

Research Paper

An Economic Analysis of Production of Cauliflower in Sikar District of Rajasthan

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Received: 13-08-2021

Revised: 27-11-2021

Accepted: 06-12-2021

ABSTRACT

The present investigation was undertaken to study about costs and returns from the cultivation of cauliflower in Sikar district of Rajasthan. In this study, primary data were collected from the selected cauliflower cultivators through personal interview method with the help of pre-structured schedule. The study concluded that, on an average, total costs of cauliflower cultivation was estimated at ₹ 79786 per hectare. Out of which, overall total operational costs were observed as ₹ 55718 per hectare (i.e., 69.83 percent of total costs). It was decreased with the increase in farm size holdings whereas, total fixed costs were calculated at ₹ 24068 per hectare which accounts for 30.17 per cent of total costs. It was found positive relationship with the size of farms holdings. Total cost of cultivation of cauliflower was highest on medium farms (₹ 91764) and lowest on marginal farms (₹ 77511). The results also revealed that major components of cost of cauliflower cultivation were found human labour with ₹ 22482 per hectare followed by rental value of owned land (₹ 21265 per hectare), cost of manure (₹ 10340 per hectare) and cost of improved seed (₹ 9498 per hectare). The results of study indicated that overall gross returns obtained from cauliflower cultivation were ₹ 243275 per hectare. Gross returns were found to be highest (₹ 286750 per hectare) on medium farm and lowest (₹ 231250 per hectare) on marginal farms. On an average, cost of production in cauliflower was estimated at ₹ 670. The cost of production was found maximum (₹ 682 per quintal) on marginal farms and minimum (₹ 651 per quintal) on medium farms. It was decreased with increase in the farm size groups. It was observed that, an overall return per rupee earned from cauliflower cultivation was ₹ 2.77. Among the farm size groups, return was estimated as ₹ 2.71, ₹ 2.82, ₹ 2.83 and ₹ 2.84 per rupee on marginal, small, semi-medium and medium farm, respectively.

HIGHLIGHTS

- Total cost of cultivation of cauliflower was highest on medium farms (₹ 91764) and lowest on marginal farms (₹ 77511).
- Gross returns were found to be highest (₹ 286750 per hectare) on medium farm and lowest (₹ 231250 per hectare) on marginal farms.
- Overall return per rupee earned from cauliflower cultivation was ₹ 2.77.

Keywords: Costs, returns, cost of production and returns per rupee

Horticulture is a very important and integral part in the national economy. The contribution of horticulture crops in the Indian GDP was 6 per cent and about 30 per cent in Agricultural GDP in the year 2018-19. A vegetable contributes about 60 per cent in total horticulture production. Among the vegetable crops, cauliflower (*Brassica oleracea* var. *botrytis*) is one of the important vegetable crops in

India. It is a cruciferous vegetable. It originated in the island of Cyprus from where it moved to other areas of world like Syria, Turkey, Egypt, Italy, Spain and North Western Europe. It was introduced to

How to cite this article: Vasavada, K.M. and Shiyani, R.L. (2021). Co-Growth and Instability of Exports of Vegetable Products from India. *Economic Affairs*, 66(04): 535-542.

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



India in the year 1822 by botanist James from Kew garden, London (Swarup and Chatterjee, 1972).

Production of cauliflower was 25.2 million metric tonnes in the world during the year 2017-18. China and India contributed about 75 per cent in cauliflower production. China was the largest cauliflower producing country with an area of 5,32,556 hectare with a production of 10.2 million metric tonnes and productivity of 191.52 quintal per hectare followed by India, Spain, Mexico, Italy etc. during the year 2017-18.

India was the second largest cauliflower producing country with an area of 4,52,000 hectare with a production of 8.6 million tonnes and productivity of 190.26 quintal per hectare during the year 2017-18. Major cauliflower producing states in India are West Bengal, Madhya Pradesh, Bihar, Haryana, Orissa, Gujarat, Uttar Pradesh, Punjab, Rajasthan etc.

In Rajasthan state, area under cauliflower was 10,660 ha with a production of 51,805 metric tonnes with productivity of 48.60 q/ha during the year 2017-18. Major cauliflower producing districts in Rajasthan are Sikar, Ajmer, Sri Ganganagar, Jaipur etc. Sikar is the largest cauliflower producing district with an area of 506 hectare, production of 10,627 metric tonnes and productivity of 210.02 q/ha during the year 2018-19.

For effective farming, knowledge of cost of cultivation from each farm enterprise is a pre-requisite as it enables the cultivators to adjust and co-ordinate the accessible production resources in a profitable manner. As such, there is a need to study the cost of cultivation on different farm size groups in the Sikar district of Rajasthan. Examination of costs and returns in agriculture plays a significant role in making the farm sector economically viable and feasible under the pressure of continuous rise in input prices (Kale *et al.* 2005). This study was conducted to examine the cost of cultivation of cauliflower in Sikar district of Rajasthan.

MATERIALS AND METHODS

Sikar district was purposively selected as it ranked first in production and productivity of cauliflower in the state of Rajasthan. Out of nine tehsils, one tehsil namely Sikar was selected purposively on the basis of highest production and productivity of cauliflower. Two villages, namely Radha kishanpura

and sikar *kasba* of Sikar tehsil, having maximum production and productivity of cauliflower were selected purposively for the study. From selected villages, sixty cauliflower cultivators were selected randomly in proportion to their total number in each size farm group for detailed study.

The primary data were collected from the selected cauliflower cultivators using personal interview method with the help of pre-structured interview schedule. Information about the farm inventories, inputs used in (like human labour, machinery labour, seed, irrigation charges, plant protection chemicals etc.) and output obtained from watermelon cultivation in both physical and monetary terms was collected.

The cost of cultivation of cauliflower per hectare was computed on the basis of the following cost items:

1. Value of hired human labour
2. Value of owned animal labour
3. Value of hired animal labour
4. Value of owned machine labour
5. Value of hired machine labour
6. Value of owned seed
7. Value of purchased seed
8. Value of owned farm yard manure (FYM)
9. Value of purchased farm yard manure (FYM)
10. Value of fertilizers and insecticides
11. Irrigation charges
12. Depreciation
13. Land revenue
14. Interest on working capital
15. Miscellaneous expenses
16. Interest on fixed capital
17. Rental value of owned land
18. Rent paid for leased in land
19. Value of imputed family labour

Cost A₁: 1 to 15 items

Cost A₂: Cost A₁ + rent paid for leased in-land.

Cost B₁: Cost A₁ + interest on fixed capital assets (excluding land)

Cost B₂: Cost B₁ + rental value of owned land + rent paid for leased-in land.

Cost C₁: Cost B₁ + imputed value of family labour.

Cost C₂: Cost B₂ + imputed value of family labour.

Cost C₃: Cost C₂ + 10 per cent of cost C₂ as managerial cost.

Interest on working capital

The interest on variable cost was calculated at the rate of 7 per cent per annum as per the rate charged by the financial institution for short term credit. The interest was calculated for half of the length of crop production period (*i.e.*, for 3 months).

Interest on fixed capital

Interest on present value of fixed assets (excluding land) was calculated at the rate of 12 per cent per annum as per the rate charged by the financial institution.

Depreciation

Depreciation on an asset was calculated using the straight-line method as follows:

$$\text{Depreciation} = \frac{\text{Purchase price of an asset} - \text{Junk value}}{\text{Expected life of the asset in years}}$$

After calculating total annual depreciation of the farm, the depreciation for a particular crop was worked out. This was done as follows:

Depreciation for crop of 'X' =

$$\frac{\text{Total annual depreciation}}{\text{Total cropped area}} \times \text{Area under crop 'X'}$$

(Where 'X' = Cauliflower crop)

Rental value of owned land

Rental value of owned land was assessed on the basis of rent paid for the similar category of land in the sample villages. It was obtained on the basis of discussion with the sample farmers in the selected villages.

Cost of production

The cost of production was worked out by using following formula:

Cost of production (per quintal) =

$$\frac{\text{Total Cost of cultivation (In Rs.)}}{\text{Quantity of main product (In Qtl.)}}$$

Income measures

1. **Gross income:** It is the total value of main product as follows: -

$$GI = Qm \times Pm$$

Where,

GI = Gross Income in rupees

Qm = Quantity of main product in quintal

Pm = Price of main product in rupees

2. **Farm business income:** Gross income - Cost A₁ (Cost A₂ in case of tenant operated land)
3. **Family labour income:** Gross income - Cost B₂
4. **Net income:** Gross income - Cost C₃
5. **Return per rupee of investment:**

$$\text{Return per rupee} = \frac{\text{Gross Income (G.I.)}}{\text{Total Cost (Cost C}_2\text{)}}$$

RESULTS AND DISCUSSION

Inputs use pattern in cauliflower cultivation

The various inputs like machine labour, human labour, seed, fertilizer, plant protection measures, irrigation charges, etc. were used by farmers in the production of cauliflower. Inputs use pattern in cauliflower cultivation on different size group of sample farms are given in Table 1.

The study on inputs use pattern in cauliflower cultivation revealed (Table 1) that on an average, human labour utilization was 48.58 man days per hectare. Out of Which, utilization of family and hired human labour per hectare was 35.79 and 12.79 man days, respectively. Among the utilization of human labour, family human labour utilization was highest on marginal farm (40.63 man days/ha) and lowest on medium farms (18.62 man days/ha.) while, hired human labour was highest on medium farm (34.91 man days/ha) and lowest on marginal farms (7.10 man days/ha.). The overall use

Table 1: Inputs use pattern in cauliflower cultivation on different farm size groups

Sl. No.	Farms size	Marginal	Small	Semi-medium	Medium	Overall
	Inputs					
1	Hired machine labour (hrs/ha)	8.16	9.0	9.52	10.20	8.57
2	Human labour (man days/ha)					
	A. Hired labour	7.10	14.54	21.74	34.91	12.79
	B. Family labour	40.63	33.70	28.80	18.62	35.79
	Total human labour	47.73	48.24	50.54	53.53	48.58
3	Seed(gm/ha)	443.72	480.47	535.72	545.32	473.01
4	Fertilizer (Kg/ha)					
	A. Nitrogen (Urea)	57.43	62.47	67.53	70.72	61.03
	B. Phosphorus (DAP)	61.42	62.92	66.71	69.49	63.04
	Total	118.85	125.39	134.23	140.21	124.07
5	Manures (q/ha)	286.2	189.4	86.4	64.2	217.6
6	Plant Protection (l/ha)	0.39	0.51	0.63	0.69	0.47
7	Number of Irrigations (per hectare)	13.71	14.45	14.92	15.42	14.18

of machine labour was estimated at 8.57 hours per hectare in the study area. Utilization of Machine labor was found positive relationship with the size of operational holdings. The average utilization of seed (473.01 gram per hectare), fertilizer (124.07 kg/hectare), plant protection chemical (0.47 lit/ha), Irrigation (14.18 irrigation per hectare) were also found positive relationship with the size of operational holdings. The average utilization of manure was 217.6 q/ha. It was highest on marginal farms (286.2 q/ha) and lowest on medium farms (64.2 kg/ha). Thus, utilization of manure had negative relationship with size of operational holdings.

Cost of cultivation of cauliflower

Input wise costs incurred in cauliflower cultivation on different farm size groups are shown in Table 2 and fig. 1, 2 and 3.

Table 2 depicts that, on an average, total cost of cauliflower cultivation was ₹ 79786.35 per hectare. Out of which, overall total operational cost was ₹ 55717.7 per hectare (*i.e.*, 69.85 percent of total cost) and total fixed cost was ₹ 24067.62 per hectare (30.15 percent of total cost). Among the farm size groups, per hectare operational cost was highest on medium farm (₹ 61208) and lowest on marginal farm (₹ 55057.25). The total fixed cost was highest

on medium farm (₹ 30555.94 per hectare) and lowest on marginal farm (₹ 22453.52 per hectare). It showed positive relationship with the farm size holdings. The similar results were in conformity with the results of Tegar (2009) and Patel *et al.* (2018).

It was observed that, among the operational cost items, cost of human labour was found major item which accounted for 28.17 percent of total costs (₹ 22482.16 per hectare). This may be reason that cauliflower cultivation has required more labour for plantation of seedling, intercultural operations and harvesting/picking of cauliflower heads. Similar findings were reported by Kumar *et al.* (2016) and Patel and Pundir (2013). The component wise cost of cauliflower cultivation was also revealed that overall cost of machine labour, seed, manure, fertilizers, plant protection chemicals and irrigation were calculated at ₹ 5214.03, ₹ 9498.42, ₹ 10340, ₹ 1796.87, ₹ 1794.25 and ₹ 3536.89 per hectare, respectively. The average interest on working capital was estimated at ₹ 475.65 per hectare.

In fixed costs, rental value of owned land was observed as major cost item *i.e.*, 26.65 percent of total cost of cultivation because the land of sample farms lying in nearby city of Sikar district. On an average, the value of depreciation and interest on fixed capital was computed as ₹ 2317.13 and ₹ 485.51 per hectare, respectively.

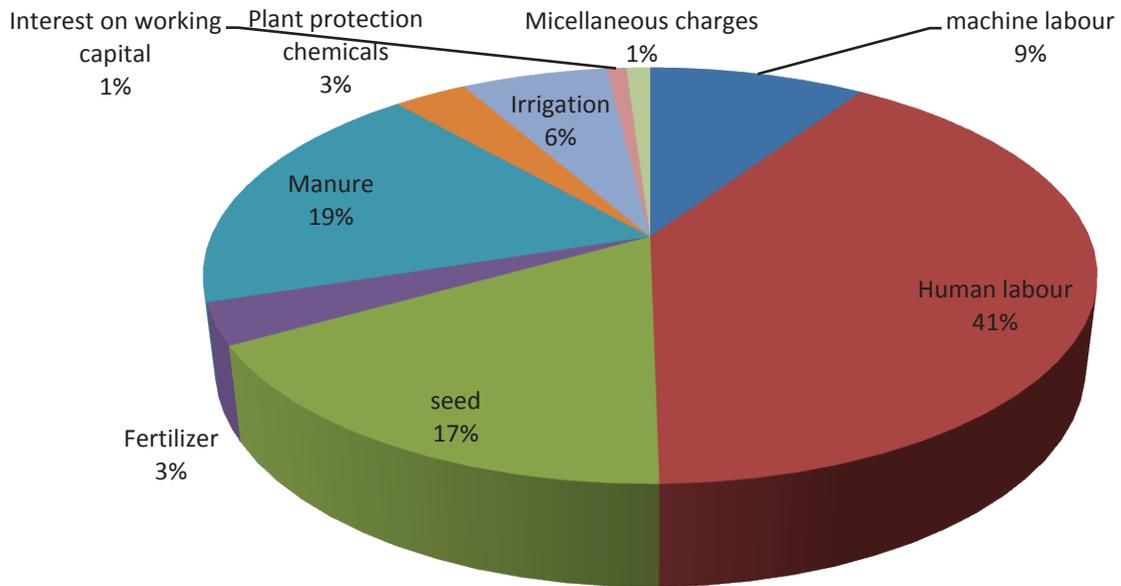


Fig. 1: Percentage share of each variable input in total operational cost of cauliflower cultivation

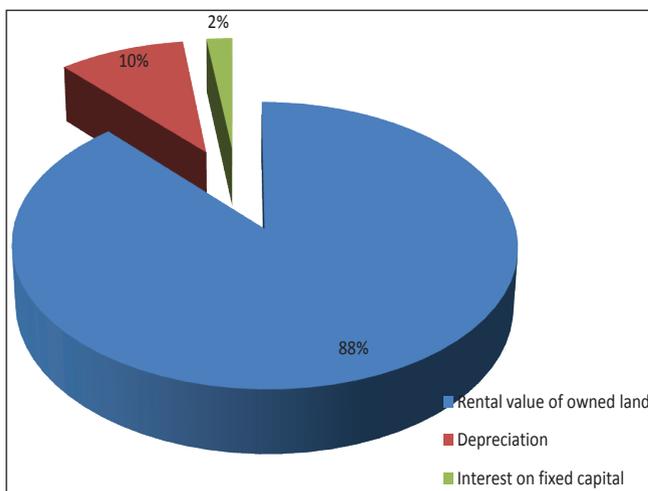


Fig. 2: Percentage share of each fixed input in total fixed costs of cauliflower cultivation

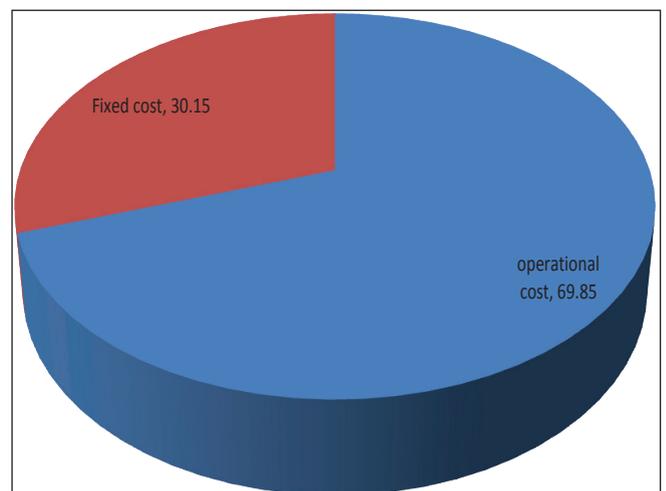


Fig. 3: Percentage share of operational cost and fixed cost in total cost of cauliflower cultivation

Cost groups of cauliflower cultivation

In this, all cost items incurred in cultivation of cauliflower were categorized under different cost groups (cost A_1 , cost A_2 , cost B_1 , cost B_2 , cost C_1 , cost C_2 and cost C_3). The cost groups of cauliflower cultivation on different farm size groups are given in Table 3.

The Table 3 shows that, on an average, cost A_1 of cauliflower cultivation was estimated to ₹ 44142 per hectare in the study area. Cost A_1 was diversified on different size of sample farms. It was ₹ 40881, ₹ 43650, ₹ 52169 and ₹ 56565 per hectare on marginal, small, semi-medium and medium, respectively. Cost

A_2 was equal to cost A_1 because of no farmer took land on rent for cauliflower cultivation. The overall cost B_1 and cost B_2 was calculated as ₹ 44627 and ₹ 65892 per hectare, respectively. On an average, Cost C_1 was found to be ₹ 58520 per hectare.

Among different size group of farms, Cost C_2 (total cost) on marginal, small, semi – medium and medium farm was estimated at ₹ 77511, ₹ 78593, ₹ 85886 and ₹ 91764 per hectare, respectively. Cost C_2 was lowest for marginal and highest for medium farms. On an average, cost C_2 was ₹ 79785 per hectare. Cost C_3 equals cost C_2 and 10 percent of cost C_2 on account of the management functions performed by the farmers. The overall cost C_3 was

Table 2: Item wise cost of cultivation of cauliflower on different farm size groups (In ₹ / ha)

Sl. No.	Farms size	Marginal	Small	Semi-medium	Medium	Overall
(A) Operational cost						
1	Hired machine labour	5040.29 (6.50)	5208.28 (6.62)	5571.10 (6.48)	5971.08 (6.50)	5214.03 (6.53)
2	Human labour					
	A.Hired labour	4402 (5.67)	9014.8 (11.47)	17856 (20.79)	21644 (23.58)	8589.16 (10.76)
	B. Family labour	16252 (20.96)	13480 (17.15)	8696 (10.12)	7448 (8.11)	13893 (17.41)
	Total human labour	20654 (26.64)	22494.8 (28.62)	26552 (30.91)	29092 (31.70)	22482.16 (28.17)
3	Seed	8208.82 (10.59)	9561.35 (12.16)	12589.42 (14.65)	13196.74 (14.38)	9498.42 (11.90)
4	Fertilizers					
	(A) Nitrogen (Urea)	356.06 (0.45)	387.31 (0.48)	418.68 (0.48)	438.46 (0.47)	378.42 (0.47)
	(B) Phosphorus (DAP)	1381.95 (1.78)	1415.70 (1.80)	1500.97 (1.74)	1563.52 (1.70)	1418.44 (1.77)
	Total fertilizer	1738.01 (2.24)	1803.01 (2.29)	1919.65 (2.23)	2001.98 (2.18)	1796.87 (2.25)
5	Manures	13594.50 (17.53)	8996.50 (11.44)	4104 (4.77)	3049.5 (3.32)	10340.00 (12.95)
6	Plant Protection chemicals	1482 (1.91)	1900 (2.41)	2394 (2.78)	2622.4 (2.83)	1794.25 (2.24)
7	Irrigation	3353.35 (4.32)	3638.25 (4.62)	3819.2 (4.44)	4011.7 (4.37)	3536.89 (4.43)
8	Interest on working capital	441.22 (0.56)	468.09 (0.59)	562.95 (0.65)	612.46 (0.66)	475.65 (0.59)
9	Miscellaneous charges	545.07 (0.70)	608.61 (0.77)	619.00 (0.72)	650.51 (0.70)	579.43 (0.72)
10	Total operational Costs	55057.25 (71.00)	55678.89 (69.59)	58131.32 (67.70)	61208 (66.72)	55717.70 (69.85)
(B) Fixed cost						
11	Rental value of owned land	19868.40 (25.63)	20997.30 (26.71)	24567 (28.60)	27307.10 (29.75)	21264.98 (26.65)
12	Depreciation	2075.40 (2.65)	2451.20 (3.11)	2734.12 (3.18)	2804.50 (3.05)	2317.13 (2.90)
13	Interest on fixed capital	509.72 (0.62)	465.73 (0.59)	453.25 (0.52)	444.34 (0.48)	485.51 (0.60)
14	Total fixed cost	22453.52 (28.90)	23905.23 (30.41)	27754.37 (32.30)	30555.94 (33.28)	24067.62 (30.15)
15	Total costs (A+B)	77510.78 (100)	78593.12 (100)	85885.69 (100)	91764.21 (100)	79786.35 (100)

Figures in the parentheses are percentages of total costs

Table 3: Cost groups of cauliflower cultivation on different farm size groups (in ₹/ha)

Cost Groups	Marginal	Small	Semi-medium	Medium	Overall
Cost A ₁	40881	43650	52169	56565	44142
Cost A ₂	40881	43650	52169	56565	44142
Cost B ₁	41390	44116	52623	57009	44627
Cost B ₂	61258	65113	77190	84316	65892
Cost C ₁	57642	57596	61319	91320	58520
Cost C ₂	77511	78593	85886	91764	79785
Cost C ₃	85262	86452	94474	100941	87764

estimated at ₹ 87764 per hectare. Similar results were found by Meena *et al.* (2016), Nandeshwar *et al.* (2013), Kumar, S. (2016) and Yadav and Pawar (2011).

Returns from the cultivation of cauliflower

The obtained yield, average market price, gross returns, total costs, net returns, returns per rupee, family labour income and family business income from the cultivation of cauliflower are given in Table 4. This table presents that per hectare yield

obtained on marginal, small, semi-medium and medium farms was 125, 132, 145 and 155 quintals, respectively. The overall yield realized from cauliflower cultivation was 131 quintal/hectare. On an average, per quintal market price of cauliflower was ₹ 1850.

The gross returns obtained from cauliflower cultivation, on an average, were estimated at ₹ 243275 per hectare. The overall net returns per hectare were computed as ₹ 155511. On an average, family business income and family labour income

Table 4: Returns from the cultivation of cauliflower in different farm size groups

Sl. No.	Particulars	Marginal farm	Small farm	Semi- medium farm	Medium farm	Overall
1	Yield (q/hectare)	125	132	145	155	131
2	Average market price (₹/q)	1850	1850	1850	1850	1850
3	Total cost (in ₹/ha)	85262	86452	94474	100941	87764
4	Gross returns (in ₹/ha)	231250	244200	268250	286750	243275
5	Net returns (in ₹/ha)	145988	157748	173776	185809	155511
6	Return per rupee	2.71	2.82	2.83	2.84	2.77
7	Cost of production (₹/quintal)	682	654	652	651	670
8	Family labour Income (in ₹/ha)	169992	179087	191060	202434	177383
9	Family Business income (in ₹/ha)	190369	200550	216081	230185	199133

were calculated as ₹ 199133 and ₹ 177383 per hectare, respectively. It was also observed that, on an average, returns per rupee was found ₹ 2.77. The returns per rupee were lowest (*i.e.*, ₹ 2.71) on marginal farms and highest (*i.e.*, ₹ 2.84) on medium farms. The findings of this study support the findings of Yadav and Pawar (2011) and Verma *et al.* (2018). Cost of production per quintal was estimated to be ₹ 682, ₹ 654, ₹ 652 and ₹ 651 for marginal, small, semi-medium and medium farm, respectively with an overall average of ₹ 670 per quintal. The similar results were inconformity with the results of Chandrashekhar (2007) and Gauraha *et al.* (2007). Study revealed that cost of production had inverse relationship with size of operational holdings because per unit cost was declined by the expansion in the size of operational area.

CONCLUSION

Average cost of cultivation of cauliflower was ₹ 87764 per hectare. It was highest (₹ 100941 per hectare) on medium farm and lowest (₹ 85262 per hectare) on marginal farm. Among cost items, major item of cost of cauliflower cultivation was human labour (28.17 percent of overall total cost) followed by rental value of owned land (26.65 percent), cost of manure (12.95) and cost of improved seed (11.90). Overall gross returns, net returns, farm business income and farm labour income were found to be ₹ 243275, ₹ 155511, ₹ 199133 and ₹ 177383 per hectare. Cost of production was highest (₹ 682 per quintal) for marginal farmers and lowest for medium farmer (₹ 651 per quintal) with an overall average of ₹ 670 per quintal. On an average, return per rupee was ₹ 2.77. On the basis of findings, cultivation of cauliflower was found economically profitable in the

study area. So, it may be recommended that farmers may be encouraged for adopting cauliflower crop in the cropping pattern at own their farm through stakeholders.

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