Society of Krishi Vigyan
www.iskv.in

J Krishi Vigyan 2025, 13(3) : 550-554

ISSN 2319-6432 (Print)
ISSN 2349-6433 (Online)

DOI: 10.5958/2349-4433.2025.00100.5

Good Agricultural Practices for Sustainable Production of Tomato Crops in Mizoram

Rohit Shukla[1]* and T Vanlalngurzauva[2]
[1]College of Horticulture and Forestry
Central Agricultural University, Pasighat, East Siang District, (791102), Arunachal Pradesh, India

ABSTRACT

Different good agricultural practices (GAP) for sustainable production of tomatoes, *viz.,* high-yielding varieties, community nursery under protected structure, popularisation of community water harvesting and micro irrigation, furrow irrigated raised bed (FIRB) planting for water use efficiency, mulching with locally available materials, application of zinc and boron and intercropping with marigold were demonstrated in different agro-climatic zones in the Serchhip district through sixty demonstrations by KVK, N. Vanlaiphai, Serchhip District with the aim for increased tomato productivity quality through optimum utilization of available resources and technologies. The result showed that demonstrating good agricultural practices (GAP) significantly boosted tomato yield. The findings from the current study showed that the good agriculture practices of tomato cultivation increased the total tomato production by almost 30-40% compared to conventional crop production practices followed in Serchhip District, N. Vanlaiphai, Mizoram.

Keywords: Economics, Extension gap, Front-Line Demonstrations , Good agricultural practices, Tomato,Technology Gap,Yield.

INTRODUCTION

Tomato (*Solanum lycopersicum* Mill.) is a major vegetable crop cultivated year-round across tropical, subtropical, and temperate regions worldwide (Oraon *et al,* 2018). It holds substantial value in both fresh produce markets and the processing industry (Reddy *et al,* 2022). Nutritionally, tomatoes are a rich source of vitamins A and C, as well as lycopene a carotenoid responsible for the characteristic red colour of ripe tomatoes, which is also believed to have anti-cancer properties (Tripathy *et al,* 2021; Malathi *et al,* 2021). Additionally, tomatoes serve as natural antioxidants as ascorbic acid (Vitamin C) present in them plays a crucial role in scavenging reactive oxygen species such as superoxide, hydrogen peroxide, and singlet oxygen, while beta-carotene helps prevent and neutralize free radical chain reactions (Rehal and Kaur, 2021). According to FAOSTAT (2022), global tomato production reached approximately 186.82 million tonnes in 2022, cultivated over an area of 5 million hectares, with an average productivity of 36.97 t/ha. China led global production with 64.86 million tonnes, accounting for 34.72% of the total, followed by India with 20.57 million tonnes (11.01% of global output).

In Mizoram, tomatoes are cultivated over 1,470 ha, yielding a total production of 11,870t. Among its districts, Serchhip is a key tomato-growing region, with 568 ha. under cultivation and a production of 6,055 MT, averaging 10.66 t/ha (Directorate of Economics and Statistics, Government of Mizoram, 2022). Despite its potential, tomato productivity in Serchhip remains relatively low due to a combination of limiting factors such as undulating terrain, dependence on rainfed agriculture, and water scarcity during the dry season (November to March). Furthermore, the use of unscientific farming practices, limited access to quality seeds and inputs, and both biotic and abiotic stresses significantly constrain production. To overcome these challenges, the promotion and adoption of Good Agricultural Practices (GAPs) have been advocated. GAPs encompass a set of principles, guidelines, and technical recommendations designed to ensure sustainable tomato production, post-harvest handling, and marketing. In response, Krishi Vigyan Kendra (KVK), Serchhip, implemented Front-Line Demonstrations (FLDs) to showcase

Corresponding Author's Email - roshuhort@gmail.com
1College of Horticulture and Forestry, Central Agricultural University, Pasighat, East Siang District, (791102), Arunachal Pradesh, India
2Krishi Vigyan Kendra, Serchhip District, North Vanlaiphai, (796184), Mizoram, India

Table 1: Details of Good Agricultural Practices for Tomato Cultivation

S. No.	Technology intervention	Farmer's practice	Improved technology demonstrated	Gap
1	Variety	Arka Abhed	Arka Abhed	No Gap
2	Nursery Raising & Management	• Seed rate: 200 g/ha • Proper nursery management not followed	• Seed rate: 150 g/ha • Community nursery under protected structure for disease-free planting material	Partial Gap
3	Transplanting Method	• Flatbed transplanting Row-to-row: 60 cm; Plant-to-plant:60 cm	• Furrow Irrigated Raised Bed (FIRB) method • Raised bed: 90 cm wide, 20 cm high • Irrigation furrow: 30 cm • Transplanting on both sides of bed • Furrow irrigation (¾ height) • Mulching with paddy straw @ 7.5 t/ha	Full Gap
4	Nutrient Management	• Application of Manure and Fertilizes without soil test & recommendation	• Application based on soil test reports • Foliar spray of Zinc 0.5% + Boron 0.5% at 30-day intervals starting 60 days after transplanting	Full Gap
5	Water management	• Limited use of micro-irrigation systems	• Construction of *Jal Kund*, community water storage tanks, and *Amrit Sarovar* for irrigation • Use of drip and other micro-irrigation systems to improve water use efficiency	Partial Gap
6	Weeding and intercultural operations	• Manual weeding	• Mulching with locally available materials • Manual weeding	Partial Gap
7	Disease and Pest Management	• Chemical application without proper knowledge	• Adoption of Integrated Pest Management (IPM) • Intercropping with marigold • Use of yellow sticky traps	Full Gap

improved tomato cultivation technologies across various agro-climatic zones of the district.

MATERIALS AND METHODS

Front-line Demonstrations (FLDs) on Good Agricultural Practices (GAPs) for sustainable tomato production were conducted by Krishi Vigyan Kendra (KVK), Serchhip, at multiple locations across Serchhip District during the cropping seasons of 2022-23 and 2023-24. A total of 60 farmers from different villages were selected to participate in the demonstrations. Critical inputs were provided to the farmers and applied according to the recommended package of practices. The technologies demonstrated are detailed in the table 1. Baseline data from all 60 participating farmers were collected through personal interviews using a well-structured interview schedule, both before and after the demonstrations. Prior to implementation, beneficiary farmers were given skill training sessions. Continuous technical support was also provided through regular field visits and WhatsApp-based advisories. Data on crop yield and economic performance were recorded and used to compute the following metrics as per the method proposed by Samui *et al* (2000).

Table 2: Pooled data (2022-23 and 2023-24) on growth and yield attributes under FLDs

S. No.	Parameter	Demonstration	Farmer's Practices
1	Days to 50% flowering	36.20	38.50
2	No. of fruits per plant	26.00	24.00
3	Days to first harvesting	72.00	77.00
4	Average fruit weight (g.)	91.50	72.50
5	Yield q/ha	363.34	264.67

Table 3: Yield Performance, Extension Gap, Technology Gap, and Technology Index under FLDs

Year	No. of FLDs	Yield (q/ha)-FLD	Yield (q/ha)-Local Check	% Increase Over Local Check	Technology Gap (q/ha)	Extension Gap (q/ha)	Technology Index (%)
2022–23	60	352.44	257.78	36.72%	247.56	94.67	41.26%
2023–24	60	374.23	271.56	37.81%	225.77	102.67	37.63%
Mean	60	363.34	264.67	37.28%	236.66	98.67	39.44%

Table 4: Economics of front-line demonstrations of tomato

Years	Cost of Cultivation (₹/ha)		Gross Return (₹/ha)		Net Return (₹/ha)		B: C Ratio	
	FLD	Local Check	FLD	Local Check	FLD	Local Check	FLD	Local Check
2022-23	104600	84940	317200	232000	212600	147060	3.03	2.73
2023-24	106600	87940	336807	244404	230207	156464	3.16	2.78
Mean	105600	86440	327004	238202	221404	151762	3.10	2.76

RESULTS AND DISCUSSION

Growth Attributes and Yield

The results presented in table 2 shows significant differences in growth and yield attributes between the demonstration plots and farmer' practices. The Front-Line Demonstrations (FLDs) recorded earlier flowering (36.20 days to 50% flowering) and earlier harvesting (72.00 days to first harvest) compared to the farmers' traditional practices (38.50 days and 77.00 days, respectively). Additionally, the FLDs exhibited superior yield attributes, including a higher number of fruits per plant (26.00 vs. 24.00), greater average fruit weight (91.50 g vs. 72.50 g), and a substantially higher average yield (363.34 q/ha vs. 264.67 q/ha). The improved performance in the demonstration plots can be attributed to the comprehensive adoption of Good Agricultural Practices (GAPs). These included the use of raised beds, mulching, soil test-based nutrient management, timely irrigation using micro-irrigation systems, and effective plant protection measures such as the use of yellow and blue sticky traps. These findings are consistent with previous studies by Nagouajio et al (2008), Islam *et al* (2012), Mishra *et al* (2009), Kumar *et al* (2022), Shukla *et al* (2022), Hobbs (2023) and Ramniwas *et al* (2023) and which documented yield improvements in various crops through the adoption of improved agricultural technologies under frontline demonstration programmes.

Yield improvement, extension gap, technology gap, and technology index in front-line demonstrations

The impact of Front-Line Demonstrations (FLDs) on tomato productivity is summarized in Table 3. The data clearly indicate that the demonstrations significantly improved tomato yields compared to the farmer's practices (local check). In 2022-23, FLDs achieved a 36.72% increase in yield over the local check, while in 2023-24, the increase was 37.81%. The average yield increase across the two years was 37.28%, demonstrating the consistent effectiveness of the improved practices. The technology gap, which is the difference between the potential yield and the demonstrated yield, was recorded at 247.56 q/ha in 2022-23 and 225.77 q/ha in 2023-24, with a mean gap of 236.66 q/ha. These differences can be attributed to various local factors such as soil fertility, soil type, irrigation water quality, microclimatic conditions, pest pressure, and farmer-specific management practices. This highlights the importance of developing and promoting location-specific recommendations to minimize these gaps and enhance yield performance. The extension gap-the difference between demonstration yield and yield from farmers' traditional practices ranged from 94.67 to 102.67 q/ha during the study period, with a mean of 98.67 q/ha. The substantial extension gap suggests a strong need for increased awareness and adoption of improved agricultural technologies among farmers to boost productivity. The technology index, which reflects the feasibility and adaptability of demonstrated technologies under real farm conditions, decreased from 41.26% in 2022-23 to 37.63% in 2023-24. A lower technology index indicates greater potential for technology adoption. The declining trend suggests increased acceptability and suitability of GAP-based tomato cultivation practices among the farmers in the region. These findings align with earlier studies by Pandey and Chandra (2013), Kumar *et al* (2022), Shukla *et al* (2022) and Ramniwas *et al* (2023), all of which demonstrated the positive impact of improved technologies under FLDs in bridging the yield gap

Economics of front-line demonstrations

The economic analysis of tomato yield performance revealed that farmers participating in the Front-Line Demonstrations (FLDs) achieved significantly better economic returns compared to those following traditional practices and selling in local markets. The improved package of practices not only enhanced yield but also allowed farmers to fetch better prices due to higher quality produce. The results indicated that the mean cost of cultivation was higher in the demonstration plots (₹ 1,05,600/ha) compared to the farmer practice plots (₹ 86,440/ha). However, this higher investment led to substantially greater returns. The mean gross returns from FLDs were ₹ 3,27,004/ha, while those from the farmer practice plots were ₹ 2,38,202/ha. Consequently, the mean net returns were also higher in the FLD plots at ₹ 2,21,404/ha, as compared to ₹ 1,51,762/ha under traditional farmer practices. Importantly, the benefit-cost (B:C) ratio, an indicator of economic viability, was significantly improved under FLDs. The average B:C ratio was 3.10 for the demonstration plots, while it was 2.76 for the farmer practice plots. This demonstrates the clear economic advantage of adopting Good Agricultural Practices (GAPs) in tomato cultivation. These findings are consistent with earlier studies by Kumar *et al* (2022), Shukla *et al* (2022) and Ramniwas *et al* (2023), who reported similar improvements in profitability through the adoption of improved cultivation technologies under FLDs.

CONCLUSION

The present study clearly demonstrated that the adoption of good agricultural practices plays a pivotal role in enhancing the productivity, profitability, and sustainability of tomato cultivation in the Serchhip district of Mizoram. The Front-Line Demonstrations (FLDs) conducted over two years significantly improved yield performance, with an increase of nearly 30-40% compared to traditional practices. These improvements were attributed to scientific nursery management, proper nutrient and water management, pest and disease control using IPM, and efficient planting techniques. In addition to improving yields, the adoption of GAPs led to higher net returns and a more favourable benefit-cost ratio, indicating strong economic viability. The demonstrations also contributed to increased awareness among local farmers, encouraging the wider adoption of sustainable practices across the district. Overall, the study concludes that GAPs not only contribute to safe and environmentally responsible tomato production but also serve as a catalyst for improving farmers' livelihoods through increased income and better resource use efficiency. Continued promotion and scaling up of such practices, supported by location-specific recommendations and training, are essential for the long-term development of tomato cultivation in the region.

REFERENCES

Directorate of Economics and Statistics, Government of Mizoram (2022). *Mizoram Statistical Abstract 2021*. Retrieved from https://des.mizoram.gov.in

FAOSTAT (2022). *Food and Agriculture Organization of the United Nations*. Retrieved from https://www.fao.org/faostat/en/#home

Gagliardi L, Sportelli M, Fontanelli M, Sbrana M, Luglio S M, Raffaelli M and Peruzzi A (2023). Effects of conservation agriculture practices on tomato yield and economic performance. *Agronomy* **13**(7): 1704. https://doi.org/10.3390/agronomy13071704

Gazi M N I, Arshad F M, Radam A and Alias E F (2012). Good agricultural practices (GAP) of tomatoes in Malaysia: Evidences from Cameron Highlands. *African J Busin Manag* **6**(27): 7969-7976.

GIZ (2023). Good Agricultural Practices in Tomato Cultivation: A Technical Manual for Karnataka. Green Innovation Centres for the Agriculture and Food Sector – India. Retrieved from https://snrd-asia.org/wp-content/uploads/2023/06/Tomato_KA.pdf

Hobbs J E (2023). Incentives for the adoption of good agricultural practices (GAPs). *Department of Agricultural Economics, University of Saskatchewan*.

Kumar S, Gangwar B, Prusty A K and Shamim M (2013). Prospects of organic agriculture in Eastern Himalayan region-A case study of Mizoram. *Prog Agri* **13**(2): 139-150.

Kumar S, Nongthombam J, Chaudhary K P, Khangembam J, Nongmaithem L D, Pandey N K, Shukla R and Singh B M (2022). Impact and economic analysis on cluster front-line demonstration of good horticultural practices in Broccoli. *Scientist* **1**(3): 1-14.

Malathi G and Kohila P (2021). Evaluation of tomato hybrids in Salem district of Tamil Nadu. *J Krishi Vigyan* **10**(1): 328-331.

Mishra D K, Paliwal D K, Tailer R S and Deshwal A K (2009). Impact of frontline demonstration on yield enhancement of potato. *Indian Res J Ext Edu* **9**(3): 26-28.

Oraon D, Singh R K, Pandey V K, Rai V P, Singh U K and Alam Z (2018). Constraints in adoption of improved tomato production technologies in Chatra district of Jharkhand. *J Krishi Vigyan* **7**(special): 24-26.

Nagouajio M, Auras R, Fernandez R T, Rubiano M, Counts J W and Kijchavengkul T (2008). Field performance of aliphatic-aromatic copolyester biodegradable mulch films in a fresh market tomato production system. *Hort Tech* **18**(4): 605-610.

Pandey S K and Chandra K K (2013). Impact of integrated nutrient management on tomato yield under farmers field conditions. *J Env Bio* **34**(6): 1047-1051.

Ramniwas K M, Jat S R, Radhakrishnan S K, Renjith P S and Patel A (2023). Adoption study on improved cultivation practices of tomato on yield and economics in western Gujarat. *Pharma Inn J* **12**(8): 1776-1780.

Reddy P, Chaitanya T S and Veeraiah A (2022). Suitability of tomato (*Solanum lycopersicon* L.) having multiple disease resistant. *J Krishi Vigyan* **11**(1): 341-346.

Rehal J and Kaur I (2021). Development and evaluation of soup mix utilizing tomato pomace powder. *J Krishi Vigyan* **11**(1): 59-62.

Samui S K, Maitra S, Roy D K, Mondal A K and Saha D (2000). Evaluation on frontline demonstration on groundnut (*Arachis hypogaea* L.). *Indian J Soc Coast Agri Res* **18**(2): 180-183.

Shukla R, Hnamte V and Kumar S (2022). Impact of front-line demonstration on yield and economics of Tomato (*Solanum lycopersicum* Mill.) in Mamit district of Mizoram. *Int J Plant Soil Sci* **34**(22): 1745-1750.

Sibounnavong P S, Utthajadee A, Makhonpas C and Soytong K (2012). Efficacy test for good agricultural practice, pesticide-free production and organic agriculture in tomato. *J Agri Tech* **8**(1): 363-376.

Tripathy L, Srichandan S, Dash S K, Bhuyan J and Sahoo T R (2021). Effects of chemical mutagens on the physio-chemical traits of Tomato (*Lycopersicon esculentum*). *J Krishi Vigyan* **9**(2): 62-67.

Received on 15/05/2025 Accepted on 18/08/2025