

# Insights into Fresh Vegetable Supply: Perspectives of Kathmandu Valley's Wholesale Suppliers

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**Abstract** This comprehensive study delves into the intricate challenges and dynamics characterizing the wholesale vegetable markets in Kathmandu Valley, Nepal. It sheds light on the pervasive issues confronting local producers, ranging from the absence of robust market structures to the frequent price fluctuations that erode profit margins. The study underscores the profound influence of intermediaries, hindering farmers from reaping expected profits while driving up distribution costs, ultimately impacting consumers. It emphasizes that Nepal's agricultural landscape is predominantly rooted in subsistence farming, hampered by inadequate infrastructure and a lack of support for modernization and supply chain development. Inadequate market access and the absence of storage and processing facilities contribute to significant post-harvest losses, exacerbating the challenges faced by farmers. The study also highlights the substantial profit margins enjoyed by middlemen and the competitive pressures imposed by Indian vegetable imports. In response to these multifaceted challenges, the research aims to discern strategies to enhance market conditions and bolster local farmers. However, the study acknowledges certain limitations, including its exclusive focus on wholesale markets within Kathmandu Valley and potential data gaps stemming from inadequate record-keeping. Nonetheless, it offers invaluable insights into the complexities of Nepal's vegetable supply chain, providing actionable recommendations to improve market efficiency, reduce losses, and ensure equitable profits for domestic producers, ultimately fostering the growth of the agricultural sector in the region.

**Keywords:** *fresh vegetables, wholesale suppliers, kathmandu valley, perception, supply chain, market efficiency, post-harvest losses, market challenges*

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## 1. Introduction

In the marketing of fresh vegetables, a critical issue arises from their inherent perishability, demanding swift distribution within a short timeframe from harvest. Unlike many other commodities, price controls are notably absent in this sector, resulting in considerable short-term price fluctuations. These fluctuations create substantial risks for both buyers and sellers. Furthermore, consumer preferences have shifted from hardy vegetables like potatoes and onions toward more delicate options such as tomatoes and lettuce, intensifying the complexities within the fresh vegetable market [1].

Fresh vegetables navigate a convoluted network of marketing entities, often characterized by outdated and ineffective structures. Typically, these vegetables pass through a minimum of two, and sometimes as many as four, intermediary distribution points. With each transfer, the risk of damage grows, handling expenses escalate, and quality control issues become increasingly pronounced [2].

The cost of distributing fresh vegetables is a significant factor, typically representing 25% to 40% of the sales price. However, this field has been neglected by both businesses and scholars. Roughly two-thirds of the price consumers pay for food is due to marketing costs, with about half of that going to physical handling. Many parts of the food marketing system have clung to outdated practices, especially in wholesaling. Among food products, the fresh vegetable industry is particularly problematic, with assembly and distribution often accounting for 80% of the retail selling price [3].

The absence of proper market structures and frequent price fluctuations present major challenges in vegetable farming. The volatility in vegetable prices during production and over extended periods has been reported to be significant. The presence of intermediaries often prevents farmers from realizing expected profits, while distribution costs increase, ultimately impacting consumers. Moreover, the majority of farming systems in Nepal are still focused on subsistence agriculture, with only a limited number of farms employing modern production methods. The growth of the agricultural sector in Nepal is hindered by inadequate infrastructure,

ineffective institutions, and insufficient technical assistance for commercialization and supply chain development [4].

In spite of the great potential of vegetable farming in Nepal, domestic producers face marketing problems such as lack of road access to the market, reliable market information, price uncertainty, and lack of infrastructure facilities for storage and processing of surplus products [5]. The marketing of vegetable crops is highly complex and requires special arrangements due to their perishable nature [6]. Consequently, the supply of vegetables is subject to various problems, including wide fluctuations in prices. The vegetable marketing situation in Nepal is still in its developing stages, characterized by influences in demand and supply and price realization. The inefficient marketing system is a result of poor linkage and integration between marketing functionaries, particularly in hill areas. Due to imbalanced production of vegetables and a lack of market access and organized marketing systems, there is always a market accumulation and scarcity from season to season. Therefore, it is necessary to identify different marketing constraints along with production constraints to boost vegetable production [5,6].

According to the vegetable growers, they believe that the absence of institutionalized services results in non-remunerative prices for their produce. They argue that the poor linkage between producers and consumers allows traders and middlemen to benefit from this situation by offering low prices at the farm gate while charging higher prices to consumers. It was observed that middlemen had a profit margin of 50% of the farm gate price [7].

Due to a lack of a well-functioning infrastructure for vegetable production and distribution, domestic producers continue to face difficulties. As a result of their perishable nature, inadequate market access, and the issue of dealing with surplus vegetables during peak seasons, they frequently are forced to either trash the product or sell it at drastically reduced prices. Likewise, as native crops have greater production costs, they are unable to command fair prices during the off-season due to competition from imported vegetables from India. For instance, in a show of defiance in February 2023, farmers in Chitwan dumped vegetables including tomatoes, cauliflower, cabbage, pumpkin, and peas on the streets of Narayangadh to draw attention to their battle for fair market conditions and competitive prices [8].

In order to better compete with Indian products, this study will assess the current state of the vegetable markets and identify strategies to do so. This study tries to comprehend market trends and aid farmers in obtaining fair prices for their output. With the help of this study, we hope to identify the most effective method for selling vegetables to consumers and farmers alike. In order to avoid being taken advantage of by middlemen and to receive the anticipated profit, this research also makes farmers aware of the market's intermediaries. The primary objective of this study is to conduct a survey aimed at identifying the key barriers and advantages related to the movement of vegetables. Additionally, the study aims to assess the opinion of wholesale suppliers on various market attributes and provide practical strategies to address these challenges.

The study's limitations stem from its exclusive focus on wholesale markets within the Kathmandu Valley. These

limitations include the potential unavailability of essential data due to inadequate record-keeping by market participants and incomplete responses. Additionally, the study is further constrained by its relatively short evaluation period of only six months, necessitated by time and financial constraints.

## 2. Methodology

The primary objective of this study was to gauge the perceptions of wholesale suppliers, farmers, and market participants concerning the supply of vegetables in the market. Additionally, the study aimed to investigate post-harvest losses and their underlying causes, the criteria that defined a vegetable as a quality product for both suppliers and consumers, the methods used for price determination in the market, preferred transportation modes, and the concept of a premium agricultural product based on volume and profit margins, as viewed by wholesale suppliers. Furthermore, the study sought to identify transportation challenges, inherent market issues, and recommendations from suppliers for mitigating losses. To achieve these objectives, a series of planned strategies were implemented, including site assessment, identification of key vegetables by trade volume, and determination of the appropriate respondents to gather meaningful data. Various tools, techniques, and methodologies for sample selection, data collection, analysis, and data interpretation were employed to accomplish the intended goals.

## 3. Selection of Study Area

The Kathmandu Valley (KV), comprising three districts—Kathmandu (the capital city of Nepal), Lalitpur, and Bhaktapur—has been a pivotal commercial center in Nepal for centuries. With a total area of 569.80 square kilometers, the KV has held significant political and economic importance throughout its history. In fact, the nation's first organized vegetable wholesale market, the Kalimati Fruits and Vegetable Market, was established in Kathmandu and remains operational today. Additionally, the KV hosts the Balkhu Vegetable Market at its core, and recently, the country's largest vegetable market, the Surya Binayak Green Agriculture Wholesale Market, spanning 4.4 acres (35 ropani) of land, was inaugurated. Several other markets, such as Bouddha Modern Vegetable Pvt. Ltd., Icchumati Vegetable Market, Chabahil Vegetable and Fruits Agriculture Market, Gwarko Vegetable and Fruits Market, Sangrila Agro Market, and more, are also situated in the KV, making it an ideal location for obtaining impartial data. A total of 23 vegetable markets were surveyed for this study.

## 4. Research Design, Sampling & Data Collection

The research design employed in this study was cross-sectional, allowing for data collection from various sources simultaneously. Given the significant economic role of vegetable production and marketing, the industry involved a substantial workforce comprising farmers,

collectors, wholesalers, and merchants in the Kathmandu Valley (KV). To ensure a representative sample, a predetermined number of respondents were selected from each of these segments. The sample consisted of these chosen participants, and the sampling method was used to make these selections. The sampling frame included commercial vegetable growers engaged in production and collection, as well as wholesalers and retailers involved in marketing within the KV. To select samples from these groups, a random stratified sampling approach was employed. Data collection involved conducting surveys with a minimum of 50 commercial growers in the KV and neighboring areas. Additionally, interviews were conducted with collectors, wholesalers, and retailers associated with the vegetable supply chain, each comprising a sample population of 5-10 respondents.

## 5. Research Instrument

This study employed various research tools and methods to collect essential primary data, including a pre-pilot field visit, questionnaire surveys, Focus Group Discussions (FGDs), Key Informants' Interviews (KIIs), Rapid Market Analysis (RMA), and case studies. To obtain information regarding production, marketing structure, and pricing within the region, a questionnaire survey was administered to farmers, wholesalers, collectors, and retailers within the targeted group. FGDs were conducted with farmers and wholesale suppliers to ascertain pricing and profit margins for major vegetables. KIIs were utilized to gain insights into the current state of vegetable cultivation, including yield statistics, farming participation, marketing structures, and economic aspects. These interviews involved progressive farmers, representatives from farmer and women groups, as well as local leaders and market experts. RMA was employed to evaluate the market potential of vegetables by surveying local vegetable vendors to gather data on quantities, pricing mechanisms, price stability, and supply and demand dynamics. Furthermore, case studies were conducted on successful vegetable farmers in the area to identify pricing strategies specific to the study region.

Various research instruments employed for this study are as follows:

- a. **Pre-pilot field visit:** To get a general understanding of the site's demographic, sociocultural, topographical context, and marketing mechanisms, pre-pilot field trips were made. This data was used to create a schedule and a framework for sampling.
- b. **Questionnaire survey:** The research team conducted a number of open-ended and closed-ended questions to the targeted group, which included farmers, wholesalers, collectors, and retailers, in order to gather some helpful information about the social dynamics, economic situation, production, marketing structure, and price in the region. Since not every member of the target group could participate in the survey, the sample population was selected using a simple random sampling procedure.
- c. **Focus Group Discussion (FGD):** The farmers were gathered for a discussion with the goal of

learning more about common farming and marketing issues in the region and coming to a consensus on a solution to the identified problem or problems.

- d. **Key Informants' Interview (KII):** Key informants such as the progressive farmers, village leaders/elders, representatives of farmers' groups, representatives of women groups as well as local leaders and market representatives were asked a series of questions about the present scenario of vegetable cultivation in the area, current yield statistics, number of people involved in agriculture and vegetable farming, marketing structure and the economics associated with vegetable cultivation.
- e. **Rapid Market Analysis:** Market potential of vegetables in the area were assessed via an RMA which assessed local vegetable grocers (sampled by SRS) a sequence of questions regarding the quantity and rate of different vegetables they bought from local farmers and sold to local customers, price fixing mechanism, stability of price, demand, and supply of vegetable crops in the area.
- f. **Case studies:** Detailed studies about successful vegetable farmers in and around the area were carried out to find out about methods that could be useful in making vegetable farming a successful occupation specific to the study area.

To complement the primary data, a wide range of secondary sources, both published and unpublished, were consulted. These sources included articles, reports, and publications from various institutions and organizations such as the Nepal Agriculture Research Council (NARC), Central Bureau of Statistics (CBS), Agro-Enterprise Center (AEC), District Agriculture Development Office (DADO), Ministry of Agriculture and Livestock Development (MoALD), among others.

## 6. Data Analysis

The collected data underwent a thorough analysis, incorporating suitable qualitative and quantitative techniques. Qualitative data from Focus Group Discussions (FGDs) and Key Informants' Interviews (KIIs) were transcribed, coded, and subjected to thematic analysis to discern patterns, themes, and trends related to the market flow of fresh vegetables. Quantitative data gathered through surveys of wholesale suppliers, retailers, and farmers were input into statistical software tools like MS Excel and SPSS (Statistical Package for Social Sciences) for data cleaning and analysis. The analysis encompassed descriptive statistics, inferential statistics, and quantitative techniques, with the results presented through appropriate tables and charts. The findings derived from this data analysis were then interpreted and discussed in relation to the research questions and existing literature.

## 7. Results and Discussions

In Nepal, the organization of vegetable marketing channels is limited, and conventional supply chains are

commonly followed. The process of getting vegetables from farms to markets involves multiple intermediaries, including wholesalers, middlemen, and retailers. This study specifically examined the vegetable supply chain within the Kathmandu Valley market. The results showed that the majority of vegetables in the market are sourced through intermediaries, although in certain markets, direct supply from small and medium-scale farmers was

observed. Notably, the Kalimati Fruits and Vegetables Market, the largest wholesale market, emerged as a crucial link in the distribution of vegetables to various markets in the Kathmandu Valley, acting as an intermediary between farmers and other wholesale or retail markets.

Followings is the commonly adopted channel for the flow of vegetables in the market of Kathmandu Valley:

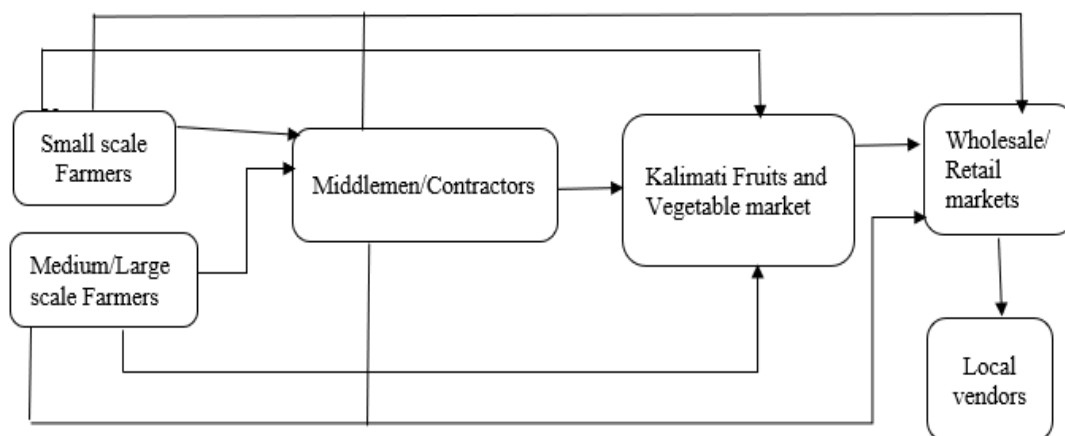


Figure 1. Commonly Adopted Marketing Channel in Kathmandu Valley

## 8. Source of Vegetable for Wholesale Suppliers in Kathmandu Valley

From study it was found that, the majority of vegetables supplied to wholesale suppliers come through middlemen or brokers, accounting for 39% of the total. A significant portion, 22%, is sourced directly from small-scale farmers, while 17% comes directly from medium-scale farmers. There is also a notable percentage of 17% where vegetables are obtained from all sources, including both middlemen and direct farmer supply. Imports contribute 4% of the vegetable supply. Overall, this indicates that wholesalers receive vegetables from a combination of middlemen, small-scale farmers, medium-scale farmers, and imports.

Table 1. Source of Vegetables for Wholesale Suppliers in Kathmandu Valley

Source of vegetable for Wholesale Suppliers	No. of Responses	Percentage
Middlemen/brokers	9	39.13%
Directly from Small Scale/holder farmers	5	21.74%
Directly from Medium Scale/holder farmers	4	17.39%
All of them	4	17.39%
Imports	1	4.35%
Total	23	

## 9. Mode of Price Fixation

In the study conducted on price fixation methods by wholesale suppliers, several approaches were identified. The results revealed that the most prevalent method utilized for price determination was based on the demand and supply dynamics, accounting for a substantial 57% of

the responses. This approach reflects a market-driven pricing mechanism, where prices are influenced by the interplay of consumer demand and product availability.

Furthermore, the findings indicated that collective bargaining played a significant role, constituting 17% of the responses. This method involves negotiations and agreements reached among multiple stakeholders, such as associations or cooperatives, to collectively determine prices that are mutually beneficial. Additionally, the study highlighted the adoption of the supplier's bargain (13%) and farmer's bargain (9%) approaches, where suppliers and farmers negotiate prices individually. These methods signify the importance of direct interactions between suppliers and farmers in price determination. Lastly, the auction method emerged as another avenue for price fixation, accounting for 4% of the responses. Auctions provide a platform for buyers to competitively bid for products, resulting in price discovery through a transparent and competitive process.

Table 2. Methods of Price Fixation by Wholesale Suppliers in Kathmandu Valley

Mode of Price Fixation by Wholesale Suppliers	No. of Responses	Percentage
Auction	1	4.35%
Farmer's Bargain	2	8.70%
Supplier's Bargain	3	13.04%
Collective Bargain	4	17.39%
Demand & Supply	13	56.52%
Total	23	

## 10. Suppliers' Definition of Premium Product

A brief survey was conducted in order to determine the vegetables that were considered premium products by wholesale suppliers in the vegetable markets of

Kathmandu Valley based on two attributes namely, a) Trade Volume and b) Profit Margin. The results of the study are as follows:

#### a). Based on Trade Volume

Based on the survey data regarding the suppliers' perspective on defining premium vegetable products using trade volume as the criterion, the following insights can be garnered. The percentages assigned to each vegetable indicate the perceived profitability and market demand of the respective products.

Potato emerges as the top choice among suppliers, with 87% considering it a premium product due to its high trade volume. Tomato follows closely behind, with 78% of the suppliers recognizing its potential as a profitable vegetable. Onion also garners a significant percentage, with 65% of suppliers identifying it as a premium product based on trade volume.

As we move further down the list, the proportion decreases. Okra is considered a premium vegetable by 39% of the surveyed suppliers, indicating a relatively lower trade volume compared to the previous three. Lastly, ginger and garlic secure a 26% rating, suggesting a comparatively smaller trade volume and profitability according to the surveyed suppliers' perspective.

**Table 3. Suppliers' Definition of Premium Vegetables based on Trade Volume**

Premium Vegetable Item	No. of Responses	Percentage
Potato	20	86.96%
Tomato	18	78.26%
Onion	15	65.22%
Okra	9	39.13%
Ginger & Garlic	6	26.09%
Other	3	13.04%

#### b). Based on Profit Margin

Based on the survey responses regarding suppliers' definition of premium vegetables based on profit margin, a different perspective emerges. The percentages assigned to each vegetable indicate the perceived profitability and financial gains associated with the respective products.

According to the survey, tomato takes the lead with 78% of suppliers considering it a premium vegetable due to its favorable profit margin. Potato follows closely behind, with 65% of suppliers recognizing its potential for generating higher profits. Interestingly, off-season vegetables are also regarded as premium by 52% of the surveyed suppliers. This indicates that the higher profit margin achieved by supplying off-season vegetables outweighs any potential drawbacks related to trade volume or market demand. Onion, on the other hand, secures a lower percentage, with only 39% of suppliers identifying it as a premium vegetable. This suggests that while onion remains a valuable commodity, its profit margin may be comparatively lower in the suppliers' perspective.

Finally, 26% of the suppliers surveyed indicated that there is no fixed margin that defines a premium vegetable. This implies that some suppliers may have different criteria or considerations beyond profit margin when defining premium vegetables.

These survey responses shed light on the varying perceptions of profitability among different vegetable

products based solely on profit margin. It emphasizes the importance of understanding suppliers' perspectives and criteria when evaluating the premium status of vegetables in the market.

**Table 4. Suppliers' Definition of Premium Vegetables based on Profit Margin**

Premium Vegetable Item	No. of Responses	Percentage
Tomato	18	78.26%
Potato	15	65.22%
Off-Season Vegetables	12	52.17%
Onion	9	39.13%
No Fixed Margin	6	26.09%

## 11. Preferred Mode of Transportation

The gaps between farmers and markets are filled by transportation. In order to guarantee that fresh food reaches customers and retailers in the best possible condition, timely transportation is essential in the vegetable industry. However, there are logistical issues with distribution and transportation for vegetable markets. It was discovered that pickup jeeps are typically used to deliver vegetables from the farm to the market. For farmers and traders to connect with other markets and reach a larger consumer base, access to transportation networks and distribution channels is essential. However, due to a lack of transportation choices, small-scale farmers have trouble getting their produce to markets located far away, restricting their market reach to nearby areas only. When traveling a short distance, farmers carry their own produce to the market in Dokos.

The survey responses on the preferred mode of transportation among wholesale suppliers showcased a variety of methods utilized in the industry. The results indicated that the most prominent mode of transportation, selected by an overwhelming 87% of respondents, was the use of pickup jeeps. This mode of transport offers flexibility, speed, and the capacity to transport large volumes of goods efficiently, making it a popular choice among suppliers.

In addition, the survey revealed that approximately half of the suppliers (52%) relied on delivery by farmers themselves. This approach allows for direct involvement of farmers in the transportation process, ensuring freshness and quality while also fostering a close relationship between suppliers and producers. Furthermore, the option of pickup by wholesalers accounted for 26% of the responses. This method involves wholesalers collecting the produce directly from farmers or designated collection points, enabling them to oversee the transportation process and maintain control over the quality and handling of the goods. Lastly, a portion of respondents (13%) indicated the use of porters for transportation. Although less prevalent compared to other modes, porters offer a cost-effective and localized solution, particularly in areas with challenging terrain or limited access to motorized vehicles.

Overall, these survey findings highlight the diversity of transportation methods employed by wholesale suppliers, with pickup jeeps emerging as the preferred choice due to their efficiency, followed by delivery by farmers

themselves. The selection of an appropriate mode of transportation allows suppliers to ensure timely delivery, maintain product quality, and establish a robust supply chain to meet market demands.

**Table 5. Preferred Modes of Transportation for Supply of Vegetables in Kathmandu Valley**

Mode of Transportation	No. of Responses	Percentage
Pickup Jeep	20	86.96%
Delivery by Farmers	12	52.17%
Pickup by Wholesaler	6	26.09%
Porter	3	13.04%

## 12. Transportation Problems

Based on the survey responses of suppliers regarding problems during transportation, several key observations were made. Firstly, the most prevalent issue reported by suppliers is decaying or wastage of vegetables, with a significant majority of 74% indicating this as a problem. This highlights the critical need for improved transportation conditions, such as proper refrigeration or storage facilities, to ensure the freshness and quality of the vegetables during transit. Secondly, a considerable percentage, 65%, reported late arrival as a problem. This indicates a potential issue with logistics and scheduling, which may lead to delays in delivering the vegetables to the intended destinations. Addressing this issue requires better coordination and planning to minimize delivery delays and ensure timely availability of vegetables in the markets.

Additionally, 26% of suppliers mentioned vehicle shortage or high fare as a problem. This suggests a challenge in accessing sufficient transportation resources at reasonable costs. Finding solutions to this issue may involve exploring options such as expanding the transportation network, promoting collaborations among suppliers for shared transportation, or negotiating better rates with transport providers. Lastly, a smaller percentage of respondents, 13%, cited vehicle breakdown or parking issues. Although this percentage is relatively low, it still highlights the need for regular vehicle maintenance and addressing parking-related challenges to ensure smooth transportation operations.

**Table 6. Problems incurred during Transportation of Vegetables in Kathmandu Valley**

Problems during Transportation	No. of Responses	Percentage
Decaying/Wastage	17	73.91%
Late Arrival	15	65.22%
Vehicle Shortage/ High Fare	6	26.09%
Vehicle Breakdown/ Parking	3	13.04%
No Problem	3	13.04%

## 13. Post Harvest Losses and its Causes

The primary problem impeding the market for vegetables is post-harvest loss, which causes a decrease in both the quality and quantity of vegetables offered for sale. This results in a reduction in the overall quantity of fresh products on the market, creating a shortage and perhaps raising prices due to an imbalance between supply and

demand. Variations in supply brought on by unforeseen losses make it difficult to predict market patterns, hamper long-term planning, and hinder investment for all parties concerned. Post-harvest losses cost money to farmers, merchants, and other middlemen in the supply chain for vegetables. Due to the decreased amount and quality of vegetables available for sale, farmers are unable to recoup their production expenses, while dealers and retailers suffer losses as a result of unsold or ruined products. As a result of deterioration, it was also discovered that sellers must either sell perishable vegetables for less money or discard them in large quantities, incurring financial losses that deter investment, limit profitability, and hinder market expansion.

The study found that the majority of losses occur during transportation from the farmyard to the collection center and thereafter to the wholesale market and retail outlets. The losses in vegetables were found to be 15%-40% and the vegetables having shorter shelf life were found to be: 1) Green leafy, 2) Tomato, 3) Chilies, 4) Okra and 5) Capsicum.

The study reveals the post-harvest losses in vegetable markets and the causes of these losses in wholesale markets. In vegetable markets, the primary causes of post-harvest losses are inappropriate packaging and poor handling, accounting for 52% of the total losses. This is followed by the lack of cold storage facilities, which contributes to 35% of the losses. Poor quality of produce is also a factor, contributing to 13% of the losses.

**Table 7. Post-harvest Losses of Vegetables in Markets of Kathmandu Valley**

Post harvest Losses	No. of Responses	Percentage
Inappropriate Packaging and Poor Handling	12	52.17%
Lack of Cold Storage Facility	8	34.78%
Poor Quality of Produce	3	13.04%
Total	23	

When examining the causes of post-harvest losses specifically in wholesale markets, rotting is identified as the leading cause, responsible for 48% of the losses. Mechanical damage, such as physical harm during transportation or handling, accounts for 22% of the losses. Additionally, physiological factors, such as natural deterioration processes, contribute to 30% of the losses.

**Table 8. Causes of Post-harvest Losses of Vegetables in Markets of Kathmandu Valley**

Causes of Post harvest Losses	No. of Responses	Percentage
Rotting	11	47.83%
Mechanical Damage	5	21.74%
Physiological Loss	7	30.43%
Total	23	

## 14. Supplier's Recommendations for Controlling Losses

Based on the survey responses of suppliers regarding recommendations for controlling vegetable losses, several key insights were drawn. Firstly, the highest percentage of suppliers, 35%, emphasized the importance of good

packaging. This suggests that suppliers recognize the significance of proper packaging in preserving the quality and freshness of vegetables during transportation and storage. Implementing effective packaging techniques, such as using appropriate materials and ensuring secure packaging, can help minimize damage and spoilage. Secondly, 26% of suppliers highlighted the need for storage facilities. This underscores the importance of having proper storage infrastructure to maintain optimal temperature and humidity conditions for vegetables. Access to adequate cold storage facilities can significantly extend the shelf life of perishable vegetables, reducing post-harvest losses and ensuring a longer period for distribution and sale.

**Table 9. Suppliers' Recommendations for Controlling Post-harvest Losses in Market**

Suppliers' Recommendations	No. of Responses	Percentage
Good Packaging	8	34.78%
Storage Facility	6	26.09%
Avoidance of Oversupply	4	17.39%
Grading Commodity before Delivery	3	13.04%
Careful Handling and Transportation Facility	2	8.70%
Total	23	

Furthermore, 17% of suppliers emphasized the importance of avoiding oversupply. This recommendation highlights the need for better planning and forecasting to match the supply of vegetables with market demand. By closely monitoring market trends, suppliers can make more informed decisions about the quantity of vegetables to produce or procure, minimizing the risk of excess supply and subsequent losses. Additionally, 13% of suppliers suggested grading the commodities before delivery. This involves categorizing vegetables based on their quality, size, and other attributes to ensure consistency and meet specific market requirements. By implementing a grading system, suppliers can effectively manage their product offerings and ensure that customers receive vegetables that meet their expectations, minimizing the chances of unsold or rejected produce.

Lastly, 9% of suppliers emphasized the importance of careful handling and transportation facilities. This recommendation highlights the need for gentle and careful handling of vegetables during loading, unloading, and transportation to minimize physical damage and bruising. Investing in suitable transportation equipment, such as vehicles with proper suspension systems, can contribute to maintaining the quality and appearance of vegetables throughout the supply chain.

## 15. Attributes of a Quality Product

Because they buy vegetables from farmers or middlemen to resell to their customers, vegetable merchants are also the consumers. Vegetable dealers have particular needs and tastes when it comes to the product they buy. Therefore, while purchasing vegetables, it is important to take into account a number of variables, including quality attributes, customer preferences, supplier relationships, margins, seasonal availability, supply

amount, transportation costs, vegetable condition, etc. It was discovered that the vendors prioritize their own list of needs when buying the vegetables. According to the vendors' perceptions, they were asked to rank the quality characteristics of vegetables in accordance with their needs, preferences, and numerous important criteria that they prioritize when choosing the vegetable providers.

The survey responses from wholesale suppliers indicate their perceptions of tangible and intangible quality attributes for vegetables. When considering tangible quality attributes, the highest importance was placed on product freshness, with a frequency of 96% among the responses. Color rightness was mentioned by 70% of the suppliers, while product ripeness and product uniformity had frequencies of 61% and 43%, respectively.

Regarding intangible quality attributes, a smaller proportion of suppliers mentioned the importance of environmentally friendly production techniques, which had a frequency of 17%. Brand reputation was mentioned by 13% of the respondents, and the image of the supplier had a frequency of 9%.

In summary, the surveyed wholesale suppliers highly emphasized tangible quality attributes such as product freshness, color rightness, product ripeness, and product uniformity. Meanwhile, the significance of intangible quality attributes, including environmentally friendly production techniques, brand reputation, and the supplier's image, was relatively lower based on the survey responses.

The survey conducted among wholesale vegetable suppliers in Kathmandu Valley aimed to discern the key criteria that guide their selection of vegetable suppliers. The findings revealed a distinct hierarchy of priorities within these criteria.

At the forefront of their considerations was "Margin," representing profitability, which consistently emerged as the top priority across all markets. It received the lowest average rank of 1.61, signifying its paramount importance in supplier selection. An overwhelming 52% of the respondents emphasized profitability as a crucial factor, highlighting its centrality in decision-making. Following closely in the second position was the "Distance of Supplier" criterion, with an average rank of 3.043. Approximately 26% of respondents recognized the significance of geographic proximity to suppliers, underscoring its role in shaping their choices. "Continuous Supply Capacity" held the third spot in importance, with an average ranking of 3.61. Approximately 30% of respondents emphasized the need for a reliable and consistent vegetable supply, reflecting its high value in the selection process.

In contrast, factors such as "Volume" and the "Production Environment" were considered of moderate importance, with average rankings of 4.04 and 4.48, respectively. They represented criteria that, while significant, did not overshadow the primacy of profitability and supplier proximity. "Quality of Packaging" was generally deemed important, securing the fifth position with an average ranking of 4.78, and approximately 17% of respondents highlighting its importance. Conversely, "Relation to Supplier" emerged as the least significant criterion in the decision-making process, with an average ranking of 6.43. This result indicated that personal relationships with suppliers were of relatively minor



concern to the wholesale vegetable suppliers surveyed.

In summary, these findings unveiled a clear hierarchy of priorities among wholesale vegetable suppliers in Kathmandu Valley. Profitability, supplier proximity,

supply reliability, and quality were the dominant factors guiding their selection of vegetable suppliers, while personal relationships held lesser weight in their decision-making process.

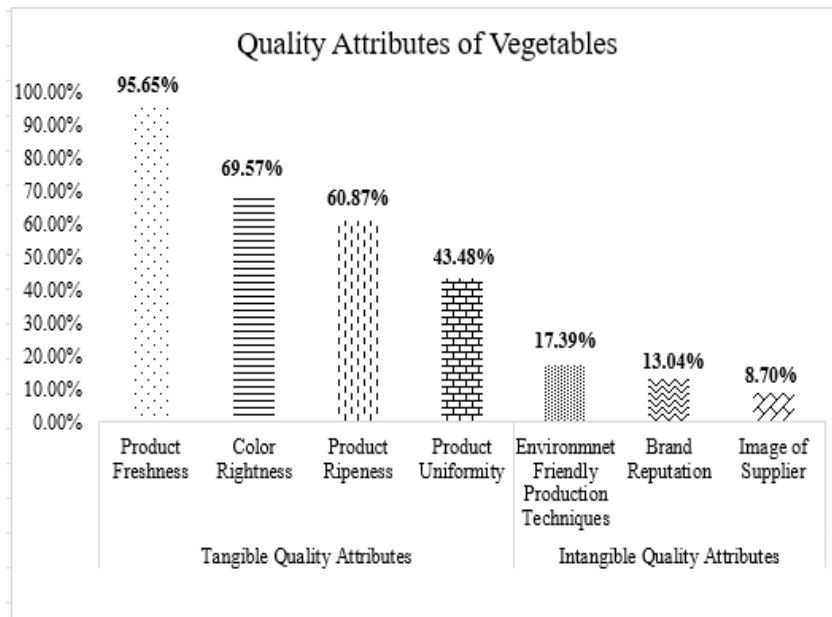


Figure 2. Tangible and Intangible Quality Attributes of Vegetables for SelectionCriteria for the selection of Vegetables from suppliers

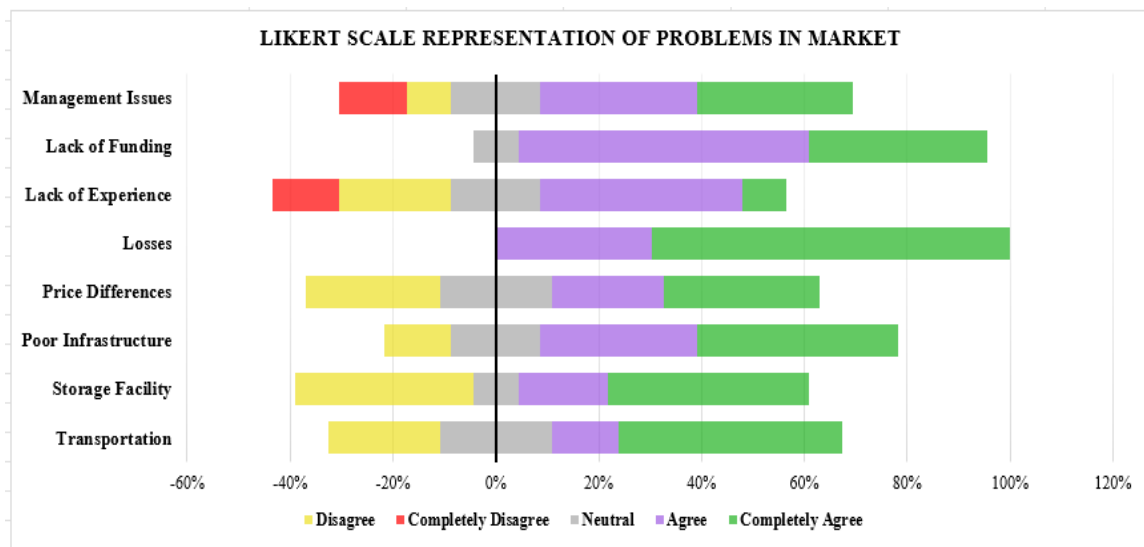


Figure 3. LIKERT Representation of Inherent Problems in Vegetable Marketsconclusion and recommendations

Table 10. Criteria for Selection of Vegetables from Farmers and SuppliersCriteria for selection of vegetable

	Margin	Distance of Supplier	Continuous Supply Capacity	Volume	Production Environment	Quality of Packaging	Relation to Supplier
Average rank	1.609	3.043	3.609	4.043	4.478	4.783	6.435
First Priority	52.17%	26.09%	4.35%	8.70%	0.00%	8.70%	0.00%
Second Priority	34.78%	21.74%	30.43%	4.35%	0.00%	8.70%	0.00%
Third Priority	13.04%	13.04%	26.09%	13.04 %	26.09%	8.70%	0.00%
Fourth Priority	0.00%	17.39%	8.70%	47.83 %	13.04%	13.04%	0.00%
Fifth Priority	0.00%	8.70%	13.04%	8.70%	52.17%	17.39%	0.00%
Sixth Priority	0.00%	8.70%	4.35%	8.70%	4.35%	17.39%	56.52%
Seventh Priority	0.00%	4.35%	13.04%	8.70%	4.35%	26.09%	43.48%



### Survey on inherent market problems

The survey outcomes shed light on the multifaceted challenges plaguing Kathmandu Valley's wholesale markets, providing a comprehensive understanding of the sector's concerns. Examining the Likert scale responses, we observe significant data points that underscore the gravity of these issues.

**Poor Infrastructure:** A substantial 39% of respondents agree, while an additional 30% completely agree that poor infrastructure poses a significant challenge within the wholesale markets. These percentages reflect a consensus among participants on the pressing need for infrastructure improvements to enhance market efficiency and reliability.

**Price Disparities:** Price disparities emerge as another major concern, with 30% agreeing and 22% completely agreeing that they are significant issues. These percentages emphasize the economic implications of price disparities, impacting both market stakeholders and consumers.

**Lack of Experience and Funding:** The survey data indicates that 39% agree and 9% completely agree that a lack of experience is a substantial challenge, while an even more significant 57% agree and 35% completely agree that a lack of funding hampers operations within these markets. These findings underscore the difficulties faced by smaller-scale farmers and traders and the importance of financial support and knowledge enhancement.

**Management Issues:** Management issues are recognized as problematic by 30% of respondents who agree, and an additional 30% completely agree. This highlights the imperative for improved governance and operational practices within these markets.

**Storage Facilities and Transportation:** While not unanimously agreed upon, the survey results indicate notable concerns about storage facilities (17% agree, 39% completely agree) and transportation (13% agree, 43% completely agree). These findings suggest areas that require enhancement to maintain the quality and timely delivery of vegetables.

**Losses:** One unanimous agreement arises regarding the issue of losses, with a striking 70% completely agreeing on its severity. This aligns with the challenges of managing perishable products and the imperative for improved handling and preservation methods.

In conclusion, the survey results, rich with percentage data, provide a holistic view of the challenges faced by wholesale markets in Kathmandu Valley. These data-supported findings underscore the multifaceted nature of these issues and the urgent need for comprehensive reforms, investments, and improved management practices. By addressing these challenges effectively, the wholesale market system can significantly enhance its efficiency, reliability, and sustainability, benefiting both producers and consumers in the region.

In conclusion, the comprehensive survey conducted among wholesale vegetable suppliers in Kathmandu Valley has unveiled a nuanced and multifaceted landscape within the vegetable supply chain. From understanding the various sources of vegetable procurement and diverse pricing mechanisms to identifying premium products and transportation challenges, this study provides a holistic view of the industry. The critical issue of post-harvest losses, particularly during transportation, calls for urgent attention and systemic improvements. The supplier recommendations

offer practical solutions for reducing losses and enhancing supply chain efficiency. Moreover, the clear hierarchy of criteria for supplier selection highlights the paramount importance of profitability, supplier proximity, and supply reliability. The inherent market problems, including infrastructure deficiencies, price disparities, and management issues, underscore the imperative for comprehensive reforms and investments in the wholesale markets. Ultimately, these findings serve as a compelling call to action for market stakeholders, policymakers, and participants to collaboratively address the challenges and seize the opportunities within the vegetable industry, working towards a more efficient, reliable, and sustainable future for producers and consumers alike in the Kathmandu Valley.

To forge a more robust and sustainable vegetable supply chain in Kathmandu Valley, a series of strategic recommendations emerged from the comprehensive survey of wholesale vegetable suppliers. Firstly, a substantial infusion of funds into infrastructure improvements within wholesale markets is paramount. This encompasses the modernization of storage facilities, sanitation standards, and loading/unloading areas to elevate product handling and preservation capabilities. Secondly, fostering price transparency through effective price reporting mechanisms becomes pivotal to mitigate price disparities and instill equitable pricing practices. Thirdly, proactive support measures, such as specialized training programs and financial aid initiatives, must be initiated to bolster small-scale farmers and traders grappling with experience and funding challenges.

Fourthly, elevating market management practices, encompassing operational streamlining and heightened governance, is pivotal in building stakeholder trust. Fifthly, crucial investments in cold storage and transportation infrastructure are imperative to curtail post-harvest losses, particularly during transit, ensuring the consistent delivery of premium-quality vegetables to markets. Sixthly, a collaborative approach to implementing loss-reduction strategies, including improved packaging and handling practices, should permeate the entire supply chain.

Seventhly, fostering the adoption of grading and standardization practices among suppliers is pivotal in ensuring uniform product quality and alignment with specific market demands. Eighthly, facilitating accessible and affordable credit and financing options for small-scale farmers and suppliers will help alleviate financial constraints and stimulate essential investments in infrastructure and technology. Ninthly, nurturing a culture of collaboration among diverse market stakeholders, encompassing farmers, traders, governmental bodies, and private sector entities, is indispensable for collective troubleshooting and the realization of sustainable solutions.

Lastly, establishing a robust system for continual monitoring and evaluation of market dynamics and interventions is of utmost importance. This will empower stakeholders to assess the efficacy of implemented measures and make necessary adaptations to address evolving challenges. Embracing these compelling recommendations, the vegetable supply chain in Kathmandu Valley can embark on a trajectory of heightened efficiency, reduced losses, equitable pricing practices, and heightened sustainability, ultimately enriching the livelihoods of producers and the satisfaction of consumers across the region. Top of Form.

Table 11. Survey Data for Major Vegetable Markets in Kathmandu Valley

S.N.	Market name	<sup>a</sup> Source of Vegetable	<sup>b</sup> Method of Price Fixation	<sup>c</sup> Post-harvest Losses	<sup>d</sup> Causes of post-harvest loss	<sup>e</sup> Suppliers' Recommendations for controlling losses	Premium vegetable by Trade Volume	Premium vegetable by Profit Margin	<sup>f</sup> Mode of Transportation	<sup>g</sup> Problems during Transportation	<sup>h</sup> Quality of Product
1	Surybinayak	B	E	A	B	C	Tomato, cauliflower, potato, onion	Tomato, potato, onion	A, B	A, B	A, B, C
2	Ichhumati tarkari bajar	E	E	B	C	A	Potato, onion, ginger, garlic	Off Season, Not fixed	A, B	A, B	A, B, D
3	Bauddha aadhunik tarkari pvt.Ltd	A	E	A	A	D	Okra, Tomato, pointed gourd	Off Season, Tomato	A, B	A, B	A, B, C
4	Chabahil Vegetable and Fruit Agriculture Market	A	E	A	A	B	Tomato, Potato, Onion, Okra	Tomato, Onion, Off Season	A	A, B, C	A, B
5	Tarkari tatha Falful Jilla Sangh	B	B	A	C	A	Potato, Ginger, Garlic, Tomato	Potato, Tomato	B, D	E	A, B, C
6	Kalimati Bajar, Balaju	A	E	A	A	B	Tomato, Potato, Onion, Okra	Tomato, Off Season, Onion	A, B	A, B	A, C, D
7	Gwarko Tarkari tatha falful bajar	C	D	A	B	E	Tomato, Onion, Potato	Tomato, Onion, Potato	A, B	A, B	A, B, G
8	Sangrila Agro Market	B	D	B	C	A	Cucumber, Ginger, Garlic, Okra	Off Season, Not fixed	D	E	A, B, C, F
9	Balkhu market	A	E	A	A	C	Tomato, Potato, Onion, Okra	Tomato, Potato, Onion, Off Season	A, B	A, C	A, C, D
10	Kalimati Bajar	A	E	A	A	C	Potato, onion, ginger, garlic	Potato, onion, Off Season	A, B	A, C	A, C, D
11	Ghattakulo Vegetable Market	C	C	B	B	B	Okra, Potato, Tomato	Off Season, Potato, Tomato	A, B	C, D	A, B, E
12	RB Fruits and Vegetable Suppliers	D	E	B	B	A	Tomato, Onion, Potato	Tomato, Potato	A	A, B	C, D, E, F
13	Vegetable & Fruits Market, Pepsicola	E	E	B	A	B	Tomato, Onion, Potato	Tomato, Onion, Potato	A, C	A, B	A, B, D
14	Farmers' Mart, Handigaun	B	D	C	C	A	Okra, Potato, Tomato	Off Season, Potato, Tomato	A	D	A, C, E
15	Vegetable & Fruits Market, Rudramati	A	E	A	A	A	Potato, Okra, ginger, garlic	Potato, Off Season	A, C	A, B	A, B, C
16	Sailung Mahabharat Krishi Bazar	E	A	A	B	D	Tomato, Onion, Potato	Tomato, Off Season	A	C, D	A, B, D
17	Dhumbarahi Vegetable Market	A	D	B	A	B	Potato, Okra	Potato, Off Season	A, B	A, B	A, B, C
18	Organic Farmers' Market	C	B	C	C	A	Tomato, garlic, ginger	Tomato, Not fixed	D, C	E	A, B, E, F
19	Tinkune Vegetable Market	E	E	B	A	B	Tomato, Onion, Potato	Tomato, Potato, Not fixed	A, C	A, B	A, B, C
20	Lagankhel Vegetable Market	A	E	A	C	D	Onion, Potato, Tomato	Onion, Potato, Tomato	A, B	A, B	A, B, G
21	Manahara Wholesale Tarkari Bazar	A	C	B	A	E	Tomato, Onion, Potato	Tomato, Not fixed	A, C	A, B	A, B, D
22	Kalanki Fruit and Vegetable Market	C	E	A	C	A	Tomato, Onion, Potato	Tomato, Onion, Potato	A, B	A, B	A, C, D
23	Fresh Ktm Naikap Distribution Centre	B	C	C	A	C	Tomato, Onion, Potato	Tomato, Not fixed	A, C	A, B, C	A, C, D

<sup>a</sup>Source of Vegetable: (A. Middlemen/brokers, B. Directly from small-scale/holder farmers, C. Directly from medium scale/holder farmers, D. Imports, and E. All of them)

<sup>b</sup>Method of Price Fixation: (A. Auction, B. Farmers' bargain, C. Suppliers' bargain, D. Collective bargain, and E. Demand & Supply)

<sup>c</sup>Post-harvest Losses: (A. Inappropriate packaging & poor handling, B. Lack of cold storage facility, and C. Poor quality of produce)

<sup>d</sup>Causes of post-harvest loss: (A. Rotting, B. Mechanical damage and, C. Physiological losses)

<sup>e</sup>Suppliers' Recommendations for controlling losses: (A. Good packaging, B. Storage facility, C. Avoidance of oversupply, D. Grading before delivery, and E. Careful handling and Transportation facility)

<sup>f</sup>Mode of Transportation: (A. Pickup Jeep, B. Delivered by Farmers, C. Pickup by wholesaler and, D. Porter

<sup>g</sup>Problems during Transportation: (A. Decaying/wastage, B. Late arrival, C. Vehicle shortage/high fare, D. Vehicle breakdown/parking, E. No problem)

<sup>h</sup>Quality of Product: (A. Product Freshness, B. Color Rightness, C. Product ripeness, D. Product uniformity, E. Environment friendly production techniques, F. Brand reputation, and G. Image of supplier

**Table 12. Rank Survey Data of Criteria for Selection of Vegetable from Suppliers by Wholesalers (Rank 1 to 7)**

S.N.	Market name	Margin	Continuous Supply Capacity	Volume	Production Environment	Distance of Supplier	Quality of Packaging	Relation to Supplier
1	Surybinayak	1	2	4	3	5	7	6
2	Ichhumati tarkari bajar	1	3	4	5	2	6	7
3	Bauddha aadhunik tarkari pvt.Ltd	1	2	4	3	7	5	6
4	Chabahil Vegetable and Fruit Agriculture Market	2	1	5	4	3	7	6
5	Tarkari tatha Falful Jilla Sangh	3	7	1	5	2	4	6
6	Kalimati Bajar, Balaju	1	3	4	5	6	2	7
7	Gwarko Tarkari tatha falful bajar	2	4	3	5	1	7	6
8	Sangrila Agro Market	1	2	5	3	4	6	7
9	Balkhu market	2	3	4	5	1	7	6
10	Kalimati Bajar	2	5	4	3	1	6	7
11	Ghattekulo Vegetable Market	1	2	3	5	4	7	6
12	RB Fruits and Vegetable Suppliers	3	7	1	5	2	4	6
13	Vegetable & Fruits Market, Pepsicola	1	3	2	5	4	7	6
14	Farmers' Mart, Handigaun	1	4	6	3	2	5	7
15	Vegetable & Fruits Market, Rudramati	3	2	7	5	1	4	6
16	Sailung Mahabharat Krishi Bazar	1	2	7	3	4	5	6
17	Dhumbarahi Vegetable Market	2	5	4	6	1	3	7
18	Organic Farmers' Market	1	3	4	5	6	2	7
19	Tinkune Vegetable Market	2	6	4	5	3	1	7
20	Lagankhel Vegetable Market	2	7	3	4	5	1	6
21	Manahara Wholesale Tarkari Bazar	1	2	4	7	3	5	6
22	Kalanki Fruit and Vegetable Market	1	3	4	5	2	6	7
23	Fresh Ktm Naikap Distribution Centre	2	5	6	4	1	3	7

**Table 13. Likert Scale Survey Data for Inherent Market Problems in Vegetable Markets in Kathmandu Valley**

S.N.	Vegetable Market	Transportation	Storage Facility	Poor Infrastructure	Price Differences	Losses	Lack of Experience	Lack of Funding	Management Issues
1	Surybinayak	Agree	Disagree	Completely agree	Completely agree	Completely agree	Agree	Agree	Agree
2	Ichhumati tarkari bajar	Completely agree	Completely agree	Completely agree	Completely agree	Completely agree	Agree	Agree	Completely agree
3	Bauddha aadhunik tarkari pvt.Ltd	Completely agree	Agree	Agree	Completely agree	Completely agree	Completely agree	Completely agree	Completely agree
4	Chabahil Vegetable and Fruit Agriculture Market	Disagree	Disagree	Disagree	Disagree	Agree	Agree	Completely agree	Completely agree
5	Tarkari tatha Falful Jilla Sangh	Completely agree	Completely agree	Completely agree	Neutral	Completely agree	Disagree	Completely agree	Completely agree
6	Kalimati Bajar, Balaju	Disagree	Disagree	Completely agree	Agree	Completely agree	Disagree	Agree	Completely Disagree
7	Gwarko Tarkari tatha falful bajar	Disagree	Agree	Disagree	Disagree	Agree	Disagree	Completely agree	Agree
8	Sangrila Agro Market	Completely agree	Neutral	Agree	Disagree	Completely agree	Completely Disagree	Agree	Agree
9	Balkhu market	Neutral	Completely agree	Neutral	Neutral	Agree	Neutral	Neutral	Neutral
10	Kalimati Bajar	Completely agree	Agree	Agree	Agree	Completely agree	Agree	Completely agree	Disagree

11	Ghattekulo Vegetable Market	Neutral	Completely agree	Neutral	Neutral	Agree	Neutral	Agree	Neutral
12	RB Fruits and Vegetable Suppliers	Completely agree	Completely agree	Agree	Disagree	Completely agree	Completely Disagree	Agree	Agree
13	Vegetable & Fruits Market, Pepsicola Farmers' Mart, Handigaun	Disagree	Disagree	Disagree	Disagree	Agree	Agree	Completely agree	Completely agree
14	Vegetable & Fruits Market, Rudramati	Agree	Disagree	Completely agree	Completely agree	Completely agree	Agree	Agree	Agree
15	Sailung Mahabharat	Completely agree	Completely agree	Agree	Disagree	Completely agree	Completely Disagree	Agree	Agree
16	Krishi Bazar Dhumbarahi	Disagree	Disagree	Completely agree	Agree	Completely agree	Disagree	Agree	Completely Disagree
17	Vegetable Market Organic Farmers' Market Tinkune	Completely agree	Completely agree	Completely agree	Completely agree	Completely agree	Agree	Agree	Completely agree
18	Vegetable Market Lagankhel	Completely agree	Neutral	Agree	Completely agree	Completely agree	Completely agree	Completely agree	Completely agree
19	Vegetable Market Manahara	Neutral	Completely agree	Neutral	Neutral	Agree	Neutral	Agree	Neutral
20	Wholesale Tarkari Bazar Kalanki	Agree	Disagree	Completely agree	Completely agree	Completely agree	Agree	Agree	Agree
21	Wholesale Tarkari Bazar Kalanki Fruit and Vegetable Market	Neutral	Disagree	Completely agree	Agree	Completely agree	Disagree	Neutral	Completely Disagree
22	Fresh Ktm Naikap Distribution Centre	Neutral	Completely agree	Neutral	Neutral	Agree	Neutral	Agree	Neutral
23		Completely agree	Agree	Agree	Agree	Completely agree	Agree	Completely agree	Disagree

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