Eco. Env. & Cons. 28 (October Suppl. Issue) : 2022; pp. (S118-S122)

ISSN 0971–765X

DOI No.: http://doi.org/10.53550/EEC.2022.v28i06s.020

An Empirical Assessment of Economic Efficiency of Okra in Middle Gujarat

Vikesh Rami[1], Mahida Navghan[1,2], Sakilahemad A. Saiyed[1], Khushvir Singh[2,3] and Hoilenting[2,4]

[1]College of Agriculture, Parul University, Vadodara 391 760, Gujarat, India
[2]Central Institute of Fisheries Education, Versova, Mumbai 400 061, M.SA., India
[3]Krishi Vigyan Kendra, Barnala, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana 141 004, Punjab, India
[4]Krishi Vigyan Kendra, Senapati, Hengbung 795 129, Manipur, India

(Received 16 January, 2022; Accepted 11 March, 2022)

ABSTRACT

In order to find out the efficiency of resources used by okra growers, taking gross income as dependent variable Cobb Douglas production function was employed. This analysis indicated that cost of seed, fertilizers, manure, irrigation, plant protection chemicals and tractor charges have exerted positively significant influence on the gross income. The value of co-efficient of multiple determinations (R^2) was 0.8827 which showed that 88.27 per cent variation in the gross income was explained by the independent variables included in the function. The sum of regression co-efficient was (0.8998) indicating decreasing return to scale.

Key words : *Economic efficiency of a crop, Okra, Middle Gujarat, India*

Introduction

India, with diverse soil and climatic conditions, produces many horticultural crops like fruits, vegetables, ornamental, medicinal, aromatic and spices crops. India is considered as basket of fruits and vegetables in the world. India's diverse climate ensures availability of all varieties of fresh fruits & vegetables. It ranks second in fruits and vegetables production in the world next to China (APEDA). It contributes 14 per cent to the world vegetable production (www.hortidaily.com).

In most developing countries of the world, agriculture as well as horticulture occupies an important place because of their major share in the economy in terms of their contribution to the national income and employment. In India, agriculture contributes 14 per cent to the gross domestic product and most of population in villages is still engaged in it. In India, the growth in agricultural and horticultural sector needs to be accelerated to generate more surpluses for export in order to earn foreign exchange.

Vegetables are rich and comparatively cheaper source of vitamins. Consumption of these items provides taste, palatability and fiber for digestion. Their consumption in plenty provides fair amount of protein and also play a key role in neutralizing the acids produced during digestion of fatty foods. Some of the vegetables are good sources of carbohydrates, proteins, vitamins A, vitamin B, vitamin C and minerals. As per dietician, daily requirement of vegetables is 75 to 125 g of green leafy vegetables, 85 g of roots and tuber and 85 g of other vegetables with other food. Vegetables are mostly consumed as fresh, cooked and in preserved forms.

Vegetables from different groups such as the solanaceous, cucurbitaceous, leguminous, cruciferous, root and leafy types are grown in tropical, subtropical and temperate regions. The major vegetables grown are tomato, onion, brinjal, potato, cabbage, cauliflower, okra and pea. Besides this, a large number of minor vegetables are also grown in different parts of the country.

The on-going economic reforms in India are likely to result in structural changes in agriculture particularly in favour of vegetable crops, which has great potential to increase farm income as well as nutritional status of the citizens of the nation. Vegetables play an important and significant role in the human diet by making it balanced and supply important natural elements that are generally deficient in other food materials, except fruits. Vegetables are excellent sources of proteins, vitamins, carbohydrates and minerals required for maintaining perfect health and curing of nutritional disorders.

Vegetables now-a-days, are considered as most profitable cash crop, and can be play an important role in raising economic status to small and marginal farmers as well as it provides source of many nutrients.

Okra is one of the world's oldest cultivated crops believed to have originated from India and it remains the most important vegetable grown throughout the country. The special taste and nutritional value of this crop had attracted more attention in many areas of the world. Okra is most popular in India, Nigeria, Pakistan, Cameroon, Iraq and Ghana. Though, it is virtually not grown in Europe and North America, yet, lot of people in these countries prefers this vegetable because of its vitamin content. It is a nutritious vegetable which plays an important role in meeting the demand for vegetables in our country where vegetables are scanty in the market.

Okra is good source of vitamin A, folic acid, carbohydrates, magnesium and potassium. Okra is a popular health food due to its high fibre content, vitamin C and minerals. Okra is also known for being high in antioxidants, and is also often eaten as part of a weight loss diet since it is both fat-free and cholesterol-free. Okra is also a good source of calcium. Greenish-yellow edible okra oil is obtained from okra seeds as it has a pleasant taste, odour and it is high in unsaturated fats such as linoleic acid. The oil content of some varieties of the seed can be quite high, about 40 per cent and oil yields from okra crops are also high.

Apart from the nutritive importance, okra has several important roles for human health point of view. It is a very good remedy for kidney stone. It contains high iodine, which helps to control goitre, while leaves are used in inflammation and dysentery. It fruits give vitality to the body and also help in cases of renal colic, leucorrhoea and general weakness. The oil is used in soap and cosmetic industry while protein is used for forfeited feed preparation. The crushed material is used to feed for cattle for more milk production and the fibre is utilized in jute, textile and paper industry.

Materials and Methods

A multistage stratified sampling was adopted as appropriate sampling procedure for the study.In the first stage,out of nine districts, Anand, Vadodara and Kheda districts were selected purposively. In second stage, it is decided to select two talukas from each selected district based on concentration of area of okra cultivation. Hence, total six talukas were selected. Further, in third stage, two villages were selected purposively from each selected talukas.

From each selected village, respondents were selected purposively by using proportionate sampling in such a way that total numbers of respondents are 20 at each taluka level. Thus, total 120(6x20) respondents of okra growers spread over 6 talukas of Anand, Kheda and Vadodara districts were comprised the ultimate sample size for the detailed inquiry.

Method of Analysis

The primary data on socio-economic characteristics, time series data, cost of production and marketing were compiled and analyzed systematically keeping in view the stipulated objectives of the study. The major analytical tools employed for the study included tabular analysis, percentage, ratios and production function analysis. The details of each of these tools are narrated as under.

Production Function Analysis

Resource use efficiency

The Cobb-Douglas production function was fitted to evaluate the resource use efficiency in the production of okra.

The general form of production function used is as follows:

$$Y = a.xi^{bi}.e^{u} \quad .. (1)$$

The specific form of production function is as follows:

$Y = a \bullet x1^{b1} \bullet x2^{b2} \bullet x3^{b3} \bullet x4^{b4} \bullet x5^{b5} \bullet x6^{b6} \bullet e^{u}$ .. (2)

The equation (2) was transformed into log linear form and the parameters wereestimated by using the ordinary least square method.

log Y = log a + b1 log x1 + b2 log x2 + b3 log x3 + b4 log x4 + b5 log x5 + b6 log x6 + log x7+ Ut

Where,

Y = Gross income of okra (Rs/ha)
a = Intercept
x1 = Cost of seed (Rs/ha)
x2 = Cost of fertilizer (Rs/ha)
x3 = Cost of irrigation
x4 = Cost of irrigation (Rs/ha)
x5 = Cost of plant protection chemicals (Rs/ha)
x6 = Tractor charges (Rs/ha)
$_{x}7$ = Labour charges (Rs/ha)

b1, b2,…, b7 = Regression coefficients (output elasticity of respective xi inputs)

$\sum_{i=1}^{n} bi$ = Return to scale and

Ut = Error term with usual assumptions

The Cobb-Douglas production function was employed in the present study as it is widely used because it gives the best fit, the regression coefficients are the elastic and used to measure the rate of return to scale which is the measure of a firm's success in producing maximum output from a set of inputs. A criterion to return to scale is as follows:

ΣEp > 1 : Increasing returns to scale
ΣEp = 1 : Constant returns to scale
ΣEp < 1 : Decreasing returns to scale

Marginal Value Product

The regression coefficients of inputs obtained were used to calculate marginal value products (MVP) at their geometric mean.

$$MVP(xi) = bi \frac{\bar{Y}}{\bar{X}}$$

Where,

Y = Geometric mean of output (Y)

X = Geometric mean of respective inputs (xi)

bi = Regression coefficient associated with the xi input

MVP in relation to factor costs

The basic criterion of an efficient resource use is that the MVP of the input just cover the factor cost, that is MVPXi = PXi. Hence, for evaluating the efficiency of resource use the ratio of marginal value product for different factors to their respective factor cost was estimated.

If the marginal contribution of one unit of input is greater than the price of the input, then the farmers is said to be allocating the resources inefficiently and as such there is further scope for allocating more unit of that particular input. If the marginal contribution is negative, then the farmers are said to be using the input excessively so the fixed resources are no longer responsive to the variable input applied. The criterion for determining optimality of resource use is as follows,

MVP/MFC > 1 : Under utilization of resources
MVP/MFC = 1 : Optimal use of resources
MVP/MFC < 1 : Over utilization of resources

Results and Discussion

Production Function Analysis

It is difficult to estimate efficiency of the farms without knowledge of the conditions under which the production is performed. To achieve maximum, the farmers have to be price-responsive. Comparison of output in relation to the level of inputs used will reveal the true picture of efficiency. The studies on efficiency have shown that it is possible to raise the productivity of crop without actually raising the input application. The corrective steps undertaken to mitigate the reasons for the low efficiency of the farmers will help them in long run to achieve higher productivity. As such the production function approach was used to find out the productivity of resources used for okra production. For this purpose, the Cobb-Douglas form of production function was estimated taking gross income as dependent variable, and cost of seed (X_1), cost of fertilizer (X_2), cost of manure (X_3), cost of irrigation (X_4), cost of plant protection chemicals (X_5), tractor charges (X_6) and labour cost (X_7) as independent variables.

A perusal of Table 1 indicates that regression coefficients of seeds (0.2542), fertilizers (0.1557), irrigation (0.1937) and tractor charges (0.0455) were statistically significant at 1 per cent level while that of manures (0.1246) and plant protection chemicals

(0.1408) was significant at 5 per cent level. It implies that one per cent investment increase in the use of these inputs *viz.*, seed, fertilizers, irrigation and tractor charges will result in increase of 0.2542, 0.1557, 0.1937 and 0.0455 per cent in the gross income of okra respectively. The regression coefficient of labour was negative and statistically not significant. In other words, it did not have a significant impact on the gross income of okra.

The sum of the elasticity coefficient was 0.8995, which is less than one which indicated a decreasing return to scale. In other words, sample farmers were observed operating in the second zone of production. The value of the coefficient of multiple determination (R^2) was estimated to be 0.8827 which indicated that 88.27 per cent of the total variation in the income from okra production was explained by identified explanatory variables included in the function. The results reported by Sankhe *et al.* (2008); Sheikh *et al.* (2014) and Priscilla and Singh (2016) were closer to these findings.

Resource use efficiency in okra production

The marginal value product (MVP) of a particular resource represents the expected addition to the gross income caused by an addition of one unit of that resource, while other inputs are held constant. For evaluating the efficiency of resource use, the ratio of the marginal value products for different factors to their respective factor costs were estimated for okra. Allocative efficiency (MVP/FC ratio) more than 1 indicates underutilization of particular resource and scope to increase its application till the ratio reaches to one. The estimated marginal value products (MVP), factor costs and their ratio for okra was computed and the results are given in Tables 2.

The data furnished in the Table 2 reveal that the MVP/FC ratio was the highest in case of fertilizers (3.37) followed by seed (3.36), plant protection chemicals cost (2.79) and manure (2.27). This indicates that an addition of one rupee in fertilizers, seed, plant protection chemicals cost, manure and tractor charges would yield return of Rs.3.37, 3.36, 2.79, 2.27 and 1.65 respectively.

Conclusion

The regression coefficients of seeds (0.2542), fertilizers (0.1557), irrigation (0.1937) and tractor (0.0455) were statistically significant at 1 per cent level, while that of manures (0.1246) and plant protection chemicals (0.1408) was significant at 10 per cent level. It

Table 1. Production Elasticity estimation from the production function of okra

Sr. No.	Variables	Production Elasticities(bi)
1	X_1= Seed (Rs/ha)	0.2542**(0.0896)
2	X_2= Fertilizers (Rs/ha)	0.1557**(0.0459)
3	X_3= Manure (Rs/ha)	0.1246*(0.0520)
4	X_4= Irrigation (Rs/ha)	0.1937**(0.0648)
5	X_5= Plant Protection Chemicals (Rs/ha)	0.1408*(0.0585)
6	X_6= Tractor charges (Rs/ha)	0.0455**(0.0154)
7	X_7= Labour cost (Rs/ha)	-0.0150(0.0219)
8	a=Intercept	1.8500
9	R^2=Coefficient of multiple determination	0.8827
10	Óbi=Sum of elasticity	0.8998
11	n = Number of farms	120

Note: Figures in the parentheses indicate standard error of corresponding elasticity
**Significant at 1 per cent level
* Significant at 5 per cent level

Table 2. Resource use efficiency in okra production

Resources	MVP	MFC	MVP/MFC Ratio	Level of resource use
Seed (X_1)	3.36	1.00	3.36	Under Utilization
Fertilizers (X_2)	3.37	1.00	3.37	Under Utilization
Manure (X_3)	2.27	1.00	2.27	Under Utilization
Plant Protection Chemicals (X_4)	2.79	1.00	2.79	Under Utilization

implies that one per cent increase in the use of these inputs *viz*., seed, fertilizers, irrigation and tractor charges will result in increase of 0.2542, 0.1557, 0.1937 and 0.0455 per cent in the gross income of okra respectively. The regression coefficient of labour was negative and statistically not significant. In other words, it did not have a significant impact on the gross income of okra.

The value of the coefficient of multiple determination (R^2) was estimated to be 0.8827 which indicated that 88.27per cent of the total variation in the income from okra production was explained by identified explanatory variables included in the production function analysis.

The sum of the elasticity coefficient was 0.8998, which is less than one indicated a decreasing return to scale. In other words, sample farmers were observed operating in the second zone of production.

The MVP to MFC ratio of seed (3.36), fertilizers (3.37), manure (2.27), tractor charges (1.65) and plant protection chemicals cost (2.79) was more than one indicating under utilization of these resources in the cultivation of okra in the study area. It implies that farmers have the opportunity to increase the yield of okra by increasing the use of these inputs.

References

Bansal, R. K. 2015. An economic analysis of marketing cost, price spread and marketing efficiency of potato in middle Gujarat. *International Journal of Humanities and Social Sciences*. 4 (3) : 21-26.

Goni, M., Umar, A. S. S. and Usman, S. 2013. Analysis of resource-use efficiency in dry season vegetable production in Jere, Borno State, Nigeria. *Journal of Biology, Agriculture and Healthcare.* 3: 8–24

Karthick, V., Alagumani, T. and Amarnath, J. S. 2013. Resource use Efficiency and Technical Efficiency of Turmeric Production in Tamil Nadu - A Stochastic Frontier Approach. *Agricultural Economics Research Review*. 26 (1) : 109-114.

Khatri, R. T., Mistry, H. H. and Patel, K. S. 2011. Resource use efficiency of important vegetables in Chorayasitaluka of south Gujarat. *International Research Journal ofAgricultural Economics and Statistics*, 2 (1): 42-45.

Kshirsagar, P. J., Talathi, J. M. and Wadkar, S. S. 2016. Resorce use efficiency of bitter gourd in Konkan region (M.S.). *The Asian Journal of Horticulture*. 11(2): 401-407.

Lokapur, S., Kulkarni, G. N., Gamanagatti, P. B. and Gurikar, R. 2014. Resource use efficiency of major vegetables in Belgaum district in Karnataka. *International Research Journal of Agricultural Economics and Statistics*. 5 (1) : 108-110.

Priscilla, L. and Singh, S. P. 2016. Resource use efficiency in vegetable production in Manipur state. *International Journal of Basic and Applied Agricultural Research.* 14 (1) : 1-5.

Sankhe, N. K., Talathi, J. M., Naik, V. G. and Torane, S. R. 2008. Resource productivity and profitability of little gourd [*Cocciniacordifolia* (Voigt.)L.] in Raigad district of Maharashtra. *Agricultural Update*. 3 (3&4): 273-279.

Sheikh, S., Chourad, R., Amarapurkar, S. and Kondaguri, R. 2014. Resource use efficiency of turmeric cultivation under conventional and modern methods in Northern Karnataka. *Research Journal of Agricultural Economics and Statistics*. 5 (2): 133-138.

Sidhu, R. S., Sidhu, M. S. and Singh, J. M. 2011. Marketing efficiency of green peas under different supply chains in Punjab. *Agricultural Economics Research Review*. 24 (2): 267-273.