

RESEARCH ARTICLE

PRODUCTION PRACTICES, MARKETING, AND ECONOMICS OF TOMATO IN PANCHAPURI MUNICIPALITY OF SURKHET DISTRICT

Bipana Yogi*, Desire Rana Chhetri, Kapil Prasad Marasini, Krish Rauniyar

^a *Himalayan College of Agricultural Sciences and Technology (HICAST), Kathmandu, Nepal.**Corresponding author email: bipanayogi2023@gmail.com

This is an open access article distributed under the Creative Commons Attribution License CC BY 4.0, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

ARTICLE DETAILS

Article History:

Received 23 November 2024
Revised 18 December 2024
Accepted 20 December 2024
Available online 07 January 2025

ABSTRACT

This study explores the journey of tomato farming in Panchapuri Municipality, Surkhet, Nepal, focusing on its production, marketing challenges, and economic prospects. Conducted between 10th July and 5th August 2023, the research engaged 80 randomly selected farmers through interviews and discussions with growers, cooperatives, and traders. The findings reveal a promising future for tomato farming, with a Benefit-Cost (B:C) ratio of 1.6 and farmers earning an average of Rs. 50.25 per kilogram. Popular varieties like Gaurab 555, Srijana, and Manisha thrive in the region, and polyhouse farming has gained popularity due to its high-income potential and external support. However, the lack of robust marketing infrastructure has left farmers dependent on local collectors, limiting their profits and market reach. To fully unlock the potential of tomato farming in Panchapuri, investments in training, storage facilities, and stronger links between farmers and buyers are essential. This could pave the way for a thriving, more sustainable agricultural sector in the region.

KEYWORDS

Benefit-Cost Ratio, Economic Sustainability, Marketing Challenges, Pest and Disease Management, Polyhouse Farming, Production Practices

1. INTRODUCTION

1.1 Background

Tomato (*Solanum lycopersicum L.*) is among the most widely cultivated and extensively consumed horticultural crops around the globe. Tomato plants originated in the Andean region of South America. This area includes the countries of Peru, Bolivia, Chile and Ecuador (Singh, 2010). Tomato belongs to the Solanaceae family and is a common vegetable that ranks second in significance behind potatoes (Thapa et al., 2018). Tomatoes are cultivated globally for their delicious and versatile fruit. The tomato plant typically has green leaves, yellow flowers, and produces red, green, or yellow fruits that are used in various cuisines and dishes. Tomatoes are not only valued for their taste but also for their nutritional content, as they are a good source of vitamins, minerals, and antioxidants. Tomatoes are also known as "love apples", "golden apples" and "poor man's apples" (Ayyar, 2019). It is cultivated for fresh fruit and processed products.

Tomatoes contain many health-promoting compounds including vitamins, carotenoids, and phenolic compounds. In addition to its economic and nutritional importance, tomatoes have become the model for the study of fleshy fruit development (Quinet et al., 2019). Tomato is the second most important vegetable worldwide in terms of vitamins and minerals it contributes to the diet. Tomatoes have high medicinal value, serving as a good source of Fe and vitamins A, B, and C. An edible portion of Tomato contains 18kcal of energy, 0.95 g of protein, 0.11g of fat, 4.01 g of carbohydrate, 2.49 g of sugar, 11mg of Calcium, Fe 0.68 mg, 9 mg of Mg, P 28 mg, 218 mg of K, 11mg of Na, 0.14 mg of Zn, 22.8 mg of Vitamin C, 0.036

mg of Thiamine, 0.022 mg of Riboflavin, 0.079 mg of Vitamin B-6 and 0.56 mg of Vitamin E per 100 g (Yadav et al., 2022).

Tomatoes are grown over an area of 5.2 million hectares worldwide with an annual production of 189.1 million metric tons (FAOSTAT, 2021). China is the largest producer of tomato with production of 67.538 million MT, which alone accounted for nearly 36% of the worldwide harvest that is followed by India, Turkey and United States respectively (FAOSTAT, 2021). With the help of advances in modern technology, tomato can now be cultivated in both tropical and temperate zones in the open field, in home gardens, in small-scale agricultural patches as well as in large-scale urban market production. It can be grown in traditional farming systems (shifting cultivation) as well as in modern and intensive systems using greenhouses, plastic cover nurseries, etc. This vegetable species is adapted to grow under different environmental and cultural conditions (OECD, 2008). In Nepal, tomato sits in third position after cauliflower and cabbage in terms of area and production with 22,911ha area and 422,703 tons of production (MoALD, 2023).

In Nepal, Tomato is cultivated as winter crop in Terai and Inner Terai whereas in mid hills of Nepal it can be produced successfully in two growing seasons-spring and rainy. Tomato is grown at altitudes up to 2500 meters above sea level in Nepal however terai region is best suited for its cultivation (Bhandari et al., 2021). Rainy season tomato cultivation is financially advantageous enterprise to the hill farmers because the supply from the Terai districts is constrained by high temperature, low fruit set, flowering and bacterial wilt etc. (Pandey et al., 2006). Some popular tomato varieties among farmers in Nepal are Abinash, Allrounder, Trishul, Srijana, Manisha, Samjhana, Dhanalaxmi, Indira, Roma, Pusa Ruby, NCL-1, etc. Tomato is one of the most grown vegetables in Nepal. Its commercial production is in increasing trend due to higher return over

Quick Response Code



Access this article online

Website:
www.fabm.org.my

DOI:
10.26480/fabm.02.2024.124.130

investment particularly in off-season. Despite the large potential for domestic production, the current production does not satisfy national demand and large number of tomatoes are imported from India every year (Ghimire et al., 2017). Tomato is grown from subsistence to commercial scale and from the east to the far west and Terai to mid-hill and mountain region in Nepal (Ghimire et al., 2001). The highest productivity was seen in Koshi province followed by Bagmati province with least productivity being in Karnali province (MoALD, 2023). According to the most commonly grown areas of tomato in Nepal are Ishworpur (Sarlahi), Dhalkebar (Dhanusha), and Panchkhal (Kavre), Namatar, Bajrbarahi and Handikhola (Makwanpur), Lamatar (Lalitpur), Hirapur (Mahottari), Harre (Surkhet., Singh ,2010).

1.2 Objective

The following objectives are designed to provide a comprehensive understanding of the tomato sector in the study area. By focusing on both general and specific aspects of tomato production, marketing, and its economic significance, we aim to identify key trends, challenges, and opportunities that can inform future agricultural practices and policies.

1.2.1 General Objective

- To analyze the production status, marketing scenario, and economic importance of tomatoes in the study area.

1.2.2 Specific Objectives

- To examine the socio-economic status and production practices of tomatoes in the study area.
- To analyze the tomato marketing situation in the study area.
- To estimate the input costs and returns from tomato cultivation.

1.3 Limitations

This study aims to provide insights into the production and marketing of tomatoes in Panchapuri Municipality. However, several limitations may affect the validity and applicability of the findings, as outlined below:

- This study covered only the Panchapuri municipality of Surkhet district. The findings may not represent the whole district.
- The information given by the farmers was based on their perceptions, opinions, and individual responses, so it may have some deviation from reality.
- There was a lack of annual data record books at the farmer's level.
- There was a lack of cooperation from the farmer's side while conducting the survey.

2. MATERIALS AND METHODS

2.1 Selection of study area

The study was conducted in the Surkhet district, located in the Karnali province of Nepal. Panchapuri municipality was selected for conducting the survey. This municipality was purposefully selected for the study as many farmers were involved in commercial tomato production in this area. The total area of this municipality is 329.9 km² and the total population of this municipality was 32,231 individuals as per 2011, Nepal census. This municipality is divided into total 11 wards. The Panchapuri municipality lies at Latitude 28° 47' 31.2" N and longitude 81° 23' 13.2" E, and elevation of 780 masl. The climate of the study area is sub-tropical and the average temperature ranges from 10°C to 33°C. The average annual rainfall is estimated to be approximately 190 mm per year.

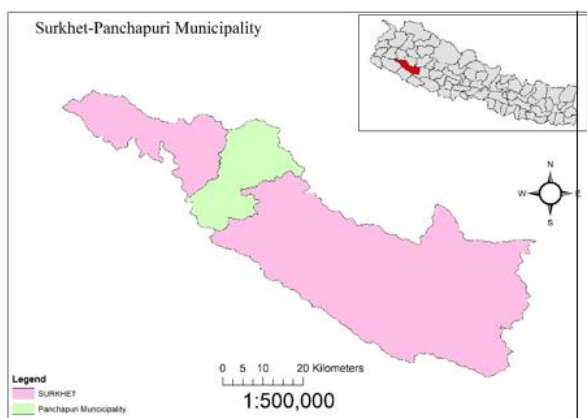


Figure 1 : Map of Surkhet District showing study area

2.2 Sample size

The total numbers of farmer respondents were 80. They were taken randomly from Panchapuri municipality of Surkhet district. The sample size was determined considering time constraints. Farmers from different locations were chosen, and a field survey was in the major tomato-producing areas of Panchapuri municipality

2.3 Source of data collection

The study was conducted mainly by collecting primary data supported by secondary data to some extent. We collected primary data through field surveys. Secondary data were collected after reviewing various published as well as unpublished documents, reports and the research paper related to the topic of the study.

2.3.1 Primary data collection

The primary data were collected during the field survey by interviewing the farmers associated with tomato cultivation with the prepared questionnaire.

2.3.2 Questionnaire

A semi-structured questionnaire was prepared. It included all the questions needed to fulfill the specific objectives of this study. Pre-testing of questionnaire was carried out and modifications were made on it before the actual field survey. Some general information about the respondents and the household members such as age, education, family size, main occupation, total land under cultivation, etc. were also included in the questionnaire.

2.3.3 Secondary data collection

The secondary data were obtained through books, reports, research papers, MoALD, CBS, national and international journals, and different related websites.

2.4 Data processing and analysis

After the collection of data, they were carefully analyzed for every missing and incomplete answers. The data were then processed by using both the computer programs Microsoft excel, and manual tabulation formats. The data were converted into the standard units, such as land in hectare, weight in kilogram and liquid in liter etc. It was then processed in excel of the computer. Statistical tools such as mean, percent etc. were used for data analysis. The analyzed data are presented in tables, graph and charts.

2.5 Economic analysis

2.5.1 Marketing margin

Marketing margin is the difference between the farm gate price and the retailer's price, which can be calculated as follows:

$$\text{Marketing margin (MM)} = \text{Retailer's price (Pr)} - \text{Farm gate price (Pf)}$$

Marketing margin indicates the efficiency of marketing system because it refers to the efficiency of intermediaries between the producer and consumer in respect of the services rendered and the remuneration received by them.

2.5.2 Produce's share

Producer's share (Ps) is the price received by the farmer expressed as a percentage of the retail price, i.e. the price paid by the consumers. It can be calculated by the following formula;

$$Ps = \frac{Pf}{Pr} * 100$$

where,

Pf= farm gate price (producer price)

Pr= retailer's price

2.5.3 Cost of Production

The cost of production is the value of inputs that have been used to produce something. The cost of production was calculated to find out the profit from the tomato production. For analyzing cost of production, variable and fixed cost were calculated.

Variable cost includes cost of seeds, fertilizers, irrigation, labors, transportation, etc. Fixed cost includes depreciation of equipment such as spades, dokos, plastic crates etc. The cost of tomato production was calculated by using the following formula:

$$TC = TVC + TFC$$

where,

TC= Total cost

TVC= Total variable cost

TFC= Total fixed cost

2.5.4 Benefit- Cost Ratio (BCR)

The benefit-cost ratio (BCR) is used in a cost-benefit analysis to get a summary of the overall relationship between the relative costs and benefits of a proposed project. It is the ratio of benefits obtained from the tomato production relatives to its cost. BCR calculation was done to analyze whether the firm are in profit or loss.

$$\text{Benefit cost ratio (BCR)} = \frac{\text{Gross return}}{\text{Total cost}}$$

$$\text{Gross return} = \text{Total quantity of tomato sold} * \text{Average Price}$$

2.5.5 Problem ranking

Problems related to the production of tomato were ranked with the use of index. Scaling techniques which provide the direction and extremity attitude of the respondents towards any proposition the study was used to construct index (Miah,1993).

The formula given below was used to find the index for intensity of production problems faced by farmers

$$I_{\text{prob}} = \sum \frac{S_i f_i}{N}$$

where,

I_{prob} = index value for intensity of problem

\sum = summation

S_i = I^{th} scale value

f_i = frequency of i^{th} importance given by the respondents

N = total number of respondents

3. RESULTS AND DISCUSSION

3.1 Socio-economic information

In the study area, the majority of the respondents were in the 30-40 age group (57.50%) followed by 40-50 (25%), 50-60 (7.5%), 20-30 (10%). Among the 80 respondents, 52.50% were female whereas 47.5% were male respondents which shows that the participation of female respondents in tomato farming was more compared to male respondents. Among the respondents in the study area 85% were married whereas 15% were unmarried. Out of the total respondents, 41.25% of respondents were just able to read and write, 30% were educated only up to primary level while 12.50% respondents were educated up to secondary level. Likewise, 8.75% respondents were educated up to higher secondary level and 7.50% respondents had completed their university level. Farmers' income relied primarily on agriculture (51.25%), followed by government services (23.75%). Business accounted for 13.75%, with the lowest percentage (11.25%) from remittances.

3.2 Cultivation information

3.2.1 Years of farming experience

In the study area, 41.25% of respondents have more than 10 years of farming experience in tomato. Likewise, 32.50% respondents have 6-10 years of farming experience and 26.25% respondents have 1-5 years of farming experience in tomato.

3.2.2 Other crops cultivated

Farmers in the study area were also engaged in cultivating a variety of other crops. Among them, 65% grew field crops such as rice, wheat, and maize, while 24.25% focused on vegetable farming, including crops like cabbage, cauliflower, tomato, and chili. Additionally, 10.75% were involved in mustard cultivation.

3.2.3 Variety

In the study area, four varieties of tomato were cultivated by the respondent farmers. As shown in figure 2, 40% of the respondents were using Gaurab 555 variety, 7.5% respondents were using Heem Sohna, 18.75% were using Manisha and 33.75% were using Srijana variety for tomato cultivation. Majority of respondents were using Gaurab 555 and Srijana variety as they have high yielding potential i.e. 105-110 MT/Ha.

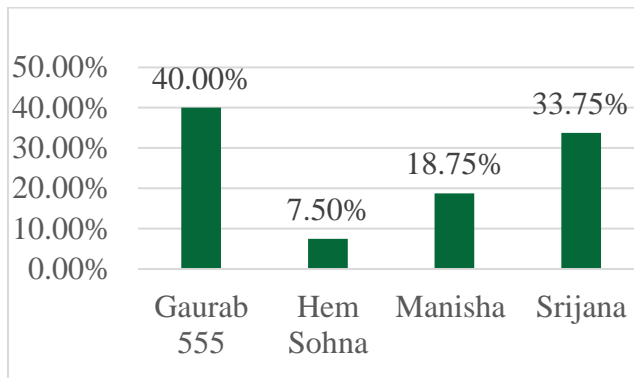


Figure 2: Varieties of tomato cultivated by respondents

3.2.4 Total cultivated area and tomato cultivation area

The average total land area of the respondents was 0.4 hectare. The maximum total land area of the respondents was 1.02 hectare and the minimum total land area of the respondents was 0.15 hectare. The average tomato cultivation area was 0.06 hectare. Small portion of total land cultivated area was used for tomato production. The maximum tomato cultivation area of the respondents was 0.09 hectare and minimum tomato cultivation area of the respondents was 0.05 hectare.

Table 1: Total cultivated area and Tomato cultivation area					
S. N	Category	Average (ha)	Maximum	Minimum	Standard deviation
1	Total cultivated area	0.4	1.20	0.15	0.18
2	Tomato cultivation area	0.06	0.09	0.05	0.01

3.2.5 Mode of cultivation

From the study area it was found that 100% of the respondents cultivated tomato in tunnel.

3.2.6 Subsidy

During the survey, it was found that 26.25% of the respondents had received seed and tunnel as a subsidy from PMAMP (Prime Minister Agriculture Modernization Project), Surkhet. Likewise, 73.75% of the respondents did not receive subsidy from any private or government sector.

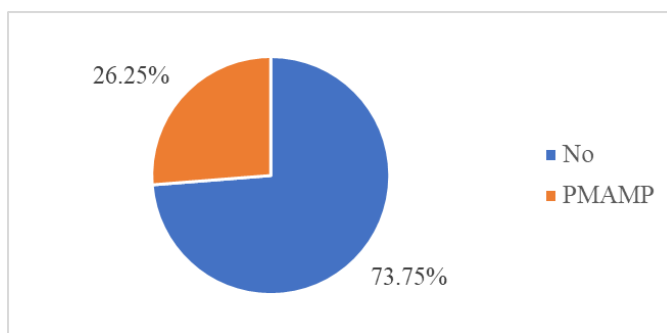


Figure 3: Subsidy received by Farmers

3.2.7 Training

During the survey, it was found that most respondents (i.e., 52.50%) had never received any training from any institutions while 47.5% respondents had taken training regarding tomato cultivation in tunnel and insect-pest and disease management.

3.2.8 Reasons for choosing tomato production

During the survey, it was found that 47.50% of respondents chose tomato because they found it to be a profitable business whereas 41.25% of the respondents found favorable climatic condition for tomato and 11.25% of the respondents said that they found tomato cultivation easier.

3.2.9 Source of seed

In the study area, 57.25% of the respondents used seed from agro vets whereas 13.75% of the respondents used seed from nursery, 19.0% of the respondents used seed that they received as a subsidy from PMAMP and 10% of them were using seeds from previous year.

3.2.10 Irrigation method

In this sample, it was found that, all respondents used drip irrigations system for irrigation.

3.2.11 Weeding

First weeding was done after 25-30 days and second at 50-60 days after planting. None of the respondents were found to be using pesticides.

3.2.12 Disease and pest incidence

At the study area, there was incidences of Downy mildew, Bacterial wilt, Tuta Absoluta and Aphids by 21.25%, 13.25%, 23.75% and 22.25% respectively.

Table 2: Incidence of Major Tomato Diseases and Pests					
S. N	Major disease and pest	Frequency		Percentage	
		Affected	Not affected	Affected	Not affected
1	Downy Mildew	17	63	21.25%	78.75%
2	Bacterial wilt	11	69	13.25%	86.75%
3	Tuta Absoluta	19	61	23.75%	76.25%
4	Aphids	18	62	22.25%	77.75%

3.2.13 Control measures

During the survey, it was found that the respondents used both organic pesticides and chemical pesticides as a control method. The respondent farmers lacked detailed information about the pesticides. All of them were found to be using higher doses of pesticides to control diseases and pests. They were using Mancozeb for controlling Downy Mildew, for controlling Bacterial wilt, the respondents removed all the diseased plant from the field and buried it and also performed crop rotation whereas Neem oil for controlling Tomato leaf miner i.e. Tuta absoluta and soap water and ash for controlling aphid in the study area.

3.2.14 Fertilizer

The survey data revealed that 65% of the respondents used organic fertilizer such as; Cow manure, Buffalo manure, Poultry manure, Compost manure and Cow urine for the cultivation of tomato. Likewise, 35% of the respondents used inorganic fertilizer such as; Urea, DAP and Potash along with the organic fertilizer.

3.2.15 Harvesting

The different stages at which the tomato is harvested are immature green, mature green, turning pink, half ripe, red ripe and over ripe. In the study area harvesting of tomato starts from the first week of Chaitra and continuous to be harvested up to 2-3 months. As per respondents its usually late harvesters who would get better price for their produce. Storage of harvested tomato is not practiced in the study area. Harvesting is done as per the demand of market or collectors and farmers sell the tomato immediately after harvesting. The cost of packing, loading and transportation all would be covered by collector themselves. They sell the tomato at higher price depending on the demand in market and make their profit.

3.2.16 Trend of tomato production

Respondents were asked about the area under tomato cultivation at present and it was compared with results from past few years. It was found that 69.25% farmers have increased the area under tomato cultivation whereas 30.75% farmers had decreased the area under tomato cultivation. So, the trend of tomato production was found to be increasing in the study area.

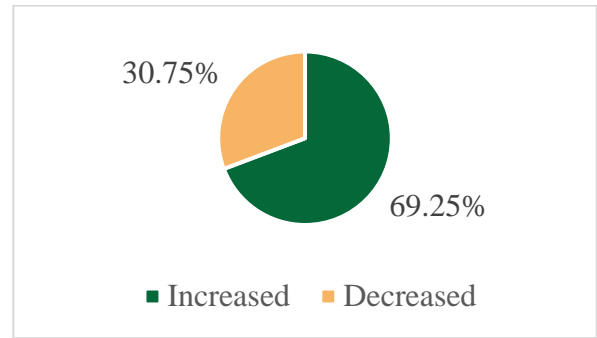


Figure 3: Increasing Trend of Tomato Cultivation Area in Panchapuri

3.2.17 Constraints related to tomato sector associated to the farmer level

Respondents were asked to rank the problems in the study area from 1 to 6. Analysis of problem revealed that availability of market and price fluctuation were very serious problem in the study area followed by incidence of Tuta absoluta, lack of storage facilities. Lack of transportation facilities was the least problematic of all the problems.

As shown in Table 3, the unavailability of a proper market ranked as the most severe issue (index value: 0.90), followed by price fluctuation.

Table 3: Constraints in tomato production			
S. N	Problems	Index value	Rank
1	Unavailability of proper market	0.90	I
2	Price fluctuation	0.74	II
3	Middlemen intervention	0.70	III
4	Prevalence of pest and disease	0.40	IV
5	Lack of storage facility	0.33	V
6	Lack of transportation facility	0.30	VI

Note: Scale value ranges from 1 to 0, where 1 = most serious, 0.75 = serious, 0.5 = moderate, 0.25 = little bit, and 0 = no problem at all.

3.3 Marketing information

3.3.1 Marketing situation

The marketing situation of the farmers was that the respondents sold their produce in the nearest market i.e. haat bazar or at local area and even at long distance market situated within the district.

3.3.2 Selling pattern of tomato

Figure 5 reveals that majority of the respondents sold their produce to the middlemen (31.25%) followed by wholesaler (18.75%) with the least being sold directly to consumer (8.75%).

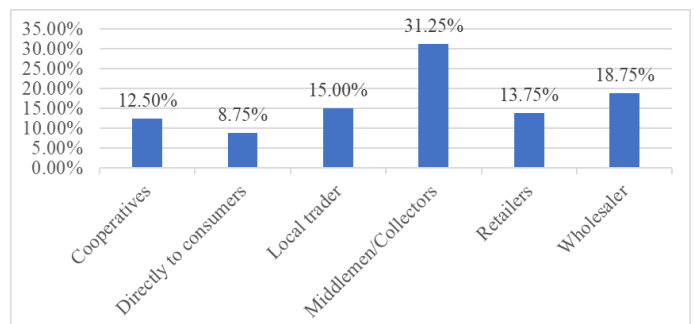


Figure 4: Selling pattern of tomato

3.3.3 Price fixing

In the surveyed area, the pricing of tomato was influenced by four entities; middlemen, which sets price for majority of the respondents i.e. 30%; cooperatives which sets price for 27.50% of the respondents; government with price followed by 26.25% of respondents; and wholesalers; whose price were adhered to by 16.25% of the respondents.

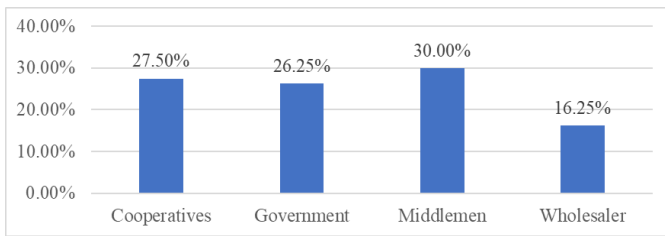


Figure 5: Distance to the nearest market

3.3.7 Price of the tomato

The price of the tomato was high during off season and low during on season. The average price of the tomato was Rs 20-60 per kg during normal season and the price was normally high in off-season i.e. rainy season that ranged from Rs 80-90 per kg. However, fluctuation of price was one of the major problems indicated by respondents. Price instability not just over years but within a year is also seen. Farmers are unable to predict whether the return from tomatoes will be profitable enough due to price fluctuation; hence, they hesitate to cultivate it in larger areas.

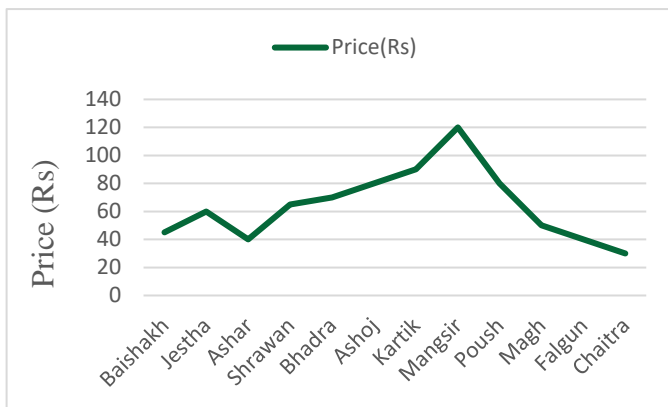


Figure 6: Price trend of Tomato

3.3.8 Level of satisfaction with the price of tomato

Figure 9 reveals that 20% of the respondents were not satisfied with the market price. 45% of the respondents were neutral and 35% of the respondents were satisfied with the market price.

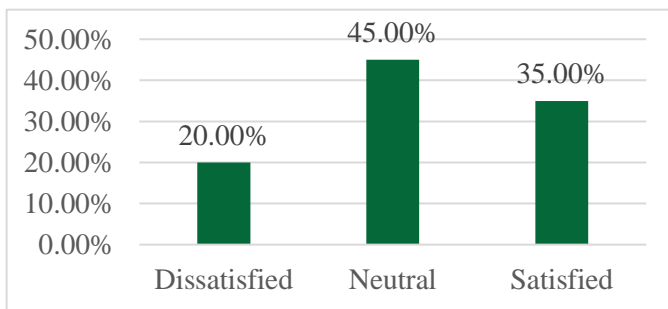


Figure 7: Level of satisfaction of the respondents from the price

3.3.9 Marketing channels

Producers, wholesalers, retailers, cooperatives and middlemen were the major actors involved in value chain of tomato. In the study area, different types of channels were observed through which produced tomato reached to the consumer level from the producer/farmer. Out of given six marketing channels most common of them was channel II followed by 31.25% of the respondents. 18.75% of the respondents followed channel V. 15% of respondents followed channel VI, 13.75% of the respondents followed channel IV, 12.5% of the respondents followed channel III and the rest i.e. 8.75% of the respondents followed channel I. Marketing channels are listed below:

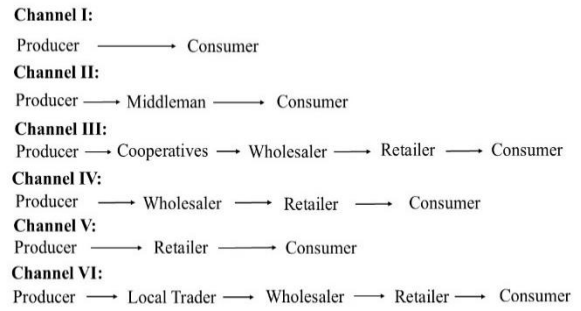


Figure 8: Marketing channel of Tomato

3.4 Economics of tomato

3.4.1 Fixed cost

Fixed costs are expenses that remain the same for a period of time regardless of the level of production. For farmers in Panchapuri, fixed cost includes land taxes and maintenance cost of equipment and machineries used.

S. N	Description	Unit	Average cost Rs/ha
1	Land tax	Rs	1,179
2	Depreciation		
i	Tunnel	Rs	12,44,250
ii	Drip irrigation	Rs	33,970
iii	Farm equipment	Rs	1,350
iv	Power tiller	Rs	10,240
v	Sprayer	Rs	1,350
vi	Motor	Rs	14,700
vii	Crates	Rs	1,125
Total			1,308,164

3.4.2 Variable cost

Variable costs are expenses like labor, seeds, and fertilizers that change directly and proportionally to the changes in production output or sales. For Panchapuri's tomato farmers, these costs reflect the day-to-day investments needed to keep their crops thriving and profitable.

S.N	Description	Unit	Per unit cost (Rs)	Average cost (Rs/ha)
A.	Labor cost			
1	Land preparation and seed sowing	Man days	500	26,000
2	Staking	Man days	500	46,000
3	Irrigation	Man days	500	13,000
4	Manuring	Man days	500	26,000
5	Weeding	Man days	500	6,500
6	Harvesting	Man days	500	46,000
7	Transportation cost	Man days	500	46,000
B.	Material cost			
1	Seed	Gm	150	35,550
2	Manure	Doko	50	118,500

Table 4: Variable Cost

S.N	Description	Unit	Per unit cost (Rs)	Average cost (Rs/ha)
		(1 Doko=15kg)		
3	Urea	Kg	25	3,425
4	DAP	Kg	55	5,390
5	Potash	Kg	40	1,560
6	Disease and pest control	g	30	5000
Total				378,925

Total cost = Total fixed cost + Total variable cost

$$= \text{Rs } 1,308,164 + 378,925$$

$$= \text{Rs } 1,687,089$$

The study showed that the total cost of production of tomato per hectare was Rs.1, 687,089.

3.4.3 Gross income

Gross income represents the total earnings from tomato farming before costs are deducted. For farmers in Panchapuri, this figure captures the hard work and yield of their efforts, reflecting the season's productivity and market success.

Table 5: Gross Income

S.N	Average production per hectare (kg)	Average price per kg (Rs)	Total Return (Rs)
1	53,720	50.25	2,699,430

3.4.4 Benefit cost ratio of tomato production

The benefit-cost ratio (BCR) shows how profitable tomato farming is by comparing earnings to expenses. For Panchapuri farmers, a positive BCR highlights the rewards of their investment and effort in tomato production.

It was calculated using total cost of production and gross return per unit area.

$$\begin{aligned} \text{Benefit cost ratio} &= \frac{\text{Gross return}}{\text{Total cost}} \\ &= \frac{2,699,430}{1,687,089} \\ &= 1.6 \end{aligned}$$

3.4.5 Marketing margin

Marketing margin is the difference between the farm gate price and the retailer's price.

In the study area farm gate price of the tomato was Rs 50 while retailer's price was Rs 70. It is calculated as given below;

$$\begin{aligned} \text{Marketing margin (MM)} &= \text{Retailer's price (Pr)} - \text{Farm gate price (Pf)} \\ &= \text{Rs } 70 - \text{Rs } 50 \\ &= \text{Rs } 20 \end{aligned}$$

This shows that the intervention of intermediaries was prevalent in the study area.

4. SUGGESTIONS

Based on this study, following suggestions have been made;

4.1 Suggestions to farmers

- Farmers should be encouraged to adopt modern farming techniques such as drip irrigation, poly house cultivation and integrated pest management to improve tomato production efficiency.

- Disease and pest occurrence was one of the problems seen in the study area so, to tackle it, farmers are advised to monitor the crop regularly for pest and disease infestations. Additionally, implement the integrated pest management (IPM) practices.
- There should be proper coordination among the tomato farmers to know about the new technology on the cultivation of tomato.
- Farmers are advised to maintain detailed records of both expenses and income to accurately assess their profitability so it would be easier for farmers to evaluate profit and loss.

4.2 Suggestions to policy makers

- Proper storage house should be established to reduce post-harvest loss faced by the farmers.
- Proper training activities regarding technical knowledge should be carried out.
- Subsidy should be given to all the farmers involved in tomato farming to receive the maximum productivity.
- Government has focused on production aspects of tomato and in providing subsidies but very less attention is given on proper marketing to the produced tomato. Thus, markets should be made accessible to all farmers.

5. CONCLUSION

Tomato farming in Panchapuri Municipality shows great potential as a profitable venture, with farmers achieving a Benefit-Cost (B:C) ratio of 1.6. This study highlights how the adoption of modern techniques like tunnel farming and drip irrigation has helped farmers improve their yields and income. However, despite the promise, challenges such as unpredictable price fluctuations, a lack of proper market infrastructure, and ongoing pest and disease issues still hinder farmers from fully reaping the benefits of their hard work. Farmers in Panchapuri are resilient and recognize the value of tomato farming. Yet, their dependence on middlemen for selling their produce, coupled with the absence of storage facilities, limits their ability to earn what they truly deserve. To unlock the full potential of tomato farming in this area, greater support is needed whether through improved market access, better pest management training, or increased subsidies for farming technology. Tomato farming can continue to be a pillar of economic growth for Panchapuri, but it will take collaboration between farmers, government bodies, and NGOs to overcome these challenges and ensure a brighter, more sustainable future for agriculture in the region.

ACKNOWLEDGMENT

I would like to express my deepest gratitude to PMAMP, Surkhet, for their invaluable guidance and support throughout my research. A special thanks to Mr. Bhim Pandey, Agriculture Officer, and all the dedicated staff who were always ready to help in every possible way. I am also incredibly thankful to my advisor, Mr. Krish Rauniyar, for his constant guidance, insightful feedback, and unwavering encouragement, which made this research journey smoother. My sincere appreciation goes out to all the respondents who generously gave their time and shared valuable information during the survey. Finally, I would like to thank all my friends for standing by me, offering help and encouragement.

REFERENCES

- Ayyar, S., 2019. Mulching and fertigation on the yield and quality of tomato.. IJCS, 7(4), Pp., 2539-2541.
- Bhandari, H., Bhandari, T., Timsina, K. P. and Panta, H. K., 2021. Supply chain efficiency of Tomato in Kathmandu valley.. Journal of Agriculture and Natural Resources., 4(1), Pp.,111-119.
- FAOSTAT, 2021. Worldwide total fresh tomato production in 2021. [Online]
- Ghimire, N., Kandel, M. and M Aryal, B., 2017. Assessment of tomato consumption and demand in Nepal. The Journal of Agriculture and Environment, 18, Pp., 83-95.
- Ghimire, S., Subedi, P. and Green, S., 2001. Status of tomato yellow leaf curl virus in tomato in the western hills of Nepal.. Nepal agriculture research journal,1-4.
- MoALD, 2023. Statistical information on Nepalese Agriculture 2078/79 2021/22, Kathmandu,Nepal: Government of Nepal. Ministry of Agriculture and Livestock Development,Planning and Development Cooperation Coordination Division. Statistics and Analysis section.

Miah, A. Q. ,1993. Applied statistics: A course handbook for human settlements planning. Asian Institute of Technology, Division of Human Settlements

OECD, 2008. Safety Assessment of Transgenic Organisms in the Environment, 7 edition. Paris: OECD Consensus Documents, Harmonisation of Regulatory Oversight in Biotechnology.

Pandey, Y., Pun, A. and Upadhyay, K., 2006. ,2006. Participatory Varietal Evaluation of Rainy Season Tomato under Plastic House Condition.. Nepal Agri. Res. J. , 7, Pp.,11-15.

Quinet, M., Angosto, T., Yuste-Lisbona, F.J., Blanchard-Gros, R., Bigot, S.,

Martinez, J.P. and Lutts, S., 2019. Tomato fruit development and metabolism. *Frontiers in plant science*, 10, Pp.,1554.

Singh, D., 2010. Tomato 'Srijana': Cultivating Technology., Lalitpur: Vegetable Development Directorate, Lalitpur, Nepal..

Thapa, B., Srivastava, K. and Bhandari, H., 2018. Assessment studies on genetic variability traits in different lines of tomato (*Solanum lycopersicum* L.). *Int. J. Curr. Microbiol. Appl. Sci.*, 7, Pp.,824-829.

Yadav, M.K., Kumar, J., Silas, V.J., Mandal, N. and Jha, S., 2022. Effect of different levels of N, P and K on growth, yield and quality of tomato (*Lycopersicon esculentum*) under Kanpur agro-climatic condition.

