



Economic Analysis and Marketing Strategies of Tomato Cultivation in Mizoram: A Case Study of the Khawzawl Cluster

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Abstract: *Tomato cultivation plays a pivotal role in the agricultural economy of India and contributes significantly to farmers' incomes, food security, and the horticultural supply chain. This study focuses on the economic and marketing analysis of tomato cultivation in the Khawzawl district of Mizoram, specifically covering five villages where tomato farming is concentrated. Data were collected from 203 randomly selected farmers through structured questionnaires and personal interviews. The study explores the cost of cultivation, annual income generated from tomato farming, production levels, and marketing strategies. The findings indicate that labor and irrigation costs constitute the major input expenses, reflecting the labor-intensive and resource-demanding nature of tomato farming. Income analysis reveals that most farmers earn a moderate income, though profitability is hindered by high input costs, reliance on intermediaries, and inadequate post-harvest infrastructure. Farmers predominantly sell their produce through commission agents due to immediate payment and credit availability, although this limits their bargaining power. The average production level remains moderate, with scope for improvement through advanced farming practices and market interventions. Recommendations include promoting efficient irrigation systems, farmer-producer organizations (FPOs), value addition through processing industries, and improving storage and transportation infrastructure. Addressing these challenges can enhance productivity, optimize input costs, and improve income stability, fostering sustainable tomato farming and rural economic growth in Mizoram.*

Keywords: *Tomato cultivation, economic analysis, marketing strategies, input costs, income generation, rural economy.*

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Introduction

Agriculture is the backbone of the Indian economy, providing employment to nearly 58% of the population and contributing significantly to the country's gross domestic product (GDP) (Government of India, 2023). Among the various horticultural crops cultivated in India, tomatoes hold a prominent position as they are a key component of household diets, food processing industries, and agricultural exports. India ranks as the second-largest producer of tomatoes globally, contributing approximately 11% of the world's total production (National Horticulture Board, 2023). However, the economic viability and marketing strategies of tomato cultivation vary significantly across regions, influenced by factors such as input costs, production methods, market access, and socio-economic conditions of farmers. Analyzing these dynamics is crucial for identifying opportunities to enhance the income and livelihoods of tomato farmers across the country.

Tomato cultivation in India is labor-intensive and cost-sensitive, with expenditures on labor, irrigation, fertilizers, and pest management constituting the major cost components (Singh et al., 2021). Human labor, both hired and family-based, accounts for a significant proportion of total cultivation costs, as manual operations dominate tomato farming practices in the country (Sharma & Jain, 2020). For instance, irrigation facilities also add to the financial burden, particularly in regions where water scarcity necessitates heavy investments in water resource management. These high input costs often leave farmers vulnerable to fluctuating market prices, which can erode their profitability and financial stability. Despite these challenges, tomato cultivation remains attractive to small and marginal farmers due to its short crop cycle, high productivity potential, and consistent market demand.

The marketing of tomatoes in India is characterized by the dominance of intermediaries, fragmented supply chains, and price volatility. Farmers typically sell their produce through commission

agents, local markets, and wholesale mandis, where prices are largely determined by demand-supply dynamics and the quality of the produce (Reddy et al., 2022). A significant portion of farmers also face challenges such as lack of storage facilities, post-harvest losses, and inadequate transportation infrastructure, which further impact their net income. While modern supply chains such as contract farming and farmer-producer organizations (FPOs) have shown promise in improving market access and price realization, their adoption remains limited due to lack of awareness and institutional support (Kumar et al., 2019).

In terms of income generation, studies have shown that the profitability of tomato cultivation is influenced by both production and marketing efficiency. According to Singh and Sharma (2022), farmers with access to better inputs, modern irrigation systems, and advanced farming techniques tend to achieve higher yields and incomes. However, the majority of smallholder farmers struggle to break even due to low productivity and high marketing costs. For instance, a study conducted in Karnataka revealed that farmers incurred significant post-harvest losses and marketing expenses, which reduced their net income to unsustainable levels (Rao et al., 2021). Addressing these issues requires interventions to optimize input usage, strengthen farmer-market linkages, and develop cost-efficient marketing strategies.

Despite the challenges, tomato cultivation in India presents significant opportunities for growth and development. Enhancing productivity through the adoption of advanced farming practices, reducing input costs through government subsidies, and improving market access through digital platforms and cooperatives are critical steps toward strengthening the sector (National Institute of Agricultural Marketing, 2023). Additionally, promoting value addition and processing industries can help stabilize prices and provide farmers with alternative revenue streams during periods of oversupply. As India moves toward achieving agricultural sustainability and food security goals, addressing the economic and marketing challenges of tomato cultivation will play a pivotal role in supporting farmers and driving rural economic growth.

Literature Review

Tomato cultivation occupies a significant position in India's agricultural economy, contributing to both food security and farmers' livelihoods. India is the second-largest tomato producer in the world, accounting for 11% of global production (National Horticulture Board, 2023). The crop's short cultivation cycle, market demand, and profitability make it an attractive choice for small and marginal farmers (Singh et al., 2021). However, several economic and marketing challenges impact the sustainability and growth of tomato farming, particularly in regions like Mizoram.

The economic viability of tomato cultivation depends largely on input costs, yield, and price realization. Studies indicate that input costs such as labor, irrigation, fertilizers, and pest management represent the major expenditures for tomato farmers (Sharma & Jain, 2020). Labor costs are particularly significant, given the manual nature of operations in smallholder farms. For example, Rao et al. (2021) reported that in Karnataka, human labor accounted for nearly 40% of the total cost of cultivation, followed by irrigation and fertilizers. These costs reduce profitability, especially in regions where water scarcity and poor infrastructure escalate expenses.

Farmers who adopt efficient irrigation methods and mechanization tend to achieve better economic returns. Singh and Sharma (2022) observed that access to modern irrigation systems and improved inputs significantly increases yields and incomes, particularly among resource-constrained farmers.

The marketing of tomatoes in India is characterized by intermediaries, fragmented supply chains, and post-harvest inefficiencies. Farmers typically sell their produce to commission agents or at wholesale markets, where price volatility is a persistent challenge. Reddy et al. (2022) highlighted that farmers face substantial losses due to a lack of storage facilities, inadequate transportation infrastructure, and price fluctuations driven by seasonal demand and supply imbalances.

Although farmers benefit from credit facilities and immediate cash payments, their reliance on intermediaries reduces their bargaining power. Modern marketing strategies, such as farmer-producer organizations (FPOs), contract farming, and digital platforms, offer potential solutions for improving price realization and market access (Kumar et al., 2019).

Tomato farming contributes significantly to the annual income of cultivators, though income levels vary based on production efficiency and access to markets. Similar trends were reported by Rao et al. (2021), who found that low productivity and high input costs limit profitability for small-scale farmers in Karnataka. Improving productivity through advanced farming techniques, access to quality inputs, and government subsidies has been suggested as a pathway for income enhancement. National Institute of Agricultural Marketing (2023) emphasized that increasing productivity and reducing post-harvest losses are critical for raising farmers' incomes and ensuring economic sustainability.

Effective cost management is a key determinant of profitability in tomato cultivation. Studies have shown that reducing input costs through optimized resource use can enhance farm incomes (Sharma & Jain, 2020). In Mizoram, labor costs and irrigation expenditures are the largest cost components, contributing significantly to the total cost of cultivation (Primary Data, 2024). Reducing these costs through mechanization, efficient irrigation, and targeted subsidies could improve farmers' profit margins.

Chemical fertilizers and pesticides, though essential, represent a relatively smaller share of expenses. Singh et al. (2021) observed that balanced fertilizer application and integrated pest management practices not only reduce costs but also improve yields. Training programs to educate farmers on cost-efficient practices can therefore play a crucial role in enhancing productivity and profitability.

Post-harvest losses remain a major challenge for tomato farmers across India. A study by Reddy et al. (2022) reported that inadequate storage and transportation infrastructure result in significant spoilage, further exacerbating income losses. In Mizoram, marketing expenses range from ₹1,500 to ₹4,500, with an average cost of ₹2,930.04 (Primary Data, 2024). Enhancing marketing efficiency through cold storage facilities, transportation networks, and farmer cooperatives can help mitigate these losses and stabilize farmers' incomes.

Several studies emphasize the need for policy interventions to address the economic and marketing challenges of tomato

cultivation. Kumar et al. (2019) recommended promoting FPOs and cooperatives to strengthen farmer-market linkages and reduce dependency on intermediaries. Additionally, government support in the form of subsidies for irrigation, fertilizers, and mechanization can help lower input costs and improve farm productivity (National Institute of Agricultural Marketing, 2023).

The promotion of value-added products, such as tomato paste and puree, can also provide farmers with alternative revenue streams and reduce the impact of market price fluctuations (Singh & Sharma, 2022). Developing processing industries in regions like Mizoram can create employment opportunities and contribute to the local economy.

Objectives and Methodology

The economic analysis and marketing strategies of tomato cultivation are essential for understanding the challenges and opportunities faced by the farmers in Mizoram. By examining key aspects such as production costs, income distribution, marketing strategies, and policy interventions, this study aims to provide valuable insights into improving the profitability and sustainability of tomato farming in Mizoram. Targeted efforts in these areas will not only enhance farmers' livelihoods but also contribute to the overall development of India's agricultural economy.

This study is mainly based on primary data which were collected through a well-designed household level questionnaire and personal interview with the cultivators. There are 38 villages in Khawzawl district, out of which 5 villages such as Tualte, Khawhai, Chawngtlai, Neihdawn, and Rabung were chosen for research area purposively as tomato cultivation is mostly concentrate in these villages. From these five villages, a total of 203 farmers were randomly selected, based on the number of cultivators in each village. The collected data were analyzed using descriptive statistical methods, such as percentages and averages.

Result and Discussions

This study analyzed and interpreted various aspects related to tomato cultivation, including annual income from all sources, income generated specifically from tomato cultivation, the cost of cultivation, marketing channels, and the quantity of tomato production.

It could be observed from the table that the majority (57.1%) of tomato growers have an annual income between ₹2.6

lakhs and ₹3.5 lakhs. This suggests that most tomato growers enjoy a moderate income, providing a decent standard of living. However, this income level may also pose challenges in terms of accumulating significant savings or investing in substantial farm improvements. In addition, 30% of growers earn between ₹1.6 lakhs and ₹2.5 lakhs, placing a significant portion within the middle-income category.

Table 1: Annual Income of the Respondents

| Income Range | No. of Respondent | Percent |
|-----------------------|-------------------|---------|
| Less than 1.5 lakhs | 6 | 3.0 |
| 1.6 lakhs -2.5 lakhs | 61 | 30.0 |
| 2.6 lakhs -3.5 lakhs | 116 | 57.1 |
| 3.6 lakhs -4.5 lakhs | 18 | 8.9 |
| 4.6 lakhs & above | 2 | 1.0 |
| Total | 203 | 100 |
| Average Annual Income | ₹282069 | |

Source: Primary Data, 2024

This group likely experiences a mix of financial stability and occasional constraints, particularly during off-seasons or when faced with unexpected expenses. Moreover, the low-income group (earning less than ₹1.5 lakhs) and the high-income group (earning more than ₹4.6 lakhs) are minimal, representing just 3.0% and 1.0% of the sample, respectively. This indicates limited income disparity among the growers, with most falling within a moderate-income range.

The average annual income of ₹282,069 reflects an overall moderate economic standing for tomato growers. While this income level suggests a reasonable ability to meet sustenance and basic needs, it also highlights the potential need for financial support, better market access, and diversification to improve economic resilience.

In conclusion, the income distribution data indicates that the majority of tomato growers fall within a moderate-income range, with few individuals at the extremes. This overall moderate economic standing underscores opportunities for targeted interventions to enhance income stability and growth among tomato growers.

Table 2: Cost of Tomato Cultivation

| Particulars | | Mean Cost per Unit | Mean Quantity | Total Average Cost |
|-----------------------------------|-----------|--------------------|---------------|--------------------|
| Human Labour (Hired) | Male | 558 | 5 | 2717.14 |
| | Female | 463 | 4 | 1979 |
| Farm Yard manure | Owned | 3772 | 2 | 4006.84 |
| | Purchased | 99.84 | 1 | 1012.83 |
| Chemical Ferlilizers | | 100 | 18.77 | 1837.56 |
| Pesticides | | 100 | 5 | 500 |
| Irigational facilities | | 1200 | 4.35 | 5230.77 |
| Total Average Cost of Cultivation | | 6292.84 | 40.12 | 17284.1 |

Source: Primary Data, 2024

Human labor, both male and female, constitutes a significant portion of the total cultivation cost, amounting to ₹4696.14. This highlights the labor-intensive nature of tomato farming. Owned manure incurs a substantially higher cost compared to purchased manure, suggesting either higher usage or a greater perceived value of owned manure. The total cost for manure is ₹5019.67, making it a substantial input cost.

The combined cost of chemical fertilizers and pesticides is ₹2337.56. Despite their relatively high quantities, their costs are lower compared to labor and irrigation. The expenditure on irrigation facilities is notably high at ₹5230.77, indicating a significant investment in water resources, which are crucial for tomato cultivation.

The total average cost of cultivation for tomatoes is ₹17284.1. The major cost components include human labor and irrigation facilities, highlighting the labor-intensive and water-dependent nature of tomato farming. Effective cost management in these areas could lead to more efficient and profitable cultivation practices.

Understanding these cost dynamics is essential for developing strategies to optimize input usage and reduce unnecessary expenses, thereby enhancing the overall productivity and profitability of tomato farming.

Table 3: Annual Income from Tomato

| Income Range | No. of Respondent | Percent |
|-----------------------------------|-------------------|---------|
| ₹01-₹99000 | 51 | 25.1 |
| ₹100000-₹199000 | 139 | 68.5 |
| ₹200000-₹299000 | 10 | 4.9 |
| ₹300000 & above | 3 | 1.5 |
| Total | 203 | 100 |
| Average Income from tomato | | 116,892 |

Source: Primary Data, 2024

A significant concentration of growers (68.5%) earns between ₹100,000 and ₹199,000 annually, indicating this range as the most common income level. To help these farmers move into higher income brackets, efforts should focus on increasing their productivity and improving market access. Meanwhile, 25.1% of growers earn less than ₹99,000 annually, highlighting a substantial portion of the community that may face low profitability. These farmers could benefit from targeted interventions, such as improved access to farming inputs, training, and financial support. The relatively few growers in higher income ranges (above ₹200,000) suggest that high profitability is less common. Studying the practices of these successful growers could provide valuable insights and effective strategies to be shared with others. Moreover, the average income from tomato cultivation is calculated at ₹116,892, which is more than half of the per capita income of Mizoram, recorded at ₹232,126 according to the latest economic survey of Mizoram.

Marketing Channel

All respondents stated that they sell their produce through commission agents, regardless of whether they sell the entire crop.

They also reported retaining a portion of their tomatoes for household consumption and for sharing with friends, relatives, and neighbors, with an average retention of 14 kilograms.

Moreover, all respondents sell their produce to commission agents at a price of ₹40 per kilogram. They prefer this method due to the availability of credit facilities, better prices, immediate cash after sales, long-term relationships with agents, and higher off-take rates. It was also noted that tomato prices vary by grade, with Grade I tomatoes fetching ₹40 per kilogram and Grade II tomatoes fetching ₹20 per kilogram. Despite these variations, all respondents receive a uniform price for their produce and consider this price remunerative. They also expressed satisfaction with the available market facilities, stating that these facilities are sufficient for their needs.

Table 4: Marketing Cost of Tomato

| Expenditure | No. of Respondent | Percent |
|------------------------|-------------------|----------|
| ₹01-₹1500 | 27 | 13.3 |
| ₹1500-₹3000 | 61 | 30.0 |
| ₹3000-₹4500 | 94 | 46.3 |
| ₹4500-₹6000 | 12 | 5.9 |
| ₹6000-₹7500 | 5 | 2.5 |
| More than ₹7500 | 4 | 2.0 |
| Total | 203 | 100.0 |
| Average Marketing Cost | | ₹2930.04 |

Source: Primary Data, 2024

As can be observed from the table that majority of tomato growers (46.3%) spend between ₹3000 and ₹4500 on marketing, 43.3% of growers spend between ₹01 and ₹3000 while a small percentage of growers (10.4%) incur higher marketing expenses (above ₹4500). The analysis reveals that most tomato growers incur marketing expenses within the ₹3000-₹4500 range, with an average marketing cost of ₹2930.04. Efforts to enhance marketing efficiency should focus on supporting lower-spending growers to optimize their marketing strategies and helping higher-spending growers ensure their investments yield maximum returns. By doing so, the overall marketing effectiveness and profitability of tomato cultivation can be improved.

Table 5: Quantity of Production of Tomato

| Production (in Qtl.) | No. of Respondent | Percent |
|----------------------|-------------------|-----------|
| 01-19 | 38 | 18.7 |
| 20-39 | 134 | 66.0 |
| 40-59 | 22 | 10.8 |
| 60-79 | 7 | 3.4 |
| 80 & above | 2 | 1.0 |
| Total | 203 | 100.0 |
| Average Production | | 28.8 Qtl. |

Source: Primary Data, 2024

It could be seen from the table that majority of growers (66%) produce between 20 and 39 quintals, 18.7% of growers producing 19 quintals or less, and only a small percentage of growers achieve high production levels (40 quintals and above). Therefore, we may infer that most tomato growers fall within the moderate production range of 20 to 39 quintals, with an average production of 28.8 quintals. Efforts to enhance tomato production should focus on supporting lower-producing growers to increase their yield, while also learning from the practices of higher producers. By doing so, the overall productivity and profitability of tomato cultivation can be improved, benefiting the entire community of tomato growers.

Conclusion

This study provides a comprehensive analysis of the economic and marketing aspects of tomato cultivation in the Khawzawl district of Mizoram. The findings highlight that tomato farming plays a crucial role in the livelihoods of farmers, with the majority of them falling within a moderate-income range. Despite its economic significance, tomato cultivation is labor-intensive and incurs high input costs, particularly in terms of human labor and irrigation facilities. These cost components, coupled with challenges such as limited access to advanced farming technologies and inadequate post-harvest infrastructure, pose barriers to achieving higher profitability.

The study also reveals that marketing channels remain dominated by intermediaries, with commission agents playing a significant role in facilitating the sale of produce. While this method provides farmers with immediate cash payments and credit facilities, it reduces their bargaining power and limits their income potential. Additionally, marketing expenses, though manageable for most farmers, could be further optimized through the development of efficient transportation systems and storage facilities.

To improve productivity and profitability, targeted interventions are essential. These include promoting advanced agricultural practices, providing access to cost-effective irrigation

systems, and offering training programs to enhance input efficiency. Strengthening farmer-producer organizations (FPOs) and encouraging value addition through processing industries can further improve market access and income stability.

By addressing the economic and marketing challenges identified in this study can significantly enhance the profitability and sustainability of tomato farming in Mizoram. By implementing strategic interventions and policies, tomato cultivation can serve as a driver of rural economic growth, ultimately improving the livelihoods of farmers in the region.

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