as resources. Cobb Douglas production function was fitted to the data. The results revealed that, regression co-efficient of economic life of custard apple garden was 0.630 followed by area under custard apple garden (0.194), manure (0.021) and bullock labour (0.015) which were positive and significant at 1 per cent level. Regression co-efficient of hired human labour, nitrogen, phosphorous and potash were positive but non-significant. On the contrary, regression coefficient of plant protection was -0.018 which was negative and significant at 1 per cent level. Marginal product of area under custard apple garden was 15.507 quintals followed by that of economic life of custard apple garden (2.804 q), bullock labour (1.465 q) and manure (0.156 q) and so on. MVP to price of ratio with respect to bullock labour was 11.78 followed by potash (4.09), manure (3.20), nitrogen (2.93), phosphorus (2.71), area under custard apple (1.15), hired human labour (1.22) and economic life of custard apple garden (0.89). Hence, preference might be given to bullock labour on priority basis in custard apple production.

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KEY WORDS:
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BACKGROUND AND OBJECTIVES

Annona is important fruit in dry land. Annona fruit is originated from tropical Region of America and widely distributed throughout the tropics and subtropics. The Annonaceae family comprises of 40 genera and 120 species of which only five of them produce edible fruits. Custard apple (*Annona squamosa* L.) is the dry land fruit crop. It belongs to the family Annonaceae. The custard apple is popularly known as *Sitaphal* in Maharashtra. In India custard apple is cultivated mostly in Assam, Andhra Pradesh, Bihar, Karnataka, Madhya Pradesh, Maharashtra, Orrisa, Rajasthan and Uttar Pradesh.

Custard apples grow successfully in sand to light soil and wastelands may be utilized for growing these fruits. The climate of Aurangabad district is subtropical. Custard apple is mostly subtropical fruits preferring warm climate with moderate winter and high humidity for high production. The average rainfall of district is 743 mm. In custard apple production, area under custard apple garden, economic life of custard apple garden, human labour, bullock labour, manure, nitrogen, phosphorus, potash and plant protection are the important resources. Planting is done in the rainy season at a distance of (3m x 3m) by adopting square system. Seedling as well as vegetatively propagated plants begins flowering within three years after the planting. Two to three irrigations are given after monsoon to promote fruit set. The custard apple starts flowering from July to August. The flowers develop into fruits during winter season. Custard apple harvesting starts from the months of October to November. The fruits are harvested in two to three picking. The economic life of custard apple is 17 years. In production process, some of

the resources are either over utilization or under utilization. By keeping in view the above aspects, the present study was under taken in order to determine the optimum utilization of resources in custard apple production.

RESOURCES AND METHODS

Multistage sampling design was used for selection of district, tehsils, villages and custard apple growers. In the first stage, Aurangabad district was purposely selected for the present study because availability of highest area under custard apple cultivation. In second stage, Khultabad and Soygaon tehsils were selected because of contribution of major area under custard apple fruit crop. In the third stage, from each of selected tehsils, six villages were selected on the basis of highest area under custard apple. Thus, these selected villages from Khultabad tehsil were namely, Abdimandi, Dultabad, Ellora, Kagzipura, Khultabad and Maliwada and from Soygaon tahsil were namely, Amkheda, Galwada, Jangla tanda, Murti, Palaskhed and Soygaon. In the last stage, from each selected village, five custard apple growers were selected randomly. Thus, from twelve villages, in all 60 custard apple growers were selected.

The cross sectional data were collected from 60 custard apple growers with the help of pre-tested schedule for the year 2010-2011.The data were related to use of resources namely area under custard apple, age of custard apple garden, human labour, bullock labour, manure, fertilizers and plant protection. Data were also related to custard apple production. Cobb- Douglas production function was fitted to the data to estimate resource use efficiency with respect to each of the explanatory variables. The fitted equation was as follows.

$$Y = a X_1^{b1} X_2^{b2} X_3^{b3} \ldots\ldots\ldots X_n^{bn} e^u$$

In this functional form 'Y' is dependent variable, 'X_i' 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 coefficients obtained from this function directly represent the elasticities of production, which remain constant throughout the relevant ranges of inputs. The sum of coefficients 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 of this function is-

$$\log Y = \log a + b_1 \log X_1 + b_2 \log X_2 + \ldots\ldots + b_n \log X_n + u \log e$$

The main consequences of multicollinearity are (a) the sampling variances of the estimate co-efficient increases as the degree of collinearity increases between the explanatory variables (b) estimated co-efficient may become very sensitive to small changes in data that is addition or deletion of few observations produce a drastic change in some of the estimates of the co-efficient. This results in non significance of regression co-efficient sometimes it so happens that more of the regression co-efficient are significant but the value of R^2 is very high. The equation fitted was of the following formula.

$$Y = a X_1^{b1} . X_2^{b2} . X_3^{b3} . X_4^{b4} . X_5^{b5} . X_6^{b6} . X_7^{b7} . X_8^{b8} . X_9^{b9} .$$

where,

Y = Estimated custard apple production in quintals per garden

a = Intercept of production function, bi = Partial regression coefficient of the respective resource variable (i=1, 2,…,9), X_1 =Area under custard apple in hectares per garden, X_2 = economic life of custard apple garden in years, X_3 = Human labour in man days per garden, X_4 = Bullock labour in pair days per garden, X_5 = Manure in kg per garden, X_6= Nitrogen in kg per garden, X_7= Phosphorous in kg per garden, X_8= Potash in kg per garden and X_9= Plant protection in liter per garden.

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

$$MVP = b \frac{\bar{Y}}{\bar{X}} Py$$

where,

b = Regression co-efficient of particular independent variable, $\bar{X}$ = Geometric mean of particular independent variable, $\bar{Y}$ = Geometric mean of dependent variable, Py = Price of dependent variable.

OBSERVATIONS AND ANALYSIS

The findings related to elasticity of production, marginal production, resource use efficiency and optimum resource use in custard apple production were obtained and are presented in Table 1.

Elasticity in custard apple production:

Regression co-efficient with respect to various explanatory variables were calculated and are presented in Table 1. It was observed from the table that regression co-efficient of economic life of custard apple garden was 0.630 which was positive and highly significant at one per cent level. It implied that when 1 per cent increased in economic life of custard apple garden over its geometric mean, it would lead to increase custard apple production of 0.630 by per cent. Regression co-efficient of area under custard apple was 0.194 which was positive and highly significant at one per cent level. It inferred that when 1 per cent increased area under

custard apple over its geometric mean, it would lead to increase production of custard apple by 0.194 per cent. The results are in conformity to results obtained by Paranjape and Borade, (1978) with respect to elasticity of production

Regression co-efficient of manure and bullock labour was also positive and significant. When use of manure and bullock labour was increased by one per cent, it would lead to increase custard apple production by 0.021 and 0.015 per cent. Similarly, regression co-efficient of human labour, nitrogen, phosphorus and potash were 0.085, 0.021 and 0.019, respectively which were positive but non-significant. On the contrary, regression co-efficient of plant protection was negative but significant at one per cent level. Co-efficient of multiple determination was 0.985, it means that there was 98.50 per cent effect of all independent variables together on custard apple production. Returns to scale was found to be 0.973 which indicated that production of custard apple was found in decrease returns to scale**.**

Marginal productivity in custard apple production:

Resource productivity with respect to various explanatory variables was estimated and is also presented in the Table 1. It was obvious that the marginal productivity with respect to area under custard apple was the highest as 15.507 quintals followed by that of age of custard apple garden (2.804 years), bullock labour (1.465 q), manure (0.156 q), human labour (0.073 q), phosphorus (0.032 q), nitrogen (0.019 q) and potash (0.019 q). It inferred that if area under custard apple production was increased by one hectare at its geometric mean level, it would lead to increase production of custard apple with 15.507 quintals. Similarly, age of custard apple garden, bullock labour, manure, human labour, phosphorus, nitrogen and potash would be increased then it would cause to increase production of custard apple production by 2.804, 1.465, 0.156, 0.073, 0.032, 0.019 and 0.019 quintals, respectively.

Resource use efficiency in custard apple production:

In regards to resource efficiency, it was also evident from the Table 1 that use of bullock labour in custard apple production indicated MVP to price ratio as 11.78 followed by potash (4.09) manure (3.20) and phosphorus (2.71), which were greater than unity. It implied that there was scope to increase these resources in custard apple production. On the contrary, in regard to plant protection, MVP to price ratio was negative. Use of plant protection in custard apple production was excess. These results are in agreement with the earlier results obtained by Shivanand (2002)

Optimum resource use in custard apple production:

In regards to optimum resource use, it was observed that optimum use of area under custard apple was 0.70 hectares over its geometric mean followed by that of age of custard

Table 1 : Estimates of cobb douglas production function for custard apple production

Sr. No.	Independent variable:	Regression co-efficient (bi)	Standard error (SE)	't' value:	Geometric mean (Xi)	Marginal product (q)	Marginal value product (Rs.)	Price of input (Rs.)	MVP to price ratio	Optimum resources use
1.	Area under custard apple (ha/garden)	0.194	0.059	3.288**	0.48	15.507	31184.50	21097.19	1.15	0.70
2.	Economic life of custard apple garden (years)	0.630	0.054	11.666**	8.62	2.804	5638.84	6348.47	0.89	7.65
3.	Human labour (man day / garden)	0.085	0.081	1.049	44.37	0.073	146.80	120	1.22	54.65
4.	Bullock labour (pair day / garden)	0.015	0.044	2.613**	3.01	1.465	2946.11	250	11.78	4.62
5.	Manures (q / garden)	0.021	0.04	5.250**	5.06	0.156	319.74	100	3.20	16.20
6.	Nitrogen (kg. / garden)	0.021	0.011	1.909	41.58	0.019	38.20	13.04	2.93	124.26
7.	Phosphorus (kg. / garden)	0.019	0.010	1.900	22.54	0.032	64.35	23.75	2.71	61.72
8.	Potash (kg. / garden)	0.006	0.005	1.200	11.83	0.019	38.20	9.33	4.09	49.62
9.	Plant protection (litres / garden)	-0.018	0.007	-2.571**	0.03	23.023	46299.25	180	257.20	..
Intercept (log. a)	.....	1.607	Notes: Geometric mean of (Y) custard apple production was 38.37 q per orchard and price was Rs. 2011/q							
F value:	.....	3.653**								
R^2	.....	0.985								
Return to scale (∑bi)	.....	0.973	* and ** indicate significances of values at P 0.05 and 0.01, respectively							

apple garden (7.65 years), human labour (54.65 man days), bullock labour (4.62 pair days), manure (16.20 quintals), nitrogen (124.26 kg), phosphorus (61.72 kg) and potash (49.62 kg).

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REFERENCES

Chinnappa, B. and Ramanna, R. (1997). An economic analysis of guava production. *Agric. Banker*, **11**(3): 202-207.

Ghulghule, J.N., Asmatoddin, M., Thombre, A.P. and Shinde, R.B. (2009). Resource use efficiency in fig production in Maharashtra. *Asian. J. Hort.,* **4** (1):158-160.

Koujalagi, K.B., Tikhanna, M.J. and Kunnal, L.B. (1992). Resourse use efficiency of Pomegranate fruits production. *Indian J. Agric. Mktg.*, **4**(1):185-189.

Kshirsagar, P.J. (2008). Production, processing and marketing of kokum in Konkan region of Maharashtra. M.Sc. (Ag.) Thesis, University of Agricultural Sciences, Dharwad, KARNATAKA (INDIA).

More, S.S. (1999). Economics of production and marketing of banana in Maharashtra State. M.Sc. (Ag.) Thesis, University of Agricultural Sciences, Dharwad, KARNATAKA (INDIA).

Rohile, V.V., Naik, V.G. and Talathi, J.M. (2006). Resource use efficiency in banana Production in Sindhudurg district. *Indian. J. Agric. Sci.*, **2**(1): 198-200.

Shivanand, M. (2002). Performance of banana plantations in north Karnataka-An economic analysis, M. Sc. (Ag.) Thesis, University of Agricultural Sciences, Dharwad, KARNATAKA (INDIA).

Sudersan, R. and Thanasekaran, M. (1984). Production and marketing of grapes in Madurai district. *Indian J. Mktg.,* **14** (1): 26-29.

Wagale, S.A., Talathi, J.M., Naik, V.G. and Malave, D.B. (2007). Resource use efficiency in Alphonso mango productionin Sindhudurg district. *Internat. J. Agric. Sci.*, **3** (1): 32-38.