

## **Economic Feasibility and Identification of Suitable Crop (Capsicum and Tomato) for Protected Cultivation under Insect Net House in Udaipur District of Rajasthan- A Case Study**

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### **Abstract**

*Protected structure is one of the ways to overcome the harmful effects of the biotic and abiotic stresses. Further, protected structure also provides strong base for organic farming or minimum use of pesticides. But, high initial investment for construction of structures and impact of different covering materials on the internal climate on growing plants inside are the limiting factors hence, this study is proposed to study the impact of covering material on growth and yield of horticultural crops (capsicum and tomato) and also for the identification of suitable horticulture crops based on its economic feasibility for cultivation in the insect net house under this region. To study the economic feasibility of both the crops namely capsicum and tomato under insect net house the pooled mean data of the year 2012 and 2013 were used for calculating cost of cultivation, yield, gross income and net income. Two components of cost of cultivation namely fixed and variable cost has been considered for its analysis. For fixed costs, rental value of land, depreciation of structure, crop training system and drip irrigation system, interest on fixed capital, maintenance charges on structure and drip irrigation system were considered. Items for variable cost are depreciation on covering material of structure, maintenance charges of covering material, interest on working capital cost of seeds, fertilizers, field preparation, insecticides, operational costs for production of capsicum and tomato. Average yield for capsicum for two years pooled data for insect net house from 0.10 ha area was exhibited 5499 kg while, it was recorded 11204 kg of tomato under the same. Average gross income was calculated for 0.10 ha area for capsicum crop from two years pooled data for insect-net house was found Rs. 2,47,455.00 while, it was obtained Rs. 1,68,060.00 for tomato crop. Average net income from 1 sq. mt. area for capsicum crop under insect net house was calculated Rs. 179.06 while, it was found Rs. 103.04 for tomato crop. The pooled input- output ratio or per rupee returns from 0.10 ha. area for capsicum crop based on two years pooled data for insect net house was found Rs. 3.62 while, it was obtained Rs. 2.58 for tomato crop. Hence, it was concluded that growing of capsicum is more profitable as compared to tomato crop for protected cultivation under with insect- net house in Udaipur district of Rajasthan.*

Key words: biotic and abiotic, cultivation, economic, insect, net house, investment

### **Introduction**

Horticultural crops are more prone to the biotic and abiotic stresses, otherwise it have immense potential to produce qualitative and quantitative yields. Protected structure is one of the ways to overcome the harmful effects of the biotic and abiotic stresses. Further, protected structure also provides strong base for organic farming or minimum use of pesticides. But, high initial investment for construction of structures and impact of different covering materials on the internal climate on growing plants inside are the limiting factors hence, this study is proposed to standardize and evaluate the material used for covering of structure and also for the identification of suitable horticultural crop based on economic analysis for

cultivation in the protected structure under this region.

Construction of insect-net house through locally available materials was done to study the economic feasibility of crops like capsicum and tomato under climatic condition of Udaipur district of Rajasthan. Evaluation study mainly of the economic aspects viz. gross returns, net returns and per rupee returns has been carried out.

### **Methodology**

One small sized green house structure of sized 64 sq. m (16 m x 4 m) of GI pipe frame have been constructed at local level and was covered with UV stabilize (50% absorbance ability) insect net. Objective of the study is to determine the impact of covering

material on the growth and yield of the capsicum and tomato and identification of suitable crop based upon their economic analysis. Height of vertical post was kept 2.7 m and the top curved arch was made in such a way that the 6 m long GI pipe was having 4 m width between its both ends. The capsicum cv. "Indira" and tomato cv. "Dev" was taken for cultivation during the year 2012 and 2013. The total growing area of the small structure is 16 m X 4 m i.e. 64 sq.mts. There are four replications on four raised beds each with two rows of capsicum planted with using spacing of 50 x 50 cm and for tomato crop spacing of 50 x 30 cm was adopted.

All agronomical practices were followed according to the suggested package of practices from Department of Horticulture, GOR, Udaipur. The data were recorded from the randomly selected ten tagged plants under each replication. Lay out of experiments of each crop were done according to the plan and regular observation, data collection with respect to the economic aspects has been carried out for both the crops under insect- net house.

The field experiment for growing of capsicum and tomato has been conducted in the year 2012 and 2013 to study the economic feasibility of both the crops under insect- net house. The statistical analysis was made on the pooled data of two years.

#### *Calculation of cost of cultivation*

- A separate cost of cultivation, yield, gross income and net income of capsicum and tomato was calculated considering the 1 sq. mt. area and it was multiplied for 1000 sq. mt. area for protected cultivation. On the basis of calculated data input-output ratio or income on per rupee investment has been calculated.
- Two components of cost of cultivation namely fixed and variable cost has been considered for analysis.
- Items for fixed costs are-
  - (i) Rental value of land- Assumed as it is prevailing in the locality.
  - (ii) Depreciation of structure and drip irrigation system was considered @ 10% of the value of the structure including drip irrigation system.
  - (iii) Interest on fixed capital was taken as 12 % of the total fixed capital.
  - (iv) Maintenance charges on structure and drip irrigation system were considered as 2% of its costs of framing structure and establishment of drip irrigation system considering the ideal size of protected structure i.e. 1000 sq. mt. area.
  - (v) Salary for permanent labour – These are the data of AICRP (All India Coordinated Research Project on application of Plastics in Agriculture in which no permanent labour was employed in the scheme.

#### *Items for variable cost*

- (i) Depreciation of covering material of structure- it is fact that the life of covering material i.e. insect-net

house (50 % absorbance) is 3 years. Thus, 33% value of its cost was considered in this component

- (ii) Maintenance charges of covering material were considered as 2% of its price of UV stabilized plastic coverings. Polysheet was purchased @ Rs.74 per sqm and insect net and shade net both was purchased at the same rate i.e. on Rs. 40 per sqm.
- (iii) Working capital- total working capital for 6 months is added. It includes the charges for field preparation, high yielding variety seeds, farm yard manure, fertilizers, pesticides, land revenue, electricity charges and wages for casual labour for both the crops under insect net house.
- (iv) Interest on working capital is calculated only for 6 months for each crop (as per their life span).
- (v) Marketing cost was considered as Rs. 1.10 /kg output for capsicum and tomato are included in wages of labour.

### **Results and Discussion**

Fixed Cost (pooled value) for cultivation of capsicum and tomato crops under insect –net house during the year 2012 and 2013 has been shown in the table 1. The fixed cost for insect net house was found to be same i.e.Rs. 53,400.00 for the period of six months for both the crops. The components of fixed cost covers depreciation @ 10% of the value of insect-net house, drip irrigation system & fixed assets like farm buildings etc. which is calculated on Rs. 8,73,000.00 per hectare basis and was found to be Rs. 21,825.00, interest on fixed capital was calculated on Rs. 8,73,000.00 per hectare basis @ 12%, half amount for each crop of 6 months was calculated as Rs. 26,190.00, maintenance cost of structure was calculated @ 2% value of the structure with drip irrigation system in 0.10 ha @ 873/sq.mt. (Half amount of total charges per crop was calculated on Rs. 8,73,000.00 per hectare basis) was found Rs. 4,365.00 and rental value of land for 0.10 ha at existing rates of market was Rs. 1000.00 and rent paid for land was Rs. 20.00. Though, the rental value and rent paid for land was not considered during experimental reports considering it as negligible amount for small structure (64 sq. mt. area) but, here it is included as the economic analysis is assumed for 1000 sq. mt. sized insect-net house. Thus, it was concluded that fixed costs for cultivation of both the crops capsicum and tomato under insect-net house was found to be same.

The pooled value of variable and total cost for cultivation of capsicum and tomato crops under insect-net house for the year 2012 and 2013 has been given in the table 2. The depreciation on covering material @ 33% of the value of the insect-net house was found to be same for insect net house for both the crops of tomato and capsicum i.e. Rs. 159.70. Interest on working capital @ 12% was for insect net house for

Table 1: Pooled data of fixed cost for cultivation of capsicum and tomato crops under insect net house during the years 2012 and 2013 (in Rupees)

S.No.	Particulars	Insect net house	
		Capsicum	Tomato
A.Fixed Cost (FC)			
1.	Rental value of land (0.10 ha. area)	1000.00	1000.00
2.	Depreciation @ 10% of the value of farm buildings, drip irrigation system, crop training system & fixed assets like small greenhouse structure i.e. on Rs. 8,73,000.00 per ha)	21825.00	21825.00
3.	Interest on fixed capital (i.e. on Rs. 8,73,000.00 per ha @ 12%) half amount for a crop of 6 months	26190.00	26190.00
4.	Maintenance cost of structure @ 2% value of the structure with drip irrigation system in 0.10 ha @873per sqm (Half amount of total charges/crop) i.e. on Rs. 8,73,000.00 per ha)	4365.00	4365.00
5.	Rent paid for land	20.00	20.00
	Total fixed costs (A)	53400.00	53400.00

Table 2: Pooled data variable and total cost for cultivation of capsicum &amp; tomato crop under insect net house (1000 sqm area) for the year 2012 and 2013 (in Rupees)

S.No.	Particulars	Insect net house	
		Capsicum	Tomato
B. Variable Cost			
1.	Depreciation on covering material @ 33% of the value of the material	159.70	159.70
2.	Interest on working capital @ 12%	58.10	58.10
3.	Maintenance Charges @ 2% of the value of the material	9.70	9.70
4.	Field preparation @ Rs.800/hr. for 1 hr.	800.00	800.00
5.	Seeds apsicum@50gm @ Rs.75,000/kg Tomato @ 12.5gm @ Rs.49000/kg	3750.00	652.50
6.	FYM@250qt/ha @ Rs.1.0 per kg (for 0.10ha)	2500.00	2500.00
7.	Fertilizer		
	i. Uria @ Rs 5.5/kg	220.00	210.00
	ii. DAP @ Rs. 12.0/kg	240.00	230.00
	iii. Muriot of Potash @Rs 6.0/kg	180.00	175.00
	iv. Micronutrients- Agromin and calcium Nitrate	160.00	160.00
8.	Pesticides -i. Fumigant	300.00	300.00
	Insecticide		
	i.Chloropyrophose	40.00	30.00
	ii. Prophanophose	40.00	30.00
	iii. Cypermethrin	40.00	30.00
	iv. Imedachloprid	40.00	30.00
	v. MP dust	40.00	30.00
9.	Electricity charge	200.00	200.00
10.	Casual labour charge@ labour/day/ha @ Rs. 147/day (half amount of total charges/crop)	5365.50	5365.50
11.	Half amount per crop of interest on working capital @ 12% per annum	848.60	653.70
	Total variable cost (B)	14991.60	11624.20
	Cost of cultivation(A+B)	68391.60	65024.20
	Cost of cultivation per sqm area	68.39	65.02

single crop was found to be Rs. 58.10 for both the crops of tomato and capsicum. Maintenance Charges @ 2% of the value of the material was found to be same for both the crops grown under insect net house and for individual crops it was found to be Rs. 9.70.

The cost calculated for field preparation under insect net house for both the crops was found same i.e. Rs. 800.00 for 0.10 ha area. The capsicum seeds was required @ 50 gm for 0.10 ha area and purchased @ Rs.75,000 per kg of valued Rs. 3,750.00 while, the

seeds required for tomato was @ 12.5 gm for 0.10 ha and purchased @ Rs.49,000 per kg of valued Rs. 652.50. FYM required @ 250 qt per ha and purchased @ Rs.1.0 per kg and it costs Rs 2,500.00 for 0.10 ha area and used similarly for both the crops.

Recommended doses of fertilizers were used for both the crops for insect net house structures and it costs Rs. 800.00 for capsicum and Rs. 750.00 for tomato for 0.10 ha area. The market price of Urea was @ Rs.5.5 per kg, DAP @ Rs.12 per kg and MoP

@ Rs. 6 per kg. In the same way Rs. 300.00 were invested for purchasing of fumigants i.e. Formaldehyde for both the crops. While, Rs. 200.00 for capsicum and Rs. 150.00 for tomato was invested for pesticides such as; prophenophos, chloropyrophos, cypermethrin, imedacholoprid and MP dust and applied as per need.

Electricity charges were paid to be Rs. 200.00 for each crop of capsicum and tomato. Wages for casual labour were calculated @ 2 labour/day/ hectare @ Rs.147/day wage rate (half amount of total charge per crop) and the wages paid for casual labour was Rs. 5,365.50 for insect net house structures and was paid similarly for both the crops capsicum and tomato.

Half amount per crop of interest on working capital @12% per annum was noted different for both the crops in insect net house. For capsicum crop it was found to be Rs. 848.60 for 0.10 ha whereas, for tomato crop interest on working capital was Rs. 653.00 for insect net house.

The pooled value of the total variable cost (B) was found to be same for capsicum crop under insect net house was Rs. 14,991.60 while, for tomato it was found to be i.e. Rs. 11,624.20. Further, the pooled value of the total cost of cultivation (A+B) i.e. fixed plus variable costs were calculated Rs. 68,391.60 under insect net house for the capsicum crop whereas, it was found to be Rs. 65,024.20 for tomato crop. Cost of cultivation per sq. mt. area was found to be Rs. 68.39 under insect net house for the capsicum while, it was observed Rs. 65.02 for tomato crop. Thus, it can be said that for growing of capsicum, more variable cost was observed as compared to tomato growing due to variation in cost of seeds, working capital, use of fertilizers and insecticides and pesticides.

Table 3: Pooled data yield and income of capsicum and tomato crops insect net house (for 1000 sqm area) for the year 2012 and 2013.

S.No.	Particulars	Insect net house	
		Capsicum	Tomato
1.	Yield in 1 sqm area (kg)	5.499	11.204
2.	Yield in 1000 sqm area (kg)	5499	11204
3.	Gross income/structure (Rs.)	2,47,455	1,68,060
4.	Gross income/sqm area (Rs.)	247.46	168.06
5.	Net income/structure (Rs.)	1,79,063.4	1,03,035.8
6.	Net income/sqm area (Rs.)	179.06	103.04
7.	Input-output ratio	3.62	2.58

Pooled yield and income of capsicum and tomato crops for 0.10 ha sized insect net house has been presented in the table-3. Average pooled yield of capsicum from both the year 2012 and 2013 for insect net house was found to be 5499 kg while, it was recorded 11204 kg of tomato crop under the same

structure. The pooled yield per square meter area was also calculated by dividing the data by its factor. The average gross income of capsicum crop from 0.10 ha area during the year 2012 and 2013 for insect net house was found to be Rs. 2,47,455.00 while, for tomato crop the gross income was obtained Rs. 1,68,060.00 under the insect net house. The pooled net income from 0.10 ha area for capsicum during the year 2012 and 2013 for insect net house was found to be Rs. 1,79,063.40 whereas, it was observed Rs. 1,03,035.80 for tomato crop under the same structure. The variation in gross income and net income of both the crops was mainly due to high market price of capsicum as compared to tomato. Hence, it can be said that market demand of capsicum is greater than tomato and low production of capsicum in the area.

The pooled net income from per sq. mt. area for capsicum from both the year 2012 and 2013 for insect net house was recorded Rs. 179.06 while, it was obtained Rs. 103.04 for tomato crop under insect-net house.

The pooled input- output ratio or per rupee returns from 0.10 ha area for capsicum crop from insect net house was obtained Rs. 3.62 while, it was found Rs. 2.58 for tomato crop under the same structure of insect-net house. Thus, it can be concluded that capsicum growing is more profitable as compared to tomato crop for protected cultivation under insect-net house in Udaipur district of Rajasthan.

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