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Assessing Challenges in Vegetable Farming: A Comparative Study of Municipalities in Surkhet, Nepal

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Abstract

Vegetable farming plays a pivotal role in Nepal's rural economy, particularly in Surkhet District, which serves as a significant agricultural hub. Despite its potential to enhance food security and rural incomes, the sector faces multifaceted challenges that vary across different municipalities. This study investigates these barriers by conducting a comparative analysis across five municipalities Birendranagar, Barahatal Rural, Panchhapuri, Gurvakot, and Bheriganga. Although prior studies have explored agricultural challenges at regional or national levels, there is a notable gap in understanding the municipality-level dynamics within Surkhet. Addressing this, the research employs a descriptive quantitative design using structured questionnaires administered to 228 vegetable farmers. Disproportionate stratified sampling ensured adequate representation from each municipality. The study identifies key production, financial, environmental, institutional, and infrastructural constraints and uses chi-square tests to evaluate differences in challenge prevalence across locations. Results reveal significant spatial disparities, indicating that urban and rural farmers encounter distinct issues shaped by infrastructure, geography, and market access. These findings carry important policy implications. Tailored interventions (such as improved irrigation in Bheriganga, pest management support in Barahatal, and better market infrastructure in Panchhapuri) can strengthen the sustainability of vegetable farming. Moreover, the research emphasizes the need for localized agricultural support services and climate-resilient farming strategies. By highlighting intra-district variations, the study contributes to more targeted and effective rural development policies in Karnali Province, supporting Nepal's broader goals of economic resilience and agricultural modernization.

Keywords: Agricultural Constraints, Comparative Analysis, Rural Livelihoods, Vegetable Farming

Introduction

Vegetable farming is a very important part of Nepal's economy; it supports the livelihood of more than 60 percent of the population and plays an essential role in the development of the rural economy (Shrestha et al., 2022). Vegetable production offers opportunities for enhancing food security, increasing income, reducing poverty and improving rural livelihoods, especially in areas of high agricultural potential. Vegetable farming is also a vital source of income in both local and regional markets and will continue to

be a major focus for developing sustainable and resilient economies in Nepal. However, the sustainability of vegetable farming in Nepal is facing an increasing number of complex challenges and therefore requires urgent, focused research to address these problems effectively. Therefore, this study is particularly timely, in light of the international efforts to promote sustainable agriculture practices, and Nepal's commitment to achieving the United Nation's Sustainable Development Goals (SDGs); specifically, SDG 2 (Zero Hunger) and SDG 8 (Decent Work and Economic Growth) (Paudel et al., 2022) that highlight the need for increased agricultural productivity and improved rural livelihoods. This study seeks to identify some of the challenges faced by vegetable farmers in Surkhet District and will provide evidence-based information to assist in informing policy and practice to ensure the long term viability of the sector.

Located within the Karnali Province, Surkhet District cover 2,488.64 km² area and has a population of approximately 417,776 although rapid growth is anticipated (CBS 2021). Surkhet is an important agricultural district and produces a wide variety of vegetables including tomatoes, capsicums, cucumbers and pumpkins that are used to supply local and surrounding markets (Shrestha et al., 2022; Maharjan et al., 2024). Vegetable production in Surkhet relies heavily on the activities of smallholder farmers who grow vegetables in nine municipalities (five urban e.g. Birendranagar and four rural) that have different geographic and socio-economic characteristics (Ghimire & Shrestha, 2020). In addition to being an important agricultural district, Surkhet has fertile valleys and hills that provide a range of other crops, however the sector is experiencing increasing pressure from various sources that affect different municipalities. This context highlights the need for a detailed investigation into the dynamic nature of vegetable farming to support the rural economy and food security of the district.

However, despite its potential, vegetable farming in Surkhet District is challenged by a range of inter-related problems that limit its ability to serve the needs of farmers and to supply the market requirements. Climate variability, including variable rainfall and temperature patterns, disrupts crop cycles in rural areas where most farmers rely on rain fed agriculture (Shrestha et al., 2022). Access to irrigation is limited for many farmers, and they rely on traditional irrigation methods that are unable to function when there is little water available, resulting in lower yields (Paudel et al., 2022). Pests and diseases represent a further threat, and rural farmers lack the access to pesticides and technical expertise to manage pest and disease outbreaks effectively (Shrestha et al., 2021; Panday et al., 2024). A further challenge to vegetable farmers in Surkhet is access to markets; urban farmers can sell directly to nearby markets, whereas rural farmers face high transport costs and unstable prices due to the lack of collection centers (Ghimire & Shrestha, 2020). Finally, financial constraints, such as limited access to finance and high costs associated with inputs, constrain the use of modern farming practices and thereby contribute to low levels of productivity (Shrestha et al., 2022). It is likely that the extent and type of these challenges will vary between Surkhet's municipalities, primarily as a result of differences in infrastructure, land availability and socio-economic status. However, the exact nature of how these problems vary between the municipalities of Surkhet and the relative impact of each problem are currently unknown.

Vegetable farming in Nepal has been the subject of considerable recent research. However, these studies primarily identify widespread problems rather than compare the problems of individual districts' municipalities. The national study conducted by Shrestha et al. (2022) investigated the profit efficiency of all small-scale vegetable growers in Nepal, identified obstacles such as market distance and lack of access to credit; however, their study was limited by not focusing on the municipal level. A study on livelihood impacts in Dhankuta District, which included irrigation and price fluctuations as the primary issues, was limited to one geographic area and did not include the unique environment of Surkhet. Although Ghimire and Shrestha (2020) evaluated Surkhet's agricultural transition, such as the shift from growing opium to

vegetables, the authors were limited in conducting a comprehensive municipality-by-municipality comparison. It appears there are gaps in our knowledge of how the differences between rural and urban municipalities' such as infrastructure disparities and land availability create different challenges for vegetable growers, which would limit the ability to develop specific strategies for each municipality (Paudel et al., 2022).

In order to carry out this study, the geographic diversity of Surkhet Municipality along with its different municipal characteristics are critical. In addition to the variety of geographic conditions, ranging from the fertile valley to the rugged hills in Surkhet District, the variety of soil quality and climate significantly impact agricultural practices and availability of resources to the farmer (Shrestha et al., 2022). For instance, urban municipalities like Birendranagar have better access to market and roadway improvements than do rural municipalities due to their distance from those same areas which increases the difficulty of obtaining inputs and customers (Ghimire & Shrestha, 2020). Additionally, municipalities that previously grew opium and now grow vegetables, i.e., Kaltadi, present additional complexities to overcome when transitioning to the new crop and marketing systems (Rai et al., 2019). Consequently, the diversity of the local area, combined with the fact that Surkhet is the central agricultural hub in the province of Karnali, create an opportunity to conduct a comparative analysis and help tailor solutions to each of the municipalities' unique needs for the approximately 350,804 people living in Surkhet who depend on vegetable farming to support their livelihood (Shrestha et al., 2022). Thus, it is imperative to examine the variability of each of Surkhet's nine municipalities' levels of infrastructure and socio-economic conditions so that solutions may be developed to address the unique needs of each municipality.

This study aims to comprehensively identify the challenges faced by vegetable farmers in Surkhet District including the major production, marketing and financial limitations; determine the frequency and degree of the challenges across Surkhet's five selected municipalities (urban/rural) and the challenges associated with the geographic and infrastructure limitations; therefore, the study will also provide context-specific policy recommendations to increase the sustainability and effectiveness of vegetable farming in Surkhet District.

The results of this study will provide empirical based evidence for decision-makers and other stakeholders. This study will contribute to the existing body of knowledge related to small-holder agriculture in Nepal and provide practical suggestions to improve the sustainability of vegetable farming and increase the quality of life of vegetable farming families in Surkhet's many diverse municipalities (Paudel et al., 2022). Through this comparative analysis, the study bridges a significant gap in research and supports targeted interventions to improve food security and economic resilience in Karnali Province, which is a crucial component of Nepal's agricultural economy.

Literature Review

Vegetable production is essential to Nepal's agriculture and economy. Vegetable farming supports food security, nutrition, and rural livelihoods. Vegetable farming has huge development opportunity in Surkhet; however, it is also challenged in all aspects of six thematic areas: production, financial and economic, environmental and climate, institutional and policy, social and labor, and infrastructure and marketing. Sources of data included the Nepal Vegetables Sector Analysis Report by the CASA Programme (2020), a study on agroecological farming in Karnali Province by ICIMOD (2023), a journal article on vegetable cultivation in Eastern Nepal by Ghimire and Kattel (2024), an assessment of good agricultural practices (GAP) in Nepal's mid-hills by Kharel et al. (2023), and a report on mixed farming in Nepal by Woli et al. (2025). There is lack of journal or study on Surkhet in depth, the studies above have provided the basis for

understanding challenges in Surkhet, because of the studies were done in areas with similar agroecological and socio-economic characteristics to those found in Surkhet.

Production Challenges

The technical and environmental problems of Surkhet vegetable production are significant. High post-harvest loss of vegetables of 25-50% from producers to retailers due to poor handling, transportation, and storage facilities is reported by the CASA Programme (2020). The topographic conditions of Surkhet mid-hills make this difficult to manage. Poor-quality seeds are identified by ICIMOD (2023) as a main problem in Karnali Province with many farmers unsure whether they can rely on the quality of seeds purchased resulting in uncertain yields. The continued use of chemicals results in poorer soil quality, and therefore less productive soils in the long term. Pest attack, poor-quality seeds, and inadequate technical knowledge are major challenges to vegetable farming in Eastern Nepal as reported by Ghimire and Kattel (2024). Pests were the greatest challenge to growers in Eastern Nepal. Similar agroecological conditions exist in Surkhet. The Kharel et al. (2023) study reports that management difficulties and knowledge gaps are major challenges to GAP adoption in the mid-hills with the management being the greatest difficulty. Woli et al. (2025) indicate irrigation deficits in Surkhet, even after the introduction of micro-irrigation programs, as limiting the maximum amount of production possible in Surkhet. The combined impact of these challenges limits the yield and quality of vegetables, thereby limiting the full potential of the vegetable farming industry.

$H1_0$: *There is no significant association between municipalities and the frequency of production challenges (e.g., pest/disease outbreaks, irrigation deficits).*

Financial and Economic Challenges

Several financial and economic limitations on the profitability of vegetable farming in Surkhet are present. The CASA Programme (2020) reported that the majority of vegetable farm income is lost to post-harvest losses and that vegetable imports from India account for approximately 40% of the Kalimati market (approximately NPR 22.67 billion in 2017). Only 1% of agricultural enterprises use commercial bank financing, while 56% of them indicated that they did not have adequate access to banking services, especially for small-scale growers and female growers. Fertilizer shortages and price fluctuations in Karnali Province are reported by ICIMOD (2023) with the majority of the 600,000 metric tons demanded by Nepal being imported and increasing production costs. Higher production costs in Eastern Nepal, primarily due to lower levels of education and the inefficient use of resources (e.g., 28.11% overuse of labor) are reported by Ghimire and Kattel (2024) as making it difficult for growers to compete with vegetable imports from India, which experienced a 602.94% growth in value between the years 2009/10 and 2018/19. A lack of premium pricing for GAP produce in the mid-hills makes sustainable practices unattractive according to the Kharel et al. (2023) study. Limited access to funds in Surkhet limits the investment in water-saving technologies, and therefore reduces the economic feasibility of vegetable farming in Surkhet. The limited availability of funds in Surkhet prevents growers from investing in improvements and sustaining their livelihoods.

$H2_0$: *Municipalities are independent of financial challenges (e.g., loan accessibility, input costs, income sufficiency).*

Environmental and Climate Challenges

Vegetable farming in Surkhet is exposed to several environmental and climatic challenges. The CASA Programme (2020) indicates that the increasing temperature (0.04 – 0.09 °C/year) and the changes in precipitation are causing decreased soil moisture, changes in the growing season, and an increase in pest populations. Soil degradation from chemical overuse in Karnali Province is emphasized by ICIMOD (2023) as decreasing long-term productivity. The dependence on rain-fed farming in certain parts of Surkhet increases the vulnerability to variable weather conditions. Environmental factors, including weather variability and irrigation issues, are among the greatest challenges to vegetable growers in Eastern Nepal as reported by Ghimire and Kattel (2024); the same environmental concerns are probably true for Surkhet. The Kharel et al. (2023) study emphasizes that the mid-hills are experiencing climate-related challenges, such as increased pest pressure due to warming. The need for water-conserving systems in Surkhet to mitigate drought risk is emphasized by Woli et al. (2025), and the continued environmental challenges affecting vegetable farming in Surkhet indicate the necessity for climate-resilient solutions.

***$H3_0$**: The distribution of environmental challenges (e.g., droughts, heat stress, irregular rainfall) is uniform across municipalities*

Institutional and Policy Challenges

The institutional and policy environment has many obstacles to vegetable production in Surkhet. For example, CASA Programme (2020) explains how the lack of market access for Nepalese vegetables is caused by trader monopolies and India's free imports (50-60% of total consumption), resulting in very low domestic production levels. Similarly, ICIMOD (2023) lists some of the inadequacies in the Karnali province, for example poor agricultural infrastructure; including under-equipped soil laboratories (Surkhet has only one State laboratory), no or limited capacity for storage and insufficient recognition of the role of agriculturalists, therefore, limited extension services. Ghimire and Kattel (2024) also identified the lack of Government support for marketing in the Eastern region of Nepal and indicate that the inadequate availability of storage was identified as the main marketing barrier. Kharel et al. (2023) point out the lack of governmental policies to promote GAP in the Mid-Hill Region of Nepal and indicate there are several barriers to GAP promotion including land leasing issues and low level of consumer awareness regarding the safety of food. Woli et al. (2025) found that there is limited policy support for micro-irrigation in Surkhet, limiting the use of sustainable farming practices. Therefore, these institutional limitations prevent the farmer from being able to compete and/or adapt to modern farming practices.

***$H4_1$**: Institutional challenges (e.g., uneven policy implementation, lack of support programs) differ significantly across municipalities.*

Infrastructure and Marketing Challenges

Obstacles related to the physical infrastructure and marketing of Surkhet's vegetables greatly impede the productivity of the area's vegetable farmers. The CASA Programme (2020) describes the lack of road connectivity into and around the hills; where approximately one third of hill residents walk between four and six hours to get to the nearest all-season road, thereby increasing the costs of transporting their crops and reducing post-harvest crop retention. Furthermore, the lack of cold storage (only 49 facilities exist in Nepal and an additional 25 are required) means that farmers are forced to sell their crops immediately after harvesting at lower prices. ICIMOD (2023) states that the limited number of storage facilities and market infrastructure in the Karnali Province limits the sale of organic products. Ghimire and Kattel (2024)

describe low market prices and fluctuation in those prices as the greatest marketing challenges for vegetable producers in Eastern Nepal (average index values were 0.80 and 0.75); and that they depend largely on middlemen to sell their product. Kharel et al. (2024) report that Surkhet lacks adequate storage and marketing infrastructure in the mid-hills to allow for the adoption of GAP. Woli et al. (2025) stated that poor infrastructure in Surkhet constrains the scaling up of innovation in agriculture. The cumulative effects of these marketing and physical infrastructure challenges contribute to income volatility and fewer market opportunities for vegetable farmers.

H5₀: *Infrastructure limitations (e.g., transportation, storage) and marketing barriers (e.g., middlemen exploitation, price fluctuations) are uniformly distributed across municipalities.*

There are multiple interdependent constraints on Surkhet's vegetable farming industry and these constraints can be characterized by: constraints on production due to poor quality seeds, pest attacks and irrigation shortages; financially, vegetable farmers earn little revenue, are affected by import competition and have limited credit access; and a significant gap exists between the two, since Surkhet's nine municipalities comprise five urban and four rural municipalities, each of which have different geographical, infrastructural and socio-economic conditions that will affect the types of problems faced by vegetable farmers (Paudel et al., 2022). In urban municipalities, vegetable farmers may experience land shortages, however, they enjoy greater proximity to markets than do rural vegetable farmers who are subject to geographic remoteness, and consequently, have greater quantities of arable land available to them. Because prior studies provide a general overview of the challenges experienced by vegetable farmers in Surkhet, but lack the necessary detail to enable development practitioners to target their interventions in ways that account for the unique conditions facing vegetable farmers in each municipality, this study seeks to develop a detailed understanding of the specific production, marketing and financing challenges confronting vegetable farmers in each of Surkhet's municipalities, and to provide decision-makers with the evidence base they need to implement targeted interventions in Surkhet, and ultimately, to better understand the dynamics of vegetable farming in rural and urban municipalities in Nepal.

Methodology

This study uses a quantitative descriptive study with a positivist philosophy to understand the challenges of vegetable farmers in Surkhet District, Nepal. The study applies a deductive methodology to investigate the challenges in the form of both the type and frequency of challenges that farmers encounter, which vary between rural and urban municipalities. The data was collected via a structured questionnaire containing categorical closed ended questions relating to challenges like pests/disease/pests, weather conditions, and access to input materials. The five municipalities studied are: Birendranagar, Barahatal Rural Municipality, Panchhapuri, Gurvakot and Bheriganga. As per the Agriculture Census 2023 (Central Bureau of Statistics [CBS] 2023) the total number of vegetable farming households in the mentioned municipalities were as follows; Birendranagar (3470), Barahatal Rural Municipality (177), Panchhapuri (158), Gurvakot (136) and Bheriganga (134).

The disproportionate stratified sampling method was applied for selecting respondents from each municipality to provide a fair representation of smaller and large scale farmer sub groups that may have been marginalized or under represented in a proportional sampling method (Etikan & Bala 2017). The survey included a total of 228 respondents who were distributed amongst the municipalities as follows; Birendranagar (55), Barahatal Rural Municipality (42), Panchhapuri (45), Gurvakot (43) and Bheriganga (43).

All the data were tabulated and analysis through SPSS 25 which is perfect software for social science research (Field,2018). Descriptive statistics (mean/frequency) were employed to analyze the challenges that the participants experienced. In addition, this study used the chi-squared test of independence to assess if there were statistically significant associations between the municipalities and the individual challenges. The chi-squared test of independence is a non parametric test that can be utilized to assess the relationship between two categorical variables, which can be applied to agricultural and social science studies (Mc Hugh 2013). The outcome of the chi-squared test provided an understanding of whether the frequency of challenges experienced by farmers were significantly different across the various municipalities. Therefore, this will add further clarity to the application of the findings. Ethical consideration were taken into account during the study, specifically informed consent and maintaining confidentiality, to ensure the study met the ethical standards and to develop robust evidence regarding the challenges that vegetable farmers experience within Surkhet District.

Analysis

Vegetable farming represents an important income-generating strategy for rural communities but has numerous obstacles to overcome if productivity and sustainability are to be achieved. The objective of this research is to examine the demographic profile of vegetable growers as well as their production, financial, environmental, institutional, and infrastructure related constraints in order to understand how these constraints vary amongst five different municipal districts: Birendranagar, Barahatal Rural, Panchhapuri, Gurvakot, and Bheriganga. Results were gathered through a survey of 228 individuals regarding their vegetable growing operations and provide insight into the social-economic and operational aspects of vegetable farming; chi-squared statistical hypothesis testing was used to test the relationship between the municipalities and each of the various challenges. The results will be presented in a structured format and will include the demographic features of the vegetable growers, production constraints, financial constraints, environmental impacts, institutional barriers and infrastructural limitations as well as the implications of the chi-squared hypothesis testing.

Table 1

Demographic Status of the Respondents

Gender of Respondent	Frequency	Percent
Male	105	46.1
Female	123	53.9
Total	228	100.0

Age of Respondent	Frequency	Percent
Below 25 years	10	4.4
25-35 years	61	26.8
36-45 years	122	53.5
46-55 years	29	12.7

Household Size of Respondent	Frequency	Percent
1-3	25	11.0
4-6	172	75.4
7-9	30	13.2
10 or above	1	0.4
Total	228	100.0

Household income is from vegetable farming	Frequency	Percent
Less than 25%	55	24.1
25-50%	118	51.8

Above 55 years	6	2.6
Total	228	100.0

Education Level of Respodent	Frequency	Percent
No formal education	11	4.8
Primary education	132	57.9
Secondary education	73	32.0
Higher secondary education	10	4.4
Bachelor's degree or higher	2	0.9
Total	228	100.0

51-75%	53	23.2
More than 75%	2	0.9
Total	228	100.0

Income sufficinecy from vegetable farming	Frequency	Percent
Sufficient for household needs	82	36.0
Just enough to cover basic expenses	84	36.8
Inadequate, need additional income sources	54	23.7
Highly insufficient	8	3.5
Total	228	100.0

Source: field survey, 2025

A demographic profile of 228 individuals involved in vegetable farming was produced through an analysis of the information contained in the table. The results revealed some important demographic trends among the respondents. Based on gender, the majority of respondents were women (53.9%) and men (46.1%). In terms of age, most respondents (53.5%) were between 36-45 years old and 26.8% were between 25-35 years old. This indicates that there is a middle-aged farming population. Household size data showed that the majority (75.4%) of households had 4-6 people; however, very few (0.4%) of households had ten or more people. The educational level of the respondents was generally low as well; 57.9% had only completed primary school, 32.0% had completed secondary school and only 4.4% had completed high school or higher education. Economic dependence on vegetable farming varied; 51.8% of the respondents earned between 25%-50% of their household's income from vegetable farming, while only 0.9% relied on vegetable farming for over 75% of their household's income. However, based on the income data, many of the respondents were experiencing economic difficulties; 36.8% reported earning only enough money to cover the basic needs of their household; 23.7% needed additional income sources to meet their family's financial obligations; and 3.5% were severely financially insufficient.The findings suggest that vegetable farmers are facing structural challenges; namely, low education levels, modest contributions to household incomes and unstable finances. These data indicate that vegetable farming would benefit from increased access to agricultural training, alternative forms of income and policy support to increase profitability and long-term viability.

Table 2
Production related Challenges in Vegetable Farming

		Municipality					Total
Theme		Birendra nagar	Barahatal Rural	Panchha puri	Gurva kot	Bheri ganga	
Experience of pest and disease outbreaks affecting farming	Every season	22	27	26	8	5	88
	Occasionally (1–2 times in a year)	13	12	7	14	31	77
	Rarely	18	3	9	17	5	52
	Never	2	0	3	4	2	11
Total		55	42	45	43	43	228
Type of irrigation system use in farming	Traditional/manual irrigation	14	10	10	9	7	50
	Canal irrigation	15	23	26	16	24	104
	Drip irrigation	17	5	8	16	8	54
	Rain-fed only (no irrigation system)	9	4	1	2	4	20
Total		55	42	45	43	43	228
Facing difficulties in accessing water for irrigation	Yes, always	9	9	15	3	22	58
	Yes, but occasionally	11	19	25	15	19	89
	No, water is readily available	25	14	5	18	1	63
	No, I do not need irrigation	10	0	0	7	1	18
Total		55	42	45	43	43	228
Most significant challange in veg production (Multiple Response Set)	Lack of quality seeds	24	38	35	22	19	138
	Lack of access to irrigation	19	25	33	19	27	123
	Pest and disease infestation	24	29	31	26	24	134
	Unfavorable weather conditions (floods, droughts, etc.)	16	14	21	16	15	82
	Soil degradation or poor soil fertility	17	18	33	27	16	111

	High cost of inputs (fertilizers, pesticides, seeds)	24	31	20	19	11	105
	Lack of modern agricultural equipment	24	22	27	14	20	107
	Limited technical knowledge and training	21	14	31	22	16	104
Total	Total	169	191	231	165	148	904

Source: field survey, 2025

Agricultural challenges and practices vary greatly throughout the region among the five municipalities. The greatest number of farmers experienced pest and diseases in Barahatal Rural (27) and Panchhapuri (26) per season, while the lowest number was experienced by Bheriganga. Primary irrigation method for the majority of the farmers (104 out of 228) is canal irrigation which is predominant in Panchhapuri and Bheriganga; however Birendranagar has slightly greater use of drip irrigation. Water accessibility to farmers is another major problem and the issue is most acute in Bheriganga, where 22 farmers experience persistent water shortages; whereas Birendranagar experiences less water shortage than the other two municipalities. Major production constraints identified include; pest (134 mentions), poor quality of seeds (138), and water or irrigation access (123). Soil degradation and high cost of inputs also create additional challenges for farmers.

The results indicate that each municipality has its own set of problems and therefore would require different types of assistance. For example, Panchhapuri has many problems including pests, soil degradation, and knowledge about farming techniques. However, the major problem for farmers in Bheriganga is the lack of adequate water. Although farmers in Birendranagar have relatively better access to water they still experience problems with pests and poor quality of seeds. Therefore, improved pest control methods and/or better irrigation systems in Barahatal and Panchhapuri; improved irrigation systems and better seed distribution systems in Bheriganga; and better seed distribution systems in Birendranagar may increase agricultural productivity. By addressing the localized challenges and providing the appropriate level of support to address the localized challenges and provide the necessary support to mitigate the wide-spread constraints affecting farmers in these municipalities, agricultural productivity will likely be increased.

Table 3

Financial and Economic Challenges in Vegetable Farming

		Municipality					Total
Theme		Birendra nagar	Barahatal Rural	Panchha puri	Gurva kot	Bheri ganga	
Facing any financial difficulties in running your vegetable farming activities	Yes, major financial difficulties	16	1	15	12	3	47
	Yes, moderate financial difficulties	15	9	24	14	27	89
	No, financial situation is stable	14	31	3	8	12	68

	No, I have access to sufficient resources	10	1	3	9	1	24
Total		55	42	45	43	43	228
Received any form of agricultural loans or subsidies in the past 5 years	Yes, frequently	9	12	13	10	1	45
	Yes, occasionally	17	25	16	17	31	106
	No, I have applied but was not approved	17	3	9	14	3	46
	No, I did not apply	12	2	7	2	8	31
Total		55	42	45	43	43	228
facing difficulties in repaying agricultural loans	Yes, it is very difficult	14	1	13	3	4	35
	Yes, somewhat difficult	18	6	18	17	20	79
	No, manageable	13	18	9	21	9	70
	No, I do not have any loans	10	17	5	2	10	44
Total		55	42	45	43	43	228
fluctuation in market prices impact in income from vegetable farming	Significantly, causing financial instability	9	16	18	7	15	65
	Moderately, but manageable	21	22	13	17	18	91
	Minimal impact, I can cope	16	4	12	12	6	50
	No significant impact	9	0	2	7	4	22
Total		55	42	45	43	43	228
Primary financial challenge (Multiple Response Set)	Lack of access to credit or loans	11	6	22	8	5	52
	High-interest rates on loans	21	30	27	17	9	104
	High cost of farm inputs	20	27	22	11	20	100

	Insufficient income from vegetable sales	22	32	31	15	25	125
	High cost of labor	14	10	11	3	4	42
Total		88	105	113	54	63	423

Source: field survey, 2025

Vegetable farmers across five municipalities are experiencing serious financial problems. However, Barahatal Rural appears to be the only municipality where many (31 of 42) farmers indicate that they have stable finances. At the other end of the spectrum is Panchhapuri, which faces the most serious financial problems (15 major + 24 moderate financial challenges). Bheriganga experienced the second-most serious financial difficulties (27 farmers reported moderate financial difficulties). Farmers in Barahatal Rural and Panchhapuri had access to the most frequent loans and/or subsidies (12 and 13, respectively) while farmers in Bheriganga were least successful when applying for a loan (31 farmers applied but only 1 farmer in this municipality received frequent assistance). In terms of burden of repaying loans, the two municipalities with the greatest difficulty were Birendranagar (14 farmers found it very difficult) and Panchhapuri (13 farmers faced great difficulty). Price fluctuations significantly impacted Panchhapuri (18 farmers reported instability) and Barahatal Rural (16 farmers reported instability); however, both Birendranagar and Gurvakot demonstrated relatively greater stability. Overall, the primary financial problems included low income from the sale of produce (125), high interest on loans (104), and the cost of farm inputs (100). Barahatal Rural and Panchhapuri appear to experience these problems at higher rates than do the other municipalities.

Table 4

Environmental and Climate Challenges

		Municipality					
		Birendranagar	Barahatal Rural	Panchhapuri	Gurvakot	Bheriganga	Total
Notice any climate change effect in vegetable production in the past 5 years	Yes, significant changes	13	1	17	3	2	36
	Yes, minor changes	16	20	20	23	35	114
	No noticeable changes	16	18	5	14	5	58
	Not sure	10	3	3	3	1	20
Total		55	42	45	43	43	228
Natural disasters (e.g., floods, landslides, or droughts) affect in vegetables farming	Yes, frequently	15	4	13	10	5	47
	Yes, but occasionally	12	7	23	19	28	89
	No, rarely	17	25	6	8	7	63
	No, never	11	6	3	6	3	29
Total		55	42	45	43	43	228

Envirinmental challange in VF	Irregular rainfall	15	31	29	14	8	97
	Prolonged droughts	36	19	34	25	39	153
	Flooding	18	6	7	12	3	46
	Landslides	14	1	8	16	0	39
	High temperature/heat stress	22	31	30	10	33	126
	Frost or cold stress	32	31	28	10	42	143
Total		137	119	136	87	125	

Source: field survey, 2025

This data indicates that, for the last 5 years, all five municipalities (Birendranagar, Barahatal Rural, Panchhapuri, Gurvakot, Bheriganga) have experienced many environmental and climate related issues with the 228 respondent farmers. The majority of the respondent farmers (36) felt that they had noticed significant climate change impacts to their vegetable crops; 114 noted minor impacts; 58 noted little to none; and 20 could not determine if there was an impact, so we are seeing a somewhat mixed result in terms of climate change impacts to vegetable farms but we are seeing an overall increase in impacts, especially in Panchhapuri (17 significant; 20 minor) and Bheriganga (35 minor). In addition to climate change impacts, natural disaster events such as floods, landslides and droughts are impacting vegetable farms. Specifically, 47 respondent farmers stated that they experienced these types of disasters frequently; 89 occasionally; 63 rarely; and 29 never. We see that both Panchhapuri (23 occasionally) and Bheriganga (28 occasionally) are showing higher levels of vulnerability to natural disasters than other municipalities. Additional specific environmental challenges that the respondent farmers are facing are: long duration droughts (153); frost/cold stress (143); heat stress/high temperatures (126); irregular rainfall (97); flooding (46); and landslides (39). Finally, Birendranagar and Bheriganga are showing the highest level of frequency of droughts (36 and 39) and frost/cold stress (32 and 42) respectively, which further indicate that climate change is having a strong signature through extreme weather events that are impacting vegetable production.

Table 5

Institutional and Policy Challenges in Vegetable Farming

		Municipality					Total
		Birendranagar	Barahatal Rural	Panchhapuri	Gurvakot	Bheriganga	
Accessibility of agricultural extension services in farming area	Easily accessible, frequent visits by extension agents	15	9	5	10	28	67
	Moderately accessible, occasional visits	17	28	16	7	8	76

	Rarely accessible, extension agents are unavailable	17	5	10	20	7	59
	No access to agricultural extension services	6	0	14	6	0	26
Total		55	42	45	43	43	228
facing difficulties in accessing government support programs for vegetable farming (e.g., subsidies, training, or insurance)	Yes, major difficulties	18	2	20	9	21	70
	Yes, but manageable	20	30	10	19	20	99
	No difficulties	11	10	14	13	2	50
	No, I do not need support	6	0	1	2	0	9
Total		55	42	45	43	43	228
Received any formal agricultural training or attended workshops for vegetable farming	Yes, frequently	8	20	12	11	13	64
	Yes, but rarely	13	20	21	20	27	101
	No, I am unaware of such opportunities	23	1	12	10	3	49
	No, I do not think I need training	11	1	0	2	0	14
Total		55	42	45	43	43	228
challenges in accessing government support (***Multiple Response Set***)	Lack of information about available programs	12	31	28	9	10	90
	Bureaucratic or complex application processes	28	5	30	22	33	118
	Unavailability of support in my area	17	7	27	19	9	79
	Corruption or favoritism in program selection	23	12	31	13	29	108

	Lack of awareness or eligibility	10	11	20	8	4	53
Total		90	66	136	71	85	676

Source: field survey, 2025

Significant regional variation is present for climate change impacts on vegetable production within the five municipalities. A high proportion of farmers have reported climate change impacts as noted in Panchhapuri (17), while a low proportion of farmers (1) were aware of climate change impacts in Barahatal Rural Municipality. Approximately half of all farmers (114) reported experiencing slight changes to climate conditions; these included mostly minor climate changes occurring in Bheriganga (35). Regional impact of natural disasters differs; Birendranagar experiences the greatest frequency of disaster events (15) followed by Bheriganga (14), and Barahatal Rural experiences the fewest (2). While natural disasters are experienced differently throughout the region, the frequency of occurrence for environmental challenges demonstrates clear geographic patterns. Prolonged drought was most frequently mentioned in Bheriganga (39) and Birendranagar (36) as environmental challenges, however, frost and cold stress was the dominant environmental challenge in Bheriganga (42) and Barahatal Rural (31), and heat stress was most commonly reported in Bheriganga (33) and Barahatal Rural (31).Three major environmental challenges were identified using the multiple-response data: prolonged drought (153 total mentions), frost/cold stress (143), and high temperatures (126). Other secondary environmental challenges include irregular rainfall (97 total mentions), which was also reported in Barahatal Rural (31) and Panchhapuri (29); localized disasters such as flooding in Birendranagar (18) and landslides in Gurvakot (16). While all of the surveyed areas demonstrated climate-related challenges, there were distinct regional variations in both type and severity of climate related challenges experienced. These regional variations in climate vulnerability are identifiable through the quantitative analysis of the survey responses.

Table 6

Infrastructure and Marketing Challenges in Vegetable farming

		Municipality					Total
		Birendranagar	Barahatal Rural	Panchhapuri	Gurvakot	Bheriganga	
Transportation issues affect ability to sell of vegetables	Major issue, transportation is unreliable and costly	24	3	26	4	4	61
	Moderate issue, sometimes face transportation challenges	16	11	5	19	18	69
	Minor issue, but manageable	13	9	14	14	12	62
	No issue, transportation is readily available	2	19	0	6	9	36
Total		55	42	45	43	43	228

Access to proper storage facilities for produced vegetables	Yes, I have access to cold storage or other facilities	6	4	5	13	1	29
	No, I have no access and face spoilage issues	24	26	16	19	33	118
	No, but spoilage is not a major issue	20	11	20	9	8	68
	I do not need storage facilities	5	1	4	0	3	13
Total		55	42	45	41	45	228
market intermediaries (middlemen) affecting vegetable sales	They help by providing market access	10	4	4	13	12	43
	They take too much profit, reducing my earnings	20	24	24	12	28	108
	They are necessary but create dependency	15	6	14	12	2	49
	I do not sell through intermediaries	10	8	3	6	1	28
Total		55	42	45	43	43	228
marketing challenges in selling vegetables(***Multiple Response Set***)	Low market prices	18	30	29	12	31	120
	Lack of access to distant or bigger markets	25	20	23	24	28	120
	Lack of bargaining power with buyers	21	13	25	13	15	87
	Price fluctuations	22	28	29	21	10	110
	Dependence on middlemen	12	25	26	11	12	86
	High transportation costs	16	5	19	13	2	55
Total		114	121	151	94	98	578

Source: field survey, 2025

A clear picture of the roadblocks vegetable farmers experience, on an infrastructure and marketing level, in five municipalities has emerged from this research. The biggest challenge for the farmers is getting their produce to markets; and two municipalities in particular have the worst access — Panchhapuri where 26 farmers said they had big issues, and Birendranagar where 24 farmers reported big issues; meanwhile, Barahatal Rural was the best of the group with 19 farmers reporting that they didn't have issues accessing transportation. Access to good quality storage also is a serious problem, overall, 118 farmers do not have adequate storage space; Bheriganga is the municipality with the biggest problem, 33 farmers do not have adequate space; followed closely by Barahatal Rural which also has a very high number of farmers without adequate storage 26 farmers. Farmers have mixed feelings toward market intermediaries who can help them get into markets, 43 farmers say they are helpful for getting into markets; however, 108 farmers say they take too much profit off their product, both of these were worse in Bheriganga (28) and Panchhapuri (24). Low prices and lack of market access are the biggest marketing problems facing farmers, each were cited 120 times; and price fluctuations were cited 110 times, which indicates there are structural problems in the agricultural value chain.

Significant regional differences exist in what the biggest challenges are for farmers, Panchhapuri is experiencing the most severe combination of transportation (26), market intermediary (24), and marketing (151 total mentions); Bheriganga is struggling with both storage (33) and market intermediary (28); Barahatal Rural's biggest issues are low prices (30) and storage (26); Birendranagar's biggest issues are transportation (24) and lack of market access (25); and Gurvakot has relatively less issue with storage (13 farmers have adequate storage); however, it still is experiencing significant marketing issues. Overall, the data suggests that the infrastructure gaps and inefficiencies in the agricultural market are limiting farmers' ability to sell at competitive prices and limit their ability to enter new markets — and while the severity varies significantly depending upon the region, all areas are experiencing some level of limitations.

Table 7

Hypothesis Testing

Hypothesis Statement	X2 Value	DF	level of sig	Results
$H1_0$: There is no significant association between municipalities and the frequency of production challenges (e.g., pest/disease outbreaks, irrigation deficits).	133.109	32	0.000	Rejected
$H2_0$: Municipalities are independent of financial challenges (e.g., loan accessibility, input costs, income sufficiency).	98.249	20	0.000	Rejected
$H3_0$: The distribution of environmental challenges (e.g., droughts, heat stress, irregular rainfall) is uniform across municipalities.	202.183	24	0.000	Rejected
$H4_1$: Institutional challenges (e.g., uneven policy implementation, lack of support programs) differ significantly across municipalities.	159.015	20	0.000	Supported
$H5_0$: Infrastructure limitations (e.g., transportation, storage) and marketing barriers (e.g., middlemen exploitation, price fluctuations) are uniformly distributed across municipalities.	118.074	24	0.000	Rejected

Table data represents Chi-Square (χ^2) tests on the relationships between Municipalities and the multiple types of problems/challenges (Hypotheses H1-H5). Hypothesis H1 (χ^2= 133.109, DF = 32, P = .000) rejected the Null Hypothesis, indicating a statistically significant association between municipal types and production-related challenges (pest outbreaks, irrigation deficits). Likewise, Hypothesis H2 (χ^2 = 98.249; DF = 20; P = .000), showed no independence between municipal types and financial challenges (loan access, input cost), thus rejecting the Null Hypothesis. Both Hypothesis H3 (χ^2 = 202.183; DF = 24; P = .000) and Hypothesis H5 (χ^2 = 118.074; DF = 24; P = .000) likewise rejected their Null Hypotheses showing that both environmental related challenges (drought, heat stress) and infrastructure/marketing type barriers (transportation issues, fluctuating prices) were not evenly distributed among municipal types.
Conversely, Hypothesis H4 (χ^2 = 159.015; DF = 20; P = .000) supported its Alternative Hypothesis, validating that institutional type challenges (uneven policy enforcement, lack of support programs) did vary among municipal types. All of the p-values for all Hypotheses were at or below .05 (P = .000), which indicates a high degree of statistical significance. The above findings suggest that municipalities experience unique and variable production-related, financial, environmental, marketing/infrastructure, and institutional-type challenges, thereby supporting the use of targeted approaches to address the disparity in each area.

Discussions

Vegetable farming in Surkhet, Nepal faces numerous challenges. As indicated by the study's findings based on a sample of 228 vegetable farmers in five different municipalities (Birendranagar, Barahatal Rural Municipality, Panchhapuri Municipality, Gurvakot Rural Municipality and Bheriganga Municipality) there are an array of challenges which are both production related (e.g. pest and disease problems, poor quality seeds, limited technical knowledge), financial (e.g. low incomes), environmental (e.g. soil degradation, extreme weather conditions), institutional (e.g. regulatory and bureaucratic barriers) and marketing/infrastructure (e.g. limited access to markets and/or to inputs). These challenges vary between municipalities (as demonstrated by the results of the chi-square tests - H1-H3, H5) and among different demographic groups (as shown by the rejection of the null hypothesis that all municipalities were equally challenged and the acceptance of the null hypothesis that there was no significant difference between municipalities when it came to institutional challenges - H4). The demographic information about the sample (see Table 1) will be combined with the thematic challenges in order to analyze the study's results comprehensively and draw conclusions relevant to policy and practice.

Demographic Profile and its Impact

The demographic profile of the respondents provides important context for understanding the various challenges that they have encountered. Vegetable farming in Surkhet appears to include a considerable number of females (53.9%) who participate in vegetable farming, possibly indicating a gender dimension of vegetable farming, as many women have the responsibility of managing household-based vegetable farming activities (ICIMOD, 2023). On the other hand, the relatively low educational attainment of the sample (57.9% of respondents had only completed primary school and only 0.9% of respondents reported having a bachelor's degree) likely exacerbates challenges such as a lack of technical knowledge (104 references) and difficulty accessing support from the government (118 references) because of the complexity of bureaucracy. Similarly, studies conducted in Eastern Nepal indicate that low literacy rates result in less than optimal utilization of available resources (Kharel et al., 2023). In addition, the fact that the sample included primarily experienced workers (the median age was 53.5 years, with 53.5% of respondents being 36-45 years old) indicates experience, but also the likelihood that they would resist the adoption of new

technologies as older farmers may be less flexible (Kharel et al., 2023). Lastly, the fact that most households sampled (75.4%) had 4-6 members indicates that many families rely heavily on income generated from vegetable farming; however, only 0.9% of respondents derived more than 75% of their income from vegetable farming and 23.7% of respondents stated that they found their income from vegetable farming insufficient to meet their needs. Therefore, the combination of low education and financial strain likely magnify the risk to which farmers are exposed with regards to production and marketing related challenges, as farmers lack the necessary resources and knowledge to mitigate the risks associated with pest infestations (134 references) and fluctuating prices (110 references).

Production Challenges

Production challenges are significantly correlated with municipalities (H1, $X^2 = 133.109$, $p = .000$), suggesting that specific local agricultural conditions are contributing to the production challenges that exist in each municipality. For example, pest and disease problems are a significant challenge for many farmers in Surkhet, with 27 farmers reporting that they occur at least once per year in Barahatal Rural Municipality and 26 farmers reporting similar problems in Panchhapuri Municipality, likely due to favorable microclimate conditions for pests or a lack of resources to effectively manage pests (CASA, 2020). Furthermore, the lack of quality seeds (138 references) and the limited technical knowledge (104 references) are two factors that contribute to the production challenges identified by farmers. Low educated farmers may not have the ability to identify reputable seed sources or adopt practices such as integrated pest management (ICIMOD, 2023). Access to irrigation represents another critical barrier to vegetable farming in Surkhet, with 123 farmers indicating that they face difficulties accessing adequate irrigation, including those located in Bheriganga (22 always facing shortages). The fact that 104 farmers currently use canals as a source of irrigation, while only 54 farmers are using drip irrigation systems, indicates that investment in water conserving technology is lacking in Surkhet, even though efforts to promote micro-irrigation have been made in the district (Woli, Kafle, & Mponela, 2025). Finally, the fact that 111 farmers mentioned soil degradation and 82 farmers mentioned unfavorable weather conditions as factors that impact vegetable production are indicative of environmental stressors, which are consistent with Nepal's high level of climate vulnerability (CASA, 2020). The above findings suggest that vegetable production challenges are not only technical but also represent knowledge and infrastructure gaps, and therefore require targeted extension service and input supply improvements.

Financial and Economic Challenges

The results show that financial issues were reported by many and varied greatly between the municipalities (H2, $\chi^2 = 98.249$, $p = 0.000$). Financial instability was reported at highest levels in Panchhapuri (15 major, 24 moderate difficulties) and Bheriganga (27 moderate), whereas Barahatal rural was much more stable (31 reporting no issues). Major financial issues included insufficient income from vegetable sales (125 mentions) and high input costs (100 mentions), both of which are compounded by competition from Indian imports, providing over 40% of major markets (CASA, 2020). In addition to a low percentage of their income derived from agriculture (51.8% reported deriving 25-50%), and a very large reliance on alternative income (23.7%), this indicates an overall low level of profitability in the agricultural sector. Farmers also had very different experiences when trying to access credit; those from Bheriganga were severely hampered (31 attempted to obtain credit and only one farmer obtained frequent support). High interest rates (104 mentions) and difficulty repaying loans (35 found it "very difficult") both further complicate life for farmers, particularly those in Birendranagar and Panchhapuri. These results are consistent with other

research documenting the limited access to financial services for smallholder farmers, particularly female farmers who experience even greater barriers to accessing financial services than male farmers, largely due to land ownership issues (CASA, 2020). Fluctuations in market prices (65 report significant instability) provide evidence for the need for mechanisms to stabilize prices and improve financial support systems to help farmers become economically resilient.

Environmental and Climate Challenges

There were significant differences in environmental challenges experienced by municipalities (H3, χ^2 = 202.183, p = 0.000), likely due to the varying agroecological conditions among the municipalities. Droughts lasting for extended periods (153 mentions), frost or cold stress (143), and high temperature (126) were reported as the three major issues, and farmers in Bheriganga and Birendranagar experienced the greatest extent of droughts (39 and 36) and frost damage (42 and 32). These data are consistent with data regarding temperature increases (0.04 – 0.09°C/year) and increased weather variability in Nepal (CASA, 2020). Additionally, the high sensitivity to climate change in Panchhapuri (17 report significant changes) may be due to its topography's susceptibility to variable and unpredictable rainfall (29 mentions). Furthermore, natural disasters including floods and landslides also contribute to the risks faced by farmers in Panchhapuri (23 occasional) and Bheriganga (28 occasional). The results presented above are supported by research identifying climate risk in Nepal and the need for development of crop varieties that can resist climate-related stresses and improved water management practices (ICIMOD, 2023). Given that the majority of the vegetables grown in Nepal are rain-fed (20 farmers) in some of the municipalities, there is a pressing need to expand irrigation infrastructure to protect against drought related losses.

Institutional and Policy Challenges

There were significant differences in institutional challenges across municipalities (H4, χ^2 = 159.015, p = 0.000), indicating inconsistent implementation of policies. Extension service availability varies greatly; 28 farmers in Bheriganga report frequent visits from extension services, whereas 14 farmers in Panchhapuri report having no access. Bureaucratic processes (118 mentions) and corruption (108 mentions) were identified as significant barriers to obtaining government support; both of these were experienced more frequently by farmers in Panchhapuri and Bheriganga. Low levels of formal education (49 farmers report being unaware of training programs) limit farmers' ability to take advantage of existing resources. The lack of support for organic farming and linkages to markets experienced by farmers in Surkhet (ICIMOD, 2023) compounds the problems experienced by farmers in the region. Interventions tailored to meet specific needs (e.g., simplification of bureaucratic processes and expansion of extension services) are necessary to resolve the inequities in institutional support and to create more effective institutions.

Infrastructure and Marketing Challenges

Challenges to farmers in terms of infrastructure and marketing were not uniform (H5, χ^2 = 118.074, p = 0.000); however, Panchhapuri experienced the greatest number of issues (26 major transportation problems, 151 marketing problem mentions). Lack of cold storage facilities (118 have none) resulted in produce spoiling, primarily in Bheriganga (33) and Barahatal rural (26), and consistent with the limited cold storage capacity in Nepal (CASA, 2020). Transportation issues (61 major, 69 moderate) result in increased costs and reduced market access, primarily for farmers in Panchhapuri and Birendranagar. Intermediary exploitation (108 report taking excessive profits), and low prices (120 mentions) and fluctuating prices (110 mentions) negatively affect the economic stability of farmers. These results are consistent with data collected in Eastern Nepal, where intermediary control and access to markets were two of the largest

barriers to profitably growing vegetables (Ghimire & Kattel, 2024). Improvement of roads, storage facilities and direct market linkages would improve the profitability of farmers.

Implications and Recommendations

These results emphasize the need for intervention at the local level. In terms of production, Panchhapuri and Barahatal Rural will benefit from the improvement of pest control and seed quality. However, Bheriganga is urgently in need of irrigation-related investments. In terms of finance, both Panchhapuri and Bheriganga have potential to be positively affected by increased loan accessibility and lowered interest rates. Environmentalally, all areas studied will need to adopt climate resilient practices, with a focus on the development of irrigation systems in Bheriganga which has been identified as one of the most drought-prone locations. In terms of institutional capacity building, Panchhapuri is in need of streamlined bureaucracy and increased availability of extension services to fill the gap in service delivery. Finally, Panchhapuri and Bheriganga will also need to develop their infrastructure and marketing capabilities through the development of adequate storage and transportation, as well as development of policies that reduce the dependency on middlemen. The demographic analysis highlights the need for targeted outreach efforts towards low-educated and financially challenged farming households through education/training programs and diversification of income opportunities. Additionally, the high rate of women involved in farming indicates that gender sensitive policies can provide an additional means to achieve positive outcomes. Overall, the recommendations made in this report are consistent with other studies that advocate for infrastructure investments, climate adaptations, and policy reforms within Nepal's vegetable sector (ICIMOD, 2023; CASA, 2020).

Limitations

The self reported nature of the data utilized in this study may result in bias, and the inability to directly compare the findings of this study to those found in other articles limits the generalizability of the findings. Therefore, future studies should utilize longitudinal data, as well as qualitative data to identify regional variation and long term trend.

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