

Economics of Production of Tomato under Open and Protected Field Condition in Hills of Uttarakhand

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ABSTRACT

In present study, an attempt is made to work out the economics of production of tomato under open and protected field condition in Almora and Nainital districts of Uttarakhand. The study is based on primary data of seventy six farmers engaged in vegetable cultivation. Simple tabular analysis and standard cost concept was used to work out the cost of cultivation. The study revealed that the total cost of cultivation of tomato under open and protected field condition was ₹ 1,36,250 and ₹ 4,01,743 per hectare and gross return was ₹ 1,81,500 and ₹ 8,66,250 per hectare respectively. The output-input relationship for tomato was 1.3 and 2.2 at cost 'C' under open and protected field conditions was respectively. In order to find suitability of poly-houses for cultivation of tomato, economic indicators such as net present value, benefit cost ratio and pay back period were also calculated.

Key Words: Tomato production, Net present value, Internal rate of return, Benefit cost ratio, Return over investment

INTRODUCTION

Due to specific agro-climatic conditions, the normal production season in Uttarakhand hills is off season from the perspective of urban markets of plains. During June-September period, due to low production in most of the areas, vegetables arrive mostly from hilly regions of the state thereby considering it as seasonal vegetables from hilly region farmers' point of view and off season vegetables from consumers' point of view. Due to low level of arrival of off season vegetables in March-September months, these vegetables get highest prices in the wholesale markets. Since the land holdings of hill farmers are very small and scattered, vegetables growing as compared to prevailing cereals cultivation are capable of giving at least 2-4 times high returns, profitability and also provide more employment opportunities (Shri Dhar, 2006).

In Uttarakhand during 2010-11, there was 1.03 million tonnes of annual vegetable production from an area of 85,800 hectare (NHB, 2011). Tomato is one of the most widely grown temperate vegetable crops grown in Himalayas and *tarai* region of northern India. Tomato crop has the highest value productivity among other vegetables in hills of northern India (Sharma, 2007). Under Horticulture Mission for North Eastern Himalayan states, efforts are being made to encourage and help farmers to cultivate vegetables especially off seasonal vegetables under protected condition. Many farmers in Almora and Nainital districts are now actively engaged in cultivation of tomato, french bean, cauliflower, cabbage and squash under open and protected field conditions. About 110 poly houses and 90 poly tanks have been

constructed in these areas on participatory basis. The production of vegetables has increased by more than 300 per cent with the introduction of poly houses (Bisht *et al.*, 2011). Out of different vegetables grown in this region, tomato is a preferred crop by most of the farmers. Thus, the present study investigates the economics of tomato production and compares input-output relationships under open and protected field conditions.

Null Hypotheses

Tomato is a non-profitable crop for farmers under protected field conditions in comparison to open field conditions.

METHODOLOGY

Selection of samples

The present study four villages which comes under Horticulture Mission for North East Himalayan States (HMNEH) from Almora and Nainital districts were purposively selected namely Bhagartola, Todhra, Dudholi and Dubkhar and where tomato cultivation under open and protected field conditions is a major activity. In these villages farmers were grouped into four farmers' club and were engaged in intensive vegetable production. Seventy six farmers who cultivate tomato, having poly houses and members of farmers' club were selected randomly from these four villages. Pre-tested schedules were used to collect the data from the farmers. The data pertains to the tomato production under open and poly-house condition during the period of May to July in the year 2010-11.

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Analytical Tools

Cost of cultivation of crops in different situations i.e. under open and protected field situation was worked out. The basis of cost of cultivation was the standard one as given by Agricultural cost and Price commission (ACPC), Government of India. To test the hypothesis, t-test was used.

Total cost of cultivation has been segregated in three cost concepts i.e. Cost A, Cost B and Cost C.

Cost 'A' (Total Variable Cost)

It is the actual paid out costs by the cultivator in both cash and kind. The cost items include hired human labour, hired and owned bullock labour, value of seeds, manure (both produced at farm level and purchased), fertilizer used, plant protection, irrigation, machineries, land revenue, depreciation, interest on working capital and other miscellaneous charges.

Cost 'B': It is calculated as-

Cost 'B' = Cost 'A' + Rental value of land + Interest on fixed capital (excluding land)

Cost 'C':

It is calculated as-

Cost 'C' = Cost 'B' + Imputed value of family labour.

Returns Over Investment: Based on the cost and return, Net Present Value (NPV), Benefit Cost Ratio (BCR) and Internal Rate of Return (IRR) was worked out for poly house tomato cultivation. These were estimated by having following assumption. 1) Real costs and prices of input and output will be same for the period of project, 2) Age of poly house will be of 10 years from the year of operation, 3) agricultural bank rate will be about 7 per cent throughout the poly house age and 4) inflation rate is assumed to be about 10 per cent for outputs and inputs inflations is assumed to be 8 per cent.

RESULTS AND DISCUSSION

Cost of cultivation of Tomato under different field conditions:

Cost of cultivation is basically an indication of investment required for production of a crop enterprise and its efficiency of production. Per hectare cost of cultivation of tomato under open and protected field conditions was worked out by using standard cost concept as explained in methodology. The estimation of costs helps to know the profitability of a particular crop enterprise. For the purpose of crop planning, more emphasis was given on Cost 'A' i.e. direct cost, the details are showed in Table 1.

It was found that per hectare total cost of cultivation of tomato under open field condition was ₹ 1,36,250. Among the different items of expenditure, human labour was for highest (55%) to total cost. The other items of expenditure have been bullock labour (3.2%), machinery charges (0.07%), seeds (7.7%), plant protection (3.6%), manure (5.5%) and fertilizer (1.6%).

Under open field condition, Cost 'A' and Cost 'B' had been ₹ 46,000 and ₹ 76,250 per hectare respectively, which was 33.8 per cent and 56 per cent of Cost 'C'. Bharadwaj *et al.*, (2011) found average variable cost of cultivation of tomato was ₹ 18,150 per acre in hills of Uttarakhand.

It was observed that per hectare total cost of cultivation of tomato under protected field condition was ₹ 4,01,743. Among the different items of expenditure, human accounted for 22.4 per cent followed by rental value of own land i.e. 46.6 per cent to total cost. The other items of expenditure were seeds (2.6%), plant protection (1.2%), manure (1.9%) and fertilizers (0.5%). Under protected field condition, Cost 'A' and Cost 'B' were calculated as ₹ 1,39,660 and ₹ 3,26,743 per hectare respectively, which was 34.8 per cent and 81.3 per cent of Cost 'C'.

Table 1: Cost of cultivation of tomato under open and protected condition

Particulars	Cost of cultivation under open condition (₹/ha)	%	Cost of cultivation under protected condition (₹/ha)	%
Hired human labour	15,000	11	15,000	3.7
Bullock labour	4,375	3.2	-	-
Machine	90	0.07	90	0.02
Seeds	10,500	7.7	10,500	2.6
Plant protection	4,900	3.6	4,900	1.2
Manure	7,500	5.5	7,500	1.9
Fertilizer	2,200	1.6	2,200	0.5
Depreciation	799	0.6	75,900	18.9
Interest on working capital	636	0.5	1,070	0.3
Miscellaneous (Sutti)	-	-	22,500	5.6
Cost 'A'	46,000	33.8	1,39,660	34.8
Rental value of own land	30,250	22.2	1,87,083	46.6
<i>i.e.</i> 1/6 th of gross value of produce minus land revenue				
Cost 'B'	76,250	56.00	3,26,743	81.3
Imputed value of family labour	60,000	44.00	75,000	18.7
Cost 'C'	1,36,250	100.00	4,01,743	100

Economics of production of tomato under open and protected conditions

Studies on economics of production of tomato have helped to understand the profitability of crop under open and protected field condition. The data on cost & returns from tomato are presented in Table 2. The value of the produce has been calculated at the market price i.e.

₹ 1,650 per quintal for tomato.

It was revealed that gross return from tomato production under open field condition was ₹ 1,81,500 per hectare. Net return over Cost 'A' and Cost 'C' were ₹ 1,35,500 and ₹ 45,250 per hectare respectively.

Gross return from tomato production under protected field condition was ₹ 8,66,250 per hectare. Net return over Cost 'A' and Cost 'C' had been ₹ 7,26,590 and ₹ 4,64,507 per hectare respectively. As t-value of 1.74 which is significant at 1% level, null hypothesis is rejected. It implies that tomato is a profitable crop to farmers under protected field conditions in comparison to open field condition.

Table 2: Cost and returns from tomato under open and protected field condition

Particulars	Open condition	Poly house condition
Yields (qtls/ha)	110	525
Gross Return (₹)	1,81,500	8,66,250
Cost 'A' (₹)	46,000	1,39,660
Cost 'B' (₹)	76,250	3,26,743
Cost 'C' (₹)	1,36,250	4,01,743
Net Return over		
(a) Cost 'A' (₹)	1,35,500	7,26,590
(b) Cost 'B' (₹)	1,05,250	5,39,507
(c) Cost 'C' (₹)	45,250	4,64,507

* significant at 0.1 level.

Comparison of Output-Input relationship of tomato under open and protected field condition

Efficiency of investment in the cultivation of crop has been judged by calculating the output-input ratio and presented in Table 3. The output input ratio for tomato production under open field condition at Cost 'A', Cost 'B' and Cost 'C' were 3.9, 2.4 and 1.3 respectively.

The output-input ratio for tomato production under protected field condition at Cost 'A', Cost 'B' and Cost 'C' has been calculated as 6.2, 2.7 and 2.2 respectively.

Table 3: Output-Input relationship of tomato under open and protected condition

Particulars	Under open field condition	Under open field condition
Cost 'A'	3.9	6.2
Cost 'B'	2.4	2.7
Cost 'C'	1.3	2.2

Return over investment (ROI)

With the assumption that poly house constructed would be for next ten years without any major damages, viable the return over investment was estimated and the same is depicted in Table 4.

Table 4: Economic indicators for tomato production under poly house condition.

Economic indicator	Value
Net Present Value (₹)	3653176
Benefit Cost Ratio	4.97:1
Pay back period	4 years and 2 months

It was revealed that the NPV of investment made on poly houses is ₹ 36, 53,176. Based on NPV, it can be concluded that the construction of poly houses for cultivation of tomato is economical and there is substantial increase in the income of farmers. Benefit-cost ratio for tomato cultivation under poly house condition was high and it is worthwhile to construct poly-houses tomato production. The pay back period would be 4.2 years.

CONCLUSION

It is concluded from the present study that the output-input ratio was greater than unity indicating that tomato is a profitable crop in the selected area. The study also revealed that tomato production under protected field condition is more profitable than in open field condition in selected areas of hills of Uttarakhand. Tomato cultivation in poly houses is an effective solution to vegetable growers who would be able to recover investment on poly house within a period of 4.2 years. Therefore, poly house technology is very useful for the economic development of farmers. Multi tier protected farming technique needs to be developed in order to maximize productivity per unit of ground area to cope up with declining average land holding and growing demands of vegetables.

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