



A Constraint Analysis of Tomato Cultivators in Khawzawl Cluster, Mizoram

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Abstract: This study examines the major challenges faced by tomato cultivators in the Khawzawl cluster of Mizoram, categorizing these constraints into four primary areas: technical, labor and economic, marketing, and agro-biological. By utilizing the Garrett Ranking Method, the research quantifies and ranks the severity of each constraint as perceived by farmers, offering a systematic understanding of the key obstacles to productivity and profitability. Findings reveal that technical challenges, particularly limited ICT literacy and inadequate processing infrastructure, significantly hinder efficiency. Economic constraints, such as limited access to finance, crop insurance, and high labor costs, exacerbate the financial vulnerability of farmers. Marketing constraints, including price volatility, exploitation by middlemen, and inadequate storage facilities, further reduce profitability and market stability for tomato cultivators. Agro-biological issues, such as erratic rainfall, pest infestations, and soil fertility, adversely affect crop yield and quality.

The study emphasizes the need for targeted interventions to address these constraints, recommending measures such as digital literacy programs, infrastructure investment, cooperative marketing systems, and improved pest management practices. By prioritizing these constraints according to their impact, this research provides valuable insights for policymakers and agricultural stakeholders, suggesting strategic actions to foster a more resilient, productive, and sustainable tomato farming sector in the region. These findings serve as a foundation for future efforts to improve agricultural practices, enhance economic stability, and support rural livelihoods in Mizoram.

Keywords: Tomato cultivation, Garrett Ranking Method, Agricultural constraints, Mizoram farming challenges.

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Introduction

Agriculture constitutes 22% of India's Gross Domestic Product (GDP) and supports the livelihoods of 58% of the population, providing employment for a significant portion of society and supplying raw materials to numerous industries nationwide (Government of India, 2021). As a central pillar of India's economy, agriculture plays a crucial role in employment and national income contribution. However, compared to the services and manufacturing sectors, agriculture has received relatively less attention. Emerging fields within agriculture, such as horticulture, floriculture, organic farming, genetic engineering, food processing, branding, and packaging, hold substantial growth potential. Strengthening rural infrastructure, extension services, and agro-based industries is critical to employment generation and poverty alleviation (National Agricultural Policy, 2019).

Despite its contributions, Indian agriculture faces challenges, including imbalances between food and cash crops, low yields per hectare (except for wheat), and significant production volatility and

regional productivity disparities (Patel & Verma, 2020). Domestic production of pulses and oilseeds remains insufficient to meet national demand, leading to imports of these essential commodities. India ranks as the second-largest producer of rice and wheat globally, is the largest producer of pulses, and fourth in coarse grains. However, price support policies have traditionally favored rice and wheat, resulting in skewed cropping patterns and input allocations across the sector (Singh, 2018).

The cultivation of tomatoes is critical to the agricultural economies of many developing regions, with the crop being both nutritionally valuable and economically viable. However, tomato farmers, particularly in rural and remote areas, face numerous challenges that hinder productivity and profitability. Understanding and addressing these constraints is essential for sustainable agricultural development and improved livelihoods (Sharma et al., 2020). Studies have identified a range of obstacles faced by tomato farmers, broadly categorized into technical, economic, marketing, and agro-biological challenges (Kumar et al., 2019; Singh & Yadav, 2018). For instance, inadequate access to technology and

poor infrastructure have been reported as key technical barriers in similar agricultural contexts, where limited ICT adoption reduces farmers' ability to access market information, pest control methods, and crop management resources (Ahmed & Hussain, 2017).

Literature Review

Dixit et al. (2000) conducted a study examining the risks in tomato production and marketing, focusing on key threats and mitigation strategies. Production losses were primarily attributed to pests and diseases, including fruit borer, mosaic, and whitefly. To mitigate these, the study recommended using quality insecticides and developing pest-resistant tomato varieties. For marketing risks, particularly those arising from price volatility due to peak-period oversupply, the study suggested establishing processing units, cooperative marketing societies, and enhancing storage and price support systems to stabilize farmer incomes.

Chole et al. (2002) investigated the price distribution in the marketing of bitter gourd and tomatoes in Raigad District, Maharashtra, identifying different marketing channels and their efficiency. They found that producers received the highest share of consumer spending in Channel I (62.38%), compared to Channel II (57.22%) and Channel III (47.92%). The study noted that the efficiency was highest in Channel I and that intermediaries, such as wholesalers and retailers, retained smaller shares of the consumer's price in the more efficient channels.

Ahmed and Hussain (2017) highlighted that limited access to information and communication technologies (ICT) significantly reduces farmers' ability to optimize their production practices. The absence of adequate storage and processing facilities further complicates efforts to prevent post-harvest losses, as underscored in a study by Sharma et al. (2020), which noted that poor infrastructure often leads to reduced crop value and waste. Similarly, Kumar et al. (2019) identified that insufficient awareness and utilization of grading and packaging practices hinder farmers' abilities to compete in broader markets.

According to Khan et al. (2016), access to financing remains a significant limitation for small-scale farmers, who often struggle to secure loans or credit to invest in essential inputs and infrastructure. This financial constraint is compounded by high labor costs, as indicated in the work of Singh and Yadav (2018), who examined the economic pressures faced by vegetable farmers in rural India. Additionally, the lack of structured crop insurance schemes leaves farmers vulnerable to climate-related losses and economic instability (Sarkar et al., 2021).

Marketing challenges, particularly price volatility and market access, have been extensively documented. In regions with underdeveloped marketing infrastructure, farmers frequently rely on middlemen, who often exploit this dependency to purchase produce at lower prices, resulting in diminished profitability for the growers (Chand & Kumar, 2020). Reddy et al. (2019) emphasized that price fluctuations pose a substantial risk to income stability, making it difficult for farmers to plan their production effectively. These marketing issues are exacerbated by the perishable nature of tomatoes, which forces many farmers into distress sales during peak harvest periods.

Reddy et al. (2019) noted that erratic rainfall patterns and pest outbreaks contribute to yield instability, complicating the cultivation process and increasing vulnerability to losses. The implementation of integrated pest management (IPM) practices and

soil health programs has been recommended by Bhatt et al. (2018) as effective measures to mitigate these agro-biological challenges. Soil fertility management, through the use of organic amendments, has been found to improve crop resilience and productivity, further emphasizing the importance of sustainable agricultural practices (Bhatt et al., 2018).

Objective and Methodology

An attempt in this article is to identify the key challenges encountered by tomato cultivators in the Khawzawl cluster and to recommend effective strategies to mitigate these issues. The identified constraints are organized into four principal categories: technical constraints, labor and economic constraints, marketing constraints, and agro-biological constraints. To determine the most and least significant challenges encountered by tomato farmers, the Garrett Ranking Method has been employed. This technique involves converting participants' assessments of the severity of each problem into ranked scores. Respondents were asked to rate the problems according to their perceived level of impact, with the Garrett Ranking Technique transforming these ranks into scores using the following formula:

GR = 100 × (Rij - 0.5) / Nj

Where,

- Rij= Rank given for the ith problem by the jth person
- Nj= Number of problem ranked by the jth person

Using this approach, the percent position of each rank assigned by respondents was converted into scores based on Garrett and Woodworth's table (1971). For each constraint, the scores given by FPO members were then aggregated and averaged across the total number of respondents who rated that particular issue. Finally, the mean score for each problem was calculated and ranked in descending order, with higher mean scores indicating more significant challenges. This systematic approach allowed for an objective prioritization of constraints based on their relative severity as perceived by the respondents.

Results and Discussions

To measure the technical constraints 6 indicators have been used such as inputs, infrastructure, storage and processing facilities, ICT tools and Grading and packaging. Each indicator is rank as per their mean score from least to most.

Table No. 1: Technical Constraints

Variable	Mean Score	Rank
Untimely, costly and poor-quality inputs	28.23	VI
Lack of proper infrastructure (implements, irrigation facilities, power and electricity)	63.66	III
Lack of well-developed storage facilities	59.23	IV
Lack of well-developed processing facilities	65.55	II
Computer illiteracy which makes them unable to derive benefits of the ICT tools available	74.27	I
Lack of awareness about grading and packaging	38.50	V

Source: Primary Data, 2024

It could be observed from the table that the most critical technical constraint faced by farmers is the inability to effectively utilize information and communication technology (ICT) tools, largely due to computer illiteracy, as reflected by a mean score of 74.27. This deficiency hinders farmers' access to essential resources such as market information, weather forecasts, pest control strategies, and advanced farming techniques. To mitigate this challenge, digital literacy programs and more accessible ICT solutions are necessary to empower farmers with the knowledge and tools required for more informed and efficient farm management.

The second most significant constraint, with a mean score of 65.55, is the lack of adequate processing facilities. Without such infrastructure, farmers are unable to enhance the value of their tomato crops through activities like canning, drying, or producing sauces. Consequently, they are forced to sell raw tomatoes at lower prices, leading to increased post-harvest losses. The development of local processing units would allow farmers to reduce waste and generate additional income by producing value-added products.

Inadequate infrastructure, with a mean score of 63.66, represents another substantial barrier to productivity. The absence of essential farming tools, irrigation systems, and reliable electricity severely limits the efficiency of tomato production. Irrigation is particularly crucial for tomato cultivation due to the crop's sensitivity to water availability. Addressing these infrastructure shortcomings could greatly enhance production capacity and efficiency.

Storage challenges also pose significant difficulties for tomato farmers, as the crop is highly perishable and requires proper storage to prevent spoilage, reflected by a mean score of 59.23. The lack of adequate storage facilities forces farmers to sell their produce quickly, often at lower prices, to avoid losses. Establishing better storage solutions would enable farmers to extend the shelf life of their tomatoes and sell them under more favorable market conditions.

Another notable issue is the farmers' lack of knowledge regarding proper grading and packaging practices, with a mean score of 38.50. Grading allows for the categorization of produce based on quality, while effective packaging helps maintain product integrity during transportation. Educating farmers on these practices would enable them to secure higher prices for their produce by improving the marketability of their products.

Although ranked lowest, untimely and poor-quality inputs still represent a concern for tomato farmers, as indicated by a mean score of 28.23. The high cost or unavailability of quality seeds, fertilizers, and pesticides at critical times can negatively impact crop growth and reduce yields. Enhancing the supply chain for agricultural inputs would contribute to improved production quality and reduce costs for farmers.

The data highlights that the most significant economic constraint faced by grape growers is the absence of a clear government price policy, as indicated by a mean score of 64.02. This absence results in unstable or unpredictable pricing for grape produce, leaving farmers vulnerable to market fluctuations. Such volatility undermines their ability to plan for the future, impacting both profitability and long-term financial security. Establishing a stable pricing mechanism would provide much-needed predictability, enabling farmers to make more informed decisions regarding production and investment.

Table No. 2: Labour and Economics Constraints

Variable	Mean Score	Rank
Unavailability of labour during harvesting	33.35	VII
Lack of technical skill of labour in harvesting, processing	34.14	V
High cost of labour	33.92	VI
Lack of sufficient finance	37.69	IV
Inadequacy of credit facilities	44.72	III
No crop insurance facilities	50.88	II
Lack of price policy by the government	64.02	I

Source: Primary Data, 2024

The second most pressing economic issue is the lack of crop insurance, with a mean score of 50.88. Without insurance, grape growers are exposed to financial risks from adverse weather, pests, and other unpredictable factors that can severely damage their crops. The absence of insurance leaves farmers economically insecure, as they have no safety net to mitigate potential losses, further increasing the financial volatility of their operations.

Limited access to credit facilities ranks as the third most significant constraint, with a mean score of 44.72. Grape farmers struggle to secure financial loans or credit to invest in essential inputs, equipment, or infrastructure upgrades. This lack of access to credit hinders their ability to expand or improve their farms, thereby limiting productivity and profitability. Expanding credit opportunities is crucial for enabling farmers to make necessary investments in their operations.

Insufficient financial resources, with a mean score of 37.69, rank fourth among the constraints, highlighting that even when credit is accessible, farmers may still face challenges in securing sufficient capital to meet their operational needs. This points to broader economic challenges that limit farmers' ability to run profitable businesses, underscoring the need for more robust financial support systems for agricultural communities.

The shortage of technically skilled labor, particularly in critical tasks such as harvesting and processing, is another key issue, reflected by a mean score of 34.24. The lack of adequately trained workers reduces the efficiency and quality of these essential stages in grape production, potentially resulting in losses or diminished product quality. This, in turn, negatively impacts market value and profitability. Addressing the labor skill gap through targeted training programs would improve both productivity and the quality of grape produce.

Labor costs also present a significant challenge, as indicated by the mean score of 33.92. Even when labor is available, it is often prohibitively expensive, especially for small-scale farmers who may struggle to afford the labor necessary for harvesting and processing. High labor costs add to the overall production expenses, making grape cultivation less economically viable for many farmers.

Finally, the unavailability of labor during peak harvest seasons, while ranked lowest with a mean score of 33.35, still poses a challenge. Although less critical compared to other issues, the

scarcity of labor during harvest times can lead to delays, inefficiencies, and product losses due to the inability to harvest grapes at their optimal ripeness. Ensuring the timely availability of labor during harvest seasons is essential to minimize losses and maintain production efficiency.

The most significant marketing constraint identified for tomato growers is the annual price fluctuation, with a mean score of 73.37. This fluctuation results in considerable uncertainty regarding the price farmers will receive for their produce each year, complicating their ability to plan and manage their operations effectively. Such volatility contributes to financial instability and unpredictability in earnings, making long-term planning difficult and undermining the financial security of growers.

Table No. 3: Marketing Constraints

Variable	Mean Score	Rank
Price fluctuation every year	73.37	I
Lack of latest market information	34.83	VI
Lower price for produce and distress sale	46.65	III
Distraint market and high cost of transportation	32.22	VII
Exploitation by middlemen	40.33	V
Perishable nature of products	54.99	II
Delayed payment	41.11	IV

Source: Primary Data, 2024

Ranking second among the marketing constraints is the perishable nature of tomatoes, as reflected by a mean score of 54.99. Tomatoes have a short shelf life, posing significant challenges in terms of storage, transportation, and timely sale. The inability to sell the produce quickly often forces farmers into distress sales at lower prices, contributing to financial losses. The perishable quality of the crop amplifies the urgency for rapid market access and effective storage solutions.

The third most significant issue is the low prices farmers often receive for their produce, with a mean score of 46.65. This frequently leads to distress sales, where growers are compelled to sell their tomatoes at reduced prices, either due to unfavorable market conditions or the perishability of the product. This dynamic greatly reduces profitability and places tomato farmers at a disadvantage in maximizing the economic value of their produce.

Delayed payments from buyers, with a mean score of 41.11, also represent a significant marketing challenge. These delays create cash flow difficulties for tomato farmers, impeding their ability to meet immediate financial obligations such as purchasing inputs, paying laborers, or reinvesting in their farms. The lack of timely payments exacerbates financial insecurity and hinders the smooth operation of farm activities.

Exploitation by middlemen ranks as another critical issue, with a mean score of 40.33. Many farmers report being taken advantage of by intermediaries who exploit their lack of bargaining power and market knowledge to acquire produce at lower prices. This exploitation erodes farmers' profits and further diminishes their

economic returns from tomato cultivation, highlighting the need for more equitable market structures.

The lack of up-to-date market information, with a mean score of 34.83, ranks sixth among the constraints. Farmers often struggle to access timely data on market trends, pricing, and demand, placing them at a disadvantage when negotiating prices or determining the optimal time to sell their produce. This lack of information undermines their decision-making capabilities and limits their ability to optimize earnings in competitive market environments.

The lowest-ranked marketing constraint is the high cost of transportation to distant markets, with a mean score of 32.22. While not the most critical issue, transportation costs still impact farmers' profitability, particularly for those who need to travel long distances to reach viable markets. High transportation costs reduce the overall net income and further complicate market access, especially for small-scale growers.

The most critical agro-biological constraint facing tomato cultivators is the unfavorable rainfall conditions, with a mean score of 67.01. This indicates that irregular or insufficient rainfall adversely affects tomato growth, either by creating drought-like conditions or by causing excessive water accumulation, which can lead to waterlogging and increased susceptibility to diseases. Implementing effective water management practices, such as advanced irrigation systems, would be essential to mitigate the detrimental effects of erratic rainfall and ensure stable crop production.

Table No. 4: Agro-Biological Constraints

Variable	Mean Score	Rank
Incidence of Tomato disease	58.3	III
Pests attack	65.77	II
Severity of winds	41.3	V
Soil fertility	50.13	IV
Rainfall condition	67.01	I

Source: Primary Data, 2024

The second most significant constraint is the frequent occurrence of pest infestations, with a mean score of 65.77. Pests can cause extensive damage to tomato crops, compromising both the yield and quality of the produce. To address this issue, farmers may benefit from adopting more effective pest management strategies, including integrated pest management (IPM) techniques that emphasize a combination of biological, cultural, and chemical methods to reduce pest-related losses.

The incidence of tomato diseases ranks third among agro-biological constraints, with a mean score of 58.30. Tomatoes are particularly vulnerable to a range of fungal, bacterial, and viral diseases, which can lead to substantial reductions in yield and quality. Effective disease management strategies, such as crop rotation, the use of disease-resistant varieties, and the timely application of fungicides or other control measures, are crucial to minimize the impact of these diseases and safeguard tomato production.

Soil fertility ranks as the fourth most significant constraint, with a mean score of 50.13. Inadequate soil fertility can hinder the healthy growth of tomato plants, leading to reduced yields and lower quality crops. To address this issue, farmers should focus on implementing soil management practices, including the use of organic amendments, balanced fertilization, and regular soil testing, to maintain or enhance soil health and fertility for optimal plant growth.

The least significant constraint identified is the impact of strong winds, with a mean score of 41.30. While less critical compared to other issues, severe winds can still cause physical damage to tomato plants, particularly during key growth stages, by breaking branches or causing the plants to topple over. In regions prone to strong winds, farmers may benefit from the installation of protective structures such as windbreaks to reduce wind-related damage.

Conclusion

The analysis of tomato cultivation constraints in the Khawzawl cluster has highlighted several critical challenges across technical, labor and economic, marketing, and agro-biological domains. These constraints significantly impact productivity, profitability, and overall sustainability for tomato farmers in the region. The study's findings underscore the importance of targeted interventions, such as improved access to ICT tools, processing facilities, and structured market support, to mitigate these challenges.

Specifically, addressing technical challenges like ICT literacy and processing infrastructure would empower farmers with the necessary resources and skills to enhance production efficiency. Strengthening financial and insurance support, developing cooperative marketing structures, and ensuring access to reliable market information could also reduce economic and marketing risks, stabilizing income for tomato cultivators. Furthermore, agro-biological constraints, including pest and disease management and improved water management systems, are essential for sustainable crop resilience.

Therefore, the study provides a framework for prioritizing these constraints based on their severity, helping guide policy interventions and resource allocations that can enhance the livelihoods and productivity of tomato farmers in Mizoram.

References

- Ahmed, M., & Hussain, S. (2017). *The impact of ICT on agricultural productivity: A study on tomato farmers*. Journal of Agricultural Science and Technology, 9(2), 45-55.
- Bhatt, R., Gupta, V., & Patel, N. (2018). *Integrated pest management and soil fertility management for sustainable agriculture*. International Journal of Agricultural Science, 11(4), 201-214.
- Chand, P., & Kumar, R. (2020). *Market constraints for tomato farmers in rural regions: An analysis of middlemen impact and price volatility*. Agricultural Economics Journal, 15(3), 175-190.
- Khan, M., Shah, F., & Khan, N. (2016). *Economic constraints in vegetable farming: A focus on access to financing*. Asian Journal of Agriculture and Rural Development, 8(1), 50-65.
- Kumar, S., Singh, R., & Prasad, A. (2019). *Technical challenges in tomato farming: Assessing infrastructure and technology needs*. Journal of Agrarian Studies, 13(2), 120-130.
- Reddy, K. S., Naidu, G., & Rani, V. (2019). *Agro-biological challenges in tomato production under high-rainfall conditions*. International Journal of Horticultural Science, 23(5), 210-220.
- Sarkar, R., Pal, S., & Das, D. (2021). *The role of crop insurance in agricultural risk management for vegetable farmers*. Journal of Agricultural Policy and Development, 6(2), 60-75.
- Sharma, N., Verma, P., & Thakur, R. (2020). *Post-harvest management and infrastructural needs in tomato farming*. Journal of Agricultural Technology, 18(3), 305-314.
- Singh, A., & Yadav, R. (2018). *Labor and economic challenges in rural vegetable farming*. Indian Journal of Agricultural Economics, 17(1), 87-93.
- Government of India. (2021). *Annual report on agriculture*. Ministry of Agriculture.
- National Agricultural Policy. (2019). *Agricultural sector growth and emerging trends*. Government Policy Review.
- Patel, R., & Verma, S. (2020). *Agricultural productivity and economic disparity in India*. Journal of Indian Agriculture, 25(3), 158-176.
- Singh, A. (2018). *Price support and cropping patterns in Indian agriculture*. International Journal of Agrarian Studies, 10(1), 45-62.
- Chole, R., et al. (2002). *Price spread in marketing of Bitter Gourd and tomato in Panvel tahsil of Raigad District (M.S.)*. Indian Journal of Agricultural Economics, 16(2), 150-154.
- Dixit, A., Grover, R. K., Rai, K. N., & Singh, V. (2000). *Analysis of production and marketing risks of tomato in Haryana*. Indian Journal of Agriculture Marketing, 14(2), 50-66.