AN ECONOMIC ANALYSIS OF TOMATO PRODUCTION IN SONBHADRA DISTRICT OF UTTAR PRADESH

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ABSTRACT: The tomato is an edible berry (Solanum lycopersicum). Western South America, Mexico, and Central America are the main origins of tomato. The Spanish term tomato, from which the English word tomato descended, was derived from the Nahunta word tomato. Mexico's indigenous peoples are responsible for its domestication and use as a cultivated food. Tomato is also known as **Poor men's Orange**. Purposive-cum-multistage stratified random sampling technique was used for the selection of district, block, villages and farmers. Sonbhadra district of Uttar Pradesh was selected purposely because of convenience of investigator and to avoid difficulties for collection of data due to shortage of time and budget constraints. The data were collected during the agricultural year 2023-24 for this study. The study indicate that calculated value of cost C_3 came to Rs. 84476.33, 88768.86 and 89534.19 on marginal, small and medium size group of farms, respectively along with an average value i.e., Rs.43460.90. On an average cost A_1/A_2, cost B_1, cost B_2, cost C_1 and cost C_2 came to Rs. 42378.13, Rs. 58567.77, Rs. 68570.77, Rs. 66477.00 and Rs. 76477.00 respectively. On an average, gross income was recorded Rs. 487350.65 and net return over C_3 came to be Rs. 86249.90, respectively. On medium farms, gross income was highest, which was recorded Rs. 503671.23, followed by small farms Rs. 491967.51 and lowest on marginal farms i.e., Rs. 481904.66, respectively. On an average family labour income and farm business income were observed to Rs.429070.96 and Rs. 441147.60 respectively. Family labour income was highest on marginal farms followed by small and medium farms & farm business income was highest on marginal farms, followed by small farms and medium farms. On an average, cost of production per quintal and yield of tomato per hectare were estimated to Rs 236.36 per quintal and 364.87 quintal, respectively. On an average Input-Output ratio regarding costs C_3, C_2, C_1, B_2, B_1, and A_2/A_1 were recorded in the range of 1:5.54 to 1:9.04 respectively. Benefit-cost ratio was highest on marginal farms 1:5.70 followed by medium farms 1:5.62 and small farms 1:5.54. Thus, it is concluded that tomato cultivation is lucrative for the growers and suitable for doubling the income of the farmers in the study area. On the basis of cost A Input-Output ratio was highest on marginal farms (1:9.04), followed by small (1:8.16) and medium farms (1:7.89), respectively. It may be concluded the costs of cultivation on different size group of farm increases with an increase in farm size. But net return per hectare has shown of negative trend with farm size. It was because of less increase in yield against the increased input factors with increasing size of farm.
Keywords: Tomato, cultivation, production, cost concepts, farm, income, benefit ratio.

The tomato is an edible berry (*Solanum lycopersicum*). Western South America, Mexico, and Central America are the main origins of tomato. The Spanish term tomato, from which the English word tomato descended, was derived from the Nahunta word tomato. Mexico's indigenous peoples are responsible for its domestication and use as a cultivated food. At the time of the Spanish conquest of the Aztec Empire, the Aztecs used tomatoes in their cooking (Ramappa and Manjunatha, 2017). After the Spanish first encountered the tomato after their conquest of the Aztec Empire, they transported the plant to Europe as the Columbian exchange. During the 16th century, the tomato was spread from there to other European-colonized regions of the world (Varma *et al., 2020).*

A key source of umami flavour is tomatoes. They are eaten in a variety of meals, sauces, salads, and beverages, both fresh and cooked. Although tomatoes are technically considered berries by botanists, they are frequently utilized in cooking as a vegetable element or side dish.

Around the world, a wide variety of tomato plants are cultivated in temperate regions, and greenhouses enable the production of tomatoes

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throughout the year. Typically, tomato plants reach heights of 1-3 meters (3–10 feet). They are vines with weak stems that sprawl and frequently require assistance. Although they are grown as annuals, indeterminate tomato plants are perennials in their natural environment. Determinate or bush plants are annuals that have a terminal bud and stop its growth after reaching a specific height. The width of a tomato can ranges from 1 to 10 cm (1 to 24 inches) depending on the cultivar (Naika *et al., 2005)*.

A raw tomato is primarily composed of water (95per cent) and comprises only 4per cent carbohydrates and less than 1per cent fat and protein (table1.1). Raw tomatoes have a low micro-nutrient content providing only 18 kilo calories and a moderate quantity of vitamin C (17per cent of the Daily Value) in a 100 grams reference amount.

China is the largest producer of tomatoes in the world. It contributes about 36.52per cent of the world's total tomato production. India contributes to 11.07per cent of the world's total tomato production with a production of 20.69 M tons. The growth quantity increases by 1.45per cent every year. European Union and turkey are the third and fourth-largest producers of tomatoes. Turkey has seen rapid growth of 8 per cent in the last five years. However, when it comes to export, Mexico contributes to 26 per cent whereas, in countries like India and China, tomatoes are consumed locally or exported in the form of Tomato paste or other processed foods (FAO, 2022).

Tomato is the third most important crop in India after potato and onion. India is the second-largest producer of tomatoes in the world. Tamil Nadu, Andhra Pradesh, Karnataka, Madhya Pradesh, Gujarat, Odisha, West Bengal, Bihar, Telangana, Uttar Pradesh, Maharashtra, Chhattisgarh, Haryana, and Himachal Pradesh are the major tomato producing states in India. These states account for about 90per cent of total tomato production in the country. Tomato production in India in 2021-22 is about 20.69 million tonnes, which is 8per cent higher than the production compared last year. Andhra Pradesh contributes to 16.02per cent of total tomato production in India. Madhya Pradesh is the second largest producer of tomatoes and contributes to 12.14 per cent of total production. Karnataka is the third-largest producer and contributes to 10per cent of total tomato production in India followed by Gujarat, Maharashtra, Chhattisgarh, Telangana, and Tamil Nadu (Agricultural Statistics at glance 21).

Total production of Sonbhadra district has been increasing in recent years. In 2021- 2022, the production of this year is 82749 quintals which is higher for previous year. Table present the area, production, and productivity of tomato in different block of Sonbhadra district.

The goals of this study cover several important topics. First, we will look at the common tomato production methods used in Sonbhadra district, including seed selection, preparation of the ground, irrigation methods, fertilization, control of pests and diseases, harvesting procedures. To increase yields, reduce input costs, and ensure environmental sustainability, new techniques, precision agriculture, and sustainable farming practices should be adopted. Understanding the current cultivation practices will assist identify these areas for development.

Next, we'll look at the numerous difficulties that tomato farmers in Sonbhadra district confront. Water shortages, a lack of high-quality seeds, pest and disease outbreaks, price swings, a lack of infrastructure, and restricted access to credit and market information are a few examples of these difficulties. This study attempts to identify these issues in order to offer workable solutions and policy suggestions to help farmers and get around obstacles to tomato production.

RESEARCH METHODOLOGY

A purposive followed by multistage pre-stratified random sampling procedure was used to select district, block, village, and respondents. The district Sonbhadra of Vindhyanchal zone was selected for the study based on flowing factual grounds.

i.) Availability of resource for tomato cultivation.
ii.) Road network for connectivity helping transport of input and output as well.
iii.) Promising district for promotion of organic farming of vegetable crops

District Sonbhadra is distributed into 10 community development block and acreage in tomato cultivation was prepared. The blocks namely "Karma" having maximum area and production in tomato were selected purposively for this study. Lists of all the villages falling under Karma block were selected randomly. Whose tomato cultivation is being practiced. Thus, finally Five (05) villages were selected too study. A separate list of tomato growers of five selected villages was prepared based on their size of holding and stratified into three categories i.e., Marginal – (Below 1.0 ha), Small – (1.0 to 2.0 ha) and Medium – (2.0 to 4.0 ha & above). From this list a sample of 100 respondents were drawn following the proportionate random selection for different categories.

RESULTS AND DISCUSSION

It is indicated in the table-1 that calculated value of cost C_3 came to Rs. 84476.33, 88768.86 and 89534.19 on marginal, small and medium size group of farms, respectively along with an average value i.e. Rs.43460.90. On an average cost A_1/A_2, cost B_1, cost B_2, cost C_1 and cost C_2 came to Rs. 42378.13, Rs. 58567.77, Rs. 68570.77, Rs. 66477.00 and Rs. 76477.00 respectively**.**

On an average, gross income was recorded Rs. 487350.65 and net return over C_3 came to be Rs. 86249.90, respectively. On medium farms, gross income was highest, which was recorded Rs. 503671.23, followed by small farms Rs. 491967.51 and lowest on marginal farms i.e., Rs. 481904.66, respectively (Kumari, R. et.al. 2021).

On an average family labour income and farm business income were observed to Rs. 429070.96 and Rs. 441147.60 respectively. Family labour income was highest on marginal farms followed by small and medium farms and farm business income was highest on marginal farms, followed by small farms and medium farms. On an average, cost of production per quintal and yield of tomato per hectare were estimated to Rs 236.36 per quintal and 364.87 quintal, respectively. On an average Input-Output ratio regarding costs C_3, C_2, C_1, B_2, B_1, and A_2/A_1 were recorded in the range of 1:5.54 to 1:9.04 respectively. Benefit-cost ratio was highest on marginal farms 1:5.70 followed by medium farms 1:5.62 and small farms 1:5.54. Thus, it is concluded that tomato cultivation is lucrative for the growers and also suitable for doubling the income of the farmers in the study area. On the basis of cost A Input-Output ratio was highest on marginal farms (1:9.04), followed by small (1:8.16) and medium farms (1:7.89), respectively (Shinde et.al.2015). It may be concluded the costs of cultivation on different size group of farm increases with an increase in farm size. But net return per hectare has shown of negative trend with farm size. It was because of less increase in yield against the increased input factors with increasing size of farm (Kushwaha et.al. 2018).

Table-1: Measures of per hectare cost and profit of Tomato (Rs. /ha.)

S.NO.	Particulars	Size group of farms			Overall average
		Marginal (61)	Small (26)	Medium (13)	
1.	Cost A_1/A_2	53305.84	60314.25	63791.26	42378.13
2.	Cost B_1	54860.47	63451.79	66195.45	58567.77
3.	Cost B_2	64860.47	73451.79	76195.45	68570.77
4.	Cost C_1	64896.41	68731.15	69385.29	66477.00
5.	Cost C_2	74896.41	78731.15	79385.29	76477.00
6.	Cost C_3	84476.33	88768.86	89534.19	86249.90
7.	Yield (q. /ha.)	363.20	366.56	369.32	364.87
8.	Gross income	481904.66	491967.51	503671.23	487350.65
9.	Net return over C_3	397428.33	403198.65	414137.04	401100.75
10.	Family labour Income	427363.94	428768.21	437686.35	429070.96
11.	Farm business income	438918.57	441905.75	450090.54	441147.60
12.	Cost of production (Rs/Q)	232.59	242.17	242.43	236.36
	Benefit -cost ratio (Input-output ratio)				
a.	Cost A_1/A_2	1:9.04	1:8.16	1:7.89	1:8.66
b.	Cost B_1	1:7.78	1:7.75	1:7.75	1:7.61
c.	Cost B_2	1:7.43	1:6.70	1:6.61	1:7.13
d.	Cost C_1	1:7.42	1:7.16	1:7.26	1:7.33
e.	Cost C2	1:6.43	1:6.25	1:6.34	1:6.37
f.	Cost C3	1:5.70	1:5.54	1:5.62	1:5.65

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SUMMARY AND CONCLUSIONS

The present chapter summarizes undertaken study entitled "An economic analysis of Production of Tomato Cultivation in Sonbhadra District of Uttar Pradesh." and salient inferences and conclusions drawn are as follows. The sample of 100 farmers of selected block were considered to study and resulted average size of holding varied 0.55, 1.49 and 2.91 hectare in respect of marginal, small and medium farms, respectively. On all farms per farm investment to total assets on farm building, implements and machineries, and livestock accounted for 76.22, 14.46, and 9.32 per cent, respectively. Cropping pattern of the sample farm for tomato per cent area to gross cultivated area shows increasing trend with increasing size of farms. Per farm area for tomato was accounted 0.22, 0.56 and 1.34 hectare. Cropping intensity varied from 275.93, 242.95 and 238.14 per cent for marginal, small, and medium farms, respectively, Intensity of cropping showed decreasing trend with increasing size of farms.

Per hectare cost of cultivation of tomato was highest under medium size of sample farms was mainly due to higher human labour charges. In this crop maximum cost was incurred on human labour charge having overall average i.e. 23.60 per cent. On an overall average, cost of cultivation of tomato was observed to be Rs. 86249.90. Cost A1, cost B1 and cost B2 was highest under medium size of sample farms. Overall average of cost A1, cost B1 and cost B2 were worked out to be Rs. 42378.13, Rs. 58567.77 and Rs. 68570.77, respectively, Gross income per hectare was observed highest under medium size of sample farms due to high productivity of these farms. The reason of high productivity was encountered due to adopting better management practices HYV of seeds, timely sowing and manure & fertilizers highly used by the farmers. The net return over cost C3, family labour income and farm business income also highest under medium size of sample farms. Cost of production per quintal was lower under medium size of sample farms.

Gross income per hectare was highest under medium size group of farms due to high productivity of these farms. Similar reason of high productivity was envisaged as occurred in tomato. Overall average cost of production per quintal was Rs. 236.36.

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