The Pharma Innovation Journal 2023; 12(4): 1314-1316

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(4): 1314-1316

www.thepharmajournal.com
Received: 14-02-2023
Accepted: 17-03-2023

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Economics of production of tomato in Nagpur district

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Abstract
Tomato is rich source of vitamins A, C, Potassium, Minerals and fibers. Tomatoes are used in the preparation of soup, salad, pickles, ketchup, puree and sauces and also consumed as a vegetable in many other ways. The study has based on cost structure, returns and profitability during the year 2021-22 based on primary data. The study was conducted in Nagpur, Hingana and Kuhi tahsils based on purposive sampling. Four villages were selected from Nagpur tahsils and three villages selected from Hingana and Kuhi tahsils. Total 10 villages were selected for the present study. A sample of 35 Tomato growers were selected based on random sampling. Twelve tomato growers were selected from Nagpur and Hingana tahsil and Eleven tomato growers were selected from Kuhi tahsil. The study's main purpose was to estimate cost, returns and profitability of tomao production It was observed that, per hectare cost of cultivation of Tomato at cost C_3 i.e. Rs. 147394.36. The average yield and gross returns per hectare increased with increased with the increase in size of farms. The input output ratio of Tomato at cost C_3 was 1:2.49. This indicates that, Cultivation of Tomato crop was economically profitable. The average main production was 245.57 qtl/ha.

Keywords: Tomato, cost, returns, profit, input-output ratio

Introduction
Vegetables are important constituents of Indian agriculture and nutritional security due to their short duration, high yield, nutritional richness, economic viability and ability to generate on-farm and off-farm employment. Vegetables are vital sources of proteins, vitamins and minerals, dietary fibers, micronutrients, antioxidants and phytochemicals in our daily diet. India continues to the second largest producer of vegetables in the world next to china. However, the horticulture sector has witnessed tremendous growth as a result of investment through National Horticulture Mission (NHM) and a number of other programmes.

Tomato (*Solanum lycopersicum*), flowering plant of the nightshade family Solanaceae, cultivated extensively for its edible fruits. Labelled as a vegetable for nutritional purposes, tomatoes are a good source of vitamin A, C and the phytochemical lycopene. Tomato is one of the most important protective food crops in India. India ranks second in the area as well as production of tomato next to China. The fruits are commonly eaten raw in salads, served as a cooked vegetable, used as an ingredient of various prepared dishes, and pickled. Additionally, a large percentage of the world's tomato crop is used for processing, products include canned tomatoes, tomato juice, ketchup, puree, paste and "sun-dried" tomatoes or dehydrated pulp. (P. B Bandgar 2021) [9]. The area under Tomato in Nagpur district 2117.02 ha with production of 9402.40 tonnes in 2021-22.

Materials and Methods
The standard cost concepts i.e. Cost A_1, Cost A_2, Cost B_1, Cost B_2, Cost C_1, Cost C_2, and Cost C_3 were used in present analysis.

Cost A_1: All variable cost excluding family labour cost and including depreciation.
1. Value of Hired human labour (HL)
2. Value of hired and owned bullock labour (BL)
3. Value of hired and owned machine labour (ML)
4. Value of seeds
5. Value of insecticides and pesticides
6. Value of manure
7. Value of fertilizers
8. Irrigation charges
9. Depreciation on implements and farm building

10. Land revenue, cesses and other taxes
11. Interest on working capital
12. Miscellaneous expenses

Cost A_2: Cost A_1 + Rent paid for leased-in land

Cost B_1: Cost A_1 + interest value of owned fixed capital assets

Cost B_2: Cost B_1 + rental value of owned land

Cost C_1: Cost B_1 + imputed value of family labour

Cost C_2: Cost B_2+ imputed value of family labour

Cost C_3: Cost C_2 + 10 % of Cost C_2 on account of managerial functions performed by farmers.

Gross and net returns

Gross returns

Gross returns of the farmers under the present study was estimated from returns obtained from sale of main produce.

Gross returns = Value of main produce + Value of by produce

Net returns

Net returns were computed at different costs i.e. Cost A_1, Cost A_2, Cost B_1, Cost B_2, Cost C_1, Cost C_2, and Cost C_3 by deducting respective costs from the gross returns.

Input-Output ratio

It was calculated at cost A_1, Cost A_2, Cost B_1, Cost B_2, Cost C_1, Cost C_2, and Cost C_3 by dividing gross income by respective cost.

Results and Discussion

Cost of cultivation of selected Tomato growers

The cost of cultivation is helpful for crop planning therefore in order to know the cost, returns and profitability, the cost of cultivation of selected tomato growers were worked out.

Per hectare cost of cultivation of Tomato growers

The per hectare cost of cultivation of Tomato growers were workout and presented in Table 1.

Table 1: Per hectare cost of cultivation of Tomato growers (Rs/ha)

Sr. No.	Item	Unit		Input/ Ha.	Cost/ Unit of input	Total Cost per ha.	% to cost 'C3'
1	2	3		4	5	6	7
1	Hired human labour	Male	Days	54.30	250.00	13575.00	9.20
		Female	Days	73.49	180.00	13228.20	8.97
	Subtotal					26803.20	18.17
2	Bullock labour		Days	3.33	360.00	1198.80	0.81
3	Machine charges		Hrs	5.51	450.00	2479.50	1.68
4	Seeds		Gms	417.91	10.00	4179.10	2.83
5	Manure		CL	14.93	400.00	5972.00	4.05
6	Fertilizers	N	Kg	97.95		585.90	0.39
		P	Kg	48.97		440.73	0.29
		K	Kg	48.75		734.64	0.49
	Subtotal					1761.27	1.19
7	Irrigation charges					734.69	0.49
8	Plant Protection					3918.36	2.65
9	Incidental charges					244.89	0.16
10	Repairing charges					367.34	0.24
11	Working Capital					47659.15	32.33
12	Interest on working Capital					2859.54	1.94
13	Depreciation					2237.57	1.51
14	Land Revenue					293.87	0.19
15	Cost A_1					53050.13	35.99
16	Rental Value Leased in land					-	-
17	Cost A_2					53050.13	35.99
18	Int. on Fix. Cap. @10%					6158.63	4.17
19	Cost B_1					59208.76	40.17
20	Rental Value of Land					61586.32	41.78
21	Cost B_2					120795.08	81.95
22	Family human Labour	Male	Days	24.64	250.00	6160.00	4.17
		Female	Days	39.11	180.00	7039.80	4.77
	Subtotal					13199.80	8.94
23	Cost C_1					72408.56	49.12
24	Cost C_2					133994.88	90.90
25	10% Cost C_2					13399.48	9.09
26	Cost C_3	Rs.	ha			147394.36	100.00
27	Main produce		qtl	245.57	1500.00	368355.00	
28	Per quintal cost of Production	Rs	qtl			600.21	

Table 1 revealed that, the per hectare cost of cultivation of Tomato at cost A_1, cost A_2, cost B_1, cost B_2, cost C_1, cost C_2 and cost C_3 were Rs. 53050.13, Rs. 53050.13, Rs. 59208.76, Rs. 120795.08, Rs. 72408.56, Rs. 133994.88 and Rs.

147394.36 respectively. The major share of cost of cultivation goes towards cost 'A_1' and cost 'A_2' (35.99 per cent). In cost 'A_1' share of seed was 2.83 per cent, hired human labour 18.17 per cent, bullock labour 0.81 per cent, manure 4.05 per cent, fertilizers 1.19 per cent, indicating that all the above inputs are cash inputs. The cost 'B_1' contributes to 40.17 per cent, cost 'B_2' contribute 81.95 per cent. The share of family labour was 8.94 per cent. The per hectare yield obtained by tomato growers were 245.57 quintals with gross return of Rs. 368355.00. In case of tomato crop the per quintal cost of production was Rs. 600.21.

Per hectare cost, returns and profitability from Tomato

The per hectare cost and returns of the tomato growers was workout and presented in Table 2.

Table 2: Per hectare cost, returns and profitability from Tomato (Rs/ha)

Sr. No.	Particulars	Tomato
1.	Main produce (q/ha)	245.57
2.	Value of main produce	368355.00
3.	Gross Returns	368355.00
4.	**Cost of cultivation at**	
	Cost A_1	53050.13
	Cost A_2	53050.13
	Cost B_1	59208.76
	Cost B_2	120795.08
	Cost C_1	72408.56
	Cost C_2	133994.88
	Cost C_3	147394.36
5.	**Net returns**	
	Cost A_1	315304.87
	Cost A_2	315304.87
	Cost B_1	309146.24
	Cost B_2	247559.92
	Cost C_1	295946.44
	Cost C_2	234360.12
	Cost C_3	220960.64
6.	**Input-output ratio**	
	Cost A_1	6.94
	Cost A_2	6.94
	Cost B_1	6.22
	Cost B_2	3.04
	Cost C_1	5.08
	Cost C_2	2.74
	Cost C_3	2.49

Table 2 indicates that the per hectare production of tomato growers was 245.57 quintals. The gross returns from tomato was Rs. 368355.00. Whereas the cost of cultivation at C_3 of tomato has been estimated to be Rs. 147394.36. The per hectare net returns at cost C_3 received by tomato was Rs. 220960.64. The input-output ratio at cost C_3 for tomato was 1: 2.49.

The input-output ratio which is an indicator of economic efficiency in crop production for the crop and it indicates that the tomato registered a good input-output ratio was 1: 2.49 it means the hypothesis is acceptable. It indicates that the tomato cultivation was profitable.

Conclusions

The average main production was 245.57 qtl/ha. It is observed that per hectare cost of cultivation of tomato at cost C_3 was Rs. 147394.36. The gross returns from tomato was Rs. 368355.00. The average yield and gross returns per hectare increased with the increase in size of farms. The input-output ratio at cost C_3 for tomato was 1: 2.49. This indicates that, cultivation of tomato was economically profitable.

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