Original Research Article

Estimation of Cost and Returns per ha and Resource Use Efficiency of Tomato in Raipur District, Chhattisgarh

Abstract

The present study is on economic analysis of production and marketing of Tomato in Raipur Chhattisgarh. A multistage random sampling design was used for selecting the sample. The study covered 1 Block, 5 village and 60 Tomato growers from Raipur district. The primary data were collected for the season of 2023 by personal interview method. The area, production and productivity were collected from different secondary sources. In order to fulfil various objectives of the study tabular analysis was extensively used. The major findings of the study revealed that cost of cultivation per hectare and cost of production per quintal of Tomato was Rs. 67892.643 . The overall net income per hectare was Rs. 101720.00. The return per rupee of investment was Rs. 2.50.

Key words: Cost of cultivation, cost of production, gross returns, net profit, benefit-cost ratio

Introduction

Tomato *(Solanum lycopersicum*) is a native of tropical America and belongs to family *solanaceae*. The horticulture sector encompasses a wide range of crops ex. Fruit, vegetable, Potato and tuber, ornamental, medicinal and aromatic, spices and plantation crops. India with its wide variability of climate and soil is highly favourable placed for growing a large number of horticulture crops. It is the fastest growing sector within agriculture contributing towards poverty alleviation, nutritional security and it provide sample scope for farmers to increase their income and is helpful in sustaining large number of agro-based industries, which generate huge employment opportunities. Tomato is grown in over 150 countries and around 80 percent of the tomatoes produced worldwide are consumed. The major tomato growing countries are China, India, USA, Italy, Turkey and Egypt. Total cultivated area under tomato is 45,82,438 thousand hectare, production of 182,5,08,395 MT and productivity of 32.8 tonnes/Ha In the world (year 2017-18). The total cultivated area of tomato in India is about 767.32 thousand ha with total production 20,7,08,000 MT (NHB DATABASE; 2017-18). The major tomato producing states in the country are Andhra Pradesh, Madhya Pradesh, Karnataka, Gujrat, Orissa, West Bengal, Chhattisgarh, Maharashtra, Bihar, Harayana, Uttar Pradesh, Telangana, and Tamil Naidu. There states are account for <90 per cent total production of the country.In Chhattisgarh, Total production of tomato is 11,33,435 MT from an area about 64,681 Ha (2017-18). In the Chhattisgarh State major tomato producing districts area Raipur, Durg, Bastar, Balod and Jashpur etc. Raipur district produces 82,096 MT tomatoes in 4508 hectare area under vegetable crop.

Objective of the study:

1.To study socio-economic profile of the farmers in study area.

2.To estimate cost and returns per hectare and input-output ratio or B:C ratio of tomato in different size group

Research Methodology:

Sampling design:

Multi stage sampling design was adopted for the selection of district as the first stage unit, block as the second stage unit, villages as the third stage units and farm holding as the final and ultimate stage units.

Selection of the districts:

The state comprises 33 districts, among these districts, Raipur district was selected purposively for the study of Tomato for present study.

Selection of blocks:

There are 4 blocks in Raipur District. Out of them Abhanpur block was selected purposively for this study.

Selection of Villages

A complete list of all village was obtained from the related Gram Panchyat, of which 5% villages were selected randomly. In order to select the villages from these districts Raipur was selected randomly having Tomato for the study. Block development officer was contacted and lists of Tomato growing villages were prepared. From the prepared Information about the selected Districts, Block, Villages and respondents. The village Julum, Tekari, Raweli, Mundra and Kanhera

Selection of Respondents/ Farmers:

A separate list of farmers growing Tomato of selected villages were obtained from Gram Pradhan. There after these farmers were categorized into different size farm groups. Out of that, 10% of respondents were selected randomly on the basis of Tomato cultivation for the study. Based on size of holding farmers were classified into three groups i.e.

List 1 : Classification of farmers based on size of holding.

SR. NO.	CATEGORY	SIZE - CLASS
1	Marginal	Below 1.00 hectare
2	Small	1.00-2.00 hectare
3	Semi medium	2.00-4.00 hectare
4	Small Medium	4.00-10.00 hectare
5	Large	10.00 hectare & above

(https://www.pib.gov.in)

From this list 60 respondents were selected randomly through proportionate allocation to the population.

Analysis of data/ analytical tools used

The secondary data were analyzed from selected district to obtain estimates of growth rates in area, production and productivity of Tomato and the primary data were compiled and analyzed to work out the cost of production and marketing of Tomato.

Analytical techniques employed

For achieving the stated objectives, following analytical procedure was adopted**:-**

Cost of cultivation

The data pertaining to the cost of cultivation of Tomato crop are those which are generally adopted in the farm management studies. The various cost concepts are determined by agricultural economists who were used while analyzing the data as:
The economics of production and marketing was work out by using various cost concepts i.e. Cost-A1, Cost-A2, Cost-B1, Cost-B2, Cost- C1 and Cost-C2.
Cost- A1 = includes value of hired labour, value of owned bullock labour, value of hired bullock labour, value of owned machinery, value of hired machinery, hired machinery charges, value of fertilizer, value of manure (owned and purchased) value of seed (both farm produced and purchased), value of insecticides and pesticides, irrigation charges, canal water charges, land revenue, and other taxes, depreciation of farm implements, farm buildings, farm machinery and irrigation structure, interest on working capital and miscellaneous expenses, marketing cost and rent on land. Cost- A2 = Cost A1 + Rent paid for leased in land. Cost- B1 = Cost A2 + Interest on fixed capital (excluding land).
Cost- B2 = Cost- B1 + Rental value of owned land + Rent for Leased in land.
Cost- C1 = Cost- B1 + Imputed value of family labour. Cost- C2 = Cost- C1 + 10 percent of cost-C1 as managerial cost. (Note: Cost- A= Cost- A1 + Cost- A2, Cost- B= Cost- B1 + Cost- B2)

Cost concept

Wages of hired human labour were calculated at prevailing wage rates of area for male and female labour. The charges of bullock labour both owned and hired were Calculated at the prevailing rate in the concerned villages. In case of FYM the actual value paid was considered, if purchased.
The value of fertilizer and plant protection chemicals were calculated at the actual price paid by the farmers.

Income measure

Following income measure will be used.
1. Gross income: It is the total value of main product and by- product.

GI = (Qm x Pm) + (Qb x Pb) Where, GI = Gross Income.
Qm = Quantity of main product. Pm = Price of main product.
Qb = Quantity of by-product. Pb = Price of by-product.
2. Return over variable cost (RVC) = Gross income – Cost- **A1.**
3. Farm business income (FBI) = Gross income – Cost- A2.
4. Family labour income (FLI) = Gross income – Cost- B2.
5. Net income: This was defined as the difference between gross income and total cost incurred by the farmers. (NI = Gross income - Cost C2)

Result and Discussion

Cost of Production and Profitability of Tomato

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, oilseed crops, spices crops, fruits crops, vegetables and other high value crops. The input use, cost structure and profitability of Tomato crop were discussed in the following heads.

Economics of Tomato crop

In the farm management studies costs are viewed from different angles for different purposes. Costs of cultivation are used by the Agricultural Costs and Price commission for fixation of support price of agricultural commodities. Besides this, they are also useful in farm planning and policy making. Therefore, operational costs of tomato were work out to operate agriculture in a over under study and presented in table. The farmers cultivated tomato crop in 14.55 per cent of the gross cropped area of the sample farm. It is observed from the Table 1 that the total cost incurred in cultivation of tomato at the overall farm was Rs. 67892.64 per hectare which was higher in large farm (Rs.76359.03/ha) and lowest in small farm (Rs. 60493.88/ha) This revealed inverse relation with farm size due to scale economics. The operational cost was65.50 per cent (Rs. 44467.98) of the total cost and the fixed cost was Rs.23424.66, accounted for around 34.50 per cent of the total cost.The labour cost on an average accounted to be 35.76 per cent of the total cost which varied from 35.10 per cent in large farm to 36.02 per cent in medium farm. The variation in total labour requirement among different size farms is due to difference in the style of operational practices. Similar term its can also be seen in the results explained by the earlier studies conducted by Bagari, Beck and Banafar etc. Among material cost, seed alone contributed about 3.58 per cent at overall level of the total cost lowest (Rs. 2,423.07/ha) in medium farm and highest being in large farm (Rs. 2,603.44/ha). The expenditure on manure and fertilizer together accounted 7.93 per cent of the total cost on sample farm which varied between7.48 to 7.85 per cent for different size groups. Irrigation cost on an average accounted to be 3.71 per cent of the total cost. Plant protection chemical cost was around 11.08 per cent of the total cost. Interest on working capital was to the extent of 3.27 per cent of total cost on various sizes of farms. Rental value of land fixed items shared 24.97 per cent of the total cost which revealed inverse relation with farm size. The yield of main product per hectare was found to be 127.15q/ha at overall level, lowest being in small farm (130.46q/ha) and highest being in large farm (145.82q/ha), indicating the intensive cultivation of tomato by sample farmers in the study area.

Table 1. Cost of cultivation of tomato on sample farm (Rs/ha)

Particulars		Size group			
		Small	Medium	Large	Overall
1. Operational cost					
A. Labour cost					
i.Human labour	Family	5585 (9.23)	6441.71 (9.06)	4372 (5.73)	5466.23 (8.05)
	Hired	12540.3 (20.73)	16673.22 (23.44)	18887.17 (24.73)	16033.56 (23.62)
ii. Machine	Owned+	2300	2500	3545	2781.66

labour	Hired	(3.80)	(3.52)	(4.64)	(4.10)
Sub Total		20425.3 (33.76)	25614.93 (36.02)	26804.17 (35.10)	24281.46 (35.76)
B. Material cost					
i. Seed		2423.07 (4.01)	2500 (3.52)	2603.44 (3.41)	2429.7 (3.58)
ii. Fertilizer & manure		5248.84 (8.68)	5320.69 (7.48)	5993.47 (7.85)	5383.63 (7.93)
iii. Plant protection		5536 (9.15)	7794 (10.96)	9240.1 (12.10)	7523.36 (11.08)
iv. Irrigation charge		2662 (4.40)	2349.09 (3.30)	2536.31 (3.32)	2515.8 (3.71)
Total material cost		15869.91 (26.23)	17963.78 (25.41)	20373.32 (25.46)	18069 (26.61)
Interest on working capital@10%		1905.49 (3.15)	2287.88 (3.22)	2476.81 (3.24)	2223.39 (3.27)
Total operational cost (A+B)		38109.97 (63.00)	45757.64 (64.34)	49536.36 (64.87)	44467.98 (65.50)
A. Rental value of land		17394.67 (28.75)	18074.67 (25.41)	19442.67 (25.46)	16953.33 (24.97)
B. Depreciation		1960.78 (3.24)	3089.73 (4.34)	3094.72 (4.05)	2715.07 (4.00)
C. Revenue/tax		12 (0.02)	12 (0.02)	12 (0.02)	12 (0.02)
D. Interest on fixed capital@12%		3016.46 (4.99)	4186.21 (5.89)	4273.28 (5.60)	3744.26 (5.51)
Total fixed cost		22383.91 (37.00)	25362.61 (35.66)	26822.67 (35.13)	23424.66 (34.50)
Total cost (Operational cost + Fixed cost)		**60493.88 (100.00)**	**71120.256 (100.00)**	**76359.035 (100.00)**	**67892.643 (100.00)**

Cost structure

Estimates of different costs

Estimation of different costs such as cost- A, cost- B cost- C1, cost- C2 is presented in table 2

Table 2. Cost of cultivation of Tomato according to cost concept on sample farms

S. No.	Cost	Size group			
		small	Medium	Large	Overall
1	Cost A□/A□	34497.75	42417.67	48271.08	41728.82
2	Cost B□	37514.21	46603.88	52544.36	45473.08
3	Cost B□	54908.88	64678.55	71987.03	62426.41
4	Cost C□	43099.21	53045.59	56916.36	50939.31

5	Cost C□	60493.88	71120.26	76359.03	67892.64
6	Cost C□	66543.27	78232.28	83994.94	74681.91

Almost every day in farm organization and operation cost consideration enters. It is an important tool for measuring farm business activities. The farm management specialists have specified cost of cultivation into cost A□, A□, B□, B□ cost C□, C□& C□. These cost concepts have already been taken up in the methodology chapter. In this section efforts have been made to discuss cost of cultivation according to various costs concepts. The table 2 clearly shows that on an average total cost of (cost C□) Rs.74681.90 per hectare was required to produce this crop of at overall level which 61.46 per cent comprised for the variable cost commonly known as cost A□ and A□ After adding interest on fixed capital to cost A□, the cost went up to 66.97 per cent as cost B□ and when imputed value of land was further added it increased up to 91.94 per cent. Thus cost the C□ and 10 per cent cost of the cost C□ when added in this cost, it form total cost or cost C□ Table further inferred that cost A□ to cost C□ increases with the increase in size of holding.The similar results could be seen in the studies conducted earlier by Ali, Sahu, Tambe, Patel, Hajong etc.

Profitability concepts

In any field of business activity profit is the prime consideration. Thus, how much a farmer earns as net income and family labour income as a producing unit and how much satisfaction he and his family derives as a consuming unit are the major deciding factor in organization and operation of farm. Hence, in this section efforts have been made to estimate the gross income, total operational cost and total cost, net income, Benefit cost ratio, cost of production of tomato a sample farm.

Table 3. Profitability of tomato production on sample farm

S. No.	Economic parameter	Size group			
		Small	Medium	Large	Overall
1	Total operational cost	38109.97	45757.65	49536.36	44467.98
2	Total cost	60493.88	71120.26	76359.03	67892.64
3	Yield (q/ha)	130.46	135.56	145.82	127.15
4	Gross income (Rs/ha)	164861.88	179568.26	193015.03	169612.64
5	Net income	104368.00	108448.00	116656.00	101720.00
6	Return to management	98318.61	101335.97	109020.10	94930.74
7	Cost of production	463.70	524.64	523.65	533.96
8	Return over variable cost	130364.13	137150.59	144743.95	127883.82
9	Farm business income	130364.13	137150.59	144743.95	127883.82
10	Family labour income	109953.00	114889.71	121028.00	107186.23
11	Return per rupee (RPR)	2.73	2.52	2.53	2.50

From the table 3. it is clear that the total cost from tomato are Rs.60493.88 Rs. 71120.26 and 76359.03 in case of small, medium and large farm with an average of Rs. 67892.64 on sample farm. Thus, total cost incurred in tomato production increase with an

increase in farm size. When physical Output obtained from tomato are converted into monetary terms Benefit cost ratio in other words can be termed as the return per rupee of investment. The Return per rupee (RPR) was more favorable to small farm (2.73), followed by medium farm (2.52) and large farm (2.53). Therefore, it could be concluded that there is increase in the ratio of benefit cost ratio as the size of land holding increase. overall level the Net income per hectare was found to be Rs.101720.00/ha, lowest being small farm (Rs.104368.00/ha) and highest being in large farm (Rs.116656.00/ha) and (Rs.108448.00/ha) in being of medium farm. The overall per rupee investment (B:C ratio) was found to be 2.50 at overall level lowest being in medium (2.52) and highest being in small (2.73) farm size. The cost of production per quintal was found to be 463.70, 524.64 and 523.65 in small, medium and large size found with Rs.533.96/q of overall level.

Conclusion:

Total cost per hectare incurred in tomato production on sample farm was Rs. 67892.64 the proportion of operational cost and fixed cost to total cost on sample farm was 65.50 and 34.50 of the total cost. Cost of cultivation according to various cost concepts (Cost A□ to Cost C□) in different size of farms increased as the farm size increases. At overall level the net income per hectare was found to be Rs.101720.00/ha, lowest being small farm (Rs.104368.00/ha) and highest being in large farm (Rs.116656.00/ha) and (Rs. 108448.00/ha) in being of medium farm. The overall return per rupee investment (B:C ratio) was found to be (2.50) at overall level lowest being in medium (2.52) and highest being in small (2.73) farm size. The cost of production per quintal was found to be 463.70, 524.64 and 523.65 in size found with Rs. 533.94/q of overall level.

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