International Journal of Agriculture Sciences
ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 10, Issue 12, 2018, pp.-6413-6416.
Available online at https://www.bioinfopublication.org/jouarchive.php?opt=&jouid=BPJ0000217

Research Article

ASSESSMENT OF PRODUCTION COST AND RESOURCE ALLOCATION IN CUMIN PRODUCTION IN BANASKANTHA DISTRICT

PATEL PINKAL[1], BHANUPRIYA CHOYAL*[1], JOSHI A.R.[1] AND THAKAR K.P.[2]
[1]College of Agribusiness Management, C.P. College of Agriculture, Sardarkrushinagar Agricultural University, Dantiwada, 385 506, Gujarat, India
[2]Department of Agricultural Economics, C.P. College of Agriculture, Sardarkrushinagar Agricultural University, Dantiwada, 385 506, Gujarat, India
*Corresponding Author: Email - bhanupriya4.choyal@gmail.com , pinkalpatel73@gmail.com

Received: June 16, 2018; Revised: June 23, 2018; Accepted: June 24, 2018; Published: June 30, 2018

Abstract: India is the homeland of spices since ancient times. It is the largest producer, consumer and exporter of spices, with 48 percent share by volume and 43 percent share by value, in the world. India's contribution in world cumin production is about 70 percent followed by countries as Syria with 12 percent, Iran with 8 percent, Turkey with 6 percent. India's major export destinations for cumin are Vietnam, USA, UAE, UK, Malaysia, Brazil, Egypt, Bangladesh, Saudi Arabia, Nepal and Sri Lanka. Gujarat and Rajasthan are the leading states contributing more than 98 percent in cumin production. In Gujarat, Surendranagar, Banaskantha and Patan are three dominating districts in cumin production accounting for around 72 percent of total production in the state. The study was conducted to work out the resource allocation, cost of cultivation and net income from cumin production in Banaskantha district of Gujarat. In order to justify the objectives of the study, a multistage sampling technique was employed, wherein; in the first stage; two talukas *viz*., Tharad and Vav dominating in cumin cultivation were purposively selected. Further, at the next stage, four villages from each taluka and fifteen farmers from each village were selected randomly; thus total 120 farmers were interviewed for the study. It was observed that the average total cost of cultivation per hectare of cumin was Rs.59320 and the average yield per hectare was 1253 kg. Further, the gross and net income per hectare was observed as Rs.111517 per hectare and Rs.62731 respectively per hectare for the year 2014-2015 on the sampled farms. The cost of cultivation of cumin was higher in case of small farmers as compared to medium and large farmers. However, gross and net income increased with increase in the size of the farms. The value of output elasticity ranged from 0.0469 with respect to human labour to 0.3062 for cost of manure. Further, the value of co-efficient of multiple determinations (R_2) was 0.8701 indicating that about 87 percent of the total variation in the gross income from cumin cultivation was explained by the independent variables included in the production function. As regards of MVP-FC ratio, it was found less than one in case of human labour. This indicated excessive utilization of this input and gross returns can be increased by reducing it.

Keywords: Cost of cultivation, Production, Resource allocation, Gross and Net income

Citation: Patel Pinkal, *et al*., (2018) Assessment of Production Cost and Resource Allocation in Cumin Production in Banaskantha District. International Journal of Agriculture Sciences, ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 10, Issue 12, pp.- 6413-6416.

Academic Editor / Reviewer: Dr Renu Agrawal

Introduction

Cumin, also known as jeera/zeera or comino, is the second most popular spice in the world after black pepper. It is botanically known as "*Cuminum cyminum*" and belongs to family apiece. Cumin is very pungent and aromatic and is used whole and/or ground. India is the homeland of spices since ancient times. It is the largest producer, consumer and exporter of spices, with 48 percent share by volume and 43 percent share by value, in the world. Gujarat is the second leading producer of spices after Andhra Pradesh in the country. Cumin (Jeera) is one of the major spices in the country with a share of 23.38 percent in total area and 11.11 percent in total production. It has pharmaceutical, nutraceutical, perfumery and cosmetic uses. India's contribution in world cumin production is about 70 percent followed by countries as Syria with 12 percent, Iran with 8 percent, and Turkey with 6 percent. Gujarat and Rajasthan are the leading states contributing more than 98 percent in cumin production.

Trend in Production

The area under cumin cultivation in India is 8.08 lakh hectares and production are 5.03 lakh tonnes in year 2015-16. The share of Gujarat in the total area and production was 36.55 percent and 59.80 percent, respectively, during 2015-16. The average productivity in Gujarat is 886 kg/ha compared to that of Rajasthan at 368 kg/ha and India (616 kg/ha).

The compound annual growth rates (CAGR) of area and production are 5.15 and 10.95 percent, respectively in Gujarat which is higher than Rajasthan and India. The share of Gujarat in the total area and production was 36.66 percent and 58.50 percent, respectively, during 2016-17, whereas, Rajasthan's share in the total area was highest in the country as 63.10 percent. However, it ranked second in total domestic production of cumin and contributed around 41.19 percent. Surendranagar, Banaskantha, Patan, Rajkot, Porbandar, Morbi and Ahmedabad are the major cumin seed producing districts in Gujarat

Export of Cumin from India

During 2016-17, our country's export of spices and related products was all-time high with 9.48 lakh tonnes valued at about Rs.17, 665 crores. Major seed spices in country's export basket are coriander, cumin, fennel, fenugreek and celery. The second most spice contributing significantly in country's export was cumin with an increase of 22 percent in volume and around 28 percent in value. During 2016-17, India exported around 1.19 lakh tonnes of cumin valued at about Rs. 1963 crore. Indian cumin seed has an edge over that of other countries like Syria and Turkey. India's major export destinations for cumin are Vietnam, USA, UAE, UK, Malaysia, Brazil, Egypt, Bangladesh, Saudi Arabia, Nepal and Sri Lanka.

Table-1 Details of cost of cultivation of cumin crop per hectare in Banaskantha district

Particulars	Small farmers			Medium farmers			Large farmers			Average farmers		
	Physical unit	Value (Rs.)	Percent to total cost	Physical unit	Value (Rs.)	Percent to total cost	Physical unit	Value (Rs.)	Percent to total cost	Physical unit	Value (Rs.)	Percent to total cost
Hired labour (man days)	34.06	5598	9.00	32.09	4813	7.67	32.38	4857	8.76	32.37	4871	8.49
Bullock labour (pair days)	1.27	3045	4.90	0.92	3282	5.23	0.27	2979	5.37	0.46	3052	5.32
Seedlings/plants	22.10	4207	6.76	17.01	3836	6.11	11.29	2757	4.97	12.96	3054	5.15
Manure (trolley)	-	4801	7.72	-	4343	6.92	-	4407	7.94	-	4405	7.68
Fertilizer	-	5868	9.43	-	6219	9.91	-	6115	10.52	-	6132	10.34
Irrigation	-	8362	13.44	-	8847	14.10	-	7814	14.08	-	8072	14.07
Crop protection	-	3714	5.97	-	4352	6.93	-	4665	8.03	-	4562	7.69
Miscellaneous cost	-	3915	6.29	-	3945	6.28	-	3428	6.18	-	3563	6.21
Depreciation	-	901	1.45	-	919	1.46	-	868	1.49	-	881	1.49
Interest on working capital	-	1886	3.03	-	1893	3.02	-	1722	3.10	-	1767	3.08
Cost A	-	42297	68.00	-	42449	67.63	-	41001	70.56	-	41379	69.76
Rental value own land	-	5797	9.32	-	7338	11.69	-	6250	11.27	-	6488	11.31
Interest on fixed capital	-	2070	3.33	-	1875	2.99	-	567	1.62	-	919	1.60
Cost B	-	50164	64	-	51662	82.31	-	47818	82.29	-	48786	82.24
Family labour (man days)	34.24	6386	10.27	35.97	5396	8.60	33.44	5007	9.02	34.06	5141	8.96
Cost C_1	-	56550	90.91	-	57058	90.91	-	52825	90.91	-	53928	90.91
Management cost (10% cost C_1)	-	5655	9.09	-	5706	9.09	-	5044	9.09	-	5217	9.09
Cost C_2	-	62205	100	-	62764	100	-	58108	100	-	59320	100
Production	-	-	-	-	-	-	-	-	-	-	-	-
Main product (kg.)	1220	106475	-	1235	108792	-	1260	112596	-	1253	111517	-

Objectives of the study

To work out the cost of cumin cultivation per hectare

To estimate the gross and net returns per hectare from cumin production

To analyse the resource use allocation in production of cumin

Methodology

In order to fulfill the objectives of the study, a multistage sampling technique was employed. In the first stage; two talukas *viz*., Tharad and Vav dominating in cumin cultivation were purposively selected for the study. At the next stage, four villages from each taluka and fifteen farmers from each village were selected randomly; thus, the total 120 farmers were interviewed for the study. The primary data from the farmers were collected through personal interview with the help of interview schedule regarding to the area under cumin cultivation, cost incurred for different inputs, cost of production, prices received the quantity sold, income earned *etc*. The statistical tools such as simple average, tabular analysis and cost concepts were used.

Economics of cumin cultivation

Cost of cultivation refers to the economic valuation of variable inputs and fixed inputs per unit area say per hectare.

[A] Cost concepts

The cost concepts used in the present analysis are those laid down in the farm management study.

Cost-A: It include

1 Value of hired human labour,
2 Value of hired bullock labour,
3 Value of owned bullock labour,
4 Value of tractor charges,
5 Value of seed/seedlings (Both farm produced and purchased),
6 Value of manure and cakes (Both farm owned and purchased),
7 Value of fertilizers,
8 Value of insecticides and pesticides,
9 Irrigation charges,
10 Depreciation on farm building and implements,
11 Interest on working capital, and
12 Other paid out expenses, if any.

Cost-B: It includes

Cost A + Rental value of owned land + Interest on value of owned fixed capital (excluding land).

Cost-C1: It includes

Cost B + Imputed value of family labour.

Cost- C2: It includes

Cost C1 + 10 percent of cost C1 (as managerial charges)

[B] Net return

Net return per hectare at the different costs concept has been worked by deducting the respective costs from the gross monitory returns per hectare.

[C] Resource Allocation

The production function approach was used to find out the resources used for cumin production. For this purpose, the Cobb-Douglas form of production function was estimated taking gross income as dependent variable, cost of human labour, bullock labour and tractor charges, cost of fertilizers, manures, seeds, irrigation and pesticides as independent variables.

Results and Discussion

Cost of cultivation for cumin:

The studies on cost of cultivation in an area, furnishes information on the relative profitability of cultivation of a crop as well as serve as a guide for better choice and combinations of farm inputs for maximizing returns. Generally, farmers do not take into account their fixed costs such as interest on owned fixed capital, depreciation use of own implements, farm yard manure and family labour in the total cost of production and thereby, they had relevance of Cost-A only, which includes only operational cost. However, in this study the Cost-A, Cost-B, Cost-C1 and Cost-C2 were estimated in cumin production for the Banaskantha district of north Gujarat [Table-1]. The average cost of cultivation of cumin was estimated at Rs. 59320 per ha. As regards of the contribution of inputs in average cost of cultivation; cost of irrigation contributed to around 14.07 percent to total cost, fertilizer accounted for 10.34 percent. The remaining cost was distributed among other input items such as hired labour, crop protection, manure, bullock labour, seed, and tractor charges and accounted for 8.49, 7.69, 7.68, 5.32 and 5.15 percent of the total cost respectively. The total cost of cultivation of cumin production was lowest as Rs. 58108 per hectare for large farmers as compared to small (Rs. 62205 per hectare) and medium farmers (Rs.59320 per hectare). It was observed that the share of family labour was higher around 10.27 percent in case of small farmers, while it was lower for medium farmers *i.e*., 7.67 percent.

Returns to cumin producers

In this study, the yield level ranged from 1220 to 1260 kg per hectare in the area.

The variation in the yield might be due to the different time of sowing, types of land and use of variety of seedlings. Higher yield level on large farms may be due optimum level of inputs utilized along with timely weeding operations, which affect the output to a greater extent, as compared to other farms. On an average, gross income per hectare came to Rs. 111517. It varied from Rs. 106475 per hectare for small farmers to Rs. 112556 per hectare for large farmers. The details of farmers' gross income and their net income from cumin production over different costs are presented by [Table-2]. It indicated that the gross income of large farmers was higher as Rs 112596 per ha compared to the small and medium farmers. Further, the net income over Cost- A was higher in case of large farmers as Rs.73595 per hectare. Moreover; net income Cost- B, Cost- C1, Cost- C2 was also higher in case of large farmers *i.e.* Rs.59771, Rs.54488 and Rs. 64778 per hectare respectively. It can be concluded that gross and net income increased with increase in the size of the farms.

Table-2 Gross and Net income from cumin cultivation over different costs of production (n=120 and income in Rs/ha.)

Particulars	Small farmers	Medium farmers	Large farmers	Average
	(Rs.)	(Rs.)	(Rs.)	(Rs.)
Gross income	106475	108792	112596	111517
N Net income over				
Cost-A	64178	66343	73595	70138
Cost-B	56311	57130	59771	57590
Cost- C1	49925	51734	54488	52197
Cost- C2	44270	46028	64778	62731

Resource Allocation

The production function approach was used to find out the resources used for cumin production. For this purpose, the Cobb-Douglas form of production function was estimated taking gross income as dependent variable, cost of human labour, bullock labour and tractor charges, cost of fertilizers, manures, seeds, irrigation and pesticides as independent variables. The output elasticities of resources used for cumin production obtained by the production function (intercept, co-efficient of multiple determination and returns to scale) for sampled farms is depicted in [Table-3]. It is inferred from the table that the elasticity of production was positive for all variables. Among the independent variables; production elasticity was positive *i.e.*, 0.3062 for bullock and tractor charges and highly significant at 1 percent level of significance. It simply indicated that one percent increase in the bullock and tractor charges would bring 0.3062 percent increase in the output of cumin. While in case of cost of plant protection, fertilizer and value of seed, bi was positive and significant at 5 percent level of significance showing positive effect on gross income of cumin. The value of output elasticity ranged from 0.0469 with respect to human labour to 0.3062 for manure.

Table-3 Production elasticity as estimated from cobb-douglas production function

SN	Variables	Production elasticity (bi)	P-value	Standard error
1	X_1= Cost of human labour (Rs.)	0.0469	0.3446	0.0505
2	X_2 =Bullock and tractor charges (Rs.)	0.3062**	0.0001	0.0752
3	X_3 = Cost of manures (Rs.)	0.0868	0.1380	0.0581
4	X_4 = Cost of fertilizer (Rs.)	0.1689*	0.0458	0.0836
5	X_5 = Value of seedlings (Rs.)	0.1142*	0.0266	0.0508
6	X_6 = Cost of irrigation (Rs.)	0.0981*	0.2457	0.0840
7	X_7 = Cost of plant protection (Rs.)	0.1285*	0.0269	0.0573
9	a = Intercept	1.5434		
10	R^2 = Co-efficient of multiple determination	0.8701		
11	Σbi's = Returns to scale	0.95074		
12	N = Number of farms	120		

** Significant at 5% level of significance, ** Significant at 1% level of significance*.

The value of co-efficient of multiple determinations (R2) was 0.8701 indicating that about 87 percent of the total variation in the gross income from cumin cultivation was explained by the independent variables included in the function.

Marginal Value Product (MVP)

The estimated MVP (marginal value products), factor costs and MVP-FC ratio for cumin are presented [Table-4]. The MVP/FC ratio was more than one and it was highest in case of bullock and tractor charges (11.19), followed by seed (4.17), cost of plant protection (3.14), cost of manures (2.20), irrigation (1.21). This indicated that an addition of one rupee in bullock and tractor charges would yield return of Rs. 11.19. The cost of human labour had an MVP-Factor Cost ratio of 0.53 indicates thereby that farmers would gain Rs. 0.53, if they apply an additional unit of labour worth Rs 1. The production function analysis gave statistically non-significant and positive value to the cost of human labour. The ratio of cost of human labour indicates excessive use of this resource. Cumin growers can increase gross returns by reducing cost of human labour. The ratio of inputs such as bullock and tractor charges, value of seed, cost of irrigation and manure explained underutilization of these inputs. Further, it can be concluded that gross returns from cumin cultivation can be increased by using more of these inputs.

Table-4 Marginal Value Products, Factor Costs and MVP-FC Ratio for cumin cultivation

Variables	Marginal value products (MVP)	Factor cost	Ratio of MVP to factor cost
X_1 = Cost of human labour (Rs)	0.53	1	0.53
X_2 = Bullock and tractor charges (Rs)	11.19	1	11.19
X_3 = Cost of manures (Rs)	2.20	1	2.20
X_4 = Cost of fertilizers (Rs)	3.09	1	3.09
X_5 = Value of seedlings (Rs)	4.17	1	4.17
X_6 = Cost of irrigation (Rs)	1.21	1	1.35
X_7 = Cost of plant protection (Rs)	3.14	1	3.72

Conclusion

Cost of cultivation and returns for cumin production

India is the largest producer as well as consumer of cumin and its contribution in world cumin production is about 70 percent. Gujarat and Rajasthan are the leading states contributing more than 98 percent in cumin production. As regards of the average cost of cultivation of cumin was estimated at Rs. 59320 per ha. Further, cost of irrigation contributed to around 14.07 percent to total cost, followed by cash expenditures on fertilizer which accounted for 10.34 percent. The other cash expenditure items were hired labour, crop protection, manure, bullock labour, seed, and tractor charges and accounted for 8.49, 7.69, 7.68, 5.32 and 5.15 percent of the total cost respectively. The total cost of cultivation of cumin production was lowest as Rs. 58108 per hectare for large farmers as compared to small (Rs. 62205 per hectare) and medium farmers (Rs.59320 per hectare). It can be concluded from the study that cost of production over Cost- A, Cost- B, Cost- C1 and Cost-C2 decreased with increase in the size of land holdings. The labour cost (family as well as hired labour) also decreased with increase in size of holdings as small farmers employed more labour for their farm operations whereas large farmers had to depend on farm mechanization for completing their farm operations in time. Further, the net income over Cost- A was higher in case of large farmers as Rs.73595 per hectare. Moreover; net income Cost- B, Cost- C1, Cost- C2 was also higher in case of large farmers *i.e.* Rs.59771, Rs.54488 and Rs. 64778 per hectare respectively. It can be concluded that gross and net income increased with increase in the size of the farms.

Resource allocation for cumin production

There is an ample potentiality of raising production through adoption of improve technologies along with proper utilization of resources. The production function approach was used to find out the resources used for cumin production. It is inferred from the table that the elasticity of production was positive and among the independent variables; production elasticity was positive for bullock and tractor charges and highly significant at 1 percent level of significance. Elasticity of production indicated that one percent increase in the bullock and tractor charges would bring 0.3062 percent increase in the output of cumin. While in case of cost of plant protection, fertilizer and value of seed, bi was positive and significant at 5 percent level of significance showing positive effect on gross income of cumin.

The value of production elasticity ranged from 0.0469 to 0.3062 for the independent variables of cost of human labour and cost of manure respectively.
The MVP-FC ratio was found less than one in case of human labour. This indicated excessive utilization of this input. Cumin growers can increase gross returns by reducing cost of human labour. However, there is a need to increase the efficiency of marketing system by excluding middlemen, value addition and advancement in the system of cultivation of the cumin crop for increasing the producer's profit.

Application of research: The components which are contributing more to the cost of cultivation and analysis of resource use allocation for cumin had been worked out through the study. An effort to decrease the cost of these components will help in decreasing the production cost of cumin which in turn will help in realizing more returns by farmers with the optimum use of resources.

Research Category: Agricultural Economics

Abbreviations:
CAGR - Compound Annual Growth Rates
FC - Factor Costs
Ha- Hectares
Kg- kilogram
MVP - Marginal Value Product
MT- Metric tones

Acknowledgement / Funding: Authors are thankful to Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Dantiwada, 385506, Gujarat.

***Principle Investigator of research: Pinkal M. Patel**
University: Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Dantiwada, 385506, Gujarat
Research project name or number: "An empirical analysis of brand preference towards cumin seed and resource allocation in production of cumin in Banaskantha district of North Gujarat"

Author Contributions: All author equally contributed

Author statement: All authors read, reviewed, agree and approved the final manuscript

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

References

[1] Radha J. and Prasad (2001) *Indian Journal of Agricultural Marketing*, 15 (1), 55-61.
[2] Patel R. M. (2005) *International Research Journal of Agricultural Economics and Statistics*, 8, 138-141.
[3] Kumar V. (2017) *Department of Economic Analysis and Research, NABARD, Mumbai, Issue XXIII*, 1-4.
[4] Horticulture Statistics Division, Department of Agriculture, Cooperation & Farmers Welfare. Accessed on May 11, 2018.
[5] Spices Board India. Major Item/Country-Wise Export of Spices from India. Accessed on May 5, 2018.