Economic Affairs, Vol. 68, No. 02, pp. 1129-1134, June 2023
DOI: 10.46852/0424-2513.2.2023.19

AESSRA

Research Paper

Assessment of Cost of Cultivation, Resource Use Efficiency and Constraints in Cumin Production in Jodhpur District of Rajasthan

Uttam Chand[1], M. Anoop[2*] and Avdhesh Sharma[3]

[1]Office of the Assistant Director of Horticulture, Department of Horticulture, Rajasthan, Barmer, India
[2]Department of Agricultural Economics, Banaras Hindu University, Varanasi, India
[3]Narayan Institute of Agricultural Sciences, GNSU, Sasaram, Bihar, India

[*]Corresponding author: anoopmangalasseri@gmail.com (**ORCID ID:** 0000-0003-0846-6385)

Received: 16-01-2023 **Revised:** 23-05-2023 **Accepted:** 01-06-2023

ABSTRACT

Cumin is one of the most popular seed spice crops of India. Present paper looks into the cost of cultivation, efficiency of use of resources and the constraints in cumin production in Jodhpur district of Rajasthan. Using CACP cost concepts, the average cost of cultivation (C_3) per hectare of cumin was found as ₹ 46232.21. To estimate resource use efficiency, a log-linear (Cobb-Douglas) form of production function was used. Inputs like human labour, plant protection chemicals, and manure were found underutilized. Poor economic conditions of the farmers were found as a prime constraint. Lack of improved varieties of cumin seed was another major constraint faced by the respondents. The study emphasised on the need for institutional support to address capital constraints of farmers, lack of quality seeds, and lack of regulated markets.

HIGHLIGHTS

- Average cost of cultivation (C_3) of Cumin in Jodhpur was found as ₹ 46232.21/ha.
- Inputs like human labour, plant protection chemicals and manure were found underutilized.

Keywords: Cost of Cultivation, Cumin, Resource Use Efficiency

Cumin (*Cuminum cyminum*) is a common spice that has been used for ages in many different cuisines all over the world. It is indigenous to the Mediterranean region and a member of the family Apiaceae. Cumin seeds are well known for their distinctive aroma and warm, earthy flavour, which provide a variety of foods depth and richness. These tiny, elongated seeds are versatile and simple to use in cooking because they may either be used whole or processed into a powder. Cumin has become a mainstay in kitchens all over the world thanks to its distinct flavour and a host of health advantages. It is an essential component in many classic and modern recipes. It also has medicinal properties such as digestive, carminative, uterine & nerve stimulant, astringent and anti-inflammatory (Ranjeetha *et al.* 2022). It is crucial to remember that cumin production might change from year to year depending on a number of variables including weather, agricultural practises, and consumer demand.

The area under cumin cultivation in India is more than 10 lakh hectare. India is the largest producer as well consumer with about 75 percent share in global production followed by Syria, Iran and Turkey. In Rajasthan, cumin is being cultivated in 676240 ha (65.78 percent share of total area under

How to cite this article: Chand, U., Anoop, M. and Sharma, A. (2023). Assessment of Cost of Cultivation, Resource Use Efficiency and Constraints in Cumin Production in Jodhpur District of Rajasthan. *Econ. Aff.*, **68**(02): 1129-1134.

Source of Support: None; **Conflict of Interest:** None

cumin in India) with production of 378654 tonnes (54.04 percent of total production). Western region of Rajasthan is most prominent in cumin cultivation. Jodhpur district is the leading producer of cumin followed by Jalore and Barmer districts.

Studying the cumin crop in the context of Rajasthan is crucial since it is a key cash crop farmed in much of the state and supports a sizable portion of the population despite climate instability and volatility. With correct use of the existing resources, Jodhpur has a significant potential to boost the production of the cumin crop due to the advantageous and ideal climate conditions for its cultivation. Reduced cultivation costs and higher returns will result from increased per-unit productivity and efficient resource usage. With this background, the present study is looking into the cost and return in cumin production, the efficiency of resource use, and the major constraints faced by cumin farmers in Jhodhpur district.

MATERIALS AND METHODS

The study is based on primary data. Data regarding cost of cultivation, resource use pattern and constraints were collected from the respondent farmers through personal interview method with standardized schedule. A sample of 30 farmers from Jodhpur district, Rajasthan was taken for the study. Multi-stage sampling was used for the selection of respondent farmers. Based on the higher area under cumin, Jodhpur district was selected. The cost of cultivation of cumin was calculated to examine the cost incurred on different inputs during the production and the profitability of cumin production in the study area. Cost of cultivation was worked out by using CACP cost concepts such as Cost A_1, Cost A_2, Cost B_1, Cost B_2, Cost C_1, Cost C_2 and Cost C_3.

Different income measures were calculated to analyse farm profitability and the financial performance of the farmers. Following income measures were calculated:

Gross income (GI) = ($Q \times P$)

Where, Q = Quantity of product and P = Price of product

Returns over variable cost (RVC) = Gross income – Cost A_1

Farm business income (FBI) = Gross income – Cost A_2

Net income (NI) = Gross income – Cost C_3

Returns per rupee (RPR) = Gross income/Total cost (cost C_2)

To estimate resource use efficiency, log-linear (Cobb-Douglas) form of production function was fitted to the data by taking gross income as a dependent variable. Human labour, machine labour, fertilizers, plant protection measures, irrigation charges, and manure were taken as independent variables.

$$Y = aX_1^{b1} X_2^{b2} X_3^{b3} X_4^{b4} X_5^{b5}$$

Where, Y = Gross return per hectare in ₹, a = Constant representing intercept of the production function, X_1 = Human Labour use per hectare in ₹, X_2 = Machine use per hectare in ₹, X_3 = Fertilizer use per hectare in ₹, X_4 = Plant protection chemical in ₹, X_5 = Irrigation charges per hectare in ₹ and $b1$, $b2$, $b3$, $b4$, and $b5$ are the regression coefficients of the respective resource variables.

The regression coefficients obtained from this function directly represent the elasticity of production, which remains constant throughout the relevant ranges of inputs. The sum of coefficients that is 'b_i' indicates the nature of returns to scale.

To examine the efficiency of resource use, the ratio of marginal value product (MVP) to the marginal factor cost (MFC) for every significant input was computed. Marginal Value Product was obtained by multiplying marginal physical product (MPP) with product price per unit. Since all the variables in the regression model were measured in monetary values, the slope coefficient of those explanatory variables in the function represented the MVPs, which were calculated by multiplying the production co-efficient of given resources with the ratio of the geometric mean of gross returns to the geometric mean of given resources. The marginal value productivity of the i^{th} input was measured by using the following formula:

$$MVP = b_i \frac{\overline{Y}}{\overline{X}_i}$$

Where, b_i = Regression coefficient of i^{th} factor, $\overline{Y}$ = Geometric mean of gross returns (₹), $\overline{X}_i$ = Geometric mean of i^{th} input (₹)

To test whether resources are underutilized or over-utilized, the MVP/MFC ratio was tested for its equality to one. Since the inputs have been measured in monetary terms, the marginal cost of all factors (MFC) was considered as ₹ 1. If the MVP/MFC ratio is greater than 1, it indicates that the resources are underutilized and can be further used in the production process. A ratio of less than 1 indicates that the resources are over-utilized and a reduction in their present level of use will be profitable. The resources are said to be used efficiently if the MVP=MFC.

Garrett's ranking technique was used to organize the farmers' responses on constraints in seed spices production and marketing. Garrett's formula for converting ranks into a percent is as follows.

$$\text{Percent position} = 100 \times (R_{ij} - 0.5)/N_j$$

Where, R_{ij} = Rank given for i^{th} factor by j^{th} individual and, N_j = Number of factors ranked by j^{th} individual.

RESULTS AND DISCUSSION

Cost of cultivation and returns: Average cost of cultivation (C3) per hectare of cumin was found as ₹ 46232.21. It was ₹ 39977.16 for small farmers, ₹ 44941.63 for medium-sized farmers and ₹ 49263.32 for large-sized farmers (Table 1). It was lowest for small, followed by medium and large sized farmers.

Operational cost of the farm includes the cost incurred in the operation and management of the working capitals. Cost of human labour, machine labour, seed, fertilizers & manures, irrigation charges and interest on working capital comes under the operational costs. The operational cost of cumin cultivation per hectare on an overall basis was ₹ 32235.33 (69.61 percent of the total cost). The overhead cost was found less than the operational cost in all of farms size groups. Similar result was found in studies from Banaskantha, Gujarat (Salve *et al.* 2017). The details of different cost components in the cultivation of cumin in the study area are presented in table 2. It was found that among the various components of operational cost incurred in the cultivation of cumin, human labour was the major component of expenditure on sample farms. It accounted in descending order from 30.96 percent for small farmers and 29.87 percent for medium farmers to 28.92 percent for large sized farmers. The overall irrigation charges accounted for 9.49 percent of the total cost, its share was higher in large farmers (9.99 percent) followed by the small (9.05) and medium farmers (8.38 percent).

The overhead cost is the cost incurred in the operation and management of fixed resources. Among the various components of overhead costs, rental value of owned land was the major component of overhead costs. Overhead cost was found less than the operational cost in all farm size groups. Overhead cost also was found higher in the case of large farmers, compared to small and medium farmers.

The overall gross income was found as ₹ 131626.7 per hectare. It varied from ₹ 98742.86 per hectare for small farmers to ₹ 143058.8 for large farmers. The gross return was found increasing with increase in the size of the farm. Gross income was calculated by multiplying output quantity with price of the product. The mean market price of the product at the time of harvesting was taken as the price of the product. The calculated gross income value was in line with Meena *et al.* (2020). Net income was calculated by subtracting cost C_3 from the gross income. Returns over the rupee (RPR) tells

Table 1: Cost of cultivation of cumin (₹/ha)

Particulars	Small farmer (<2 ha)	Medium farmer (2-4 ha)	Large farmer (>4 ha)	Over All average
Cost A_1	27230.29	31419.33	34584.24	32235.33
Cost A_2	27658.86	31419.33	34819.53	32468.67
Cost B_1	27929.93	32272.33	35634.11	33164.11
Cost B_2	33358.5	37272.33	40869.41	38397.45
Cost C_1	33187.07	38370.67	42298.82	39387.11
Cost C_2	38615.64	43370.67	47534.11	44620.45
Cost C_3	39977.16	44941.63	49263.32	46232.21

Table 2: Various components of the operational and overhead costs incurred in the cultivation of cumin (₹/ha) in Jodhpur district

Particulars	Small farmer (<2 ha)	Medium farmer (2-4 ha)	Large farmer (>4 ha)	Over All average
(a) Operational cost				
Human labour	12335.7 (30.96)	13575 (29.87)	14249.5 (28.92)	13668.0 (29.51)
Machine labour	4642.8 (11.65)	5558.3 (12.23)	5847.0 (11.86)	5508.3 (11.89)
Seed	4885.7 (12.26)	4841.6 (10.65)	5151.7 (10.45)	5027.6 (10.85)
Fertilizers	1497.1 (3.75)	1866.6 (4.10)	1941.4 (3.94)	1822.8 (3.93)
Manure	2642.8 (6.63)	4166.6 (9.16)	5588.2 (11.34)	4616.6 (9.97)
Plant protection chemicals	3514.2 (8.82)	3766.6 (8.28)	2423.3 (4.91)	3004.6 (6.48)
Irrigation charges	3608.57 (9.05)	3810 (8.38)	4924.7 (9.99)	4394.6 (9.49)
Miscellaneous	481.7 (1.20)	536 (1.17)	760.7 (1.54)	650.6 (1.40)
Interest on working capital	2585.7 (6.48)	2821.6 (6.20)	3219.4 (6.53)	2992 (6.46)
Total operational cost	27230.29 (68.34)	31419.33 (69.13)	34584.24 (70.19)	32235.33 (69.61)
(b) Overhead cost				
Rental Value of Owned Land	5000 (12.54)	5000 (11.00)	5000 (10.14)	5000 (10.79)
Rent Paid for Leased-in-Land	428.5 (1.07)	0 (0)	235.2 (0.47)	233.3 (0.50)
Land Revenue, Taxes, Cesses	30 (0.07)	30 (0.06)	30 (0.06)	30 (0.064)
Depreciation	1537.8 (3.85)	3500 (7.70)	5233.4 (10.62)	4024.4 (8.69)
Interest on Fixed Capital	699.6 (1.75)	853 (1.87)	1049.8 (2.13)	928.7 (2.00)
Management cost	1355.1 (3.40)	1560.6 (3.43)	1720.2 (3.49)	1603.1 (3.46)
Total overhead cost	6996.42 (17.55)	8530 (18.77)	10498.76 (21.30)	9287.8 (20.05)

Note: *Figures in parenthesis indicate percent to the total cost.*

Table 3: Average return from cultivation of cumin (₹/ha)

Particulars	Small farmer (<2 ha)	Medium farmer (2-4 ha)	Large farmer (>4 ha)	Over All average
Gross income (₹)	98742.86	137600	143058.8	131626.7
Net income (₹)	58765.7	92658.37	93795.5	85394.45
Cost of production (₹/ quintal)	5324.06	4194.34	4420.46	4586.08
Net income per quintal	7617.77	8619.38	8392.22	8304.16
Returns over variable cost	71512.57	106180.7	108474.6	99391.33
Farm business income (FBI)	71084	106180.7	108239.3	99158
Returns per rupee (RPR)	2.55	3.17	3.00	2.94

how much return we are getting by investing one rupee. It is also known as the benefit-cost (B-C) ratio. Average returns over rupee for one hectare cumin crop was ₹ 2.94. Kumar (2017) had shown that in Gujarat, the cost of cultivation of cumin during 2015-16 was ₹ 56749 per hectare and gross income and net income were ₹ 96427 and ₹ 39678 per hectare respectively. Compared to this, both the cost and return were found higher in Jodhpur in the present study. It was also seen that the per hectare net return was highest in the case of large farmers (₹ 93795.5), followed by medium (₹ 92658.37) and small farmers (₹ 58765.7).

Resource use efficiency: The independent variables included in the regression model were human labour, machine labour, fertilizers, plant protection measures, irrigation charges, and manure. The R^2 value was found to be 0.8542. It indicates that 85.42 percent of the variation in gross return was explained by the independent variables used in the model. The value of regression coefficients of human labour, plant protection chemicals, and manure were found positive and significant (Table 4).

Table 5 presents the ratio of marginal value product (MVP) to their marginal factor cost for

the significant resources in the production of cumin. The explanatory variables such as human labour, plant protection chemicals and manure showed their MVP/MFC ratios as greater than unity. This indicates that these variables have been underutilized and have significant potential for further use in the production process. Additional ₹ 5.09, ₹ 38.40 and ₹ 6.70 will be added to the returns on spent of every additional rupee for human labour, plant protection chemicals and manure respectively. There is much scope for improving the returns from cumin crop in the study area by efficient use of resources.

Table 4: Resource productivity in cumin cultivation in Jodhpur

Sl. No.	Variables	Regression coefficients (b_i)	T value
1	Human Labour	0.53559	2.2049**
2	Machine labour	-0.22256	-1.2812
3	Fertilizer	-0.01311	-0.1147
4	PPC	0.311451	3.20153**
5	Irrigation	-0.03169	-0.2328
6	Manure	0.211001	3.2437**
7	R^2	0.854272	

Note: ***Significant at 5 percent level.*

Table 5: Resource use efficiency in cumin production in Jodhpur

Significant Variables	MVP	MFC	MVP/MFC
Human Labour	5.09	1	5.09
Plant Protection chemicals	38.40	1	38.40
Manure	6.70	1	6.70

Constraints in production and marketing of cumin crop: Cumin is very sensitive to fluctuations in climate and cloudy weather after flowering. It is important to understand various constraints faced by farmers in production and marketing of cumin. Pagaria & Sharma (2019) in their study conducted in Barmer district (where geographical and socio-economic conditions are almost same as Jodhpur district) found that lack of suitable seed drill for cumin sowing (shallow) and timely availability of improved seed variety resistant to wilt are the major constraints faced by the farmers. Similarly, the present study found that the poor economic conditions of the farmers was the prime production constraint. This was hampering the farmers in making adequate capital investment. Lack of improved varieties of cumin seed verified by a government agency was second most ranked constraint by the respondents. Thus, as they were not able to get good seeds, often they were not able to achieve maximum returns from other inputs applied. Also, a large number of farmers were not aware of seed treatment- which can help to protect the crop from many pests and diseases.

Table 6: Constraints in production and marketing of cumin crop

Sl. No.	Constraints	Mean score	Rank
(A) Production constraints			
1	Poor economic condition (Lack of capital)	76.03	I
2	Lack of improved seed (Govt verified)	70.4	II
3	Lack of resistant variety to major diseases	62.46	III
4	Lack of awareness about seed treatment	55.6	IV
5	Lack of improved machineries for cultivation	55.3	V
6	Lack of awareness about control measures for major diseases	54.36	VI
7	Poor texture of soil	46.33	VII
8	Lack of timely availability of fertilizers	43.13	VIII
9	High cost of fertilizers	41.96	IX
10	Non availability of timely labour	33.9	X
11	Less availability of electricity for irrigation	28.1	XI
(B) Marketing Constraints			
1	Lack of regulated market	62.23	I
2	Lack of proper market information	59.16	II
3	Lack of declaration of Minimum support prices	56.5	III
4	Lack of transportation facility	53.83	IV
5	Lack of processing units	46.36	V
6	Lack of proper storage structures	39.93	VI
7	Lack of ingredient estimations facility in seeds	32.23	VII

Lack of a regulated market was creating difficulties in marketing activities of cumin in the study area. This was the major marketing constraint faced by the farmers. There were only few regulated markets in the selected district. Lack of proper marketing information was the second important marketing constraint faced by the cumin growers. Non – declaration of minimum support price was ranked third by the respondents. Lack of facilities

for transportation, storage and ingredient estimation were the other major marketing constraints being faced by cumin farmers in Jodhpur district.

CONCLUSION

Dry and arid climate of Rajasthan favours the cultivation of various seed spices, and cumin is a major crop among them. Overall average cost of cultivation (C_3) per hectare of cumin was ₹ 46232.21. Average returns over per rupee for one hectare cumin crop was found ₹ 2.94. It can be concluded that because of the higher B-C ratio of cumin and favourable climate with higher water use efficiency, cumin cultivation is profitable for farmers. It was seen that cost of cultivation as well as returns (gross and net income) and B-C ratio tend to vary significantly among small, medium and large farmers. There is great potential to increase the productivity of cumin in Jodhpur through adoption of improved farm practices with proper use of the available resources. Increase in the use of inputs like human labour, plant protection chemicals and manure- which were found as underutilized, can improve the farm productivity and profitability of farmers. Various production and marketing constraints can be overcome by the active participation of government extension agencies and NGOs in the rural areas. Incentive given by central government in the form of cash (PM Kisan Samman Nidhi Yojana) is a right step in this direction as it will help them to purchase inputs for crop production. Establishment of regulated markets in the district will help farmers to save transportation cost incurred in taking the product to distant markets. Traders and commission agents take advantages of not having minimum support price on cumin by paying only low price for the product. Announcement of MSP for spices may provide some help in getting better price.

REFERENCES

Kumar, D.V. 2017. Cumin: Supply Chain Constraints and Prospects. https://www.nabard.org/auth/writereaddata/tender/0501180716Rural%20Pulse%20-%20XXIII.pdf

Meena, M., Lal, G., Khan, M., Meena, R.S., Meena, R.D., Meena, S.S. and Mishra, B.K. 2020. Cumin and coriander cultivation: An economic analysis. *Int. J. Seed Spices.*, **10**(2): 74–79.

Pagaria, P. and Sharma, S. 2019. Production and marketing constraints for cumin seed in Barmer District. *Int. J. Curr. Micr. Appl. Sci.*, *8*(03): 1828–1832.

Ranjeetha, R., Veeresh., Nagendrraprasad, H. and Pasha, N. 2022. Nutritional & medicinal properties of important seed spices. http://www.fnbnews.com/Spices/nutritional--medicinal-properties-of-important-seed-spices-66485

Salve, P.D., Patel, R.R., Patel, R.M. and Patel, A.S. 2017. Cultivation and production cost of cumin in Banaskantha district of north Gujarat. *Int. Res. J. Agric.l Econ. and Stat.*, **8**(1): 138–142.