

Research Paper

# Economic Analysis of Open Field Capsicum Cultivation- Findings from Solan District of Himachal Pradesh

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## ABSTRACT

The present study attempted to analyze the cost and returns of open field capsicum cultivation in the Solan District of Himachal Pradesh. A total of 80 farmers were selected randomly from two developmental blocks, namely Solan and Kandaghat. Findings revealed that the overall cost of capsicum cultivation was ₹ 134896.38 per hectare, which was ₹ 137509.09, 132978.89, 130986.75, and 136858.50 in the marginal, small, semi-medium, and medium farm categories. The return analysis revealed that among all the four categories, the highest per hectare-average returns were observed in the marginal farm category, i.e., ₹ 216609.74 and the lowest average returns were recorded in the medium farm category, i.e., ₹ 152319.63. The cost of production varied between ₹ 718.38 per quintal in the marginal farm category to ₹ 875.54 per quintal in medium farm category. The input-output ratio on an overall level concluded that at an investment of ₹ 1 on capsicum cultivation, the farmers in the study area were getting ₹ 2.39 as returns.

## HIGHLIGHTS

- ① The study area represented an overall cropping intensity of 184.97 %.
- ① The highest per hectare cost of cultivation of ₹ 137509.09 in the marginal farm category revealed a high investment on the factors of production.
- ① The net farm income was found to be the highest in the case of the marginal farm category, i.e., ₹ 216609.74, which indicated an overall good performance in capsicum cultivation.
- ① The overall input-output ratio of 2.39 indicated a great potential of capsicum cultivation under open field conditions in the study area.

**Keywords:** Cost, Production, Returns, Profit, Benefit-Cost ratio

In India, where small landholdings are predominant, vegetable cultivation is more suitable. The scope of vegetable production in India is vast. The per capita recommended vegetables per day are 300 g per person per day. Therefore, the vegetable requires an emphasis on improving its production and productivity of it to feed the second largest population in the world (Devi and Kumar, 2020). Vegetables are the most important components and are also known to prove health security to consumers (Kumar *et al.* 2018). The area and production of vegetables in India is about 10259

thousand hectares and 184394 thousand MT. Himachal Pradesh alone covers a total vegetable production of 1811.78 thousand MT from a total area of 89.32 thousand MT, (NHB, 2017-18). Himachal Pradesh, following Karnataka, produces 57.76 thousand tonnes (17.74 %) of capsicum, followed by Haryana with 40.05 thousand tonnes (NHB, 2018). Capsicum cultivation has great potential to boost

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hilly regions economically. There is a good export demand for capsicum, but due to low productivity, the supply of capsicum is inadequate (Navneet *et al.* 2020). In Himachal Pradesh, it is extensively grown as a cash crop (April-October) in agro-climatic zones-I (Sub tropical mountains and low hills), II(Sub-humid-hills), and III(Wet temperate high hills) in an open environment. Solan district of Himachal Pradesh ranks first in capsicum production with a total production of 34850 tonnes in 1217hectares, followed by Sirmaur (11874 tonnes), and Kangra (5612 tonnes), Mandi(5296 tonnes) and Shimla (5035 tonnes). Solan and Kandaghat developmental blocks of Solan district contribute most of the capsicum production in the state. The wide varieties of capsicum grown in Solan are California Wonder, Yolo Wonder, Solan Bharpur, Dollar, and Bharat.

The per hectare net income of capsicum cultivation is usually highest in the large size group, and per quintal, cost is the lowest in the large size group (Hile *et al.* 2012). The average yield and gross returns per acre increase with the increase in the size of farms. There is a need to develop labor-saving practices such as using weedicides, improved tools for planting, harvesting, *etc.* An appropriate extension method may be adopted to evaluate the farmers on optimum use of input (Jagtap *et al.* 2012).

The marginal and small farming categories with small landholdings are predominant in India. Therefore, vegetable cultivation is more suitable. However, capsicum growers are shifting to protected cultivations, yet farmers of the study area are practicing the open field cultivation of capsicum and getting good returns.

Though the protected cultivation has emerged as a good cultivation practice over open field cultivation of capsicum due to protection from various abiotic stress such as extreme solar radiation, high rainfall, high surface wind, weed competition, and biotic stress such as insects and diseases prevailing in the open field cultivation. (Nandeshwar *et al.* 2013). In a comparative analysis of protected and open field cultivation of capsicum, the cost of cultivation in protected cultivation was found to be higher than in open field conditions, yet very low returns were recorded in open field conditions (Singh *et al.* 2020). But in the study area, a good number of farmers were involved in open field capsicum cultivation.

To find out the possible reasons for such practice, the present study was conducted with the following objectives:—

1. To find out the area and cropping intensity under open field capsicum cultivation.
2. To find out the cost of capsicum cultivation under open field conditions
3. To find out the returns from open field cultivation of capsicum.

## MATERIALS AND METHODS

Multistage Random sampling was adopted to select the ultimate sample of the respondents. At the first stage, two development blocks, i.e., Kandaghat and Solan, out of 5 blocks were selected. At the second stage, a list of villages growing capsicum in the selected blocks was prepared, and 8 villages from each block were randomly selected. In the third stage, 5 five capsicum growers in each of the selected villages were selected for primary data collection. Thus, a total sample of 80 growers was selected for the study.

## ANALYTICAL FRAMEWORK

### Tabular analysis

$$\text{Cropping intensity} = \frac{\text{Gross cropped area}}{\text{Net sown area}} \times 100$$

### Costs and returns analysis

#### CACP Cost Concepts

The following CACP cost concepts were worked out to find out the cost of cultivation (Chandra *et al.* 2013)—

- ♦ Cost  $A_1$

Cost  $A_1$  includes;

1. Cost of hired human labor
2. Cost of bullock labor
3. Cost of owned machinery
4. Cost of hired machinery
5. Cost of fertilizers
6. Cost of manures
7. Cost of seed (owned/purchased)

8. Cost of plant protection chemicals
  9. Land revenue
  10. Depreciation of farm machinery, equipment, and farm buildings
  11. Interest in owned working capital
- ♦  $\text{Cost } A_2 = \text{Cost } A_1 + \text{Rent paid for leased inland}$
  - ♦  $\text{Cost } B_1 = \text{Cost } A_1 + \text{Interest on owned fixed capital assets excluding land}$
  - ♦  $\text{Cost } B_2 = \text{Cost } B_1 + \text{Rental value of own land (less land revenue) + Rent paid for leased in land}$
  - ♦  $\text{Cost } C_1 = \text{Cost } B_1 + \text{Imputed value of family labour}$
  - ♦  $\text{Cost } C_2 = \text{Cost } B_2 + \text{Imputed value of family labour}$
  - ♦  $\text{Cost } C_3 = \text{Cost } C_2 + 10 \text{ percent of cost } C_2 \text{ on account of the managerial function performed by the farmer.}$

### Income measures

For working out the profitability of capsicum in the study area following income measures were worked out: (Chandra *et al.* 2013)

#### (a) Farm Investment Income (FII)

$\text{FII} = \text{Farm Business Income} - \text{Imputed value of family labor}$

#### (b) Family Labour Income (FLI)

It is the return to family labor (including management).

$\text{F.L.I.} = \text{Gross income} - \text{Cost } B_2$

#### (c) Net Farm Income (NFI)

It is the net profit after deducting all cost items, *i.e.*, variable and fixed costs, from gross income.

$\text{NI} = \text{Gross income} - \text{Total cost (Cost } C_3)$

#### (d) Farm Business Income (FBI)

It is the disposable income out of the enterprise.

$\text{FBI} = \text{Gross income} - \text{Cost } A_1$

## RESULTS AND DISCUSSION

### Farm-specific characteristics of sampled households

The farm-specific characteristics of sampled households represented in Table 1 revealed that the landholding size varied from 0.71 hectares to 6.11 hectares in the medium farm category. The gross cropped area at an overall level was found to be 0.88 hectares. The area under capsicum cultivation varied from 0.14 hectares in the case of marginal farm category to 0.21 hectares in the large farm category. The cropping intensity shows how effectively land is being utilized. The cropping intensity was highest in the semi-medium farm category (188.04%) followed by small (186.55 %), marginal (183.77%), and medium farm categories (178.24%). The farm-specific characteristics represented a good landholding and cropping intensity in the sampled area.

### Cost of Cultivation

The per hectare cost of capsicum cultivation was estimated, and the results have been presented in Table 2. It is clear from the table that the cost of capsicum cultivation was highest in the marginal farm category (₹ 137509.09) followed by medium (₹ 136858.50), small (₹ 132978.89), and semi-medium farm category (₹ 130986.75). Human labor contributed the highest share (21.96 %) to the total cost of cultivation and varied from ₹ 28642.66 in medium farm category to 29803 in marginal farm category. The contribution of bullock labor to the total cost varied from 0.48 percent in the marginal farm category to 1.38 percent in the medium farm category. The cost of hired machinery was found to be highest for the marginal farm category (₹ 3223.14) followed by semi-medium (₹ 2678.57), and medium (₹ 1718.72), and small farm category (₹ 1512.61), respectively. The cost of planting material varied from ₹ 6571.43 in the semi-medium farm category to ₹ 8507.81 in the medium farm category. Fertilizer cost was highest for the medium farm category, *i.e.*, ₹ 6280.08 and lowest for the small farm category, *i.e.*, ₹ 4926.94. The cost of plant protection chemicals ranged from ₹ 6425.78 in the medium farm category to ₹ 7487.39 in the small farm category. Staking material costs varied from 3.92 percent in the semi-medium farm category to

**Table 1:** Farm specific characteristics of sampled households

Particulars	Marginal	Small	Semi-medium	Medium	Overall
Size of landholding (hectare)	0.75	1.54	2.63	6.11	1.71
Gross cropped area (hectare)	0.61	0.95	1.15	1.56	0.88
Area under capsicum cultivation (hectare)	0.14	0.17	0.19	0.21	0.16
Net sown area (hectare)	0.33	0.51	0.61	0.87	0.48
Cropping intensity (%)	183.77	186.55	188.04	178.24	184.97

**Table 2:** Farm category wise cost of capsicum cultivation in sampled households (Rupees per hectare)

Sl. No.	Item of cost	Marginal	Small	Semi-medium	Medium	Overall
<b>1.</b>	<b>Variable cost</b>					
a)	Human labour	29803.00 (21.67)	29776.67 (22.39)	29195.26 (22.29)	28642.66 (20.93)	29615.60 (21.96)
i)	Family labour	26707.60 (19.42)	18300.05 (13.76)	16599.57 (12.67)	6839.67 (5.00)	20758.66 (15.35)
ii)	Hired labour	3095.40 (2.25)	11476.62 (8.63)	12595.69 (9.62)	21802.99 (15.93)	8856.94 (6.61)
b)	Bullock labour	653.31 (0.48)	1211.34 (0.91)	332.14 (0.25)	1889.06 (1.38)	893.13 (0.66)
c)	Tiller/tractor (hired)	3223.14 (2.34)	1512.61 (1.14)	2678.57 (2.04)	1718.72 (1.26)	2429.94 (1.80)
d)	Material Cost					
i)	Planting material	6572.31 (4.78)	7794.12 (5.86)	6571.43 (5.02)	8507.81 (6.22)	7144.97 (5.30)
ii)	Fertilizers	5020.35 (3.65)	4926.94 (3.71)	5392.63 (4.12)	6280.08 (4.59)	5137.98 (3.81)
iii)	Plant protection chemicals	7151.86 (5.20)	7487.39 (5.63)	6979.91 (5.33)	6425.78 (4.70)	7189.05 (5.33)
iv)	Staking material	5681.82 (4.13)	6355.04 (4.78)	5133.93 (3.92)	7421.88 (5.42)	5965.77 (4.42)
v)	FYM	28186.98 (20.50)	20549.37 (15.45)	19754.46 (15.08)	17460.94 (12.76)	23444.49 (17.34)
vi)	Total material cost	52613.33 (38.26)	47112.87 (35.43)	43832.37 (33.46)	46096.48 (33.68)	48882.26 (36.21)
e)	Total working capital	59585.17 (43.33)	61313.43 (46.11)	59438.77 (45.38)	71507.25 (52.25)	61062.26 (45.28)
f)	Interest on working capital	1737.90 (1.76)	1788.31 (1.75)	1733.63 (1.69)	2085.63 (1.80)	1780.98 (1.75)
g)	Risk margin	5958.52 (4.33)	6131.34 (4.61)	5943.88 (4.54)	7150.73 (5.22)	6106.23 (4.53)
h)	Managerial cost	5958.52 (4.33)	6131.34 (4.61)	5943.88 (4.54)	7150.73 (5.22)	6106.23 (4.53)
	Total Variable cost	73240.11 (53.26)	75364.43 (56.67)	73060.16 (55.78)	87894.33 (64.22)	75055.70 (55.66)
<b>2.</b>	<b>Fixed cost</b>					
a)	Land revenue	31.25 (0.02)	31.25 (0.02)	31.25 (0.02)	31.25 (0.02)	31.25 (0.02)
b)	Depreciation	7464.81 (5.43)	8682.97 (6.53)	9961.15 (7.60)	10590.51 (7.74)	8500.04 (6.31)
c)	Interest on fixed capital	3385.63 (2.46)	3920.50 (2.95)	4654.93 (3.55)	4823.04 (3.52)	3871.04 (2.88)
d)	Rental value of land	26679.69 (19.40)	26679.69 (20.06)	26679.69 (20.37)	26679.69 (19.49)	26679.69 (19.79)
	Total fixed cost	37561.38 (27.32)	39314.41 (29.56)	41327.02 (31.55)	42124.49 (30.78)	39082.02 (29.00)
	<b>Total cost</b>	<b>137509.09</b> <b>(100.00)</b>	<b>132978.89</b> <b>(100.00)</b>	<b>130986.75</b> <b>(100.00)</b>	<b>136858.50</b> <b>(100.00)</b>	<b>134896.38</b> <b>(100.00)</b>

5.42 percent in the medium farm category. FYM was contributing 17.34 percent to the total cost at an overall level. Among different inputs on an overall level, the per farm cost was observed to be highest for human labor (₹ 29615.60) followed by FYM (₹ 23444.49), plant protection chemicals (₹ 7189.05), planting material (₹ 7144.97), staking material (₹ 5965.77), fertilizers (₹ 5137.98), hired machinery (₹ 2429.94) and bullock labor (₹ 1309.37), respectively. The total working capital contributed 45.28 percent to the total cost at an overall level and varied from 43.33 percent in the marginal farm category to 52.25

percent in the medium farm category. The cost of cultivation represented farmers' high interest in capsicum cultivation in the sampled area as a high amount has been invested in the cultivation. The farmers involved both human and hired labor forces to work upon the fields, due to which there was a high investment in the labour than all other inputs. The contribution of total variable cost to the total cost was 53.26 percent in the marginal farm category, 56.67 percent in small, 55.78 percent in semi-medium, and 64.22 percent in the medium farm category. The contribution of fixed cost to the



total cost was 27.32 percent in the marginal farm category, 29.56 percent for small, 31.55 percent for semi-medium, and 30.78 percent for medium farm category.

### Cost concepts in capsicum cultivation

Per hectare cost concepts in capsicum cultivation are presented in Table 3. It was observed from the table 3 that highest cost (Cost C<sub>3</sub>) was observed in the marginal farm category (₹ 137509.09) followed by medium (₹ 136858.50), small (₹ 132978.89), and semi-medium farm category (₹ 130986.75) where at an overall level it was ₹ 134896.38 per hectare. Cost A<sub>1</sub>, A<sub>2</sub>, B<sub>1</sub>, B<sub>2</sub>, C<sub>1</sub>, and C<sub>2</sub> at an overall level were found to be ₹ 71374.54, ₹ 71374.54, ₹ 75245.58, ₹ 101925.58, ₹ 96004.24 and ₹ 122683.92, respectively. The cost concepts serve relevance in the decision-making process. Based upon these cost concepts, we can find out different measures of return to the cultivators.

### Net returns over cost concepts in capsicum

The per hectare net returns over cost concepts in capsicum are presented in Table 4. The net returns for cost C<sub>3</sub> were highest in the marginal farm category (₹ 216609.74) followed by small farms (₹ 173273.84), semi-medium (₹ 160561.69), medium (₹ 152319.63). At an overall level, the net returns for C<sub>3</sub> were found to be ₹ 188213.21. For costs A<sub>1</sub>, A<sub>2</sub>, B<sub>1</sub>, B<sub>2</sub>, C<sub>1</sub>, C<sub>2</sub>, and C<sub>3</sub>, the net returns were highest in case of the marginal farm category i.e., ₹ 285299.69, ₹ 285299.69, ₹ 281914.06, ₹ 255234.37, ₹ 255206.46, ₹ 228526.77 and ₹ 216609.74, respectively.

### Cost of capsicum production

Cost of capsicum production was analyzed and presented in Table 5. The per hectare cost of cultivation was ₹ 137509.09, ₹ 132978.89, ₹ 130986.75 and ₹ 136858.50 for marginal, small, semi-medium, and medium farms, respectively. The yield of capsicum was found to be 191.42, 165.54, 157.59,

**Table 3:** Farm category wise cost concepts in capsicum cultivation (₹/hectare)

Size of farm	Cost concepts						
	A <sub>1</sub>	A <sub>2</sub>	B <sub>1</sub>	B <sub>2</sub>	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>
Marginal	68819.14	68819.14	72204.77	98884.46	98912.37	125592.06	137509.09
Small	71815.96	71815.96	75736.46	102416.15	94036.52	120716.21	132978.89
Semi-medium	71164.80	71164.80	75819.73	102499.42	92419.30	119098.99	130986.75
Medium	84214.64	84214.64	89037.68	115717.37	95877.36	122557.04	136858.50
Overall	71374.54	71374.54	75245.58	101925.26	96004.24	122683.92	134896.38

**Table 4:** Farm category wise net returns over cost concepts in capsicum (₹/hectare)

Size of farm	Net returns						
	A <sub>1</sub>	A <sub>2</sub>	B <sub>1</sub>	B <sub>2</sub>	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>
Marginal	285299.69	285299.69	281914.06	255234.37	255206.46	228526.77	216609.74
Small	234436.77	234436.77	230516.27	203836.58	212216.21	185536.53	173273.84
Semi-medium	220383.64	220383.64	215728.71	189049.02	199129.13	172449.45	160561.69
Medium	204963.48	204963.48	200140.44	173460.75	193300.77	166621.08	152319.63
Overall	251735.05	251735.05	247864.01	221184.32	227105.35	200425.66	188213.21

**Table 5:** Farm category wise cost of capsicum production

Particulars	Marginal	Small	Semi-medium	Medium	Overall
Cost of cultivation (₹/ha)	137509.09	132978.89	130986.75	136858.50	134896.38
Yield (qtl/ha)	191.42	165.54	157.59	156.31	174.65
Cost of production (₹/qtl)	718.38	803.29	831.17	875.54	776.81

**Table 6:** Farm category wise income measures of capsicum in sampled households (₹/ha)

	Marginal	Small	Semi-medium	Medium	Overall
Gross return	354118.83	306252.73	291548.44	289178.13	323109.58
Net farm income	216609.74	173273.84	160561.69	152319.63	188213.21
Farm business income	285299.69	234436.77	220383.64	204963.48	251735.05
Family labour income	255234.37	203836.58	189049.02	173460.75	221184.32
Farm investment income	258592.09	216136.72	203784.06	198123.81	230976.39
Output input ratio	2.58	2.30	2.23	2.11	2.39

and 156.31 quintals for marginal, small, semi-medium, and medium farms, respectively. The cost of production per quintal for marginal, small, semi-medium, and medium farm categories was found to be ₹ 718.38, ₹ 803.29, ₹ 831.17 and ₹ 875.54, respectively. At an overall level, it was found to be ₹ 776.81.

### Income measures

Farm category wise different income measures are presented in Table 6. It could be observed from the table that gross returns at an overall level and for marginal, small, semi-medium, and medium farm categories were ₹ 323109.58, ₹ 354118.83, ₹ 306252.73, ₹ 291548.44 and ₹ 289178.13, respectively. Net farm income in the case of marginal, small, semi-medium, and medium farm categories was ₹ 216685.93, ₹ 175485.56, ₹ 161796.35 and ₹ 150735.16, respectively. The farm business income was highest for the marginal farm category (₹ 285299.69) followed by small (₹ 234436.77), semi-medium (₹ 220383.64), and medium farm category (₹ 204963.48). Thus the marginal farm category received the highest total returns on their labor and investments.

Family labor income for marginal, small, semi-medium, and medium farms was ₹ 255234.37, ₹ 203836.58, ₹ 189049.02, ₹ 173460.75, respectively. Farm investment income for marginal, small, semi-medium, and medium farms was ₹ 258592.09, ₹ 216136.72, ₹ 203784.06 and ₹ 198123.81 respectively. All the income measures values represented a good amount of profit to the farmers. The output-input ratio in the case of overall farms category was found to be 2.39 and varied from 2.11 in the medium farm category to 2.58 in the marginal farm category, which means that at an investment of ₹ 1 on capsicum cultivation, the farmers in the study area were getting ₹ 2.39 as returns at an overall level.

### CONCLUSION

The total cost of cultivation in the case of marginal and medium farm categories was found to be higher than that of small and semi-medium farm categories, respectively.

Although a large number of farmers are shifting towards protected capsicum cultivation, there are many constraints in protected cultivation as well such as the high establishment and maintenance cost, high investment costs, low capital accumulation capacity, lack of technical guidance, and non-availability of skilled labor. To escape these constraints, farmers in the sampled region practice open-field capsicum cultivation. The high cropping intensity in the study area indicated an effective land utilization by the farmers. The results indicated that there is a good potential in open field capsicum cultivation as the farmers are getting good net returns from it. The high benefit-cost ratios are the perfect indicators of high profitability in the sampled region.

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