

## Research Article

## Profitability of Capsicum Cultivation under Protected Condition

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<sup>2</sup>Department of Agricultural Economics, ASPEE College of Horticulture, NAU, Navsari- Gujarat -396450**Abstract**

Capsicum popularly known as bell pepper or sweet pepper or *Shimla mirch* is one of the most popular and highly remunerative vegetable crops cultivated under protected condition. Adoption of protected cultivation technology can improve yield and productivity of capsicum in off-season. Growing of capsicum in the greenhouses is proving to be a very remunerative venture to the greenhouse growers as it fetches maximum returns in the market. Cost is the major issue in sustaining this technology. The present study examined the economic feasibility and profitability of capsicum cultivation. Data were generated by cost accounting method for estimating the feasibility of production and was analyzed by using project evaluation techniques such as Benefit Cost Ratio (BCR), Net Present Value (NPV) and Internal Rate of Return (IRR) and Pay Back Period (PBP). The present study showed that the establishment cost of polyhouse and cost of cultivation of capsicum in polyhouse for the area of 1000 m<sup>2</sup> was less with 65% and 75% subsidy being imparted by Government of Gujarat.

Net return obtained without subsidy of capsicum cultivation in polyhouse was less as compare to the net return obtained with 65% and 75% subsidy. The higher values of NPV, IRR and BC ratio and lowest value of payback period of capsicum cultivation in polyhouse with subsidy implied that the capsicum cultivation was most profitable and economically feasible with 65% and 75% subsidy.

**Keywords:** Capsicum, protected cultivation, feasibility, BCR, NPV, IRR

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**Introduction**

Protected cultivation being the most efficient means to overcome climatic diversity, has the potential of fulfilling the requirements of small growers as it can increase the yield manifolds and at the same time improve the quality of the produce significantly as per the demand of the market. Capsicum is popularly known as *Shimla mirch* or sweet pepper or bell pepper is one of the important high value vegetable crops cultivated natural and protected conditions [8]. Capsicum is rich in vitamin-A, C and minerals. Capsicum is cultivated in most parts of the world especially in temperate regions of Central and South America, European countries, tropical and subtropical regions of Asian continent mainly India and China [5].

Capsicum is grouped under nontraditional category of vegetables [3] and it is primarily cultivated during rabi and *kharif* seasons in Karnataka, Maharashtra, Tamil Nadu, Himachal Pradesh, and hilly areas of Uttar Pradesh and during rabi season in West Bengal [6].

India contributes one fourth of world production of capsicum with an average annual production of 0.90 million tons from an area of 0.88 million hectare with a productivity of 1266 kg per hectare. The main objectives of cultivation of capsicum in a polyhouse condition are, to protect the crop against pests, diseases, temperature, humidity and light to ensure round the year production of high-value quality capsicum especially, during the off-season. Capsicum cultivation in polyhouse / nethouse, not only increases the productivity but also, enhances the quality of capsicum. In India, it is a new phenomenon and is still in its initial stage [9, 10, 12-14, 16].

Capsicum also find place in preparations like pizza stuff. It is also used in burger with growing popularity of fast food. The high market price it fetches is attributed to the heavy demand from the urban consumers. There is a good demand for export too. The export market needs fruits with longer shelf life, medium size tetra lobed fruits with attractive colour, mild pungency with good taste. However, the supply is inadequate due to the low productivity of the crop [7].

Basically bell pepper is a cool season tropical crop and lacks adaptability to varied environmental conditions. Despite its economic importance, growers are not in a position to produce good quality capsicum with high productivity due to various biotic (pest and diseases), abiotic (rainfall, temperature, relative humidity and light intensity) and crop factors (flower and fruit drop). Due to erratic behaviour of weather, the crops grown in open field are often exposed to fluctuating levels of temperature, humidity, wind flow etc. which ultimately affect the crop

productivity adversely. Besides this, limited availability of land for cultivation hampers the vegetable production. Hence, to obtain a good quality produce and production during off season, there is a need to cultivate capsicum under protected condition such as green houses or polyhouses, shadow hall, shade house, etc.

Keeping in view the importance of capsicum cultivation the present study was conducted with following objectives

- To work out cost and return of capsicum cultivation in polyhouse
- To study the economic feasibility of capsicum cultivation in polyhouse

## Materials and methods

The study was conducted for capsicum raised under naturally ventilated polyhouse at Regional Horticulture Research Station, Navsari Agricultural University, Navsari (Gujarat) during the consecutive year 2013-14, 2014-15 and 2015-16. The location situated at latitude 20°57'N and longitude 72°54'E with an altitude of 12 m above the mean sea level characterized by high humid climate with high annual rainfall of 1600 to 2400 mm mostly concentrated during monsoon. The produce was marketed at *Shree* Navsari Jalalpore *Taluka* Horticulture Cooperative Society Ltd., Navsari, Gujarat and average selling rate was worked out accordingly.

The pooled economic analysis of capsicum cultivation was carried out through an accounting method [1,2]. The actual values on fixed investment were subjected to amortized accounting by adopting certain assumptions as under:

Assumptions for the calculation of fixed components of cost

Particulars	Useful life (yrs)	Remarks
Polyhouse Structure	10	*Conditional life of red soil has been considered equivalent to that of structure's life assuming that sufficient organic matter will be incorporated into it over the period of time.
Red soil*	10	
Plant support system	5	

As component of protected cultivation is being strengthened under National Horticulture Mission by Government of India by imparting 50% subsidy to the farmers. Incentives in terms of subsidy to the tune of 65% and 75% are imparted by Government of Gujarat State (India) to encourage the farmers for adopting protected cultivation by adding its share of 15 and 25% in Central Government subsidy depending upon socio-economic status of the farmers. Therefore an attempt has also been made to work out comparative trend of economic returns for capsicum cultivation under NVPH in each case i.e. without subsidy, with 65 and 75% subsidy. The labour wages were established as per the notification of Assistant Labour Commission and Minimum Wages Act, Gandhinagar, Government of Gujarat State for respective years of experimentation.

To estimate the cost of capsicum under protected cultivation, the costs were classified into variable and fixed costs. Variable costs include costs incurred on seeds, fertilizers, plant protection chemicals, micronutrient, bio-fertilizers and labours. Fixed costs included amortized cost for the establishment of structure, interest on fixed capital and rental value of land. The cost of cultivation of capsicum was worked out by using standard cost concepts i.e. Cost A<sub>1</sub>, Cost B<sub>1</sub>, Cost B<sub>2</sub>, Cost C<sub>2</sub> and Cost C<sub>3</sub>. The economic feasibility of capsicum cultivation in polyhouse was worked out using the different economic measures like Net Present Worth (NPW), Internal Rate of Return (IRR), Benefit Cost Ratio (BCR) and Pay back period was estimated. The pay back period is undiscounted measure while NPW, IRR and BCR are the discounted measure of project evaluation [1,2].

## Results and Discussion

**Table 1** shows the per unit establishment cost of polyhouse for capsicum cultivation. The establishment cost of polyhouse includes the cost of polyhouse structure, red soil and plant support system. It was evident from the study that the total establishment cost was highest (₹ 10,17,000 per 1000 m<sup>2</sup>) when subsidy was not taken by the farmers where as it was reduced up to ₹ 3,55,950 and ₹ 2,54,250 per 1000 m<sup>2</sup> with 65 % and 75% subsidy, respectively.

**Table 1** Per unit establishment cost of polyhouse (₹ per 1000 m<sup>2</sup>)

Particulars	Without subsidy	With 65% subsidy	With 75% subsidy
Polyhouse structure @ 935 per m <sup>2</sup>	935000	327250	233750
Red soil (9000 cubic ft @ 800/100 cubic ft)	72000	25200	18000
Plant support system @ 10/m <sup>2</sup>	10000	3500	2500

Total cost	1017000	355950	254250
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The decision and choice of crops to be grown on a farm and the area to be allocated under a crop depends to a large extent on the prices of output, productivity level, technology available and the level and prices of inputs used in their production. The knowledge of input use, cost structure and returns from the cultivation of crops helps in formulating the policies at macro and micro levels. Such knowledge is more useful for crops taken mainly for the market viz. the cash crops, spices crops, vegetables and other high value crops.

The cost of cultivation of capsicum in polyhouse is presented in **Table 2**. Total cost of cultivation of capsicum is comprises of variable cost and fixed cost. Amongst various components of variable cost, with and without subsidy, the highest expenditure was levied on labour charges (₹ 62696 per thousand m<sup>2</sup>) followed by the cost of fertilizers (₹ 11231 per thousand m<sup>2</sup>) irrespective of subsidy factor. Sreedhara *et al.* (2013) [15] in his study on capsicum cultivation under protected condition in Northern Karnataka expressed similar view that the labour cost was highest (₹ 10,291) among various component of variable cost. The interest on working capital was estimated to ₹ 9367.10 per thousand m<sup>2</sup>. Total variable cost with and without subsidy for capsicum cultivation in protected cultivation was worked out to Rs. 103038.10 per thousand m<sup>2</sup>.

**Table 2** Cost of cultivation of capsicum in polyhouse (₹ per 1000 m<sup>2</sup>)

SN	Particulars	Without subsidy	With 65% subsidy	With 75% subsidy
<b>A</b>	<b>Variable cost</b>			
1	Seed	4968	4968	4968
2	Fertilizers	11231	11231	11231
3	Vermicompost	1600	1600	1600
4	Bio fertilizer	3977	3977	3977
5	Micronutrients	1000	1000	1000
6	Labour	62698	62698	62698
7	Plant Protection chemicals	4000	4000	4000
8	Packing cost	2455	2455	2455
9	Other incidental charges	1742	1742	1742
10	Interest on working capital	9367.10	9367.10	9367.10
	Total Variable cost	103038.10	103038.10	103038.10
<b>B</b>	<b>Fixed cost</b>			
1	Rental value of land	73333.33	73333.33	73333.33
2	Interest on fixed capital	101700	35595	25425
3	Amortised cost	59908	20968	14831
	Total Fixed cost	234941.33	129896.33	113589.33
<b>C</b>	Total cost= Fixed cost + Variable cost	337979.43	232934.43	216627.43
<b>D</b>	Management charges	33797.94	23293.44	21662.74
<b>E</b>	Cost C3	371777.37	256227.87	238290.17

Total fixed cost of capsicum cultivation in polyhouse without subsidy and with 65% and 75% subsidy for thousand m<sup>2</sup> area was estimated to ₹ 234941.33, ₹ 129596.33 and ₹ 113589.33, respectively. Among the different components of fixed cost, interest on fixed capital was found highest (₹ 101700 per thousand m<sup>2</sup>) when the capsicum cultivation was done without subsidy. Whereas rental value of land worked out to ₹ 73333.33 per thousand m<sup>2</sup> with and without subsidy. The management charges were highest and worked out to ₹ 33797.94 per thousand m<sup>2</sup> without any subsidy where as it showed decrease in charges with increase in subsidy (Table 2). The total cost of cultivation i.e. Cost C3, of capsicum for thousand m<sup>2</sup> polyhouse without subsidy was estimated to ₹ 371777.37 while with 65% and 75% subsidy cost of cultivation reduced up to ₹ 256227.87 and ₹ 238290.17, respectively. The results are in conformity with Sreenivasa *et al.* (2009)[16], Sreedhara *et al.* (2013) [15], Kumar (2015) [4], Sanjeev *et al.* (2015) [15], Kumar (2016) [5], and Nikki *et al.* (2017) [8].

The cost and return of capsicum cultivation in polyhouse are presented in **Table 3**. From the study of three years it was observed that the yield of capsicum per thousand m<sup>2</sup> was 110 quintals which was sold at the rate of ₹ 4000 per quintal in market. Thus, the gross return from capsicum cultivation under protected condition was worked out to ₹ 440000 per thousand m<sup>2</sup>. It is depicted in Table 3 that the highest net return per thousand m<sup>2</sup> was realized when the cultivation of capsicum was done with 75% subsidy which was worked out to ₹ 201709.82. Whereas it was

estimated to ₹ 183772.12 when the cultivation of capsicum was done with 65% subsidy. This indicated that capsicum cultivation under protected condition was beneficial with the subsidy being imparted by Government of Gujarat.

**Table 3** Cost and return of capsicum cultivation in polyhouse (₹ per 1000 m<sup>2</sup>)

Particulars	Without subsidy	With 65% subsidy	With 75% subsidy
<b>Cost involved in capsicum cultivation</b>			
Cost A1	103038.10	103038.10	103038.10
Cost B1	204738.10	138633.10	128463.10
Cost B2	337979.43	232934.43	216627.43
Cost C2	337979.43	232934.43	216627.43
Cost C3	371777.37	256227.87	238290.17
<b>Return from capsicum</b>			
Yield of capsicum (quintals)	110	110	110
Price (Rs./qtls)	4000	4000	4000
Gross return	440000	440000	440000
Net return	68222.62	183772.12	201709.82
<b>Return over different costs</b>			
Cost A1	336961.90	336961.90	336961.90
Cost B1	235261.90	301366.90	311536.90
Cost B2	102020.57	207065.57	223372.57
Cost C2	102020.57	207065.57	223372.57
Cost C3	68222.63	183772.13	201709.83

**Table 4** shows the different measures to study the economic feasibility of capsicum cultivation in polyhouse. The different economics measures like NPW, IRR and BC ratio was worked out to ₹ 12.84 lakh per 1000 m<sup>2</sup>, 94% and 1.85 when the capsicum cultivation was done with 75% subsidy. Table 4 further depicted that the values of NPW, IRR and BC ratio was higher with 65% subsidy when compared with the values without subsidy. This indicated that the cultivation of capsicum in polyhouse was economically more feasible with 65% and 75% subsidy. Higher payback period recorded when cultivation done without subsidy (16 years) whereas with 65% and 75% subsidy the payback period was 3 years and 2 years, respectively. Sreenivasa *et al.* (2009) reported that the benefit cost ratio for capsicum cultivation in polyhouse was 1.80. Similar results were found by Sreedhara *et al.* (2013) in capsicum cultivation, Kumar (2015) [4] in cucumber cultivation, Sanjeev *et al.* (2015) [11] in cucumber cultivation Kumar (2016) [5] in capsicum cultivation, and Nikki *et al.* (2017) [8] in bell paper cultivation.

**Table 4** Economics feasibility of capsicum cultivation in polyhouse (₹ per 1000 m<sup>2</sup>)

Particulars	Without subsidy	With 65% subsidy	With 75% subsidy
NPW (Rs. Lakh)	6.03	11.93	12.84
IRR (%)	26	73	94
BC Ratio	1.18	1.72	1.85
Pay back period (Years)	16	3	2

## Conclusion

From the present study it can be concluded that the establishment cost of polyhouse and cost of cultivation of capsicum in polyhouse for the area of 1000 m<sup>2</sup> was less with 65% and 75% subsidy. Net return obtained without subsidy of capsicum cultivation in polyhouse was less as compared to net return obtained with 65% and 75% subsidy. The higher values of NPW, IRR and BC ratio and lowest value of payback period of capsicum cultivation with subsidy implied that the capsicum cultivation was most profitable and economically feasible with 65% and 75% subsidy.

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## Publication History

Received 13<sup>th</sup> Aug 2018  
Revised 18<sup>th</sup> Sep 2018  
Accepted 04<sup>th</sup> Oct 2018  
Online 30<sup>th</sup> Oct 2018

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