

Original Research Article

An Economic Analysis of Tomato Cultivation under Polyhouse Condition

ABSTRACT:

The present investigation was undertaken with a view to work out the costs and returns from polyhouse grown tomato under low cost naturally ventilated polyhouse conditions. Polyhouse cultivation of tomato is emerging as specialized production technology to overcome biotic and abiotic stresses during off-season and also ensure round the year production of tomato. Application with 50 per cent organic and 50 per cent inorganic fertilizers was found best in terms of economic feasibility in tomato as it produced the highest gross return (Rs. 266200.00/1000 m² area), net return (Rs. 188420.00) and net return per rupee investment (2.42) and was also found to be superior in terms of good quality produce. These results suggested that the optimum production and net return can be obtained with the integrated application of 50 per cent organic and 50 per cent inorganic fertilizers.

Keywords:- Tomato, gross income, polyhouse, cost production

Comment [HRM1]: Production cost

Introduction:-

Tomato (*Solanum lycopersicon* L.) is one of the most important vegetable crop in the world. It belongs to the family solanaceae have diploid chromosome number 24 and a self pollinated crop. Tomato is cultivated throughout the world in tropics and subtropics and more extensively in United States, China, Italy, Turkey and India. Tomato is one of the popular vegetables of great commercial value and is used in various forms of salad, soup, ketchup, sauce, chutney, pickles, powder, paste, juice, puree, and many other products. The ripened fruit have medicinal properties. India is second largest producer (11.5 per cent) of tomato in the world (Anon., 2017). In India during 2016-17 tomato had an area of 808.5 ('000' ha) with production 19696.9 ('000' MT) and productivity 24.4 MT per hectare. Protected cultivation of tomato not only overcomes the biotic and abiotic stresses but fulfills the demand of quality products and has encouraged commercial growers to raise tomato under greenhouses for year round supply with remunerative prices to the growers. Greenhouse cultivation could, therefore, be resorted to increase the tomato production. Vegetable cultivation in polyhouse, not only increases the productivity but also, enhances the quality of vegetables and it is being practiced in more than fifty countries all over the world (Singh, 1988). The present study was

Comment [HRM2]: 11.50% (use symbol if figures are in %)

taken up to examine the factors affecting gross return and profitability of tomato in a naturally ventilated polyhouse condition under different treatment combinations with sustainable crop production technology.

Research Methodology:

The experiment were carried out during two consecutive years 2017 and 2018 in naturally ventilated polyhouse for standardization of production of tomato and to workout economic feasibility of investment under polyhouse conditions was evaluated at MPUAT, Udaipur. The polyhouse was covered with UV stabilized low density 200 micron thick polyethylene sheet along with aluminate sheet, insect proof net and foldable side covers by taking into account the depreciation cost of the life of permanent structure as 20 years, while the life of UV poly cladding material and insect proof net were considered as five years. Eight different nutrient sources module including organic and inorganic fertilizers were involved in the present study. The experiment was laid out in completely randomized design with four replications. Data were generated by cost accounting method from 2017 to 2018.

Comment [HRM3]: s

Cost of cultivation calculation:-

Costs were computed by grouping following certain items (Table 1) of costs as discussed below:

- A) General costs like value of hired labour and machineries
- B) Fixed cost/ infrastructure
- C) Material inputs
- D) Variable cost due to different module applied

Total cost of cultivation= A+B+C+D

Gross Returns:-

Gross return was estimated on the basis of the average fruit yield per 1000 square meter by considering the present price of inputs and current selling price of produce.

Gross Income = Yield per 1000 square meter × Current selling price of product

Net Returns:

It is the net profit after deducting total cost of cultivation from gross income.

Net returns = Gross returns – total cost of cultivation per 1000 meter square

Returns per rupee:-

Net returns per rupee investment (B:C ratio) was estimated by using following formula:

$$\text{B:C Ratio} = \frac{\text{Net returns (Rs. per 1000 square meter)}}{\text{Total cost of cultivation (Rs. per 1000 square meter)}}$$

Results and discussion:-

Polyhouse production of vegetable is a capital-intensive technology requiring a substantial investment especially during initial investment. The details of total costs including variable costs due to different module applied in polyhouse are given in table 1 and Table 2 revealed that the lowest total cost of cultivation 73660.00 rupees was found with application of 100 percent vermicompost and highest total cost of cultivation 80410.00 rupees was found with module 2 treated with 100 percent RDF and Biofertilizers while total cost of cultivation of highest net return producing module was found 77780.00 rupees with application of 50 per cent both organic and inorganic fertilizers. The break-up of costs indicated that the highest costs was incurred on labour and material inputs like plastic ropes, insecticides, seedling etc. indicating that polyhouse cultivation of tomato is both labour and capital intensive (Murthy *et.al.*, 2009).

Economic analysis showed that application of 50 per cent both organic and inorganic fertilizers significantly produced higher gross return (Rs. 266200.00), net return (Rs. 188420.00) and net return per rupee investment of Rs. 2.42 closely followed by 75 per cent organic and 25 per cent inorganic fertilizers. Yeptho *et al.* (2012) revealed that the treatment 50 per cent NPK + 50 per cent PM + biofertilizers gave the highest net return Rs. 3,49,887 of tomato under polyhouse condition. Similar findings were also reported by Murlidharan *et al.* (2016) and Kumar *et al.* (2017) in tomato, Tuti *et al.* (2014) in pepper and Laxmi *et al.* (2015) in tomato. Besides yield, the quality of fruits was found to be superior in terms of its size, colour and shining. Protected technology breaks the seasonal barriers of production and thus, ensures availability of the tomato throughout the year by proper crop planning. It will be even more profitable for the growers if the market prices are found to be higher due to superior quality and off season produce.

Conclusion:-

Cultivation of tomato under low cost polyhouse emerged as a profitable and economically viable option to increase the farmers' income by using cost effective, eco friendly and sustainable production with minimum deteriorious effects on soil health and environment. The best combination of organic and inorganic fertilizers for obtaining the maximum net returns was found with the application of 50 per cent both organic and inorganic fertilizers.

Comment [HRM4]: use cent percent

Comment [HRM5]: use cent percent

Table: 1. Expenditure of tomato cultivation under naturally ventilated polyhouse condition for (1000 m² area)

| (A) General cost per 1000 m² area | | |
|---|---|--------------------------|
| S.No. | Particulars | Expenditure (Rs.) |
| A | VARIABLES: | |
| (i) | Nursery preparation and sowing | 440.00 |
| (ii) | Nursery management (Two hours for 30days) | 1100.00 |
| (iii) | Bed preparation | 880.00 |
| (iv) | Transplanting | 440.00 |
| (v) | Manuring and fertilization | 1320.00 |
| (vi) | Intercultural operations (Hoeing, weeding, earthing up and irrigation) | 7040.00 |
| (vii) | Spraying (insecticides, pesticides and organic substance) | 5500.00 |
| (viii) | Training and pruning | 4400.00 |
| (ix) | Picking and harvesting | 6600.00 |
| | Total | 27720.00 |
| B. | FIXED COST/ INFRASTRUCTURE | |
| (i) | Depreciation on fixed cost + interest on invested money | 25000.00 |
| C. | MATERIAL INPUT | |
| (i) | Soil treatment | 1600.00 |
| (ii) | Seedling cost | 10800.00 |
| (iii) | Insecticide and fungicides | 1740 |
| (iv) | Plastic ropes | 1800.00 |
| | Total cost (A+B+C) | 68660.00 |
| D. | VARIABLE COST DUE TO DIFFERENT MODULE APPLIED : | |
| T ₁ | 100% RDF (180:100:100 kg/ha NPK) | 11600.00 |
| T ₂ | 100% RDF + Biofertilizers | 11750.00 |
| T ₃ | 100% Vermicompost + Biofertilizers | 5150.00 |
| T ₄ | 100% Vermicompost | 5000.00 |
| T ₅ | 100% organic management | 6140.00 |
| T ₆ | 75% organic management | 5305.00 |
| T ₇ | 50% organic + 50% inorganic fertilizers | 9120.00 |
| T ₈ | 75% organic + 25% inorganic fertilizers | 6730.00 |

Table: 2 Benefit cost ratio, gross returns, net returns of different module combinations of tomato under naturally ventilated polyhouse condition.

Comment [HRM6]: returns

| S. No. | Module | Estimated yield (Quintal/ 1000 m ²) | Total cost of cultivation (Rs. / 1000m ²) | Gross return (Rs. / 1000m ²) | Net return (Rs. / 1000m ²) | B:C ratio |
|---|---|---|---|--|--|-----------|
| 1. | 100% RDF | 116.70 | 80260.00 | 233400.00 | 153140.00 | 1.91 |
| 2. | 100% RDF + biofertilizers | 120.40 | 80410.00 | 240800.00 | 160390.00 | 1.99 |
| 3. | 100% vermicompost + biofertilizers | 112.50 | 73810.00 | 225000.00 | 151190.00 | 2.05 |
| 4. | 100% vermicompost | 103.60 | 73660.00 | 207200.00 | 133540.00 | 1.81 |
| 5. | 100% organic management | 126.30 | 74800.00 | 252600.00 | 177800.00 | 2.38 |
| 6. | 75% organic management | 102.10 | 73965.00 | 204200.00 | 130235.00 | 1.76 |
| 7. | 50% organic + 50% inorganic fertilizers | 133.10 | 77780.00 | 266200.00 | 188420.00 | 2.42 |
| 8. | 75% organic + 25% inorganic fertilizers | 128.70 | 75390.00 | 257400.00 | 182010.00 | 2.41 |
| *Retail sale price of tomato @ Rs. 20 per kg | | | | | | |

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Comment [HRM7]: Indian

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