

**Status of Agribusiness Opportunities for Optimizing Vegetable Value  
Chain Development in Dhankuta, Nepal**

**A DISSERTATION**

Submitted to the Central Department of Rural Development

Tribhuvan University, Kirtipur, Nepal

For the Partial Fulfilment of the Requirements of the Degree of

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by

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### **Declaration**

“Status of Agribusiness Opportunities for Optimizing Vegetable Value Chain Development in Dhankuta, Nepal” is my dissertation, and I, Ramesh Bhandari, a Master of Philosophy in Rural Development student at the Central Department of Rural Development, Faculty of Humanities and Social Sciences, Tribhuvan University, Nepal, certify that it is entirely original research that hasn't been submitted, published, or printed anywhere in Nepal or overseas. Furthermore, this dissertation will only be used to get the degree mentioned above. I am fully aware that the institution has the authority to cancel my MPhil degree if it turns out that my statement was inaccurate at any point, including after the degree has been awarded.

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### **Recommendation Letter**

For the partial fulfilment of the requirement for requirement of the degree in Master of Philosophy in Rural Development, a dissertation on the “Status of Agribusiness Opportunities for Optimizing Vegetable Value Chain Development in Dhankuta, Nepal” was conducted by Mr. Ramesh Bhandari under my supervision. I am fully satisfied with his work, and I recommend him for evaluation and acceptance.

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### **Approval Letter**

This study submitted by Mr. Ramesh Bhandari is entitled Analysis of “Status of Agribusiness Opportunities for Optimizing Vegetable Value Chain Development in Dhankuta, Nepal ” and has been accepted and approved as partial fulfilment of the requirement for the degree in Master of Philosophy in Rural Development by the research committee comprising of:

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## **Plagiarism Report**

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## **Abstract**

Agriculture is a vital sector in Nepal, making a significant contribution to employment and food security. Among various agricultural products, vegetable farming plays a vital role in the rural economy, particularly in the Dhankuta Municipality and Chhathar Jorpati Rural Municipality of Koshi Province. However, inefficiencies in the vegetable value chain hinder its full potential, limiting farmers' access to markets, profitability, and sustainability. Addressing these inefficiencies is crucial for enhancing agribusiness opportunities and improving rural livelihoods.

Despite the importance of vegetable farming, there is a lack of comprehensive research on optimizing the vegetable value chain in the studied regions. Existing studies have not fully addressed the challenges faced by farmers, such as limited infrastructure, inadequate financial access, and market uncertainties. This study fills the research gap by analyzing key constraints and opportunities within the vegetable value chain and proposing targeted interventions to enhance agribusiness development.

The study reveals that while vegetable farming in Dhankuta and Chhathar Jorpati has significant economic potential, value chain inefficiencies-including weak market linkages, poor post-harvest handling, and limited financing pose substantial barriers. Enhancing agribusiness opportunities requires strengthening infrastructure, facilitating credit access, and promoting market system integration.

A mixed-methods approach was employed, incorporating primary surveys of Small and Medium Enterprises (SMEs), farmers, and value chain actors. The results highlight the role of SMEs in employment generation and income growth while also identifying critical constraints such as a lack of storage facilities, entrepreneurial skills, and export market competitiveness. Financial barriers, limited certification, and high transportation costs further restrict agribusiness expansion.

Optimizing the vegetable value chain can significantly boost rural economies, improve farmers' incomes, and enhance Nepal's agricultural competitiveness. This study provides policy recommendations, including the establishment of digital market platforms, cooperative-led aggregation centers, and public-private partnerships to strengthen the value chain. The findings contribute to national agricultural policies and the Sustainable Development Goals (SDGs), particularly in promoting food security, economic growth, and sustainable production.

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### **List of Abbreviations and Acronyms**

|        |                                                              |
|--------|--------------------------------------------------------------|
| A2F    | Access to Finance                                            |
| ADB    | Asian Development Bank                                       |
| AI     | Artificial Intelligence                                      |
| APP    | Agribusiness Promotion Policy                                |
| AVC    | Agricultural Value Chain                                     |
| AVC    | Agriculture Value Chain                                      |
| BCR    | Benefit Cost Ratio                                           |
| CBS    | Central Bureau of Statistics                                 |
| DMP    | Dhankuta Municipality Profile                                |
| DMP    | District Municipality Profile                                |
| EM     | Entrepreneurial Marketing                                    |
| FDI    | Foreign Direct Investment                                    |
| GDP    | Gross Domestic Product                                       |
| GVC    | Global Value Chain                                           |
| ICIMOD | The International Centre for Integrated Mountain Development |
| ILO    | International Labour Organisation                            |
| KG     | Kilo Gram                                                    |
| KII    | Key Informant Interview                                      |
| KOB    | Kitagawa Oaxaca Blinder                                      |
| LVC    | Local Value Chain                                            |
| MoALD  | Ministry of Agriculture and Livestock Development            |
| MoF    | Ministry of Finance                                          |
| MS     | Micro-Soft                                                   |
| MSD    | Market System Development                                    |

|        |                                                        |
|--------|--------------------------------------------------------|
| MT     | Metric Tones                                           |
| NPR    | Nepali Rupees                                          |
| NRB    | Nepal Rasta Bank                                       |
| PMAMP  | Prime Minister Agriculture Modernization Project       |
| QUAN   | Qualitative Analysis                                   |
| SAWTEE | South Asia Watch and Trade Economics Environment       |
| SLR    | Systematic Literature Review                           |
| SME    | Small and Medium Enterprise                            |
| SPSS   | Statistical Package for the Social Science             |
| SWOT   | Strengths, Weaknesses, Opportunities, and Threats      |
| TCE    | Transaction Cost Economics                             |
| TE     | Trade Economics                                        |
| USAID  | The United States Agency for International Development |
| USD    | United States Dollar                                   |
| VCD    | Value Chain Development                                |

## **Chapter I**

### **Introduction**

#### **Background**

In order to guarantee the effective production, processing, and distribution of agricultural products, agribusiness refers to the fusion of corporate operations with agricultural production. It includes the supply of inputs, production, processing, marketing, and retailing, among other elements of the value chain. The idea emphasizes how agriculture has evolved into a market-driven, business-oriented industry (Davis & Goldberg, 1957). Since then, the term's meaning has been broader as the agribusiness sector involves businesses of all sizes and multiple value chains from production to distribution, marketing, and consumption, plus other components. According to Van Fleet (2016, p.4-5) all businesses, big and small, profit-driven and eleemosynary, that produce, distribute, market, or use food, fibre, forest products, or biofuel including those that provide water to and remove waste from those businesses are included in the economy's agribusiness sector. In order to solve food security, economic growth, and rural development, agribusiness has emerged as a critical industry. Agribusiness has historically arisen as a result of the industrialization of agriculture in developed nations (Barrett et al., 2006). Agribusiness development is seen in developing nations as a means of modernizing agriculture and generating employment, especially for women and young people living in rural areas (Reardon & Timmer, 2001). According to agricultural entrepreneurship theories, value chain development depends on innovation, market creation, and risk management (Sinyolo, 2020).

Porter's Value Chain model and network theories are frequently used by theoretical frameworks to investigate the structural and dynamic elements affecting

agricultural chains. Empirical assessments show that effective resource allocation, robust governance, and stakeholder cooperation are necessary for successful chains. Research has demonstrated, for example, that investments in cold storage and farmer capacity building considerably lower post-harvest losses, increasing incomes along the supply chain (UNIDO, 2020; USAID, 2021). According to empirical findings, value chain development is also influenced by context-specific elements, such as regional consumer preferences and market conditions, necessitating customized strategies to optimize efficacy (UNIDO, 2020).

This idea developed into "Agribusiness" which is based on two components: Originally viewed as a separate industry, agriculture is now a component of a specialized, interdependent system of agents that work in related businesses. Goldberg's second pertinent point is that, as a percentage of the overall value of production, farm-level value contributed tends to decrease over time, with significant strategic ramifications. (Zylberszation, 2016).

Enhancing agricultural production, processing, and marketing systems to increase productivity, competitiveness, and sustainability is known as agribusiness development. Technological developments like digital platforms and mechanization, infrastructural investments (such cold chains and logistics), and the inclusion of smallholder farmers in global value chains are important factors (USAID, 2020). However, The theoretical structure is The ideas of agribusiness and filière arise from the incorporation of agriculture into industrial systems. An interdisciplinary field of research is organized gradually. However, new factors start to emerge: technical advancements and socio-environmental concerns change the dynamics of this field of study. To comprehend this dynamic, a thorough understanding of agribusiness must be organized (Muhl, et al., 2024).

Agribusiness plays a critical role in the economic development of countries like Nepal, where a significant portion of the population depends on agriculture for their livelihood. Nepal has enormous agribusiness potential (Regmi & Naharki, 2020) because Nepal is an agrarian nation where the agricultural sector contributes one-third of the country's gross domestic product (GDP). Carayannis et al. (2018) view that agribusiness has bigger role in fostering agricultural innovation. Increased upstream and downstream investments, a frenzied pace of merger and acquisition activity, and major changes in how the public and private sectors interact as a result of the creation of new prospects generate economic opportunities for all market parties.

As a subset of the broader agricultural sector, agribusiness involves the commercial activities associated with the production, processing, and distribution of agricultural products. In recent years, there has been increasing recognition of the importance of optimizing agricultural value chains to enhance the efficiency and profitability of agribusinesses, particularly in the vegetable sector. A well-developed value chain not only adds value to raw agricultural products but also ensures that benefits are distributed across all actors involved, from farmers to consumers. Value chains aim to connect regional producers in underdeveloped nations with global markets (Fleury & Fleury, 2009). The producer of raw materials and the ultimate consumer are connected by them. Similar to this, value chain management is a method for integrating the resources and elements of the value chain during business development analysis and planning (Keshelashvili, 2018).

Vegetable farming is a very important component of Nepal's agricultural sector, contributing significantly to food security, nutrition, and income generation for rural households. In the Koshi province of the eastern region of Nepal, Dhankuta Municipality and Chhathar Jorpati Rural Municipality are major areas known for their

vegetable production. The favourable climatic conditions and fertile soil in these areas make them ideal for cultivating a variety of vegetables, which are consumed both locally and exported to other regions. However, despite the potential, the vegetable value chain in these areas faces several challenges that hinder its full development.

These inefficiencies are expressed in various forms, such as poor access to markets, inadequate infrastructure, limited access to finance, and the absence of advanced agricultural technologies. As a result, the value addition process remains underdeveloped, with farmers and SMEs often unable to obtain fair prices for their produce or access profitable markets (Ghimire and Kattel, 2024). In this condition, the existing vegetable value chains in Dhankuta and Chhathar Jorpati are characterised by inefficiencies that limit the ability of local farmers and small and medium-sized enterprise (SMEs) to fully take advantage of agribusiness opportunities.

Vegetable crops farming occupies a significant space in the agriculture farming of Nepal. According to MoAld (2022), vegetables crops were planted on 1000 hectares for a total of 2 lakh 84 in the fiscal year 2020–2021. The annual production of vegetables is 39 lakh 93 thousand metric tons. The productivity of the generated vegetables is 14.05 metric tons per hectare. Compared to the prior year, production has climbed by 0.78 percent. The percentage of food crops has dominated crop production in agriculture. For the current fiscal year, food crops are anticipated to produce 44.9 percent of all agricultural crop output, followed by vegetables 17.2 percent, cash crops 14.7 percent, industrial crops 13.7 percent, and other crops 9.4 percent. Additionally, vegetable production is anticipated to have increased by 5.9 percent to 4.196 million metric tons in fiscal year 2020/21 compared to fiscal year 2019/20. Such production fell by 7.2 percent in the 2019–20 fiscal year (MoF, 2021).

SMEs are key to the agribusiness ecosystem, serving as intermediaries that connect small-scale farmers to larger markets, provide essential services such as processing and packaging, and create employment opportunities. However, these SMEs often face significant challenges, including limited financial resources, lack of technical expertise, and difficulties in scaling their operations (Bhandari, 2021). The ability of these SMEs to thrive and drive value chain optimization is further constrained by the lack of coordination and collaboration among various stakeholders, including government agencies, private sector actors, and farmer groups.

Given the importance of vegetable farming to the local economy and the critical role of SMEs in the value chain, there is pressing need to explore strategies for enhancing agribusiness opportunities in Dhankuta Municipality and Chhathar Jorpati Rural Municipality. By optimizing the vegetable value chain, it is possible to improve the economic outcomes for all stakeholders involved, from farmers to consumers. This research seeks to address the gaps in the current understanding of how value chains function in these areas and to develop actionable recommendations for enhancing the efficiency and profitability of vegetable agribusiness.

### **Statement of the Problem**

Theories on the value chain and empirical literature have pointed out a number of factors in the agriculture value chain. Trienekens (2011), for example, provides a structured framework for analyzing agricultural value chains by highlighting three key elements. First, it identifies obstacles to value chain upgrading, such as institutional gaps, resource shortages, and infrastructure issue. Second, it specifies components of value chains, including governance mechanisms, horizontal and vertical networks, and value addition. Finally, it outlines upgrading options like market research, network structure, and governance forms, drawing on literature related to developing

country value chains and inter-company connections. Globally, modern agribusiness value chains enhance market access, income, and employment through advanced infrastructure and technology. However, Nepal's agribusiness sector, particularly SMEs and smallholder farmers, faces significant challenges. These include poor export performance, limited financing options, and inadequate market linkages, resulting in farmers struggling to receive fair prices for their produce (Kharel & Dahal, 2020; NRB, 2019).

There are different ways to enhance agriculture sector of Nepal (ILO, 2019). Agribusiness significantly contributes to global economic growth, but Nepal's sector lags due to limited technological adoption, outdated farming practices, and logistical challenges. Inefficiencies from production to distribution reduce profitability and competitiveness. Additionally, high operating costs, limited financing, and inadequate infrastructure hinder youth investment and the overall potential of the vegetable agribusiness sector (Gyawali & Khanal, 2021; Musi et al., 2018). Tackling these constraints through strategic interventions and policy recommendations is essential for sustainable growth. Nepal's agribusiness sector is crucial for economic growth but faces challenges like inefficient production, poor distribution, limited technology use, and market access issues. These hinder the full potential of vegetable value chains, disproportionately affecting SMEs. SMEs are crucial in creating employment (Khatri, et al. 2020). Comprehensive identification and addressing of these challenges are necessary for increasing agribusiness opportunities and sustainable development of vegetable value chains (Regmi & Naharki, 2020).

The key economic activities oriented towards the production of commercial farming has the potential of improving farmers' financial circumstances (Rai et al., 2019). Market access and surrounding area gardening has grown to constitute a

significant component of agriculture. Describing profit efficiency in the vegetable sector, especially in developing nations, vegetable farming is a crucial sub-sector for raising revenue, reducing poverty, and enhancing nutrition (Shrestha et al., 2022). Vegetable farming is a critical component of the agricultural sector in Dhankuta Municipality and Chhathar Jorpati Rural Municipality, contributing significantly to the livelihoods of local farmers and the regional economy. However, the vegetable value chain in these areas faces several challenges, including inadequate infrastructure, limited access to modern farming techniques, insufficient financial resources, and poor market connectivity. These issues hinder the potential for agribusiness opportunities and economic growth of the region.

In spite of the importance of vegetable farming, there is lack of comprehensive research on optimizing the vegetable value chain in these specific regions. Existing studies have not fully addressed the multifaceted challenges faced by farmers or explored the potential for value chain improvements to enhance agribusiness opportunities. This gap in research necessitates a thorough investigation to identify effective strategies for optimizing the vegetable value chain, which could lead to increased productivity, better market access, and improved livelihoods for farmers.

The study is particularly timely given the growing demand for fresh vegetables in both domestic and international markets. As Nepal continues to urbanize and as consumer preferences shift towards more nutritious diets, there is significant potential for SMEs in Dhankuta and Chhathar Jorpati to expand their operations and access new markets. However, achieving this potential requires a thorough understanding of existing challenges and opportunities within the vegetable value chain, as well as the development of targeted interventions to support the growth and sustainability of agribusinesses in these areas.

## **Research Questions**

This study is directed towards finding answer to the following questions.

- i. What is the current state of vegetable production in Nepal, particularly in Dhankuta District?
- ii. How does the vegetable value chain operate in the study area, and what is its economic significance?
- iii. Why do specific market system constraints and agribusiness opportunities exist within the vegetable value chain in the study area?

## **Objectives of the Study**

To assess the development and functionality of the vegetable value chain in agribusiness in Nepal, with a specific focus on Dhankuta District, by identifying production trends, value chain actors, key constraints, and agribusiness opportunities to recommend strategies for enhancing its efficiency, sustainability, and economic impact.

### **Specific Objectives**

- iv. To examine the current state of vegetable production in Nepal, with a particular focus on Dhankuta District.
- v. To analyze the structure, functions, and economic roles of the vegetable value chain in study area.
- vi. To identify and evaluate the key market system constraints and agribusiness opportunities within the vegetable value chain in the study area.

## **Rationale/Significance of the Study**

Dhankuta District and Chhathar Jorpati Rural Municipality of Dhankuta are a famous vegetable hub in the hilly region of Koshi province of Nepal. They particularly play a vital role in the country's vegetable in general and Koshi province

in particular. The region's favorable climate and fertile soil make it an ideal location for vegetable farming, which is a major source of income and employment for the local population. In spite of its potential, the vegetable value chain in Dhankuta Municipality and Chhathar Jorpati Rural Municipality faces numerous challenges, including inefficiencies in production practices, limited market access, inadequate infrastructure, significant post-harvest losses, and restricted access to credit and modern technologies.

Vegetable farming is a critical source of livelihood for many households in Dhankuta Municipality and Chhathar Jorpati Rural Municipality, and optimizing the value chain can significantly enhance their food security and economic stability. By focusing on agribusiness opportunities, this study identifies and addresses the bottlenecks within the vegetable value chain, promoting more efficient practices, better market linkages, and improved financial services for farmers and agribusiness entrepreneurs.

This research is particularly timely and relevant as it aligns with Nepal's national agricultural policies and development plans, which prioritize sustainable agricultural development and economic growth. Additionally, it supports international frameworks such as the Sustainable Development Goals (SDGs), specifically those related to zero hunger, decent work and economic growth, and responsible consumption and production. SDG goal 2 "Zero hunger" (UN,2020) aims to end hunger, achieve food security and improved nutrition, and promote sustainable agriculture". Similarly, SDG goal 12 "Responsible Consumption and Production" (UN,2020) aims to ensure sustainable consumption and production patterns. These two SDGs are closely linked, as responsible consumption and production can help to reduce hunger and food insecurity. For example, reducing food waste can help to

ensure that more food is available for those who need it, and sustainable agriculture practices can help to increase food production while reducing the environmental impact of agriculture.

The study focuses on the challenges faced by small and medium enterprises (SMEs) agribusiness, providing insights that can guide these enterprises to overcome barriers and participate more actively in the vegetable value chain. Agribusiness related SMEs face challenges like limited access to credit, limited market reach, price fluctuations, inadequate infrastructure, bureaucratic regulatory environment and high compliance cost, among others. This study has endeavored to dig out the difficulties collecting information from the stakeholders of the SMEs.

Given the limited existing literature on the specific challenges and opportunities within the vegetable value chain in Dhankuta Municipality and Chhathar Jorpati Rural Municipality, this study seeks to fill this gap by providing comprehensive insights and practical recommendations. The findings of this study benefit policymakers, farmers, agribusiness entrepreneurs, and other stakeholders, contributing to the overall enhancement of agribusiness opportunities and the optimization of the vegetable value chain in the region.

This study contributes to the body of knowledge on vegetable value chains by offering an in-depth , context-sensitive analysis that bridges gaps in the existing literature. This helps enrich the understanding of the sustainable development of the agricultural sector of Dhankuta Municipality and Chhathar Jorpati Rural Municipality by addressing critical issues within the vegetable value chain and promoting agribusiness opportunities that lead to improved economic outcomes and livelihoods for local communities. Providing a localized study on the agribusiness vegetable value chain is one of the contributions of this study.

## **Delimitations of the Study**

Every research has limitations and delimitations which require mentioning as they address different aspects of the research process and contribute to the study's transparency, rigor, and credibility. Following Price and Murnan (2004), "A limitation of a study design or instrument is the systematic bias that the researcher did not or could not control and which could inappropriately affect the result. In contrast, a delimitation is a systematic bias intentionally introduced into the study design or instrument by the researcher." (p.p.66).

This study on enhancing agribusiness opportunities for optimizing the vegetable value chain development in Dhankuta Municipality and Chhathar Jorpati Rural Municipality of Dhankuta have limitations and delimitations as well. Here the major delimitations of the study are introduced whilst some of the major limitations are mentioned in the last chapter, "Summary and Conclusions" of the study.

As regards to the, firstly it focuses on agricultural small and medium enterprises (SMEs) in the hill areas, Dhankuta and Chhathar Jorpati, specifically in the vegetable sectors. It involves identifying the specific aspects of the agribusiness value chain development that has examined and determining what included and excluded from the study.

The study area is the hill regions of Nepal. The specific areas selected for study are Dhankuta Municipality and Chhathar Jorpati Rural Municipality of Dhankuta District of Koshi Province of Nepal. These areas are selected based on factors such as the concentration of agribusiness vegetable SMEs, the significance of the vegetable sectors, and accessibility for data collection.

The study's primary focus is on small and medium-sized enterprises (SMEs) in the agribusiness sector it may overlook insights from larger enterprises, potentially

limiting the comprehensiveness of the findings. The SMEs involved in vegetable sectors are selected based on criteria such as size, production capacity, market presence, and willingness to participate in the study. This delimitation ensures that the research delves into the specific challenges and opportunities faced by these SMEs.

The study employs a combination of qualitative and quantitative research methods. Qualitative methods like interviews and observations provide insights into the specific challenges faced by the selected agribusiness SMEs, while quantitative data analysis helps identify trends, patterns, and potential opportunities within the value chain.

By delimiting the study based on these factors, the research concentrates its efforts on the selected SMEs in the Hill region of Nepal, specifically within the vegetable sectors. This targeted approach allows for a deeper understanding of the challenges and opportunities in agribusiness value chain development within this context

### **Organization of the Study**

The research study is organised into five chapters. The first chapter is the introduction chapter, which includes background, problem statement, research questions, objectives, significance, and limitations of the study.

The second chapter examines relevant theoretical and empirical literature reviews relating to value chain development and agribusiness. This chapter also articulates the research gap in detail.

The third chapter details the research methodology of the study. It contains conceptual framework, philosophical stance of the study (ontology, epistemology, and axiology), research design, data collection strategies, sample selection, tools of data collection, secondary data sources, and method of data analysis.

Chapter four is about data analysis, interpretation and discussion. This chapter focuses on the analysis vegetable production trend in Nepal, Koshi province, and Dhankuta District, in depth analysis of vegetable value chain in the study-focussed area. It analyzes the ways that small and medium-sized (SMEs) agriculture firms participate in the value chain under consideration. A detailed analysis of several possible constraints in the vegetable value chain is presented in this chapter.

A summary of the findings, conclusion, and recommendations is included in chapter five. It highlights how the interrelated numerous elements affect the value chain's efficacy and efficiency. The study reinforces the significance of comprehensive interventions that address the larger ecosystem of infrastructure, technology, market access, and financial services in addition to individual stages of the value chain. A multifaceted strategy comprising cooperation between government agencies, players in the private sector, and development organizations is needed to realize the unrealized potential of Nepal's agriculture industry.

## **Chapter- II**

### **Literature review**

This chapter presents an overview of different theories related to value chain with their possible application in vegetable value chain. Then, it provides the review of previous studies on value chain outside and within Nepal's context. Finally, it communicates the research gap.

#### **Theoretical Review on Value Chain**

This section presents brief introduction of Theories and Frameworks related to value chains, and applicable particularly in agricultural and vegetable production to provide a solid theoretical foundation for this research. Here are several theories and models that are particularly relevant.

##### ***Porter's Value Chain Model***

Developed by Porter (1985), the value chain model outlines the primary and support activities that create value in a business. He introduced and elaborated the concept of the value chain, providing a detailed framework for analyzing the activities within and around a company that create value and competitive advantage.

For vegetable production, Porter's model can help identify the key activities that add value to the product from farm to market. This model is applicable to analyze the different stages of the vegetable value chain (inbound logistics like receiving, storing and distributing the inputs needed for vegetable cultivation, outbound logistics that encompasses the processes and activities that move the harvested vegetables from the farm to the end consumers or the market) and identify opportunities for optimization.

### ***Global Value Chain (GVC) Theory***

The global value chain (GVC) theory proposed by Gereffi, Humphery and Sturgeon (2005) and Gereffi and Fernandez-Stark (2016) focusses on the international aspects of value chains and the roles different countries play in global production networks. It examines how value chain is added at each stage of production process globally. The GVC theory provides insights into the role of governance structures, power dynamics, and coordination mechanisms in agribusiness value chains. It highlights the importance of understanding the position of actors within the chain and the implications for upgrading and innovation (Horner, 2020).

The theory is useful in this study of vegetable value chain for looking at how local vegetable production integrates with global markets and how international standards and practices influence local value chains.

### ***Supply Chain Management (SCM) Theory***

The supply chain management (SCM) theory (Mentzer et al., 2001) focuses on the efficient management of the flow of goods from producers to consumers, including procurement, production, distribution, and logistics. Proponents of the SCM theory in their paper provide a thorough definition and conceptual framework for understanding supply chain management. They discuss various aspects and components of SCM.

This theory can be applied to analyze how the supply chain in vegetable production can be streamlined to reduce costs, improve quality, and increase efficiency.

### **Empirical Review**

An empirical literature review involves a comprehensive and systematic examination of existing research studies and scholarly articles that have employed

empirical methods to investigate a particular research question or topic. The review of empirical literature provides a synthesis of current research findings, evaluate the methodological quality of the studies, and contribute to the understanding of the topic under investigation. The literature review is presented into two parts: in world context and Nepal context. They are presented in chronological order.

### ***International Context***

A number of studies have analyzed the issue of agriculture value chain in the context of different countries and regions. Market access is one of the key elements in the value chain development in rural areas. Taking the case of Latin American countries, Reardon et al. (2001) highlight the importance of market access in enhancing the income and livelihoods of rural populations through better integration into markets. In simpler terms, the main goal of improving value chains in rural areas is to make it easier for people to sell their products in markets. The study of Reardon et al. (2001) emphasized that having better access to markets that help people in rural areas make more money and improve their lives by connecting them more effectively with buyers.

ADB (2012) analyzes that agriculture's contemporary worldwide environment is undergoing rapid change and experiencing more difficulties. The shifting environment is a result of a number of causes, including rising and fluctuating food costs that lead to food price inflation, increased rural economic diversification and rural-urban connections, and more private sector investment.

Lewis et al. (2014) investigated how entrepreneurial marketing (EM) might be applied by traditional agriculture enterprises to differentiate their products at the value chain level through innovation and branding. Fresh vegetable products have typically been sold as generic goods without branding. This work employed a case study

approach, combining unstructured supply chain process observation with semi-structured interviews with managers and staff to fulfil the research goal. Based on a value chain for fresh broccoli in Tasmania, the results indicate that EM might be successfully integrated at the multi-firm level. A unified vision and a sustainable value chain can only be established with clear communication, knowledge sharing, and trustworthy connections. A growing number of agricultural companies are searching for ways to improve value for both their chain's members and themselves. When used as a strategy, EM can assist a whole value chain in achieving co-innovation and product differentiation, both of which benefit the end user. This report is among the first to use a value chain innovation framework to study EM in the context of supply chain management.

In an experimental study Matuschke et al. (2018) underscore the importance of technology adoption in agribusiness value chain development. A study in Ghana revealed that the use of mobile-based platforms for market information improved smallholder farmers' access to markets and increased their bargaining power. Similarly, a study by Ochieng et al. (2019) in Kenya found that the adoption of precision farming technologies enhanced productivity and reduced resource wastage.

Mac Clay and Feeney (2018) categorize the existing studies on agribusiness value chains based on different dimensions, such as the focus of analysis (e.g., economic, social, environmental aspects), the methodologies used (e.g., qualitative, quantitative approaches). And the geographical regions studied. They discuss the various methodological approaches that have been used in the analysis of agribusiness value chains, highlighting their strengths and limitations. The authors identify trends in the literature, such as increasing interest in sustainability and inclusiveness within

agribusiness value chains, and the growing use of value chain analysis to inform policy and development initiatives.

The findings of the review by Mac Clay and Feeney (2018) provide a detailed overview of the state of research on agribusiness value chains, making it a useful resource for scholars and practitioners interested in this field. The authors highlight several areas where further research is needed, such as the integration of social and environmental dimensions into value chain analysis, and the need for more empirical studies in developing countries.

The article by Mac Clay and Feeney is valuable for providing a structured synthesis of the literature on agribusiness value chains and offering insights into how future research can be directed to address existing gaps and emerging challenges in this field.

In their analysis Gaffney et al. (2019) indicate that some of the biggest agribusiness companies in the world have merged, raising questions about what kind of global citizens the new businesses are and whether they are hurt vulnerable rural populations, particularly smallholder men and women farmers. These new businesses are anticipated to take the lead in identifying innovative solutions for the world's most pressing agricultural problems, as leaders in the sector. In order to close the innovation gap and guarantee that high-quality science reaches nations where state funding for agricultural research is not given high priority, the private sector has a special voice and obligation.

An analytical work by Hainzer et al. (2019) sought to guide future research and intervention design by synthesizing the empirical findings from LVC projects. Firstly, it reviews the current state of knowledge regarding local value chain (LVC) interventions in the context of international agricultural research and development.

This work reviews and synthesizes recent research publications and case studies that particularly address the formation of LVCs, using guidelines for qualitative meta-synthesis and systematic review. A novel two-phase characterization of LVC interventions is identified in the article. Phase 1 finds intervention possibilities, which are typologies that are offered over a range of value chain functions, from immature to developed. Phase 2 involves choosing and putting into practice methods to take advantage of the opportunities that Phase 1 has identified. and the article describes these tactics in terms of the value chain functionality that they aim to achieve. The study makes the argument that a better understanding of these relationships is essential to the success of value chain interventions. The interplay between context, socio-economic restrictions, and intervention tactics is still a poorly known element of value chain interventions.

Wambugu et al. (2020) in case of collaboration among stakeholders is a recurring theme in successful agribusiness value chain development. In their research on the agriculture value chain in emphasized the role of collective action among farmers, processors, and marketers in improving market linkages and negotiation power. Study in Kenya highlighted the positive correlation between agribusiness value chain development and employment creation. The study found that the expansion of value chain activities, such as processing and marketing, generated job opportunities for local communities.

Sakib et al. (2021) express the view by meeting everyday requirements, agribusiness contributes significantly to the rural poor's sustainable economic development. Every country in South Asia shares a common pattern of societies, resources, climates, customs, and populations that are close to one another. For trading agricultural produce in marketplaces, the primary agribusiness sectors. On the

other hand, agriculture activities are severely harmed by several variables, including natural disasters, environmental pollution, unsafe food, labor shortages, marketing restrictions, and financial crises. These factors include global warming brought on by climate change. Agribusiness cannot effectively support the economies of South Asian developing countries unless we remove obstacles. Therefore, measures for the future can be based on cutting-edge scientific methods for crop science research, resource restoration, food quality control, the introduction of new machinery, best marketing techniques, and inclusive financing.

Raitzer and Batmunkh (2022) evaluate matching grant schemes given to cooperatives and agricultural groups have become popular ways to support smallholder farmers in their commercial endeavors. Although the exact mixes of support that each household receives vary, these programs assist farmers in connecting with output markets, gaining access to information about new technology, and overcoming obstacles to profitable investment. Through an inverse probability weighted two-way fixed effects analysis of data from a panel of 2,268 families, of which 47% are members of 246 farmer organizations in three provinces, this study separates the causal impacts of various kinds of support. It concludes that both receiving any kind of help and participating in a group without it have a significant impact on revenue and commercialization. The types of support that have the biggest impacts on output, revenue, and/or human capital are marketing assistance, production training, and a mix of assets and training. By contrast, the provision of either inputs or credit alone appears to have only minor, if any, detrimental impacts.

Neubauer et al. (2022) appraise a viable strategy to raise agricultural production, well-being, and food security for smallholder farmers in developing nations is to fortify connections with markets along the value chain. The study looks

into the effects of an integrated value chain project that connected producer groups to markets and offered their members several kinds of training. Propensity score matching can be used with primary survey data from Nepal to provide statistical balance and shared support between families in the project (treatment) and non-project (control) groups. To account for differences in technology levels between the two sets of families, we estimate a simulation-based stochastic meta-frontier and apply the selectivity-corrected stochastic production frontier methodology to compensate for unobservable variables. It discovers that selectivity bias is evident with the Cobb-Douglas production frontiers, despite the more flexible trans log specification showing no symptoms of it. This finding highlights the need to adjust for selectivity. The meta-frontier analysis's primary findings show that the project's effects are represented in sizable technological gaps and notable variations in the meta-technical efficiency that benefit treatment families. This study demonstrates that improving the connections between producers and markets can significantly boost productivity. According to heterogeneity analysis, producers who are more vulnerable such as those with smaller farms and fewer years of education receive comparatively larger returns from the project than do their counterparts.

Lewison (2022) embraced inclusive value chain frameworks as a tactic to combat rural poverty. The strategy seeks to strengthen the ties between smallholder farmers and agricultural markets while raising the value of their output there. Initiatives to create inclusive value chains that focus on apple growers in Northwestern Nepal serve as an example of this development strategy. In this study, the fast-expanding apple industry in Jumla District is examined, along with how value chain development interventions have aimed to upgrade production and connect producers with agribusiness partners in order to expedite the transition towards

commercial agriculture. These interventions operate under the fundamental premise that farmers would use entrepreneurial tactics to maximize earnings within certain value chains. This paper, however, shows that a more thorough examination of the political ecology of apple production in the area challenges this presumption. In order to understand why apples are so popular in Jumla District, the paper contends that labor-saving, risk-averse methods to participating in the apple market have to be understood in the context of processes of agrarian development and livelihood diversification. The results provide credence to recommendations for policies that give autonomy and long-term risk reduction precedence above competitive market integration.

Islas-Moreno et al. (2023) examine the steps that prosperous agricultural businesses take in order to comprehend the reasoning behind those steps as well as the variations in the kinds of families who initiate them. The business and family paths of 14 prosperous agricultural firms in Mexico were examined using a multiple case study methodology. Enterprise activities are categorized into seven distinct categories based on their strategic intent: (1) expansion and intensification; (2) reconversion; (3) diversification; (4) integration; (5) differentiation; (6) outsourcing; and (7) digitization. Entrepreneurial families are divided into three groups based on how they relate to agriculture: (1) continuing families, (2) returning families, and (3) entering families.

The three stages of the entrepreneurship logic are evaluation, expansion, and consolidation. First, various activities are tested; next, the most successful one is expanded and made the primary activity; and last, the evaluation and expansion of the primary activity are combined by contrasting and enhancing it with other agricultural activities. The distinction is that families that are still in operation now follow the

classic productivist paradigm, which is predicated on increased primary production productivity and scale expansion. However, returning and new families are more likely to engage in activities that imply a difference in the quality of production, like integration and differentiation, and that call for connections with other companies, like outsourcing.

Songermasawas et al. (2023) assess the impact of an inclusive agricultural value chain development. The goal of the intervention was to reduce transaction costs and raise agricultural productivity in order to reduce poverty among small-scale growers. In an effort to guarantee diversity, it also explicitly targeted female and minority producers. Primary survey data from more than 2,500 rural Nepalese families are used in the study. Using a treatment effect estimator, calculate the influence on agricultural productivity. Then, use the Kitagawa-Oaxaca-Blinder (KOB) decomposition approach to break it down by gender and ethnicity. Agricultural productivity is found to be positively impacted by the project; however, the impact is greater for non-minority and male-headed households than for minority and female-headed households, respectively. These results underline the necessity of providing tailored assistance to producers who are at risk, such as women and members of ethnic minorities. Programs for land tenure security that are especially designed to protect vulnerable producers might make sure they can take advantage of advantages in a way that may help close production gaps.

In a research paper Kumar et al. (2023) survey the literature on artificial intelligence (AI) utilization among participants in the agricultural value chain (AVC). The authors methodically gathered writing from various databases spanning twenty-five years (1994–2020). They categorized literature according to the AVC actors who were present at various AVC phases. Nvivo 12 (qualitative software) was used to

analyze the literature for both content and descriptive analysis. Of the reviewed papers, 35 percent were conceptual and 50% were empirical. According to the review, implementing AI in AVC might boost revenue, improve competitiveness, and save costs for agriculture. In contrast to input, production, and quality testing, there was relatively little AI research conducted throughout the AVC stages pertaining to agricultural processing and the consumer sector. Artificial neural networks with deep learning algorithms are extensively used by the majority of AVC actors in a variety of applications, including crop planning, personalized advice, yield prediction, price/demand forecasting, energy efficiency, crop resource management, and consumer behavior prediction. The study's authors solely took into account artificial intelligence (AI) in the AVC; any usage of AI in other industries or unrelated to value chain participants was left out. Previous research concentrated on the application of AI to particular AVC actors and sectors, like farming, inputs, processing, distribution, and so forth. Studies on the use of AI and the full AVC were nonexistent. This review has closed that gap in the literature.

Brenya et al. (2023) growing worldwide concern for sustainability has impacted every industry, including agribusiness, thus it is necessary to look into the key obstacles that can prevent this innovation from succeeding. Through the prism of a literature analysis, this study provides an extensive overview of the main obstacles faced by agribusinesses in order to guarantee long-term profitability. They selected 43 pertinent papers for a systematic literature review (SLR). To find and examine the chosen articles, the study uses content analysis. The conceptual framework highlights the three main obstacles that sustainable agribusinesses must overcome. The SLR's findings show that the main obstacles to agribusiness sustainability are insufficient

funding, high post-harvest losses, gender disparity, non-climate-smart policies, and lax institutional controls.

Zawislak et al. (2023) offers a paradigm for analyzing the dynamics of innovation in agribusiness, called the Dynamic Chain of Innovation. When creating the theoretical framework, the writers use a theoretical review. The limited scope of economic agents won't be satisfied by merely obtaining any resource or asset that isn't already available on the market. A more intricate kind of complementarity is achieved through cooperative partnerships that are focused on creating particular solutions, cooperative development, special orders, and partnerships with research institutes, among other things. The study's theoretical design necessitates more development using empirical data to substantiate the claims stated in subsequent research. The foundation of the dynamic chain of innovation framework is the existence of imperfect economic agents. us according to the complementarity and boundedness of enterprises.

### ***Nepalese Context Studies***

Different studies have been conducted in Nepal related to the value chain of agricultural products. The literature reviewed here is organized in chronological order. In carrying out a study on vegetable Bhandari (2019) identified that previous studies barely discussed on the position, importance of on- and off-season zoning, hinterland farming performance, value addition, and contribution of each vegetable sub-sector. The main goal of the research was to identify appealing, cost-effective, on- and off-season zoning-specific vegetables that could be sold in various market outlets. The research conducted four workshops for district-level consultation, a household survey with 290 respondents, 25 focus group discussions, 149 key informant interviews, 41 case studies, and four workshops for validation. The most desirable particular

vegetables were assessed, and the most practical sub-sectors for future cultivation were chosen, taking into account factors such as microclimate, salability, employment, recovery from earthquakes, gender, poverty, climate change, irrigation, time, and expertise. According to the survey, 2534 tons of vegetables are imported and arrive through relatively lengthy pathways to meet the needs of hamlet customers. The study examined much greater costs (45%) and profit additions (27%) by producers despite their 41% producer share of the consumer price. However, the profit and accumulated income of market intermediaries were significantly larger than their cost addition in each.

Acharya (2019) assesses the processes that combine with climate-resilient practices and marketing strategies to produce vegetables. The study also presents an integrated approach to climate-resilient activities that can aid in mitigating issues associated with climate change. Analyzing the value chain of climate-resilient vegetable agricultural systems is the study's primary goal. The investigation was conducted in Nepal's Udayapur district. The study's data came from the Himalica pilot project, which ICIMOD started. Using a semi-structured questionnaire and checklist for farmer group interviews, primary data were gathered from 300 vegetable farmer's homes. According to the value chain analysis, a farmer's profit margin is contingent upon the nature of the market, and their income rises when they sell their produce to farmer's cooperatives. To boost revenue and reduce risk from climate change and variability, farmers require material support, technology, and farmer-group organization. The value chain of vegetable cultivation provides advantages in terms of social, economic, and environmental factors, according to the study.

Sharma (2019a) examined previous studies on the value chain analysis of the vegetable subsector. Using Google Scholar, a large number of manuals, guidelines,

research articles, and were gathered in order to examine value chain approaches. Eight research papers that focused on value chain analysis of Nepal's vegetable output were chosen for examination. This study review process began with an overview of the study's focus, methods, and major discoveries. It then critically examined how the goals, challenges, and conclusions of the research were coordinated. It has also highlighted the inadequacies of the study. Nonetheless, the identification of principal and secondary actors on the agribusiness value chain, market channels, market margin, and major issues encountered was shared by all of these publications. The identification of primary and secondary actors on the vegetable value chain, market channels, market margin, and the main issues that actors on the marketing side encountered and their ideas for solutions were, nevertheless, shared by all of the studies. The majority of the publications used surveys with questionnaires and consumer, trader, and household checklists to gather data. The study concludes that Nepal's vegetable value chain is not in a suitable state. The producer's portion of the consumer price was far lower than anticipated, and market syndicates have a significant impact on prices. Therefore, in order to raise the producer's share of the consumer price and lower marketing costs, government policy should concentrate on improving the quality of input supply for vegetable producers as well as production and marketing improvements.

Sharma (2019b) identifies the value chain actors and their roles, analyzes the market channel, and pinpoints issues with the production and marketing system, this study evaluated the value chain and marketing performance of the vegetable subsector in the Sindupalchowk area of Nepal. The primary and secondary data used in the study were both sources. 84 homes that were purposefully and proportionately chosen provided the primary data. The study identified major players in the vegetable value

chain as farmers, retailers, wholesalers, bulk traders, and input suppliers. With a productivity of 7.2 tons/ha, the total number of vegetables produced was 29.73 tons, and 17.92 tons were sold through four marketing channels. In terms of volume, the route whereby producers sell their veggies directly to customers was found to be dominating; it accounted for 71.75% of the total amount of vegetables supplied by farmers (12.86 tons). Through retailers, the bulk dealers provided 18.97% of the veggies to Kathmandu and 8.77% to the residents of the Sindupalchowk district. The lowest volume of transactions made by wholesalers through retailers to consumers was 0.51%. According to the study, the government of Nepal should concentrate on building marketing infrastructures so that actors can share the market fairly.

In view of Regmi and Naharki (2020) inducement to agribusiness entrepreneurship in the agribusiness sector have the ability to expand, diversify revenue streams, and provide numerous job and business opportunities. Role of agriculture sector alone is still significant in the GDP of Nepal. Nepal offers a plethora of prospects for agribusiness enterprise, mostly due to its diverse agroclimatic, abundant plant biodiversity, specialized commodities, and strong export potential. Reviving Nepalese agriculture as an alluring and lucrative enterprise requires a transition from subsistence farming to a strong, dynamic, and commercial agriculture through technology-driven agribusiness entrepreneurship. The SWOT (strengths, weaknesses, opportunities, and threats) analysis of Nepali agribusiness entrepreneurship is presented in this review study. It also draws attention to the chances that already exist and can be enhanced to increase the potential for agriculture entrepreneurship. The authors follow the extensive review of journal articles, research papers, annual reports, theses, review articles, books, survey reports, etc. provided pertinent information about agribusiness, entrepreneurship, and SWOT analysis. It

also evaluated the internal factors (strengths and weaknesses) and external factors (opportunities and threats) of agribusiness entrepreneurship in Nepal.

According to Bhandari's (2020) survey study the majority of honey bees raised in the Pyuthan district were Apician, and almost 50% of young people were involved in the beekeeping industry. The average number of hives per family is 32, with the range being 15 to 80 hives. At HH's level, an average of 32 kg of honey was consumed, and 239 kg was sold. Honey was sold at farm gates for an average wholesale price of NPR 400–450 (USD 3.6-4.1) per kg, with a retail price of NPR 500 (USD 4.5). The annual revenue from the selling of honey ranged from NPR 20000 to NPR 120000, with an average of NPR 60000 (USD 545). While none of the beekeepers have insurance, the majority have received training. Approximately 55% of beekeepers have borrowed money from MFIs, cooperatives, and saving groups. In the research area, there is no provision for product grading, processing, or labeling at the producer's location. Disease, pests, adversaries, and habitat loss posed the biggest risks to beekeeping. This study recommends developing upgrading procedures that support fundamental value chain procedures in order to promote premium Nepali honey on international markets.

Khanal and Dhakal (2020) examined cucumber value chain in the Arghakhanchi district in 2018, this study was conducted. Purposively, four significant regions that produce cucumbers, including Ghoche Khola, Bhagwati, Baghi, and Jagata, were chosen. Calculating the benefit-cost ratio in the cucumber business, creating a value chain map, evaluating the production parameters, and identifying the main obstacles to cucumber cultivation were the goals of the value chain study. Ten traders and 64 growers of cucumbers were chosen using a basic random selection method. Just 30% of respondents cultivated hybrids, compared to the majority (95%)

who had grown the Bhaktapur local type. Additionally, Bhaktapur Local has a greater benefit-cost ratio (3.18) than hybrids (2.44). The flow of goods from farmers to merchants and ultimately to consumers was the most prevalent marketing channel. The farmers-to-producers route had the highest farm gate pricing. According to the regression estimate, the output of cucumbers was significantly impacted by input factors such as manpower, materials, organic manure, s, and plant protection materials. The results indicated that while middlemen's larger margin was the main issue with cucumber marketing, illnesses and insect and pest attacks were the main issues with cucumber production. The results also highlighted the lack of wholesalers in the value chain, which may have contributed to a decrease in cucumber production and a reduction in export potential.

The study of Adhikari and Pokhrel (2020) evaluated the agricultural subsector with the highest priority to the vegetable subsector. Nepal is an agricultural nation, although it has a significant trade imbalance in agricultural products. Over the ten years, from 2009–10 to 2018–19, a trend analysis was conducted to investigate changes in the cultivation area, production, yield, import, and export of vegetables. The majority of the data were gathered from secondary sources, such as various government websites and publications, and Microsoft Excel was used for analysis. Despite increases in vegetable output and cultivation over time, productivity growth was seen to be slower. As a result, domestic production was unable to meet the nation's need for vegetables. As a result, the import-export deficit widened and the import of vegetable commodities increased. According to the report, the majority of vegetable cultivation in Nepal is done for subsistence, and to increase exports and reduce imports, commercialization is necessary.

According to Ghimire (2020) even though about two-thirds of households are employed in the agriculture industry, farming in Nepal is only beginning to be commercialized. However, 48 percent of households in Nepal experience food insecurity, and 28.6 percent of the country's population lives in multidimensional poverty. In order to promote livelihoods and food security, this study examined the efficacy of local value chain processes in the commercialization of vegetables among specific women producers in Nepal's Kailali area. This study capitalized on the post-positivism perspective to use the QUAN-qual methodology. Comparative performance data from 1,469 women farmers growing vegetables shows that, in a short amount of time, there has been an almost three-fold increase in commodity production and a 78% rise in the producers' average revenue.

Given Regmi and Naharki (2020) consideration of its inventions, technological know-how, and managerial prowess, agribusiness entrepreneurship has the potential to become a significant economic force and an instrument for rural development. The development of agribusiness entrepreneurship is bolstered in the competitive business environment by the different climate conditions, rich biodiversity, export possibilities, and changes in consumer food consumption patterns. However, several issues, including poverty and inadequate infrastructure, hinder the actual fulfilment of agribusiness potential. These include inefficient research on agriculture value chains and systems, weak connections between the creation and diffusion of technology, and others. Nepal is forced to import agricultural products valued at billions of dollars because of its traditional farming methods and the dearth of competent laborers in the agribusiness sector. The agro-processing industries, diversification, export potential, and floriculture are just a few of the many opportunities that Nepal's agribusiness entrepreneurship may take use of. Serious risks

come from several sources, including climate change, global competitiveness, the high cost of modern technology, unorganized trade practices, and the brain drain of trained labour. Additionally, the deficiencies of Nepalese agribusiness entrepreneurship is better understood by looking at the following seven subheadings: "Low Competitiveness," "Lack of Infrastructure Facilities," "Land Degradation," "Average Land Holding," "Agricultural Value-Chain and Systems Research," and "Poor Linkages between Technology Generation and Dissemination."

Parajuli et al. (2021) identify the value chain of ginger in the Solukhumbu district of Nepal, a survey research study on the value chain analysis of the ginger sub-sector was conducted. Using a random sample technique, household level data from 60 households in the rural municipalities of Thulung Dudhkoshi and Necha-Salyan were collected. A small number of local retailers, wholesalers, and dealers were also questioned. 2.35 ropani was the average area under ginger cultivation. The majority of the production costs were borne by seed, with an average cost of manufacturing per rope being Rs. 14450.38. In the study region, ginger production was 8.22 Mt/ha, which was greater than the district productivity and lower than the national average. The average cost of dried ginger was Rs. 200/kg, whereas the average cost of fresh ginger was Rs. 85.63/kg. The main issues faced by ginger growers in the Solukhumbu District were price fluctuations, a lack of a suitable market, white grub, rhizome rot, and poor road accessibility. The study area's ginger farming was a profitable enterprise, with a benefit-cost (B/C) ratio of 2.37 for fresh ginger and 1.13 for dried ginger, despite numerous challenges. The majority of farmers in the sample relied on farming as their primary source of income. To increase the producer's income, better cultivation techniques with a specified variety,

timely planting and seed treatment, and easy processing including cleaning, sorting, and grading are essential.

A study by Kafle et al. (2021) looks into the possible mechanism and real-world implications of the effects of agricultural value chain growth in a developing nation's rural, difficult-to-reach area. They employed information from a meticulously planned primary survey conducted in Western Nepal's hilly and mountainous regions. Through the application of the inverse probability weighted regression adjustment approach, we demonstrate how establishing connections between small-scale farmers and local and regional traders can augment agricultural revenue. The study dissects the possible mechanism of the impact pathway and demonstrate that higher agricultural revenues resulting from more sales at cheaper prices are the cause of the rise in agricultural income. The contend that in rural areas where land is underutilized, value chain involvement might result in crop switching or acreage extension, which ultimately raises supply at lower output prices. Practically speaking, the increase in household income translated into increased food security, dietary diversity, and household resilience. These results hold up well to different requirements. Through an increase in agricultural revenue, targeted value chain interventions that support and stabilize small-scale producers' access to markets can help reduce rural poverty.

Lamichhane's (2022) discussion on foreign investment in Nepal's agriculture sector indicates that it has gained popularity due to its potential to increase agricultural output and create jobs. The author made a review of pertinent literature. The author describes that majority of Nepalese people reside in rural areas and are employed in agriculture, and agriculture sector is a major contributor to Nepal's economic development and GDP growth has been the agriculture sector. The study highlighted that foreign direct investment (FDI) in the agricultural sector supported

the following: the creation of jobs, the transfer of technology, access to the global market for agricultural products, the development of skills, the earning of foreign exchange, the promotion of economic growth, food security, the modernization and commercialization of local businesses, the utilization of local human and natural resources, social peace and stability, and the prevention of brain-drain. Historically, agriculture has been a significant driver of job creation and the fight against poverty. The industry has been crucial in boosting jobs in rural and semi-rural areas. Low levels of agro-investment have led to decreased levels of competitiveness, profitability, and government revenue.

Dhungana's (2022) analysis assumed vegetable to be a subsector with excellent commercialization prospects in Nepal. It helps to generate employment opportunities, which lowers the poverty rate. Nevertheless, not much empirical work has been done to understand the advantages of commercial production and how households accept it. Therefore, the purpose of this study is to evaluate farmers' adoption of commercial vegetable production in Nepal's Kathmandu area and the production economics and determinants of such adoption. 199 households in total were chosen through the use of a stratified random selection method. In January and February of 2022, the primary data were gathered. Using SPSS, the benefit-cost ratio, binary logistic regression, and descriptive statistics were used to analyze the data. According to the findings, commercial vegetable farming had a greater gross margin and benefit-cost ratio (NRs. 533, 130/ha and 3.23, respectively) than subsistence vegetable farming (NRs. 419, 031/ha and 2.49, respectively). Furthermore, age, the household head's degree, experience, family type, membership, and credit availability were found to be very significant drivers of commercial vegetable production, according to the results of binary logistic regression. Commercial vegetable farming

may therefore benefit from any agricultural development initiatives, including those that provide financial services, business training, and encouragement for farmers to form cooperatives.

Kafle et al. (2022) analyzed effects of agricultural value chain interventions on smallholder farmers in the mountainous regions of Nepal. Their analysis focuses on several key areas like how participation in agricultural value chains affects household income, the extent to which value chain development encourages the adoption of improved agricultural practices, how value chain interventions impact farmers' access to markets, livelihoods and welfare, and gender and social inclusion. The study of Kafle et al. found that the value chain interventions encouraged the adoption of modern agricultural practices, such as the use of high-yielding seed varieties, and improved farming techniques. Farmers who participated in the value chains were more likely to adopt these practices, leading to increased agricultural productivity. Overall, the study concluded that agricultural value chain development in mountainous regions of Nepal has significant potential to improve the livelihoods of smallholder farmers, but targeted interventions and supportive policies are needed to overcome existing challenges and ensure that the benefits are widely shared.

Koirala et al. (2022) examined the areas where competitiveness has to be improved for an understanding of the actors and flow of commodities. The households were questioned using a semi-structured interview schedule that had been pre-tested. Primary data came from traders, extension agents, and growers of tomatoes. Using SPSS and MS Excel, descriptive statistics and the chi-square test were employed to analyze the data. The results indicated that growing tomatoes has a significant potential to generate considerable profits at each of the three research sites. The research area's reported B:C ratio of 1.61 indicates that tomato farming is a

lucrative endeavour for both farmers and dealers. In the most popular market channel, the producer's share was 46.6% and the market margin was NRs. 32/kg. Middlemen have a significant impact on tomato prices. The primary marketing challenge faced by the producers was the low market price, which was followed by the unavailability of the market, price fluctuations, perishable goods, and inadequate transportation. Farmers were nevertheless eager to cultivate tomatoes and pleased with the harvest in spite of these issues. According to the study, tomato gardening in Lalitpur has the potential to be a very successful business venture if agriculture offices offer specific assistance. As a result, the study's recommendations to enhance transportation capabilities, market pricing data, packing, storage, and grading in order to increase tomato prices would be advantageous to all parties involved in the value chain.

Chaulagain et al. (2022) accomplished a study to calculate the agricultural production costs and net return in Nepal's Nuwakot area. A descriptive analysis was performed using information gathered from one hundred farmers engaged in strawberry farming by means of a well-structured, pre-tested questionnaire. The factors influencing the production of strawberries were investigated using an economic analysis. According to the findings, the net return from growing strawberries in Kakani and Okharpauwa was NRs 1,59,870 and NRs 175180, respectively. The primary cause of the disparity was each village's distance from the market. Strawberries are a profitable crop to grow since the yield exceeds the input costs. Two villages were compared, and the average benefit-cost ratio (BCR) was found to be 2.41. After analyzing the variables influencing productivity and net return along the value chain, it was discovered that farmers were still making good money even with the involvement of middlemen. Following a swot analysis, it was determined that one significant disadvantage was the distance between the farm and

the market. In general, strawberry production was assisted by the climate, farming expertise, landholding, education, and market channels. It is important to create policies that assist farmers. Lastly, to reduce post-harvest losses and transportation costs, a market should be developed close to the production area.

In their study Devkota et al. (2022) highlighted that since the beginning of time, agriculture has played a significant role in eradicating poverty, boosting the economy, and ensuring a country's survival. The study attempts to comprehend young farmers' awareness of and participation in agripreneurship in Western Nepal. Primary and secondary sources of data were gathered through the use of a structured questionnaire. In the study, the ordered logit model is used based on descriptive and inferential analysis. The study employs an explanatory research methodology to ascertain the level of awareness among 324 farmers in Bedkot Municipality, Kanchanpur, Nepal, regarding agriculture entrepreneurship. The results of the study indicate a statistically significant relationship between overall awareness and agricultural knowledge. According to ordered logistic regression, knowledge about agriculture has a significant impact on education and training, but sex has some influence on technical and entrepreneurial abilities. The findings indicate that a quarter of farmers demand subsidies, while one-fourth of farmers still require agricultural training. According to the study, market management, training, subsidies, and development programs are all highly necessary to raise awareness. With the backdrop of diminishing agro-products and issues with food security, the study aims to provide stakeholders and policymakers with insight into how to solve the urgent demand for agripreneurship among young people worldwide. The uniqueness and worth of the study highlight the current level of understanding of Nepalese farmers'

agripreneurship, point out new problems and their policy implications, and establish objectives for further applied research.

The study of Thakur et al. (2023) overviewing the global economy asserts that agriculture industry is a rising one. Any agribusiness that wants to succeed must have a solid understanding of value chains and optimization to be profitable, competitive, and sustainable. A thorough framework for assessing and enhancing the numerous phases involved in the production and distribution of agricultural goods is provided by value chain analysis. Agribusiness value chain optimization and analysis. It looks at the idea of the value chain, which is made up of all the procedures and actions that give agricultural products more worth. Businesses is obtain insights into the interdependencies, costs, and value-added operations inside the system by creating a value chain map. Value chain optimization is to raise competitiveness and efficiency. Every step of the value chain process must be examined for bottlenecks, inefficiencies, and potential improvement areas to achieve optimization. Agribusinesses is enhance productivity, decrease expenses, streamline operations, and eventually provide consumers with better products thanks to this method. In addition, both value chain analysis and optimization are useful instruments for strategic management and commercial decision-making, particularly in the agriculture sector. Value chain analysis aids businesses in comprehending the steps necessary to provide clients with a good or service. Businesses may find opportunities to add value, set themselves apart from rivals, and enhance overall performance by looking at the primary and supporting activities in the value chain. This analysis sheds light on factors that influence costs, competitive advantages, and areas that might use innovation and development.

Kathayat and Bhatta (2023) studied the underdeveloped and non-systematic market and farmers' lack of participation in the value chain, which results in low profitability and, consequently, lower motivation, may be the causes of the yearly fall in the production of mandarins, one of the key citrus fruits in Nepal's mid-hills. Therefore, this study uses semi-structured questionnaires to survey 100 households in the Jorayal rural municipality of Doti district in order to examine the market and value chain of the Mandarin sub-sector. The average production of the chosen Mandarin farmers, according to the results, is 1.8 Mt, with an income of Rs. 24,059; however, when family work is taken into account, gross margins are negative. With about 92% of the sales volume, farmers and collectors appeared as the most important marketing channel. Local collectors dominate the market among the various collector categories, while the price offered to collectors from outside the district is greater (Rs. 58/kg) than to local collectors (Rs. 50/kg), with the producer's share being 40% and 35%, respectively. Local collectors have a monopoly, yet farmers are forced to sell to them in order to maintain local relationships. Because the place is isolated, there are few or no value chain participants, which results in low marketing efficiency. The low market price along with the lack of collection centers or storage facilities is considered to be the main marketing issue. Farmers are reported to be uninterested in growing their Mandarin farms because of a lack of networking, which also lowers marketing efficiency. One of the greatest ways to provide small-scale and dispersed farmers more negotiating leverage may be through cooperative marketing.

Pulami (2023) analyzed agribusiness with a sample size of 405 respondents from small and medium-sized agribusinesses in the Surkhet district, this study focuses on the influence of personal promotional variables affecting agri-entrepreneurship performance. A systematic questionnaire with multiple choice and Likert scale

questions was used to gather the data. The survey of active agri-entrepreneurs was carried out in Kartik 2079 B.S. Three primary variables were identified as the elements influencing agri-entrepreneurship performance: risk preference level (RP), creativity and innovation level (CI), and self-efficacy (SE). Multiple regression analysis modelling was applied to inferential statistics. The findings indicated that the degree of self-efficacy, the degree of creativity and innovation, and the degree of risk preference of agribusiness owners all significantly influence the performance of their ventures. According to univariate analysis, risk preference level, creativity and innovation skill, and self-efficacy had the greatest effects on agri-entrepreneurship performance. In bivariate regression, variables are jointly regressed; nevertheless, coefficients are decreased. This study found that the degree of self-efficacy among agribusiness owners more strongly influences their performance. Agriculture-related agribusiness owners may find that this element helps them make better decisions while starting or growing their businesses.

The study of Khatri et al. (2023) states that microbusinesses are essential to the country's GDP growth, employment, exports, and other factors. This research addresses the investment, income, and employment (IIE) analysis of micro-enterprises in Nepal within this particular setting. The research has utilized a cross-sectional data set obtained from an enterprise survey conducted in Ward No. 14 of Kathmandu Metropolitan City, utilizing multiple regression modelling and descriptive statistics. Thirty small businesses, including tea shops, confections, haircut shops, butcher stores, and vegetable shops, made up the survey's sample size. Additionally, the model demonstrates a favourable correlation between employment, investments, and income. However, as the p-value is higher than 0.05, it is not statistically significant. In reality, though, this matters since the two most alluring industries for investments

are meat markets and hair salons. The quantity of investments made depends on the existence of these economic entities nearby. Income and employment have a statistically insignificant association ( $p\text{-value } 0.445 > 0.05$ ), as does the link between income and investment ( $p\text{-value } 0.416 > 0.05$ ). There is a strong correlation between the type of business and the number of employees ( $p\text{-value } 0.000$  to  $0.01$ ). As a result, microbusinesses are a popular economic activity that fosters small-scale investment, income generation, and self-employment. The findings of this study have a substantial impact on policymakers' general perceptions of enterprise development statistics, enabling them to maintain enterprise development policies and programs implemented by the Nepali government and the Kathmandu Metropolitan City to strengthen both the local and national economies. Moreover, the study's findings offer a crucial lesson in how to foster a climate of doing business for microbusinesses in Kathmandu in order to forge a robust local supply and value chain system as opposed to using prohibitory measures.

Kumar et al. (2023) reviewed the literature on artificial intelligence (AI) utilization among participants in the agricultural value chain (AVC), identify knowledge gaps, and suggests future research options. The authors methodically gathered writing from various databases spanning twenty-five years (1994–2020). They categorized literature according to the AVC actors who were present at various AVC phases. Qualitative software Nvivo 12 was used to analyze the literature for both content and descriptive purposes. Of the reviewed papers, 35% were conceptual and 50% were empirical. According to the review, implementing AI in AVC might boost revenue, improve competitiveness, and save costs for agriculture. In contrast to input, production, and quality testing, there was relatively little AI research conducted throughout the AVC stages pertaining to agricultural processing and the consumer

sector. Artificial neural networks with deep learning algorithms are extensively used by the majority of AVC actors in a variety of applications, including crop planning, personalized advice, yield prediction, price/demand forecasting, energy efficiency, crop resource management, and consumer behavior prediction. The study does not include any information about the employment of AI outside of the AVC or in relation to value chain actors. The authors have exclusively examined AI in the AVC. Previous research concentrated on the application of AI to particular AVC actors and processes, like farming, inputs, processing, distribution, and so forth. Studies examining the application of AI throughout the AVC were nonexistent. That vacuum in the literature has been filled by this review.

Agribusiness may succeed with the right legislation, a supportive environment for business, and government backing (WB, 2013). Even though, most vegetables grown in Illam, Panchthar, Taplejung, and Dhankuta are shipped through the border crossing at Kakarbhitta-Panitanki. Trade with the North-Eastern States of India, Bangladesh, and Bhutan is primarily conducted at this border crossing. Exporting to India are cauliflower, beans, chilies, and potatoes (SAWTEE, 2016). According to data on international commerce from the United Nations trade database, Nepal exported US\$1.33 billion to India in 2021 (TE, 2023). Dhankuta is one of the vegetable production areas among the exporting them, regarding this, vegetable production land in Dhankuta has an area of hector 7956.5, and its yearly production is 159591.5 MT (DMP, 2018).

However, the literature emphasizes the necessity of a multifaceted strategy to maximize Nepal's vegetable value chain. A sustainable and equitable agribusiness model can be achieved by addressing production inefficiencies, taking advantage of market opportunities, and cultivating public-private partnerships. To overcome

current obstacles and maximize the sector's potential, technological integration and improved regulatory execution are crucial. The agribusiness value chain development showcases the tangible outcomes and challenges in various contexts. Strategies such as technology adoption and stakeholder collaboration contribute to improved productivity and income. While positive impacts on income generation and employment creation are evident, challenges related to inclusivity and access to finance persist. Lessons from these empirical findings guide the formulation of effective policies and interventions for sustainable agribusiness value chain development.

### **Research Gap**

The review of the past studies presented in the previous sections reveals that there have been different studies on the agribusiness vegetable value chain in the context of different countries and regions. The findings and conclusions of previous studies are varied depending on geographical regions and time of studies. The Agribusiness Value Chain Study provided reliable market and value chain data to address gaps and verify assumptions from the initial Economic Analysis (USAID,2021). Yoshino (2016) highlighted that despite their significant role in Nepal's economy, SMEs face major challenges such as limited business knowledge, low capital, restricted access to technology, and poor access to finance due to high loan rates, stringent collateral requirements, and inadequate institutional capacity (NRB,2019). A chain strength assessment should thus evaluate SMEs' engagement methods, sustainability, and barriers to participation.

Previous research by Keshelashvili (2018) emphasized the importance of commercialization and diversification in agriculture through private sector involvement, as discussed by Carayannis et al. (2018). However, issues like poverty,

inadequate infrastructure, and inefficient research hinder the full realization of agribusiness potential in Nepal. Traditional farming methods and a shortage of skilled labour force the country to import agricultural products including vegetables worth billion, despite opportunities in agribusiness entrepreneurship, such as agricultural processing, diversification, and export potential (Regmi & Naharki,2020). Market access, technology adoption, and risk management are among the significant gaps identified in this area, which warrant further study to better understand the challenges and opportunities in Nepal's agribusiness value chain. This research aims to fill these gaps, particularly focusing on the vegetable value chain in Dhankuta Municipality and Chhathar Jorpati Rural Municipality, an area with limited previous research.

## **Chapter- III**

### **Methodology**

This chapter details the methods and materials used to accomplish this study of the vegetable value chain in Dhankuta Municipality and Chhathar Jorpati Rural Municipality. The main coverage of this chapter is the introduction of the study area, conceptual framework, research design, sample selection and primary data collection procedures, secondary data collection, data processing, and data analysis.

#### **Introduction of the Study Area**

Commercial vegetable production in Dhankuta district is mostly concentrated in Chhathar Jorpati Rural Municipality and Dhankuta Municipality. These two regions are chosen as the study site based on a few key factors. There are lots of commercial vegetable farmers. Due to intensive commercial vegetable production, the livelihoods of vegetable farmers have been improving. (Bhandari & Paudel, 2021). The Chhathar-Jorpati Rural Municipality is known as the vegetable capital of eastern Nepal. Vegetable farming accounted for about 91.19% of all farmed area. Among the vegetables planted there, cabbage has the biggest cropped area. (Gahatraj et al., 2019).

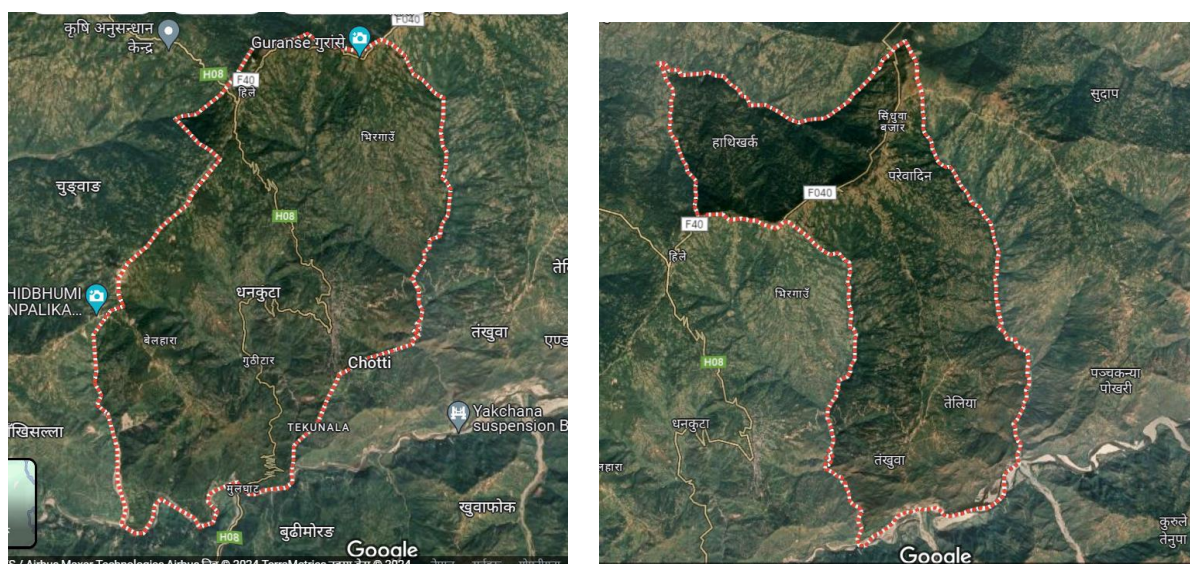
Dhankuta exported veggies that were out of season for Rs 370 million. The border crossing points at *Jogbani* and *Kakarvitta* were used for all consignments headed for the Indian market. 800 tons of cauliflower and 2,500 tons of cabbage were shipped in 2024. Other vegetable products that could be exported were chili, peas, and radish. Every farmer has been making a respectable living, with annual incomes ranging from Rs 200,000 to Rs 700,000 (Adhikari, 2015).

The study area is Dhankuta district with special concentration on Dhankuta Municipality and Chhathar Jorpati Rural municipality, a region in the eastern part of Nepal, that has a wide range of agricultural and ecological conditions. Its varied

topography, climate, and soil types support a diverse range of vegetable farming activities, making it an ideal location for studying different aspects of agribusiness value chain development. Dhankuta, a district in the eastern region in Nepal is the study area for investigating the agribusiness value chain in Nepal. Figure 1 displays the study area.

**Figure 1**

*Map of the Study area (Dhankuta Municipality and Chatter Rural Municipality)*



*Note.* Study Area Map adapted from Google Map.

The other study area Chhathar Jorpati Rural Municipality, strategically located as the midpoint between Dhankuta and Sindhurwa, has historically been a significant hub for vegetable production. Two decades ago, this area was renowned for exporting its produce to India that highlights its agricultural importance. Today, its proximity to the Koshi highway continues to benefit local farmers, who are increasingly motivated to grow offseason vegetables, leveraging their access to markets and improving their economic prospects. The area's legacy and ongoing commitment to agriculture make it a vital part of the region's agribusiness landscape.

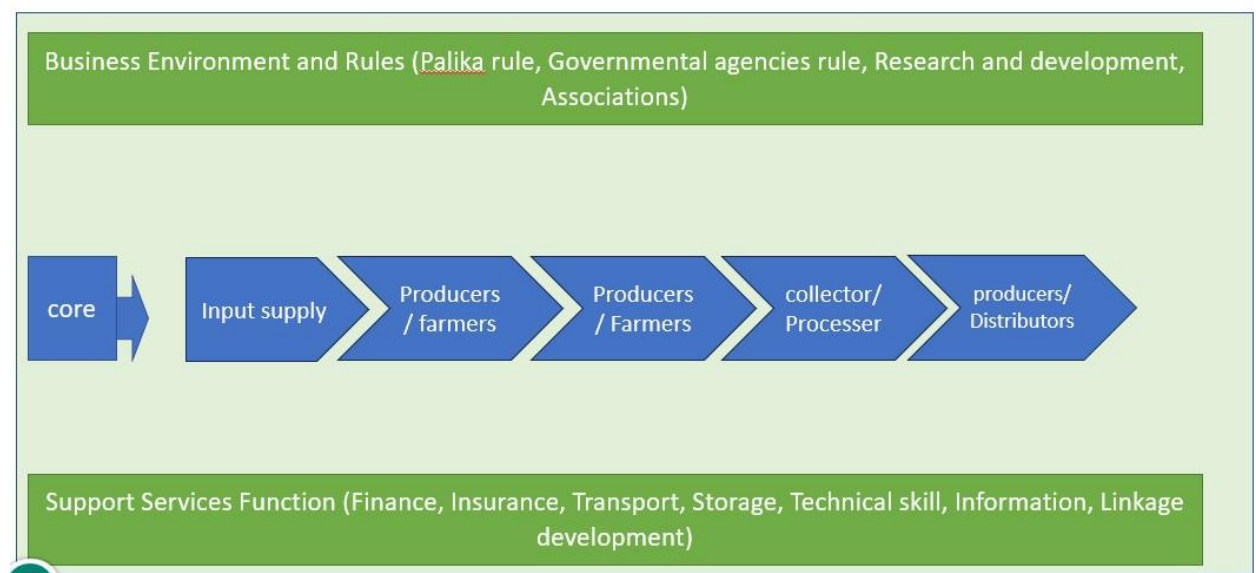
## Conceptual Framework

The conceptual framework for this study was designed to systematically analyze the vegetable value chain in Dhankuta Municipality and Chhathar Jorpati Rural Municipality, focusing on the role of Small and Medium Enterprises (SMEs) and associated stakeholders. The framework incorporates key components of value chain, the involvement of stakeholders, supporting factors, and the anticipated outcomes of optimized value chain development.

The conceptual framework for this study is created by drawing upon several value chain theories reviewed earlier and the review of previous studies. The framework is portrayed in Figure 2.

**Figure 2**

*Value Chain Conceptual Framework*



*Note.* Value Chain Conceptual Framework, Adapted from Porter 1985.

The conceptual framework outlined in Figure 3.2, Michael Porter introduced the Value Chain Model, which is used in the conceptual framework depicted in the image (1985). According to this paradigm, organizational operations are divided into primary and support activities, each of which adds value and strengthens the

organization's edge over competitors. With an emphasis on value addition at every stage, the conceptual framework of a vegetable value chain describes the interrelated phases and players involved in converting vegetables from production to consumption. Production, where vegetables are grown, comes after input supply, where farmers obtain seeds, fertilizer, and other resources. Sorting, grading, and packaging are examples of post-harvest handling tasks that improve marketability after harvest. Following their distribution to retailers, wholesalers, or exporters via logistical networks, these veggies are marketed and sold to consumers. Support services that ensure efficiency and sustainability throughout the chain include funding, agricultural extension, and policy frameworks. This framework demonstrates how each step helps to improve quality, cut waste, and provide value to final customers.

This conceptual framework provides a structured approach to analyze the vegetable value chain in Dhankuta Municipality and Chhathar Jorpati Rural Municipality, with a focus on optimizing agribusiness opportunities of SMEs and other stakeholders. By integrating core value chain components, stakeholder roles, and supporting factors, the framework sets the stage for identifying interventions that can lead to sustainable and inclusive development in the study area.

In the vegetable value chain within Dhankuta Municipality and Chhathar Jorpati Rural municipality, core elements such as production, processing, distribution, and marketing form the backbone of the chain, driving economic activities. Key stakeholders, including SMEs, farmers, intermediaries, and consumers, play pivotal roles in each stage of the chain, ensuring the flow of goods from farm to market. These market actors interact within the enabling environment shaped by policies, infrastructure, and financial services, which either facilitate or hinder value chain

activities. The ultimate outcomes and impacts of these interactions are seen in the optimization of the vegetable value chain, resulting in enhanced agribusiness opportunities, improved livelihoods for stakeholders, and greater economic resilience in the region.

### **Philosophical Stance**

In the context of a research study, a philosophical stance refers to the set of beliefs and assumptions that guide the researcher's approach to conducting the study. It encompasses the underlying way of seeing the world (Boucher, 2014), principles, and theoretical orientation that influence how the research is designed, how data is collected and analyzed, and how findings are interpreted. A philosophical stance is made up of several key components, including ontology, epistemology, axiology, and methodology.

### ***Ontology***

Ontology is concerned with the nature of reality, what exists and what can be known about it. The value chain model, as outlined by Michael Porter, aligns with the philosophical underpinnings of critical realism in its approach to understanding organizational and economic phenomena. Critical realism, an ontological perspective, emphasizes the existence of objective realities that operate independently of human perception but can be understood through scientific inquiry and contextual interpretation. In the context of value chain analysis, this ontology recognizes the underlying structures, causal mechanisms, and processes such as logistics, operations, and resource allocation that govern value creation within agribusiness systems. Critical realism prioritizes the study of the relationships between observable events (e.g., market performance or production outcomes) and the deeper, often unobservable structures (e.g., institutional frameworks, infrastructure, or power

dynamics) that shape them. In the value chain framework, these structures are embodied in both primary activities (such as logistics and operations) and support activities (such as infrastructure and technology development). The critical realist ontology allows for a layered understanding of agribusiness systems, bridging the gap between the visible challenges of inefficiencies in the vegetable value chain (e.g., poor market access) and the deeper systemic factors such as inadequate infrastructure, policy gaps, and socio-economic constraints.

The supply chain can be understood as a structure that drives observable occurrences, such as product delivery, at the actual and real levels using a critical realist ontology. However, the value chain integrates strategic components like customer-centricity and distinctiveness, as well as emerging mechanisms that transcend operational concerns. The unique primacy of one field over another is rejected by critical realism, which emphasizes a tiered reality. Rather, it emphasizes how they interact, showing how the fundamental processes of the supply chain underpin the value chain's emerging characteristics. Therefore, in order to comprehend their multifaceted effects on value creation, both are crucial and need to be examined jointly.

This study, by employing a value chain framework rooted in critical realism, aims to identify and analyze the mechanisms that limit agribusiness opportunities in Dhankuta, Nepal. By doing so, it provides a structured approach to addressing inefficiencies, uncovering causal linkages, and developing actionable strategies for optimizing value chain processes. This ontological alignment underscores the study's priority in not only describing the surface-level inefficiencies but also critically engaging with the deeper systemic and contextual realities that influence agribusiness development.

### ***Epistemology***

Epistemology is defined as the “study of knowledge” (Stroud, 2011).

Pragmatism is a suitable epistemology for this research study as it correlates with the research objective of generating practical, actionable insights and supports a flexible, mixed-methods approach that can accommodate the complexity of the vegetable value chain in the study area.

Pragmatism is an epistemological approach that focuses on the practical application of research and the use of methods that best suit the research problem. It allows researchers to combine quantitative and qualitative approaches to gain a comprehensive understanding of complex issues, such as the development and optimization of agribusiness value chains.

This study aims to enhance agribusiness opportunities and optimize the vegetable value chain, which requires a practical and problem-solving approach. Pragmatism is ideal for addressing real-world problems where multiple perspectives and methods are necessary.

Because the study of value chain development is complex, a mixed-methods approach, which pragmatism supports, allows the researcher to combine quantitative data (e.g., income levels, production statistics) with qualitative insights (e.g., stakeholder perspectives, challenges faced by SMEs). This combination provides a richer and more deep and detailed understanding of the issues at hand.

### ***Axiology***

Axiology refers to the study of values and ethics within a research context. In this study, the axiology addresses the values that guide the research, including the ethical considerations and the importance of the outcomes for the stakeholders involved. The researcher is highly aware that ethical consideration guides how data is

collected, ensuring informed consent, confidentiality, and respect for all participants. The value of doing no harm and ensuring that the research benefits rather than exploits the participants is crucial.

The axiology of this research emphasizes values such as equity, inclusiveness, practical utility, sustainability, community engagement, transparency, and accountability. These values guide not only the ethical conduct of research but also its broader purpose, to generate actionable insights that enhance the livelihoods of stakeholders in the vegetable value chain while promoting sustainable and equitable development in the study area.

### **Research Design**

A mixed-method descriptive case study design is well-suited for this research on optimizing the vegetable value chain in Dhankuta Municipality and Chhathar Jorpati Rural Municipality. This design allows for an in-depth exploration of the vegetable value chain in the study area, combining both quantitative and qualitative data providing a comprehensive understanding of the challenges and opportunities for SMEs and other stakeholders.

A mixed-methods approach is ideal for exploring complex issues like value chain development, where both numerical data (e.g., production levels, income, market prices) and qualitative insights (e.g., experiences of SMEs, stakeholders' perspectives) are important. The integration of quantitative and qualitative data allows for triangulation, where different types of data are used to confirm findings and provide a more robust understanding of the research problem.

A case study research strategy is appropriate for an in-depth, contextual analysis of the vegetable value chain in specific locations (Dhankuta Municipality and Chhathar Jorpati Rural Municipality). It allows the researcher to focus on the

particularities of the local context, including the specific challenges and opportunities faced by SMEs and other stakeholders. SMEs in the study area, along with other stakeholders in the value chain (e.g., farmers, traders, policymakers, consumers), are the primary units of analysis.

### **Data Collection Strategies**

The data for this study were gathered from both primary and secondary sources. This section describes how data from the primary and secondary sources were collected.

#### ***Primary Data Collection***

The primary data were collected by visiting the study area, contacting to individuals and institutions associated with vegetable value chain and asking them questions.

### **Sampling and Sample Size**

In the context of studying vegetable SMEs, determining the universe or total number of such enterprises can be challenging due to their diverse registration sources and lack of centralized data. These SMEs may be registered across various local government entities such as *Palikas* (Municipalities), Wards, and Gharalu offices, each maintaining separate records. This fragmentation makes it difficult to obtain a comprehensive and accurate count of vegetable SMEs. As a result, researchers may face difficulties in accurately defining the population size for sampling purposes, potentially impacting the reliability of the study's findings and the generalizability of the results.

Because of its simplicity and ease of application in situations where precise population proportions are either unknown or not necessary, Yamane's approach is reportedly frequently cited in fixing the sample size in researches (Yamane,1967).

The study used a stratified random sampling method to select the required sample size. Among others, the sample size of farmers and consumers has been designed using the following formula.

$$n = \frac{N}{1 + N(e^2)}$$

Where:

- n is the sample size.
- N is the population size.
- e is the margin of error (expressed as a decimal).

It is assumed that the number of farmers and consumers is greater than 105 and the confidence level is 95 per cent with a 5 per cent margin of error.

Since it would not have a fractional sample size, round up to the nearest whole number. Therefore, the calculated sample size is approximately 105. This means that, for a population of 209, a sample size of 105 is needed to estimate a population proportion with a 95% confidence level and a margin of error of  $\pm 5\%$ .

This study analyses the preferences of SMEs in the vegetable sector. To ensure a thorough understanding, it use a stratified random sampling method. Sampling is divided into two clusters, Dhankuta and Chatter Jorpati. This method involves dividing the population into different groups based on specific criteria, such as yearly volume of business, yearly income, roadhead, and geographical locations.

The sample size of SMEs for data collection is shown in Table 1 This table presents a detailed distribution of various respondents across different categories in Chhathar Jorpati, Dhankuta, and their combined total. The respondents are grouped into six distinct categories: Collector, Input, Processing, Production, Retailer, and Supplier/wholesale. Each category represents a specific role within a supply chain or industry, and their distribution across the two regions is outlined.

**Table 1***SMEs Sample Size for Data Collection*

| Respondent strata  | Chhathar Jorpati | Dhankuta | Total |
|--------------------|------------------|----------|-------|
| Collector          | 12               | -        | 12    |
| Input supplier     | 1                | 2        | 3     |
| Processing         | -                | 6        | 6     |
| Production         | 63               | 43       | 106   |
| Retailer           | 2                | 22       | 24    |
| Supplier/wholesale | 6                | 1        | 7     |
| Grand Total        | 84               | 74       | 158   |

*Note.* – (dash) No data available. The information was collected from Dhankuta

Municipality and Chatter Jorpati Rural Municipality, Dhankuta.

In Chhattar Jorpati, the Collector category has a total of 12 respondents, indicating a notable presence in the collection activities within this region. The Input category has only 1 respondent, suggesting limited engagement or necessity for input-related roles. There are no respondents in the Processing category for Chhattar Jorpati, which might point to the absence of processing activities or facilities in this region. Production has a significant number of respondents, totaling 63, indicating that Chhathar Jorpati is heavily involved in production activities. The Retailer category has 2 respondents, reflecting minimal retail activities. The Supplier/wholesale category has 6 respondents, showing moderate engagement in supplying or wholesaling activities.

### **Sampling Process for the Fieldwork**

The fieldwork for this study followed a systematic sampling process to ensure data reliability and representativeness. The process was designed to capture insights

from vegetable Small and Medium Enterprises (SMEs) across municipalities, aligning with the research objectives of understanding their roles, challenges, and opportunities in the value chain.

### **Questionnaire Design**

Questionnaire design is a crucial step in research, especially in surveys, interviews, and other forms of data collection where the researcher directly asks participants for their inputs. The design of the questionnaire directly impacts the quality, reliability, and validity of the data collected.

For this study a detailed questionnaire was designed using Kobo Toolbox, a robust digital data collection tool, was used to collect the primary data in this survey. Kobo Toolbox is a versatile and user-friendly platform that allows for the creation of complex survey forms, incorporating various question types such as multiple-choice, open-ended, and scaled responses. The questionnaire is designed in the Kobo tool to ensure accuracy, efficiency, and comprehensive coverage of all relevant actors within the defined study area. In the same way, quality information, used in the checklist is related to the support function and enabler or rule.

The questionnaire was meticulously crafted to gather pertinent data from different actors across various stages of the supply chain. This includes producers, collectors, input suppliers, processing units, and suppliers. The questions were tailored to extract specific information relevant to each actor's role, ensuring that all critical aspects of their operations and interactions within the supply chain are captured.

The questionnaire to collect primary data for this study comprised of three types of questions: open-ended ones that allows respondents to answer in their own words, providing rich qualitative data; closed-ended questions that provide specific response options (multiple-choice, yes/no, and rating scales), making it easier to

quantify and analyze the data; and Likert scale questions that ask respondents to rate their agreement or satisfaction on a scale (e.g., 1-5 or 1-7). The sample of the questionnaire is provided in Appendix II.

### **Pilot Survey by the Researcher**

Initially, the data collection began with self-collection by the researcher. This phase involved personally gathering data from key actors within the supply chain to understand the practicalities and nuances of the field. By engaging directly with the respondents, the researcher could refine the questionnaire, ensuring that it accurately captured the necessary information and was easy for respondents to understand. This hands-on approach also allowed the researcher to gain firsthand insights into the operational challenges and dynamics of the supply chain, enriching the overall data collection process.

### **Enumerator Training and Orientation**

Following the self-collection phase, a team of enumerators was recruited to assist in data collection. These enumerators underwent a comprehensive orientation and training program to familiarize them with the Kobo Toolbox and the survey's objectives. The training sessions covered various aspects, including the use of the Kobo Toolbox for data entry, understanding the questionnaire's structure and intent, and effective communication techniques to engage with respondents. The orientation ensured that all enumerators were well-prepared to collect high-quality data consistently and accurately.

### **Data Collection Process**

The study area and sample size were predefined, ensuring a representative and statistically justifiable collection of data. The sample was carefully selected to include a diverse range of actors across different stages of the supply chain, providing a

holistic view of the entire process. Geographic and demographic considerations were taken into account to ensure that the sample accurately reflected the study area's population and operational diversity.

With the questionnaire refined and enumerators trained, the data collection process commenced in the field. Enumerators visited the selected respondents within the study area, using the Kobo Toolbox on tablets or smartphones to record their responses. This digital method ensured real-time data entry, reducing the risk of data loss or errors associated with manual data collection. Enumerators adhered to the predefined sampling strategy, ensuring that data was collected uniformly across different stages and locations.

### **Data Verification and Analysis**

Throughout the data collection process, ongoing verification and quality control measures were implemented. The data collected by enumerators were regularly reviewed to check for completeness and accuracy. Any discrepancies or issues identified were promptly addressed through follow-up visits or clarifications with the respondents. Once the data collection was completed, the dataset was cleaned, analyzed, and interpreted to draw meaningful conclusions and insights.

This comprehensive and structured methodology ensured that the data collection was thorough, reliable, and reflective of the real-world dynamics within the study area. By leveraging Kobo Toolbox and combining self-collection with enumerator-led data gathering, the survey achieved a high level of accuracy and depth, providing valuable insights into the supply chain processes and interactions among various actors.

### **Data Collection Criteria**

Data collection criteria are specific standards, essential guidelines and conditions established that help ensure that collected data are relevant, reliable, and suitable for answering the research questions. For this survey, the criteria are designed to capture comprehensive information from different actors within the vegetable value chain or production process. The data collection survey methodology used in this study involves a comprehensive approach aimed at capturing information from various stages of the value chain across two specific locations, Dhankuta Municipality and Chhathar Jorpati Rural Municipality.

The total number of survey respondents is 158, distributed across several critical roles within the value chain: producers, collectors, input suppliers, suppliers/wholesalers, and processors. Each of these categories represents a distinct stage in the production and distribution process, thereby ensuring that the survey captures a wide array of data points pertinent to the study's objectives. Each category represents a critical phase in the lifecycle of the products or services being studied, ensuring a holistic view of the entire system.

### **Secondary Data Collection**

Secondary data collection for the study involves gathering existing data from various reliable sources to provide a comprehensive background and context. Key sources include publications from relevant ministries and government agencies, such as annual reports, policy documents, and statistical bulletins, which offer insights into national and regional trends. The Central Bureau of Statistics (CBS) is a critical source, providing official statistics on demographics, agriculture, and economic indicators, which are essential for understanding broader patterns. Additionally, agricultural research articles from academic journals contribute in-depth analysis,

empirical findings, and theoretical perspectives on specific topics. Agricultural statistics, often published by government departments or international organizations, supply detailed data on vegetable production and market trends, helping to assess the sector's performance over time. These diverse sources collectively ensure a well-rounded understanding of the subject under study.

### **Data Processing**

Data processing is the systematic procedures involved in preparing, organizing, and transforming raw data collected into a format that can be analyzed and interpreted. Data processing steps involves data cleaning (identification and correction of errors or inconsistencies in the data), data coding (converting qualitative data such as responses from interviews or open-ended survey questions into a quantitative format that can be easily analyzed), data entry (storing the cleaned data into a software or database for analysis), data transformation (preparing, aggregating, and standardizing data for specific types of analysis), data validation (cross-checking data entries, conducting consistency checks, for ensuring the accuracy and integrity of the processed data), data integration (merging datasets, resolving discrepancies), data storage and management (saving data in appropriate formats, organizing files in database, and ensuring data security store), and data analysis preparation (sorting and filtering data for statistical analysis or other analytical methods).

Data processing is essential for adding value to the products, and any issues here can have a cascading effect on the quality and market readiness of the final products. The raw data collected from primary sources for this study were processed by entering them into a Microsoft excel sheet and the SPSS software. The secondary data obtained from different published and unpublished sources were also entered and processed using Excel software.

## **Methods of Data Analysis and Interpretation**

This study used Excel software to analyze the processed quantitative data. Data were imported and cleaned to ensure that variables are correctly labelled and coded. This step is important for accurate analysis. Descriptive statistics are then generated using software to summarize and describe the main features of the quantitative data. This includes calculating measures of central tendency (mean) and dispersion (standard deviation, range). Likewise, inferential statistical analyses are performed to frequencies and make inferences about the population based on the sample. Trend regression is estimated using Excel.

Quantitative and qualitative data were combined and analyzed to gain a more comprehensive understanding of the objectives of the study. However, triangulation compares quantitative and qualitative results to validate findings and identify areas of agreement or disagreement between the two data sets. The qualitative data are transformed into a format that can be analyzed alongside quantitative data, such as assigning codes or numerical values to qualitative information.

Tables, charts, or diagrams are used to present the integrated results of quantitative and qualitative findings. Additionally, interpretation is made by analyzing the integrated results of both quantitative and qualitative findings together and looking for complementary insights that enhance the overall understanding of the research questions.

## **Ethical Consideration**

In the field of philosophy known as ethics, notions of good and wrong behavior are defended, systematized, and recommended in order to minimize wrongdoing. Discussing on the ethical issues of research, to assure a high ethical standard in research, research ethics direct, teach, and oversee scientists undertaking

all types of study. Five fundamental ethical principles that need to be taken into account during the planning and designing stages of research include: minimizing the risk of harm to participants; obtaining informed consent from those who would be identified as research participants; protecting the anonymity and confidentiality of participants; refraining from deceptive practices; and finally, providing participants with the option to withdraw.

Studying ethics are crucial moral guidelines that help scientists perform honest studies and accurately describe its findings. Additionally, research ethics guard against any potential harm to study participants. This contributes to the validity of any research. Research's legitimacy and public trust are also ensured by adhering to ethical standards. Prioritizing ethical concerns in research should happen during the study design process. So as to achieve the greatest impact, dealing with ethical problems and hurdles is consistent with the study approach (Rana and Dilshad, 2021).

The research also vouches for the validity of the work represented in the text and accept legal liability for it. Finally, an author usually contributes to the writing, revision, and approval of the submitted manuscript. Data collecting, language and grammar editing, and other regular tasks do not merit authorship on their own. During the research, This research was conducted to be aware of these ethical issues and to take steps to address them. Researchers are also aware of the ethical codes and regulations that apply to this research. It is followed the codes and regulations that is help to ensure that research is conducted ethically.

### **Novelty and Contribution of the Study in Disciplinary Areas**

This research presents a comprehensive analysis of the vegetable value chain in Dhankuta Municipality and Chhathar Jorpati Rural Municipality, emphasizing agribusiness opportunities and systemic inefficiencies. While previous studies have

broadly discussed agricultural value chains, this study uniquely integrates regional specificity, empirical data, and multi-stakeholder perspectives to offer actionable recommendations for optimizing Nepal's vegetable sector. The novelty of this research lies in its localized approach, in-depth value chain mapping, and focus on Small and Medium Enterprises (SMEs) as key drivers of agribusiness growth.

One of the key innovations of this research is its quantitative assessment of value addition percentages across different actors in the vegetable supply chain. By dissecting the profit margins of farmers, collectors, wholesalers, and retailers, the study provides an empirical foundation for understanding disparities in value distribution. Unlike previous research, which often generalizes value chain constraints, this study identifies specific bottlenecks, including limited financial access, lack of post-harvest infrastructure, and inefficiencies in market linkages. These insights help craft targeted interventions that policymakers, cooperatives, and private sector stakeholders can implement to enhance profitability and sustainability in the vegetable sector.

Another novel aspect of the research is its focus on digital transformation and financial inclusion in agribusiness. While many studies highlight traditional challenges in Nepal's agriculture sector, this study explores the potential of digital market platforms, cooperative-led aggregation models, and alternative financing solutions to improve farmers' access to profitable markets. The integration of modern technology and policy-oriented strategies makes this study highly relevant to contemporary agricultural development initiatives in Nepal.

Furthermore, the study contributes to theoretical advancements in value chain analysis by integrating concepts from Porter's Value Chain Model, Global Value Chain (GVC) Theory, and Supply Chain Management (SCM) Theory. This

multidisciplinary approach enhances the practical applicability of the research, making it useful for both academia and industry professionals. Additionally, the study aligns its findings with the Sustainable Development Goals (SDGs), reinforcing the broader impact of vegetable agribusiness on food security, employment generation, and economic resilience.

## **Chapter- IV**

### **Data Analysis and Discussion**

#### **Introduction**

This chapter presents a comprehensive analysis of the current state of vegetable production and the agribusiness value chain in Dhankuta District. It examines the patterns and trends in vegetable cultivation, the structure and functioning of the local value chain, and the economic roles played by different actors such as farmers, collectors, wholesalers, and retailers. Special attention is given to identifying major constraints within the market system, including input supply issues, price fluctuations, and infrastructural challenges. Furthermore, the chapter explores agribusiness opportunities that can strengthen the vegetable sector, highlighting areas for investment, innovation, and capacity building. The findings are based on field surveys, interviews, and secondary data, offering a detailed understanding of both the challenges and prospects within the vegetable agribusiness landscape of Dhankuta.

The primary objective of this study was to analyse the vegetable value chain in Dhankuta Municipality and Chhathar Jorpati Rural Municipality of Dhankuta. Specifically, the study concentrated on analysing trends of vegetable production in Nepal and Dhankuta district, identifying opportunities and challenges for enhancing vegetable agribusiness, and the economic role of the agribusiness vegetable value chain in the study area. To analyse the state of vegetable production in Nepal and Dhankuta District, data accessed from secondary sources have been used, and data collected from primary sources are used to analyze the vegetable value chain, and economic aspects of vegetable SMEs and identify constraints in the vegetable value. The analysis is presented in verbal form as well as in table and graph. Qualitative data were subjected to thematic analysis to extract key themes and insights.

This chapter is organized into three main sections. The first section presents the findings on the state of vegetable production in the national and provincial levels and Dhankuta district. The second section analyzes the vegetable value chain based on primary sources data along with the economic role of agribusiness vegetable value chain (income/revenue generation, sales volume, employment, and uses of the received income) in the study area. The final section analyses the opportunities and challenge associated with the agribusiness of vegetable value chain. An attempt is made to identify any barriers hindering market access for participants in the vegetable value chain with their implications on business opportunities.

### **State of Vegetable Production in Nepal**

Vegetable production in Nepal plays a vital role in the agricultural sector, contributing significantly to food security, income generation, and employment. Over recent years, the area under vegetable cultivation has steadily expanded (Appendix I; Figure 1), reflecting the increasing demand domestically and internationally. This growth in cultivation area has been accompanied by a rise in total vegetable production, driven by advancements in farming practices and the adoption of improved seed varieties. However, the yield per hectare (Ha.), while improving, still faces variability due to factors such as soil fertility, irrigation availability, and climate conditions. This section provides a detailed examination of these aspects, offering insights into the current state and trends in Nepal's vegetable production.

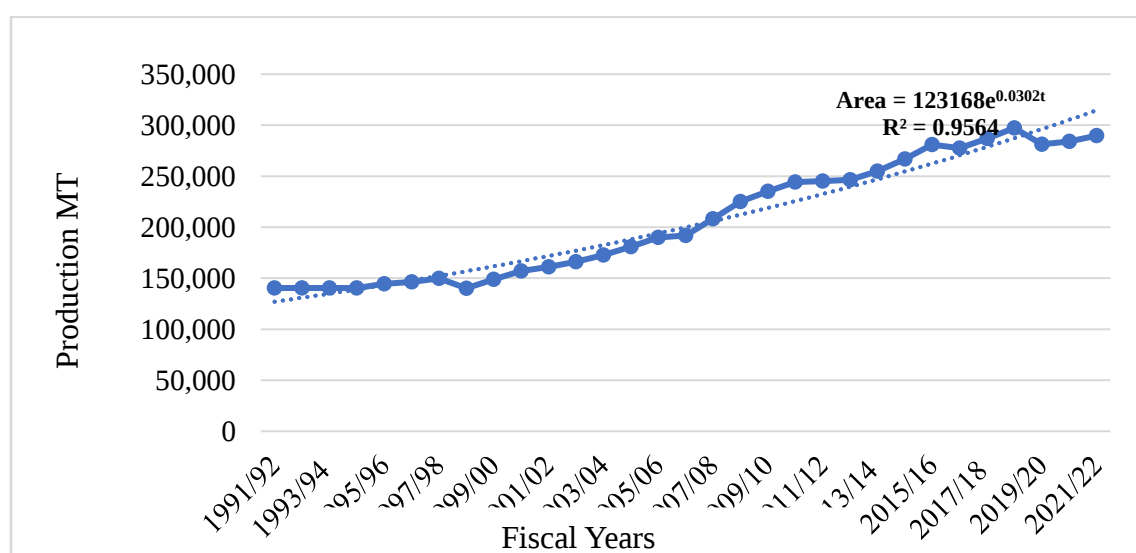
Vegetable acreage under cultivation is growing annually at a variable rate, with the exception of 1998/99 and 2015/16, when it has declined from the year before. Similar trends can be seen in the scenario of vegetable output, which is rising annually at a variable pace with the exception of the years 1980–1981 and 1998–1999 when it fell short of the prior year (Ghimire et al., 2018).

According to Manandhar et al. (2021) over the past 18 years, there has been a steady increase in the area, production, and productivity of vegetables. the total area covered by vegetation was 2,97,195 hectares under agriculture, and the output of FY 2018–19 saw 42,71,270 metric tons with a 14.4 MT/ha average production, which is extremely low compared to other countries' 30 MT. It makes it quite evident that it is enormous. Possibility of increasing vegetable yield through productive research and development initiatives. Over the past eighteen years, the area has increased by 89%, but production has increased by a significantly greater amount-158% due to a 37% increase in productivity during that time.

The area of vegetable cultivated land expanded from 140,500 ha in 1991/92 to 289,839 ha in 2021/22, reflecting almost a doubling of land used for vegetable production. The estimated exponential trend line of vegetable-cultivated area over the period 1991/92-2021/22 is portrayed in Figure 3. The data used for plotting are provided in Appendix I.

**Figure 3**

*Trend of Vegetable Cultivation Area*



Note. Vegetable Data Based Taken from MoALD. 2023. <https://moald.gov.np/>

Obviously, the area under fresh vegetable cultivation in Nepal has steadily increased over the period of 1991/92 to 2021/22. This indicates a significant expansion in the land used for vegetable farming.

The estimated exponential trend line equation for the area under vegetable cultivation with annual data points of the period 1991/92-2021/22 is:  $Area = 123168e^{0.0302t}$

Where;

- Area is dependent variable measured in hectares,
- $e$  is the base of the natural logarithm (approximately 2.718).
- $t$  is the number of years since the starting point.

The initial value 123,168 suggests that at the starting point (when  $t=0$ ), the area under vegetable cultivation was 123,168 hectares. The exponent of  $e$  is 0.0302 which indicates that the area under vegetable cultivation is increasing by about 3.2 % per year.

The estimated equation helps predict area under vegetable cultivation for a specific year by substituting the value of  $t$  into the equation. For example, for the 5<sup>th</sup> year (i.e., in 2027):  $Area = 123168e^{0.0302(5)} = 123168(2.718)^{0.151} \approx 1,43,242 \text{ hectares}$ . This means that after 5 years, the area under vegetable cultivation is projected to be approximately 1,43,242 hectares, reflecting exponential growth.

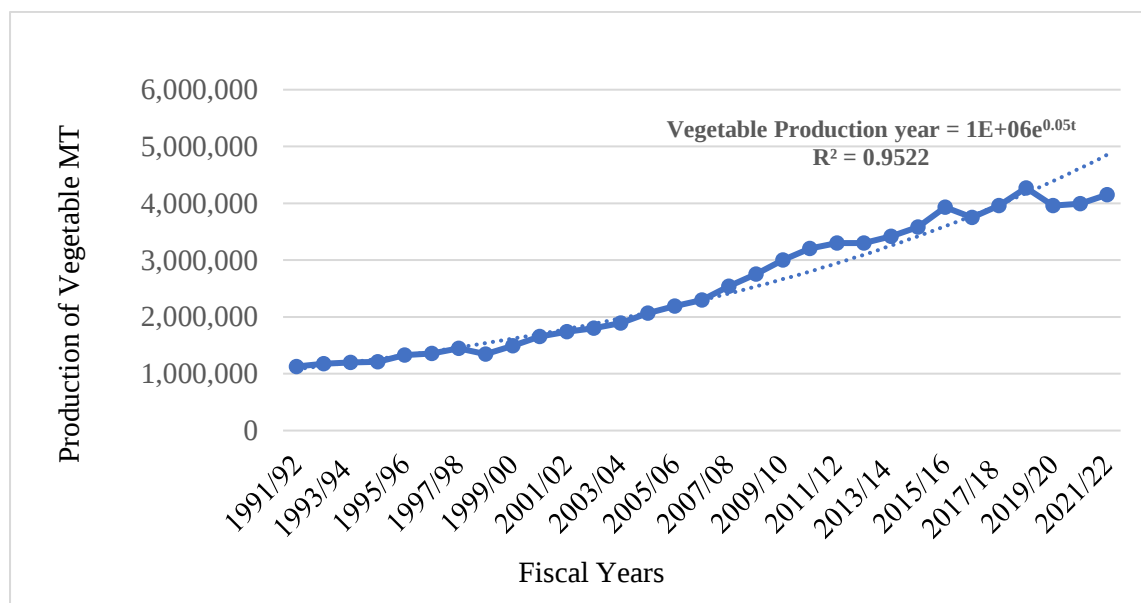
The  $R^2$  value, also known as the coefficient of determination, indicates how well the data fits the exponential trend line. In the estimate, the  $R^2 = 0.9564$  means that 95.64 % of the variability in the dependent variable (e.g., the area under vegetable cultivation) can be explained by the exponential trend model. In other words, the estimated the exponential trend line provides a very accurate representation of the actual data points. The remaining 4.36 % (i.e.,  $1-0.9564$ ) of the variability is due to

factors not captured by the model, which could be random noise (i.e., unpredictable and random errors or disturbances) or other variables not included in the analysis.

Fresh vegetable production exhibits increasing trend. Production rose substantially, starting from 1,127,884 metric tons and reaching 4,153,157 metric tons by the end of 2021/22 period. The estimated exponential trend line of vegetable production over the period 1991/92-2021/22 is portrayed in Figure 4.

**Figure 4**

*Trend of Vegetable Production*



*Note.* Vegetable Data Based Taken from MoALD. 2023. <https://moald.gov.np/>

From Figure 4, it is obvious that fresh vegetable production in Nepal has steadily grown in Nepal over the period 1991/92 to 2021/22. The estimated exponential time trend equation of vegetable production) is  $Y = 1E + 06e^{0.05t}$  which in simple form is  $Y = 1 \times 10^6 e^{0.05t}$ . The term  $1 \times 10^6$  (which is 1,000,000) represents the initial value of vegetable output (Y) when  $t = 0$ . This means that at the starting point, the variable Y is 1,000,000 metric tons (Mt.). The exponent 0.05 represents growth rate of vegetable output. This means that Y grows at an

approximate rate of 5 % per unit increase in  $t$  (per year). The actual production value is very close to the predicted production from the exponential trendline.

In the estimate, the  $R^2 = 0.9522$  means that 95.22 % of the variability in the dependent variable (e.g., vegetable production) can be explained by the exponential trend model. In other words, the estimated the exponential trend line provides a very accurate representation of the actual data points. The remaining 4.78 % (i.e.,  $1 - 0.9522$ ) of the variability is due to factors not captured by the model, which could be unpredictable and random errors or disturbances or other variables not included in the analysis.

In the context of vegetable cultivation, yield refers to the amount of vegetable produced per unit of land. It is usually expressed in terms of weight (such as kilograms or tons) per hectare or acre. Yield is a key indicator of the productivity of agricultural land. It shows how effectively the land is being used to produce vegetables. Yield is calculated by dividing the total production of vegetables by the area of land cultivated.

Yield per hectare has improved steadily, increasing from 8.03 Mt./Ha. in 1991/92 to 14.33 Mt./Ha. in 2021/22, indicating advancements in agricultural practices and efficiency over the years. The table summarizes the area, production, and yield of fresh vegetables in Nepal over a period of 31 years from 1991/92 to 2021/22. This improvement in yield indicates better agricultural practices, inputs, and possibly the introduction of higher-yielding vegetable varieties.

The estimated exponential time trend equation of vegetable production is:  $\text{Yield} = 8.3733e^{0.0196t}$ . The term 8.3733 represents the initial value of vegetable yield when  $t = 0$ . This means that at the starting point, vegetable yield is 8.3733 metric tons per hectare (Mt./Ha). The exponent 0.0197 represents growth rate of vegetable yield.

This means vegetable yield grows at an approximate rate of  $1.97 \approx 2\%$  per unit increase in  $t$  (per year).

In the estimate, the  $R^2 = 0.9454$  means that 94.54 % of the variability in the dependent variable (e.g., vegetable yield) can be explained by the exponential trend model. In other words, the estimated exponential trend line provides a very accurate representation of the actual data points. The remaining 5.46 % (i.e.,  $1-0.9454$ ) of the variability is due to factors not captured by the model, which could be unpredictable and random errors or disturbances or other variables not included in the analysis.

The analysis of vegetable cultivation from 1991/92 to 2021/22 reveals a consistence increase in the area of land cultivated, production volumes, and yield per hectare. This growth reflects improvements in agricultural practices and technology, leading to higher efficiency and productivity. The upward trend highlights the sector's expanding capacity to meet food demands, contributing positively to food security and economic growth.

### **Fresh Vegetables Production in Koshi Province**

Vegetable production in Koshi Province is a vital component of the local agricultural economy, benefiting from the province's diverse climate and topography, which range from the fertile plains of the Terai to the cooler hills and mountains. Key vegetable crops include tomatoes, potatoes, cauliflower, cabbages, and leafy greens, cultivated primarily in districts like Dhankuta, Morang, and Sunsari. The province's varied agro-ecological zones allow for year-round production, catering to both local consumption and market demand in other parts of the country. However, vegetable farming faces challenges such as limited access to modern farming techniques, inadequate irrigation infrastructure, and susceptibility to climate change impacts like erratic rainfall and drought. With increased access to markets and the adoption of

improved farming practices, Koshi Province has significant potential to enhance its vegetable production and contribute to national food security and export markets.

Table 4.1 reveals the state of fresh vegetable production in Koshi Province of Nepal. The table describes a summary of the area, production, and yield of fresh vegetables in Koshi Province over the period from 2014/15 to 2021/22.

**Table 2**

*Fresh Vegetables in Koshi Province*

| Year    | Area (Ha.) | Production (Mt.) | Yield (Mt./Ha) |
|---------|------------|------------------|----------------|
| 2014/15 | 58,150     | 792,926          | 13.64          |
| 2015/16 | 45,252     | 718,304          | 15.87          |
| 2017/18 | 60,220     | 840,310          | 13.95          |
| 2018/19 | 61,492     | 894,442          | 14.55          |
| 2019/20 | 48,608     | 771,156          | 15.86          |
| 2020/21 | 50,449     | 797,842          | 15.81          |
| 2021/22 | 51,152     | 814,689          | 15.93          |

*Note.* Fresh vegetable production in Koshi province. MoALD. 2023.

<https://moald.gov.np/>

As regards the area under fresh vegetable cultivation in Koshi Province, it has fluctuated over the years 2014/15 to 2021/22. It started at 58,150 hectares in 2014/15, dropped to a low of 45,252 hectares in 2015/16, and then increased again to 51,152 hectares by 2021/22.

As regard to production trends of fresh vegetables, it also varied, reflecting changes in the cultivated area. Production ranged from 718,304 metric tons in 2015/16 to a high of 894,442 metric tons in 2018/19, with the final figure of 814,689 metric tons in 2021/22.

Yield, measured in metric tons per hectare, generally increased over the period. It started at 13.64 Mt./Ha. in 2014/15, with a significant improvement to 15.93 Mt./Ha. by 2021/22. The improvement in yield may be because of enhancements in farming techniques or use of improved seeds and so on.

Hence on the basis of the information contained in Table 4.1 it appears that while there have been fluctuations in the area and production, the yield of fresh vegetables in Koshi Province has shown a positive trend, with notable improvements in productivity over the observed period.

### **State of Fresh Vegetable Production in Dhankuta District**

Dhankuta District, located in the hilly region of Koshi Province, is known for its favorable climate and fertile soil, making it an important area for fresh vegetable production. Farmers in the district cultivate a variety of vegetables, including tomatoes, cauliflower, cabbage, radish, leafy greens, and beans, benefiting from the cooler climate which supports year-round farming. The district's terraced farms utilize traditional and modern agricultural practices, contributing to the supply of fresh vegetables to both local and regional markets, including nearby urban centers like Dharan and Biratnagar.

Table 3 provides a summary of cultivated area, production, and yield of fresh vegetables in Dhankuta District over the period from 2014/15 to 2021/22.

**Table 3***Vegetable Production of Dhankuta District*

| Year    | Areas (Ha.) | Production (Mt.) | Yield (Mt./Ha) |
|---------|-------------|------------------|----------------|
| 2014/15 | 5748        | 124509           | 21.66          |
| 2015/16 | 4707        | 114504           | 24.33          |
| 2017/18 | 5856        | 129,740          | 22.16          |
| 2018/19 | 5,919       | 132,122          | 22.32          |
| 2019/20 | 5,983       | 133,457          | 22.31          |
| 2020/21 | 5,983       | 141,233          | 23.61          |
| 2021/22 | 6,387       | 141,233          | 22.11          |

*Note.* Vegetable area and production data. MoALD. 2023. <https://moald.gov.np/>

The area under fresh vegetable cultivation in Dhankuta District shows a gradual increase. It started at 5,748 hectares in 2014/15 and reached 6,387 hectares by 2021/22.

**Production Growth:** The production of fresh vegetables has generally increased over the years, starting at 124,509 metric tons in 2014/15 and peaking at 141,233 metric tons in 2020/21. The production remained the same in 2021/22.

**Yield Variation:** The yield, measured in metric tons per hectare, has fluctuated slightly but generally remained high. It started at 21.66 Mt./Ha. in 2014/15, reached a peak of 24.33 Mt./Ha. in 2015/16, and was recorded at 22.11 Mt./Ha. in 2021/22. The data suggests that Dhankuta District has seen a steady increase in the area dedicated to vegetable farming and a corresponding rise in production, with relatively stable and high yields over the observed period. Yield remained higher in Dhankuta District (Table 4.2) than in Koshi Province (Table 4.1) over the same period, 2014/15-2021/22

### ***Volume of Different Vegetable Production in Dhankuta***

Dhankuta district produces some vegetables in larger quantities. Though fresh vegetables and staple crops are grown in Dhankuta District, the district's focus on these high-value cash crops has helped establish it as a key agricultural player in Nepal's eastern region, with potential for further growth in both domestic and international markets.

Table 4 shows area, production and yield of some of the vegetables produced in larger volume in Dhankuta District over the period of 2015/16 to 2021/22. Area is measured in hectares (Ha), production and yield are in metric tons (Mt).

**Table 4**

### ***Volume of Different Vegetable Production in Dhankuta***

| Year    | Area/<br>production/<br>Yield | Cauliflower | Cabbage  | Tomato   | Radish   | Broad<br>Leaf<br>Mustard | Peas    |
|---------|-------------------------------|-------------|----------|----------|----------|--------------------------|---------|
|         | Area                          |             |          |          |          |                          |         |
| 2015/16 | Area                          | 560         | 1460     | 1375     | 560      | 305                      | 320     |
|         | Production                    | 10740       | 38234    | 47750    | 9700     | 3550                     | 3550    |
|         | Yield                         | 19.18       | 26.19    | 34.73    | 17.32    | 11.64                    | 11.09   |
| 2017/18 | Area                          | 590.94      | 1489.41  | 1465.29  | 573.855  | 318.585                  | 331.65  |
|         | Production                    | 11508.95    | 39246.58 | 52497.57 | 10006.07 | 3729.93                  | 2376.53 |
|         | Yield                         | 19.48       | 26.35    | 35.83    | 17.44    | 11.71                    | 7.17    |
| 2018/19 | Area                          | 595         | 1500     | 1480     | 578      | 325                      | 335     |
|         | Production                    | 11520       | 39260    | 53280    | 10050    | 3900                     | 2412    |
|         | Yield                         | 19.36       | 26.17    | 36.00    | 17.39    | 12.00                    | 7.20    |
| 2019/20 | Area                          | 597         | 1400     | 1481     | 580      | 327                      | 338     |
|         | Production                    | 11424       | 39258    | 54000    | 10173    | 3960                     | 2465    |

|         |            |       |       |       |       |       |      |
|---------|------------|-------|-------|-------|-------|-------|------|
|         | Yield      | 19.14 | 28.04 | 36.46 | 17.54 | 12.11 | 7.29 |
|         | Area       | 600   | 1500  | 1498  | 585   | 330   | 340  |
| 2020/21 | Production | 11600 | 29260 | 53800 | 10150 | 3955  | 2465 |
|         | Yield      | 19.33 | 26.17 | 35.91 | 17.35 | 11.98 | 7.25 |
|         | Area       | 1035  | 1500  | 1498  | 588   | 330   | 340  |
| 2021/22 | Production | 19665 | 39259 | 53800 | 10224 | 3955  | 2500 |
|         | Yield      | 19.00 | 26.17 | 35.91 | 17.39 | 11.98 | 7.35 |

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*Note.* Volume of Vegetable Production. MoALD. 2023. <https://moald.gov.np/>

Table 4 shows that cauliflower, cabbage, tomato, radish, broad-leaf mustard, peas and chayote are the major vegetables produced in larger quantities. The data indicate a general trend of increasing cultivation area and production for most vegetables, with yields remaining relatively stable or improving slightly over the years. Notably, cauliflower and tomato have shown the most significant increases in both area and production. However, peas have seen a decline in yield despite an increase in cultivation area. Chayote cultivation appears to be a more recent development, with consistent yield improvements since its introduction.

### ***Vegetables Land Holding in Dhankuta***

Vegetable production and landholding are crucial in determining productivity, income generation, and food security, particularly in rural agricultural economies like Nepal. Smaller landholdings, common in hilly regions such as Dhankuta, often limit farmers' capacity to scale up vegetable production, resulting in fragmented and subsistence-level farming. However, even small plots of land, when efficiently managed with the adoption of modern farming techniques, can produce high-value vegetables, which would bring better returns than staple crops. On the other hand, larger landholdings enable diversified vegetable farming, allowing for crop rotation,

higher yields, and access to larger markets. The size and quality of landholdings also influence access to resources like irrigation, credit, and extension services, which are vital for scaling production. Strengthening this linkage through policy support, land reform, and improved access to agricultural technologies is critical for increasing the productivity and profitability of vegetable farming.

Table 5 presents the number of holdings and holdings with vegetable in Nepal, Koshi Province, and Dhankuta District.

**Table 5**

*Number of Holding and Number of Holding with Vegetables*

| Region         | Total number of holdings | Number of holdings with vegetable crop |
|----------------|--------------------------|----------------------------------------|
| Nepal          | 4,130,789                | 257,020                                |
| Koshi Province | 786,108                  | 66,931                                 |
| Dhankuta       | 31,526                   | 8,044                                  |

*Note.* National Sample Census of Agriculture Nepal 2021/22.

<https://agricensusnepal.gov.np>

Nationwide, Nepal has 4,130,789 holdings out of which 257,020 are holdings with vegetable crops. In Koshi Province, the number of holdings is 786,108 out of which 66,931 accounted for vegetable farming. Specifically, in Dhankuta District, there are 31,526 holdings with 8,044 holdings of vegetable cultivation. Out of 257,020 national level holdings of vegetable, share of is Dhankuta is 3.13 % (8044 holdings), and in total vegetable holdings in Koshi Province, Dhankutta District shares 12.02 % for vegetables. Table 5 provides detailed information on the number of holdings, areas, and the usage of agricultural inputs for vegetable farming across Nepal, Koshi Province, and Dhankuta District.

**Table 6***Number of Areas of Holdings and Use of Vegetable Seeds*

| Province and District | Total          |           | Vegetables Seeds     |                |              |
|-----------------------|----------------|-----------|----------------------|----------------|--------------|
|                       | No of holdings | Area (ha) | No. of holdings used |                |              |
|                       |                |           | Local seeds          | Improved seeds | Hybrid seeds |
| Nepal                 | 4130789        | 2218409.9 | 1,277,619            | 438,271        | 261,680      |
| Koshi Province        | 786108         | 532937.2  | 367,995              | 79,848         | 24,042       |
| Dhankuta              | 31,526         | 21,780.80 | 19,401               | 5,034          | 2,885        |

*Note:* CBS.2024. National Sample Census of Agriculture Nepal 2021/22.

<https://moald.gov.np/>

Nationally, there are 4,130,789 holdings with a total area of 2,218,409.9 hectares. A significant portion of these holdings use local seeds (1,277,619), while a smaller number utilise improved seeds (438,271) and hybrid seeds (261,680). In terms of fertilizer usage, 1,516,982 holdings use local fertilizers, 90,830 holdings use mineral/chemical fertilizers, and 369,759 holdings use both types. The area treated with mineral/chemical fertilizers spans 37,173.67 hectares, with a total quantity of 145,048.80 quintals used.

In Koshi Province, there are 786,108 holdings covering 532,937.2 hectares. Among these, 367,995 holdings use local seeds, 79,848 use improved seeds, and 24,042 use hybrid seeds. Local fertilizers are used by 412,508 holdings, mineral/chemical fertilizers by 16,937 holdings, and both by 42,440 holdings. The area treated with mineral/chemical fertilizers is 6,838.57 hectares, with 21,528.66 quintals used.

In Dhankuta, 31,526 holdings cover 21,780.8 hectares. Local seeds are used by 19,401 holdings, improved seeds by 5,034, and hybrid seeds by 2,885. Local fertilizers are utilized by 18,726 holdings, mineral/chemical fertilizers by 1,080 holdings, and both by 7,514 holdings. The area treated with mineral/chemical fertilizers is 1,588.17 hectares, with 6,145.75 quintals applied. This data illustrates the extent of agricultural input utilization across the regions, showing varying levels of seed and fertilizer used in vegetable farming.

### ***Insurance for Vegetable Farming***

Insurance plays a vital role in vegetable farming by providing farmers with financial protection against unexpected losses due to factors like adverse weather conditions, pests, diseases, or market volatilities. It helps stabilize farmers' incomes by compensating for crop losses, allowing them to recover and reinvest in future planting seasons. Additionally, insurance encourages the adoption of modern farming practices, as farmers are more likely to take calculated risks when they know they have a safety net. On the whole, insurance supports the sustainability and resilience of vegetable farming by reducing financial vulnerability and promoting long-term growth. Table 7 highlights holdings and insurance for vegetable farming.

**Table 7**

*Number of Holdings and Insurance for Vegetables Farming*

| Region         | Total number<br>of holdings | Number of<br>insurances for<br>agricultural activity | Number of vegetable<br>crop holdings covered<br>by insurance |
|----------------|-----------------------------|------------------------------------------------------|--------------------------------------------------------------|
| Nepal          | 4,130,789                   | 182,441                                              | 5,819                                                        |
| Koshi Province | 786,108                     | 27,530                                               | 771                                                          |
| Dhankuta       | 31,526                      | 1,188.00                                             | 79                                                           |

*Note:* CBS. 2024. National Sample Census of Agriculture Nepal 2021/22.

<https://moald.gov.np/>

Table 7 provides data on the number of holdings reporting insurance coverage for vegetable farming across Nepal, Koshi Province, and Dhankuta District. Nationally, out of 4,130,789 holdings, 182,441 holdings have insurance for agricultural activities, with only 5,819 of these specifically insuring vegetable crops. In Koshi Province, there are 786,108 total holdings, of which 27,530 have insurance for agricultural activities, and only 771 holdings have insurance specifically for vegetable farming. In Dhankuta District, 31,526 total holdings are reported, with 1,188 having insurance for agricultural activities, but only 79 are insured for vegetable crops.

This data highlights the relatively low uptake of insurance specifically for vegetable farming compared to overall agricultural insurance coverage across the regions. Given the reliance on traditional practices like local seeds and organic fertilizers, Dhankuta's vegetable production likely experiences modest growth compared to regions that have more fully embraced modern agricultural practices. However, the gradual adoption of improved and hybrid seeds, along with some use of chemical fertilizers, suggests a slow but steady shift towards more productive farming methods, which could lead to increased yields over time.

Businesses are required to be registered with a government agency. This is beneficial for both the business operators and the government. The state of businesses registered is highlighted in Table 8.

**Table 8***Holdings Registered in Government Agencies*

| Region         | Total number<br>of holdings | Number of holdings<br>registered in the<br>government agency | Vegetable<br>crop holdings |
|----------------|-----------------------------|--------------------------------------------------------------|----------------------------|
| Nepal          | 4,130,789                   | 150,647                                                      | 34,868                     |
| Koshi Province | 786,108                     | 25,467                                                       | 4,505                      |
| Dhankuta       | 31,526                      | 1,282                                                        | 431                        |

*Note:* CBS. 2024. National Sample Census of Agriculture Nepal 2021/22.

<https://moald.gov.np/>

Table 8 reveals number of agricultural holdings engaged in vegetable farming that are registered with a government agency across Nepal, Koshi Province, and Dhankuta District. Nationally, out of 4,130,789 total holdings, 150,647(3.65 %) are registered with government agencies, with 34,868 of these specifically involved in vegetable crop activities. In Koshi Province, 25,467 out of 786,108 total holdings are registered, and 4,505 are focused on vegetable farming. In Dhankuta District, 1,282 of the 31,526 holdings are registered with the government, of which 431 are engaged in vegetable crop production. This data indicates that while a significant number of holdings operate without formal registration, there is a notable portion of vegetable-focused holdings that are officially recognized by government agencies, which may reflect efforts to formalize agricultural activities and provide access to resources and support.

### **Functionality of Vegetable Value Chain in Dhankuta**

The analysis of the functionality of the vegetable value chain involves examining how effectively the various components of the chain operate and interact to

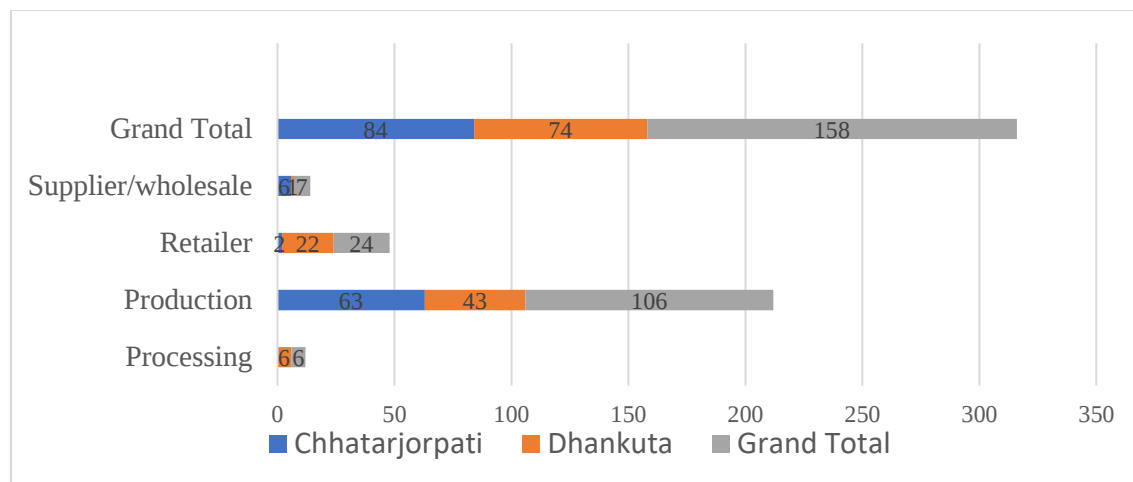
move vegetables from production to the end consumer. This particularly looks at value chain actors and their roles, linkages and relationships between actors, market dynamics, challenges and bottlenecks, institutional support and policy environment, impact on livelihoods among others. This part of analysis is primarily based on survey data collected from the study area. So, this begins with statistics related to respondents.

### ***Respondents***

The respondents of the study were SMEs operating in Dhankuta Municipality and Chhathar Deurali Rural Municipality of Dhankuta. Respondents selected for collecting data were suppliers/wholesalers, retailers, producers, and processors involved in vegetables. The number and types of respondents are shown in Figure 5.

**Figure 5**

*Respondents Number and Types*



*Note.* Researcher's Compilation from Field Survey Data, 2080.

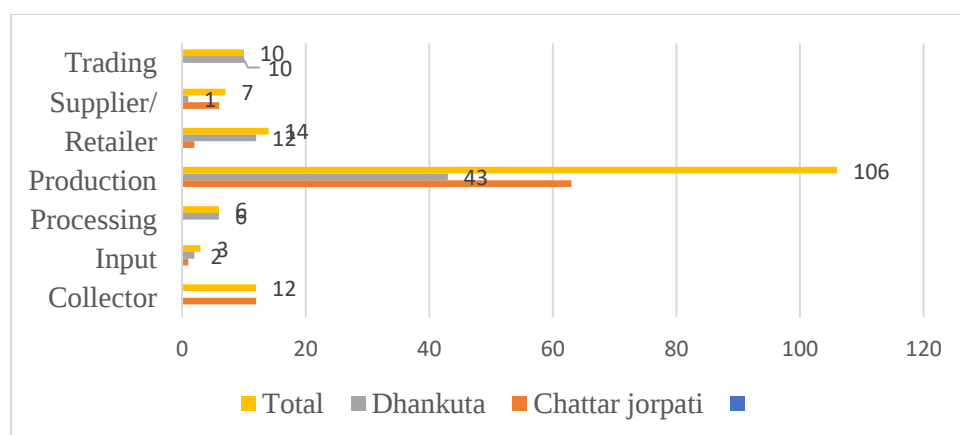
Figure 5 provides data on the distribution of respondents involved in various roles within the vegetable value chain across two regions, Chhathar Jorpati and Dhankuta. As per the sample coverage, in Chhatarjorpati, there are 12 collectors, 1 input provider, 63 producers, 2 retailers, and 6 suppliers/wholesalers, totaling 84

respondents. In Dhankuta, there are 2 input providers, 6 processors, 43 producers, 22 retailers, and 1 supplier/wholesaler, totaling 74 respondents. Combining both regions, the grand total is 158 respondents, with the highest number of respondents involved in production (106), followed by retailers (24), collectors (12), suppliers/wholesalers (7), processors (6), and input providers (3). This distribution highlights the significant involvement of respondents in production activities in both regions, with Dhankuta having a notable presence of processors and retailers, while Chhatarjorpati has a higher number of collectors and suppliers/wholesalers.

The respondents covered in the study were extensive, encompassing a significant portion of both Dhankuta Municipality and Chhatar Jorpati Rural Municipality. In Dhankuta Municipality, out of the 10 wards, 10 were included in the survey, ensuring a comprehensive representation of the area. Meanwhile, Chhatar Jorpati Rural Municipality achieved full coverage, with respondents from all 6 of its wards participating. This broad geographic reach across these municipalities provides a robust and diverse dataset, capturing the perspectives and conditions across different communities within these regions. Figure 6 highlights coverage of respondents.

**Figure 6**

*Respondent Coverage of Study Area*



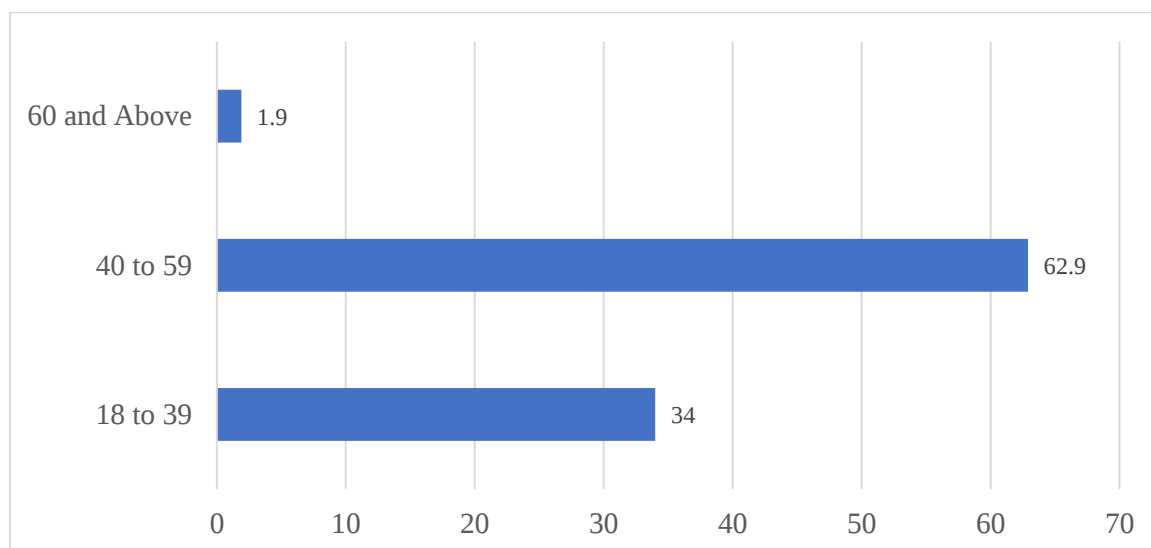
*Note.* Researcher's Compilation from Field Survey Data, 2080

Figure 6 presents value chain actors of agricultural stakeholders across Chhathar Jorpati Rural Municipality and Dhankuta Municipality, categorized into roles such as Collectors, Input Suppliers, Processing Units, Producers, Retailers, Wholesalers/Suppliers, and Traders. In Chhathar Jorpati, a total of 84 stakeholders were identified, with a significant majority (63) involved in production, followed by 12 collectors and a smaller number in other roles. Specifically, Ward 6 had the highest concentration with 37 participants across different categories. Meanwhile, in Dhankuta Municipality, 74 stakeholders were identified, with 43 involved in production and a notable presence in processing (6) and trading (10). Overall, the data captures 158 stakeholders, highlighting the active engagement in agricultural activities across these regions, with a strong focus on production and varied participation in other aspects of the value chain.

A wide range of stakeholders, including municipalities, cooperatives, NGOs, and other supporting organizations, provided the qualitative replies. These organizations offered insightful information about the operational and contextual facets of the topic being studied. Local NGOs emphasized development priorities and advocacy initiatives, DCCI, cooperatives presented grassroots-level difficulties and experiences with community participation, while municipalities offered viewpoints on local governance and policy implementation. Additional facets of resource mobilization, technical know-how, and cooperative frameworks were provided by other supporting entities. By providing a comprehensive grasp of the systemic dynamics and socioeconomic elements impacting the results, this wide range of qualitative input enhanced the analysis.

### ***Respondents Age Group***

The structure of the respondents' age group is shown in Figure 7.

**Figure 7***Age Group Percentage of Respondents*

*Note.* Researcher's Compilation from Field Survey Data, 2080.

Figure 7 provides insights into the age distribution of respondents, categorizing them into three groups: 18 to 39, 40 to 59, and 60 and above. Among the 158 respondents, the majority fall into the 40 to 59 age group, constituting 62.9% of the total, followed by the 18 to 39 age group, which comprises 34%. Only a small percentage of respondents, 1.9%, belong to the 60 and above age group.

Cumulatively, the vast majority of respondents, 98.1%, are aged between 40 and 59 or younger. This distribution indicates that the respondents are predominantly middle-aged, with a significant proportion falling within the working-age range of 40 to 59 years old, suggesting that this demographic cohort plays a central role in the context of the research or survey conducted.

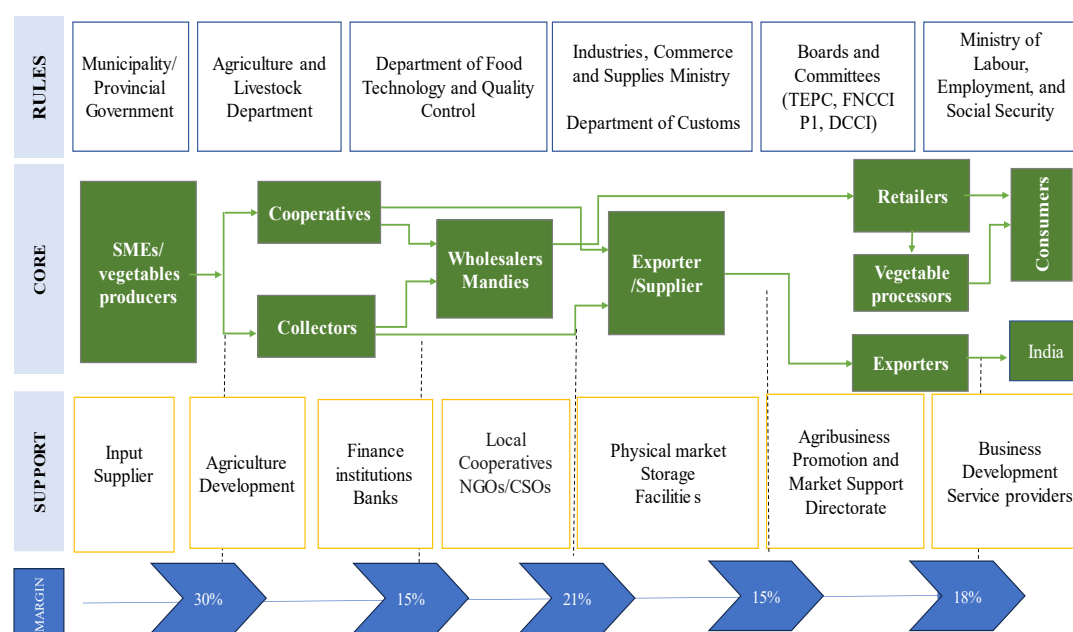
### **Vegetable Value Chain**

Dhankuta, a district in eastern Nepal, features a vibrant vegetable value chain characterized by diverse actors and activities contributing to producing, distributing,

and consuming fresh produce. The framework connecting different aspects of the vegetable value chain in the study area is portrayed in Figure 8.

**Figure 8**

*Vegetable Market System Map of Study Area*



*Note.* Researcher's Compilation from Field Survey Data, 2080.

The vegetable value chain map for Dhankuta Municipality and Chhathar Jorpati Rural Municipality in Dhankuta District, Nepal, provides a structured representation of the processes, stakeholders, and supporting factors involved in the production, transformation, and delivery of vegetables to consumers. This map is designed to illustrate the flow of goods, finances, and information across the chain while highlighting the specific dynamics and challenges of the region's vegetable sector. It builds on established value chain frameworks, such as Porter's (1985) value chain model and the global value chain (GVC) theory (Gereffi et al., 2005), adapted to the local context of eastern Nepal's hilly region.

The vegetable value chain in Dhankuta Municipality and Chhathar Jorpati Rural Municipality consists of several key actors who contribute to value addition at different stages. The distribution of value addition percentage across the chain.

**Table 9***Vegetable Value Addition and Margin Distribution Entire Market Actors*

| Distribution | Producers | Collectors/ | Wholesalers | Retailers |
|--------------|-----------|-------------|-------------|-----------|
| Margin       | Farmers   | Aggregators |             |           |
| Margin       | 30%       | 21%         | 15%         | 15%       |
| Percent      |           |             |             |           |

*Note.* Researcher's Compilation from Field Survey Data, 2080.

Farmers play a foundational role in the value chain by cultivating vegetables such as tomatoes, potatoes, cauliflower, and leafy greens. They receive about 30% of the overall margin, reflecting their role in production and initial handling. Their income is influenced by productivity, access to quality inputs, and support from cooperatives and government initiatives.

These actors serve as intermediaries, purchasing vegetables from multiple farmers, sorting, grading, and packing them based on market demand. They earn 21% of the profit, which highlights their role in the logistics and market linkage process. The efficiency of collectors impacts price stability and timely delivery to wholesalers.

Wholesalers procure vegetables from collectors and cooperatives, handling large-scale distribution. They account for 15% of the total margin, reflecting their role in bulk transactions and supply chain management. Some wholesalers directly export vegetables to India, increasing value through cross-border trade.

Retailers, including local markets, grocery stores, and supermarkets, receive 15% of the total margin.

They are responsible for product availability, customer engagement, and ensuring fresh, high-quality produce for end consumers. Their ability to handle perishable goods efficiently contributes to the overall value chain optimization.

At the heart of the value chain are smallholder farmers cultivating vegetables on terraced fields nestled within the region's hilly terrain. These farmers grow a variety of crops such as tomatoes, potatoes, cauliflower, cabbage, and leafy greens using traditional farming methods, supplemented by organic practices. Input suppliers play a crucial role in providing farmers with seeds, pesticides, and farming equipment necessary for vegetable cultivation. Local agricultural cooperatives and government extension services offer technical assistance, training programs, and access to credit, empowering farmers to enhance productivity and adopt sustainable farming practices.

After harvesting, the collectors are collected and sold to wholesale markets in Dhankuta, Dharan, Itahari, Damak, Biratnagar and Birtamodh town and nearby urban areas. Aggregators or middlemen purchase produce from farmers, sort, grade, and pack vegetables based on quality and market demand. Wholesalers procure vegetables from collectors, cooperatives and framers. And, directly sell in the Indian market. Throughout the value chain, transportation networks, storage facilities, and market infrastructure facilitate the efficient flow of vegetables from farms to consumers, contributing to farmers' economic livelihoods and ensuring food security in Dhankuta and beyond.

The vegetable market's value chain map highlights the roles and contributions of the major market participants while showing how margins are distributed among them. Because of their crucial role in primary production and cultivation, producers, who are at the base of the chain, receive 30% of the overall margin. Collectors, who are in charge of combining produce from many suppliers, earn 21% of the profit, highlighting their function in initial market linkage and logistics. 15% of the margin goes to wholesalers, who act as a middleman between retailers and collectors, reflecting their role in market distribution and bulk transactions. Retailers receive

15% as well, which is commensurate with their role in accessibility and direct sales as the last link between items and customers. The interdependence of the actors in the vegetable value chain is highlighted by this distribution. In order to guarantee fair and effective value distribution, this distribution emphasizes the interconnectedness of the many players in the vegetable value chain and points to possible areas for action.

### ***Key Actors of Vegetable Value Chain and Their Functions***

As outlined in the conceptual framework of this study in chapter III, different participants are involved in the vegetable value chain and they play different roles in ensuring the movement, processing, and delivery of vegetables from the farm to the consumer. This sub-section provides the introduction and role of the key actors or stakeholders in the vegetable value chain in the study area: Dhankuta Municipality and Chhathar Deurali Rural Municipality

### **Input Suppliers**

Input suppliers in vegetable production provide essential resources such as farming tools and equipment that are crucial for the successful cultivation of vegetables. Inputs such as crop protection and seed are manufactured or imported by a number of enterprises in Dhankuta. These suppliers often source high-quality inputs, which directly impact crop yield, disease resistance, and overall productivity. They may range from small local businesses to large agricultural companies, and they play a key role in supporting farmers by ensuring access to necessary materials, technical guidance, and innovations in farming practices. Efficient input supply chains are vital for maintaining the sustainability and profitability of vegetable production.

### **Producers/Farmers**

Producers, as primary actors in the vegetable value chain, are pivotal in initiating the entire process of vegetable production. Most of the SMEs produce

potatoes, cauliflower, tomato and cabbage even looking for export market. They encompass a diverse range of individuals and entities engaged in cultivating various types of vegetables in Dhankuta. From smallholder farmers working on subsistence plots to large-scale commercial enterprises employing modern agricultural practices, producers form the foundational layer of the vegetable value chain. At the heart of vegetable production are the farmers who till the land, sow seeds, nurture crops, and harvest the yields. These farmers operate within a spectrum of contexts, ranging from rural villages in Dhankuta including Chhathar Jorpati Rural Municipality. Despite differences in scale, resources, and methodologies, their common objective is to grow vegetables efficiently and sustainably to meet the demands of local, national, or international markets.

Some large-scale commercial producers harness advanced technologies and mechanization to optimize vegetable production. Some of them are using modern agricultural practices, including precision farming, and hydroponics, to enable producers to achieve higher yields, improve crop quality, and mitigate environmental impacts. The SMEs from Chatter Jorpati are found targeting to Indian market but Dhankuta's SMEs are more focused local and national markets, and some of them are road-head traders.

### **Collectors**

Collectors are part of the market actors in the vegetable value chain. In the vegetable value chain in this area, collectors play crucial role in linking smallholder farmers and export/wholesale/retail markets. Collectors, also known as aggregators or middlemen, act as intermediaries who gather vegetables from multiple small-scale producers and consolidate them for onward distribution to wholesalers, retailers, or processors. One primary function of collectors is to aggregate produce from numerous

smallholder farmers, often operating in geographically dispersed areas. They have based in *Sindhuwa* of Chatter Jorpati rural municipality and establish relationships with farmers, negotiate purchase agreements, and coordinate the collection of vegetables according to market demand and seasonal availability. By consolidating small quantities of produce from individual farmers, collectors achieve economies of scale, reducing transaction costs and logistical complexities associated with sourcing directly from numerous suppliers.

Additionally, collectors provide essential services such as transportation, sorting, grading, and packaging to ensure the quality and freshness of the vegetables. They may operate collection centres or depots where produce is inspected, processed, and prepared for distribution to downstream buyers. Through efficient handling and storage practices, collectors minimize post-harvest losses and maintain the marketability of the vegetables throughout the supply chain. Furthermore, collectors serve as market intermediaries linking smallholder farmers to broader markets and facilitating transactions based on prevailing market prices and demand. Their knowledge of local market dynamics, consumer preferences, and quality standards enables them to optimize pricing strategies and maximize returns for both farmers and buyers.

### **Wholesalers**

Wholesale or markets, play a critical role in the vegetable value chain by serving as key nodes where large quantities of produce are bought and sold between wholesalers, retailers, and other market participants. These wholesale markets act as centralized hubs where vegetables from various sources are aggregated, traded, and distributed to meet the demands of urban centres, regional markets, and other end consumers. Moreover, wholesale mandis serve as distribution centers, facilitating the

movement of vegetables from surplus-producing regions to deficit areas.

Transportation networks connect wholesale markets to production areas and consumer centers, enabling efficient logistics and supply chain management. Wholesalers purchase vegetables in bulk from mandis to supply retailers, food service providers, and other buyers with fresh produce regularly.

### **Supplier or Exporter**

As in other markets supplier or exporter is one of the major market actors in the vegetable market in this area. They play a crucial role in the vegetable value chain by serving as intermediaries who connect producers with international markets in India, thereby facilitating the export of fresh produce. These entities are based in *Sindhuwa* of Chatter Jorpati Rural municipality, and these entities range from agricultural input suppliers who provide farmers with seeds and equipment to specialized export firms that handle the logistics and trade of vegetables across borders.

One primary function of suppliers or exporters is to source high-quality vegetables from producers and aggregate them for export. They establish relationships with farmers or collect produce from wholesale markets, ensuring that the vegetables meet the required standards for international trade. Suppliers may also provide technical assistance and support to producers, helping them comply with export regulations, quality certifications, and packaging requirements.

Furthermore, suppliers or exporters play dynamic role in marketing and promoting vegetables in international markets. They leverage their networks, market insights, and trade expertise to identify potential buyers, negotiate contracts, and showcase the quality and diversity of locally grown produce. By fostering trade partnerships and expanding market access, exporters contribute to the economic growth and

competitiveness of the vegetable sector while creating opportunities for farmers to access lucrative export markets.

### **Retailer**

Vegetable retailers are based in the local market in Dhankuta, Dharan, Itahari and other city areas playing a crucial role in the vegetable value chain as the final link connecting producers with consumers. They are responsible for sourcing, stocking, and selling a diverse range of fresh vegetables to meet the demands of local communities, households, and institutions. Retailers operate through various channels, including grocery stores, supermarkets, farmers' markets, and online platforms, offering consumers access to a wide selection of fresh produce.

One primary function of retailers is to provide consumers with convenient access to a diverse variety of vegetables. They source produce from wholesalers, distributors, or directly from farmers, ensuring availability and freshness while catering to consumer preferences and seasonal variations. Retailers often employ merchandising techniques such as attractive displays, promotions, and product placement to enhance the visibility and appeal of vegetables to shoppers.

Moreover, retailers play a critical role in quality assurance and food safety. They adhere to regulatory standards and industry guidelines to ensure that vegetables are handled, stored, and displayed in hygienic conditions. Retailers may implement quality control measures such as inspection, grading, and labelling to reassure consumers about the freshness, safety, and nutritional value of the produce they purchase. The retailers are adjacent to glossary shops, separate vegetable shops and some department stores.

## **End Market**

The end market of vegetables in the study area is Nepal and India. The Indian market is based in Siliguri, India. Locals living close to vegetable-producing regions typically purchase veggies directly from nearby growers. These customers are typically few in number because their availability is dependent upon the presence of vegetable farms nearby. The majority of local customers purchase from *Haat* since there are enough varied sorts and supplies of vegetables available on *Haat* days. Some customers visit the long-term stores in the neighborhood market center. District-level wholesale markets exist where people can purchase the produce they need. Customers find these markets appealing since they may find a variety of vegetables in one location.

## **Support Functions**

The vegetable value chain encompasses a series of activities and support functions that facilitate the efficient flow of vegetables from production to consumption. Key support functions include input provision, where suppliers offer essential resources like seeds, and equipment. Financial services play a crucial role, providing credit and insurance to farmers and other stakeholders. Extension services and training programs enhance knowledge and skills, improving production techniques and post-harvest handling. Transportation and logistics ensure timely and safe delivery of produce, while market information systems provide data on prices, demand, and supply trends. Quality control and certification services help maintain standards and access to higher-value markets. These support functions collectively enhance productivity, reduce losses, and increase the profitability and sustainability of the vegetable value chain.

### ***Seed Companies***

Farmers' demands are met by agro-input suppliers (dealers and retailers), who support the full value chain. Inputs such as crop protection and seed are manufactured or imported by a number of enterprises in Nepal. Most of these businesses are privately held, and they have their own network of distributors, dealers, and retailers. Agro-vets typically supply farmers with inputs such as seed and crop protection goods. Based on the field study made in the context of this study approximately 70% of farmers rely on retailers, or agro-vets, for guidance on crop production and cultivation techniques.

In the vegetable industry, hybrid seeds are in more demand than open-pollinated (OP) seeds. Farmers are fond of hybrid seeds of particular vegetable crops, such as broccoli, cauliflower, cabbage, radish, carrot, and tomato. There is only one hybrid tomato variety, “*Srijana*” that is grown in Nepal, and it is also quite well-liked. Other hybrid tomato varieties from Nepal are being made, although they have not yet received registration. The majority of hybrid seed-users, 95 percent, are commercial growers, with subsistence farmers using the remaining 5 percent. Because OP seeds are less expensive than hybrids, small farmers typically utilize them for kitchen gardens.

Farmers in older production areas clean and grade the majority of their seeds but farmers in newer districts do not do this as frequently. As a result, before packaging seeds, the corporation working with new seed producing regions must clean, grade, and treat the seeds. Both domestically and imported seeds are packaged with accurate labels that include the names of the corresponding companies. Both authorized and unauthorized channels are used in the nation to import seeds. Seed varieties that are registered are imported through the official channel. This category's

imports are primarily found in the Kathmandu Valley. Seed traders, farmers, agents, and individuals import seeds, either registered or unregistered, through unofficial channels in order to evade administrative procedures and save money on taxes.

### ***Companies***

Companies play a pivotal role in the vegetable value chain by supplying essential nutrients that boost soil fertility and enhance crop growth and productivity. Their products help optimize yields, improve plant health, and ensure consistent quality in vegetable production. These companies often collaborate with farmers by guiding appropriate use, soil testing, and tailored nutrient management practices, which leads to more sustainable farming. By ensuring a reliable supply of seed and supporting farmers with knowledge and innovation, companies contribute to increased efficiency and profitability across the vegetable value chain.

The Government of Nepal-owned Agricultural Input Company Ltd. (AICL) estimates that due to financial constraints, only 2,50,000 MT of chemical is supplied nationally, compared to a need of around 7,85,000 MT. The government-owned companies AICL and Salt Trading Corporation Ltd. are responsible for importing (such as urea, diammonium phosphate, and potash murate) into Nepal (AICL, 2024). The amount of called complex that is legally imported from private enterprises is very little. AIC purchases 70% of the overall imports from the public sector, whereas Salt Trading Corporation imports 30%. The main importers of chemical are China, India, and Iran. The cost of illegally imported is significantly lower than that of legal import (SDC, 2018).

### ***Pesticides Companies and Agrovet***

Preparing botanical pesticides is typical for small farmers. These are made with plant parts that are readily available locally. In Nepal, the majority of chemical

and biopesticides are imported. Through importers, the majority of Indian manufacturers provide Crop Protection Input (CPI) to Nepal. The volume of imports from other nations, including China, Japan, and Jordan, is minimal.

In Nepal, there are six people who formulate pesticides (SDC, 2018). They repack locally after importing raw components from India for formulation. Six formulators manufacture micronutrients and synthetic and non-synthetic pesticides, with one producing both. These importers or formulators have their own network of distributors and retailers under their own distribution system. The majority of farmers purchase pesticides from agro-vets.

Pesticides are imported by majority of importers of seed and bio fertilizer. According to SDC (2018), pesticide formulated agencies are agro vet, the Department of Agriculture, projects, Extension service and Research and development, Physical market, finance, road and infrastructure service providers and transportation service providers.

Businesses sell seeds to farmers, retailers who are agro-vets, and wholesalers. City wholesalers supply seeds to agro-vets in other districts, who then resell the seeds to farmers and other distant agro-vets and merchants. Only a small number of agro-vets are located in rural areas; the majority are located near the headquarters. The agro-vet owners at the headquarters are better informed than those out in the field. A few mobile agro-vets also offer agricultural inputs at Haat Bazaar. These agro-vets sell seed as well as, insecticides, micronutrients, and equipment for agriculture.

### ***Technology Provider and Quality Control Agency***

The Ministry of Agriculture and Livestock Development's Department of Food Technology and Quality Control (DFTQC) is tasked with developing food processing technology and overseeing the quality of processed food produced in

Kathmandu. It frequently researches to advance food processing technology and facilitate technology transfer to small and medium-sized food processing facilities. It establishes the parameters for processed food quality, tests processed food quality, and certifies food products by the results. It operates a regional office called Regional Food Technology and Quality Control (RFTQC) in Biratnagar. Both have the technical staff, lab space, and other tools needed to organize these tasks.

### ***Providers of Business Development Services***

Some informal providers of company development services exist. Typically, these service providers offer assistance with business planning. There are no other services on the local market that assist processors in scaling up, such as marketing consulting, highly skilled technical expertise, connections with other national and international enterprises, branding, and brand promotion. While there are business incubators and other business development service providers in Kathmandu, their operations are centered in the city and do not give priority to the vegetable processing industry. Agriculture and agribusinesses are not given priority by business development service providers since they view these industries as complicated and having low revenue generation.

### ***Access to Financial Services***

Producers and processors of vegetables have relatively limited access to traditional funding sources. The service providers are often national and subnational banks, microfinance organizations, some angel investors, and impact investing, which have become increasingly common in recent years as a means of boosting the capabilities of agri-SMES.

### ***Service Providers for the Physical Market***

Municipalities oversee the market management committee and are in charge of overseeing the market centers. The departments in charge of developing roads and infrastructure are the Department of Roads, the Infrastructure Division, and the Ministry of Physical Infrastructure and Transport. Infrastructure and road development are also being worked on by several I/NGOs initiatives. Although passenger buses are used for about 10% of the transportation, traders typically employ mini trucks to get from commercial manufacturing sites to markets. When using micro trucks to move goods from collecting centers to wholesale markets, traders estimate that they lose between 5 and 8 percent of their value.

### ***Providers of Market Intelligence***

Farmers receive market information from local collectors, wholesalers, and retailers. Prices for wholesale and retail are offered by *Siliguri* Indian traders and the Agribusiness Promotion and Marketing Development Directorate. Retailers generally receive goods from wholesalers and the rate depend upon traders.

### ***Producers and Suppliers of Packaging Materials***

Manufacturers, fabricators, or importers provide the machinery and equipment needed for packaging vegetables, packing machines, sterilized utensils, testing-measuring units, etc. These machines and equipment, however, are not easily found in the desired size, capacity, or requirements. It is rare to find machinery that can be customized or made to order. It is rare for suppliers to train processors on how to use these devices or pieces of equipment. After-sale services are rare and typically focus on maintenance and the provision of spare components.

### ***Facilitators in the Vegetable SMEs***

A vegetable value chain facilitator is key in connecting different stakeholders, helping them work together smoothly and improving efficiency throughout the chain. This facilitator, often an individual or organization, acts as a bridge between farmers, input suppliers, processors, distributors, and retailers. They provide essential services such as market information, training, and capacity building to farmers, helping them improve their production practices and meet quality standards. Facilitators also assist in organizing farmers into cooperatives or groups, enabling them to access better resources, negotiate fair prices, and achieve economies of scale. Additionally, they help in identifying and addressing bottlenecks within the chain, fostering innovation, and promoting the adoption of sustainable practices. By creating strategic partnerships and fostering communication among stakeholders, vegetable value chain facilitators enhance the efficiency, competitiveness, and resilience of the entire value chain, ultimately benefiting both producers and consumers.

### ***Municipalities, State, and Federal Government***

The primary authority for formulating laws, policies, and enforcing them is the federal government. It guarantees that state legislation complies with federal regulations. The province government is essential to the development of province-level plans, strategies, and actions that comply with federal law.

The Ministry of Agriculture, Land Management, and Cooperatives is in charge of developing policies and providing agricultural technology extension services throughout Nepal. Providing extension services at the district level is the responsibility of rural municipalities and municipalities. Farmers prefer to consult agro-vets for technical vegetable information because they feel more at ease with them. Similarly, farmers can obtain technical information from cooperatives and

leader farmers. Plant genetic resource conservation, breeder and source seed production, variety maintenance, and new variety development are all under the purview of Nepal Agricultural Research Council (NARC).

### ***Department of Agriculture***

The Department of Agriculture (DoA) is in charge of organizing and carrying out all national activities pertaining to agriculture. The country's new organizational structure states that municipalities and rural municipalities would be in charge of organizing and carrying out agriculture-related initiatives. Farmers receive direct technical support from the municipality's agriculture staff. Farmers receive free or discounted agri-inputs, particularly seed. It also aids in the building of irrigation canals, collection centers, and other infrastructure. Its primary duty is to distribute technologies to input suppliers, farmers, and other stakeholders.

### ***Physical Service Provider and Road***

Municipalities supervise the market management committee and are in charge of directing the market centers. The departments in charge of developing roads and infrastructure are the Department of Transportation, the Infrastructure Division, and the Ministry of Physical Infrastructure and Transport. Infrastructure and road development are also being worked on by several I/NGOs initiatives.

### ***Transportation Service***

Although passenger buses are used for small-scale transportation, traders typically employ mini trucks to get from commercial manufacturing sites to markets. According to traders, when minitrucks convey goods from collecting centers to wholesale markets, they lose between 5 and 8 percent of their value. It is estimated that between 25 and 50 percent of vegetables are lost post-harvest from producer to store. In commercial production districts, transporting businesses also offer their

services, and in places where commercialization has begun, a few transporters are accessible.

### ***Market Information Provider***

Market information providers play a crucial role in agricultural value chains by offering timely and accurate data on market trends, prices, demand, and supply conditions. They gather and publicize information on factors like commodity prices, buyer requirements, seasonal trends, and regional market dynamics. This enables farmers, traders, and other stakeholders to make informed decisions about production, marketing, and sales strategies. Access to reliable market information reduces uncertainty, helps in negotiating better prices, and enhances the overall efficiency and competitiveness of the value chain.

### ***Ministry of Industries, Commerce, and Supplies***

The main responsibility of the Federal Ministry of Industry, Commerce, and Supplies (MoICS) has been to create an environment that is favourable to industrial development and investment promotion in the country. Other duties include facilitating and regulating trade on an internal, bilateral, and regional level, protecting and developing the industrial infrastructure, and establishing intellectual property rights, among other things.

The government plays a crucial role in the growth and regulation of agribusiness through the formulation of supportive policies and regulatory frameworks. It sets the overall direction for agricultural and agribusiness development by creating policies related to subsidies, pricing, taxation, and import-export management. These policies ensure that agribusinesses operate within a stable and predictable environment, promoting investment and innovation.

Financial support is another key area where government involvement is significant. By providing grants, concessional loans, crop insurance, and tax incentives, the government reduces the financial risks faced by agribusiness entrepreneurs and farmers. These supports are critical, especially in rural areas where private sector financing is limited. Subsidies on agricultural inputs like seeds, fertilizers, and irrigation equipment further lower production costs and encourage expansion of agribusiness activities.

Infrastructure development is a fundamental government responsibility to support agribusiness growth. Investments in rural roads, irrigation systems, market centers, storage facilities, and electricity improve the efficiency of agricultural production and market access. Without proper infrastructure, the transportation of goods, access to markets, and post-harvest handling become major bottlenecks for agribusinesses.

The government also plays an important role in promoting research, innovation, and extension services. It funds agricultural research institutions to develop improved crop varieties, sustainable farming practices, and modern technologies. Through extension services, governments ensure that research findings and innovations reach farmers and agribusiness entrepreneurs, helping to increase productivity and profitability.

Facilitating market access and promoting trade are other critical roles. The government negotiates trade agreements, reduces barriers to agricultural exports, and organizes trade fairs and expos to promote domestic agribusiness products. This support helps local agribusinesses expand their reach to international markets and become more competitive globally.

Building the capacity and skills of farmers and entrepreneurs is another important function. Government programs that provide technical training, entrepreneurship development, and leadership training are essential for creating a knowledgeable and capable agribusiness workforce. Special focus on women, youth, and marginalized communities ensures inclusive growth and social empowerment.

Public-Private Partnerships (PPP) are increasingly encouraged by governments to attract investment and expertise in the agribusiness sector. Through PPPs, large-scale agribusiness projects can be developed more efficiently, combining the strengths of both public institutions and private companies. Environmental sustainability is another area where government intervention is critical. Policies promoting climate-smart agriculture, regulating the use of chemical inputs, and encouraging organic farming practices help protect the environment while ensuring long-term agricultural productivity.

#### ***FNCCI/Chamber of Commerce***

An acknowledged private sector umbrella organization functional in the Koshi Province is the Federation of Nepalese Chamber of Commerce and Industry, Koshi (FNCCI Koshi). Comprising commercial membership organizations such as Commodity Associations and District Chambers of Commerce and Industry (DCCI), it functions as a representative group of business organizations, representing the interests of the private sector. In order to raise the volume and value of high-value goods both locally and abroad, the FNCCI's agricultural wing, the Agro Enterprise Center (AEC), seeks to develop and support market-oriented, private sector-driven agro firms.

### ***National Seed Board***

The National Seed Board (NSB) plays a key regulatory and oversight role in the seed sector, ensuring the availability of high-quality seeds to farmers. Its primary functions include formulating seed policies, regulating seed certification standards, approving new seed varieties, and overseeing the production, distribution, and quality control of seeds in the country. The NSB works to promote the development of the seed industry by supporting research, facilitating seed testing, and ensuring that only certified, viable seeds reach the market. By maintaining seed standards, the NSB helps improve agricultural productivity, food security, and the overall efficiency of the agricultural value chain including vegetable sector.

### **Supporting Rules and Regulations**

Supporting rules and regulations in the vegetable value chain encompass a range of measures designed to ensure the efficiency, safety, and sustainability of vegetable production, processing, and distribution. These include standards for quality and safety to protect consumer health, such as pesticide residue limits and hygiene practices; regulations for market access and fair trade to facilitate competitive and transparent markets; guidelines for environmental sustainability to minimize ecological impact; and policies for financial support and insurance to stabilize income for farmers. Together, these regulations aim to enhance the overall effectiveness of the value chain, promote food security, and ensure the integrity of the vegetable supply. The following are the relevant supporting rules and regulations worth mentioning that have influenced agricultural production activities including vegetable value chain:

### ***Agriculture Development Strategy (ADS) 2015***

This is envisaged to transform Nepal's agriculture sector in the face of common challenges such as climate change, food price volatility, low productivity and water stress, put into implementation since fiscal year 2016-17.

### ***National Agriculture Policy 2004***

The policy aims at achieving high and sustainable economic growth through commercial agriculture system contributing to food security and poverty reduction.

### ***Seed Act and Seed Regulation***

Nepal has enforced Seed Acts 2045 (amended in 2064), Seed Regulation 2069 and Seed Policy 2056. The vision was developed with the purpose to increase crop productivity, raise income and generate employment opportunities through self-sufficiency, import substitution and export promotion of good quality seeds

### ***National Fertilizer Policy 2002***

The National Fertilizer Policy was formulated to support agricultural production by ensuring supply (production, import and distribution) of good quality fertilizer.

### ***Irrigation Policy 2003***

The policy aims to develop irrigation facility to avail the year-round irrigation facility through effective management of existing water resources; develop institutional capacity of water users for sustainable management of existing systems; and enhance knowledge, skills and institutional working capability of technical human resources, water users and NGOs relating to development of irrigation sector.

### ***Plant Protection Act and Rules***

The National Plant Quarantine Program (NPQP) of the Department of Agriculture (DoA) is responsible to implement the Plant Protection Act and Rules

(NPQP, 2064). This act provides for the protection of consumers from irregularities concerning the quality, quantity and prices of consumer goods or services and from misleading propaganda regarding the use and usefulness of consumer goods or services. Producer and sellers of vegetable need to be aware of this.

### ***Agri-business Promotion Policy 2006***

This policy highlights diversification, commercialisation and promotion of agriculture sector with private sector involvement in commercial farming.

### ***Cooperatives and NGOs/CSOs***

In this study area, cooperatives and NGOs/CSOs play crucial roles in strengthening the vegetable value chain. Cooperatives serve as vital intermediaries, aggregating produce from smallholder farmers, providing them with access to inputs like seeds and fertilizers, and facilitating collective marketing efforts to ensure better pricing and reduced transaction costs. One of cooperative *Sindhuwa* based collects vegetables from farmers and provide seed and fertilizer at a reasonable price. They often offer financial services, including savings and credit, to support farmers in scaling their operations. NGOs and CSOs, on the other hand, focus on capacity-building initiatives, training farmers in modern agricultural practices, and promoting sustainable farming techniques. They also advocate for policy changes and create linkages between farmers, markets, and other stakeholders, ensuring that the value chain is more inclusive and responsive to local needs. Together, these entities contribute significantly to enhancing productivity, market access, and overall economic resilience in the vegetable sector of Dhankuta.

### ***Programme and Projects***

In Dhankuta, the Prime Minister Agriculture Modernization Project (PMAMP) plays a pivotal role in enhancing the vegetable value chain in Nepal by focusing on

increasing productivity, improving market access, and promoting sustainable farming practices. Through the Vegetable Value Chain Project, PMAMP targets specific support pocket areas, which are designated regions with high potential for vegetable production. These areas receive concentrated support in the form of improved agricultural inputs, infrastructure, and technical assistance to boost productivity and quality. The project also provides agricultural tools and equipment to farmers, enabling them to adopt modern farming techniques and reduce labor-intensive practices. This includes machinery for land preparation, planting, irrigation, and harvesting, which helps increase efficiency and reduce post-harvest losses. In the same way, PMAMP emphasizes capacity building of farmers by offering training programs on advanced agricultural practices, pest and disease management, post-harvest handling, and market-oriented production. These initiatives aim to empower farmers with the knowledge and skills needed to enhance their productivity, improve product quality, and access better markets, ultimately leading to increased income and sustainability in the vegetable farming sector.

### **Economic Aspects of the Vegetable SMEs**

The vegetable value chain in Dhankuta Municipality and Chhathar Jorpati Rural Municipality plays a crucial role in the local economy, driven by the activities of small and medium-sized enterprises (SMEs). These SMEs are not only crucial in ensuring a steady supply of vegetables but also contribute significantly to the economic well-being of the community. By generating employment, enhancing income levels, and facilitating the sales of vegetables, these enterprises enhance economic growth in the region. Analyzing the economic aspects of these MSEs, particularly their impact on income generation, employment, and the utilization of

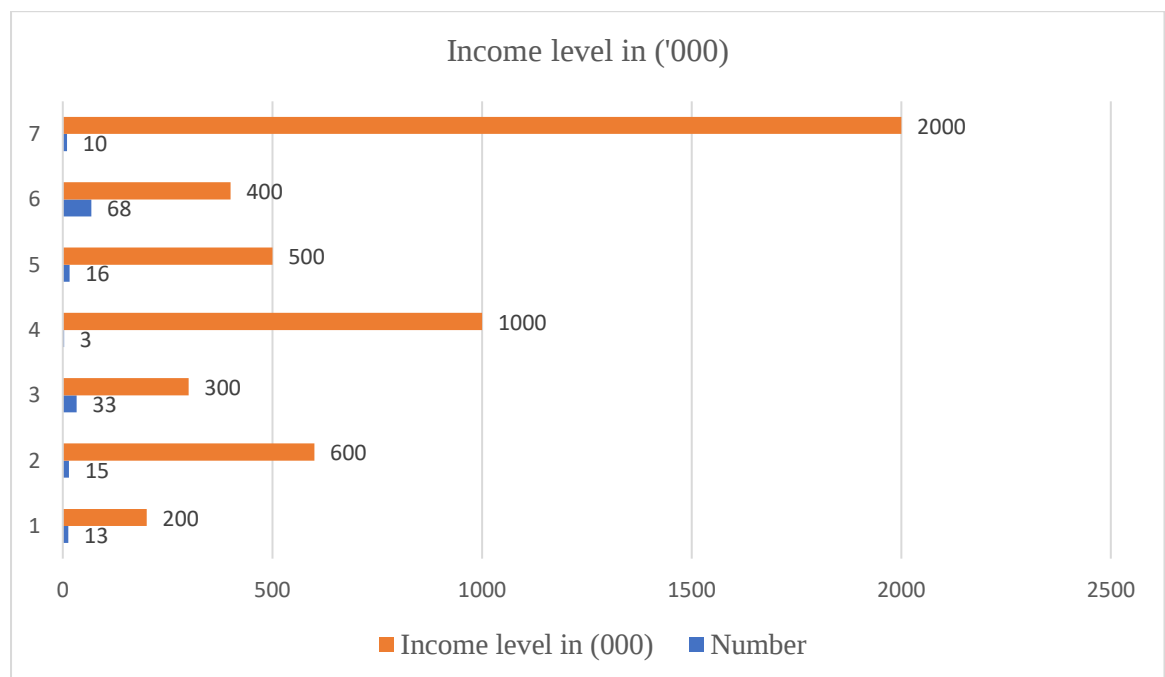
income, provides valuable insights into their role in the local economy and their potential for further development.

### ***Income Level of the SMEs***

The study on income levels reveals a distribution across three distinct categories: low, middle, and high income. Out of the total respondents, 57 participants (36.3%) fall into the low-income category, signifying a substantial portion of the sample. The middle-income category includes 72 participants (45.9%), representing the largest segment, indicating that nearly half of the respondents earn a moderate level of income. The high-income category consists of 28 participants (17.8%), which is the smallest group but still a notable portion of the study population. This distribution highlights the diversity in income levels among the respondents, providing a comprehensive overview of the economic strata represented in the study. The income level of the sampled SMEs is presented in Figure 9.

**Figure 9**

### ***Income Level of SMEs***



*Note.* Researcher's Compilation from Field Survey Data, 2080.

Figure 9 provides information on the income levels of SMEs in their various roles in the vegetable value chain, specifically collectors, input providers, processors, producers, retailers, and suppliers/wholesalers. For the income level of 200,000, there are 2 producers and 11 retailers. There are 4 producers with income level of NRs. 600,000; there are 4 producers and 11 retailers. For an income level of NRs.300,000, there are 33 retailers. The income level of NRs.1,000,000 includes 2 collectors and 1 retailer. At income level NRs.500,000, there are 16 retailers. Income level of NRs.400,000 includes 10 collectors, 34 producers, and 24 retailers. For income levels of NRs.20 million and above, there are 2 collectors, 1 input provider, and 7 suppliers/wholesalers. In total, there are 12 collectors, 3 input providers, 6 processors, 106 producers, 24 retailers, and 7 suppliers/wholesalers. This distribution shows that the majority of income levels are concentrated among producers and retailers, with notable concentrations of higher income levels among collectors and suppliers/wholesalers.

### ***Sales Volume and Revenue***

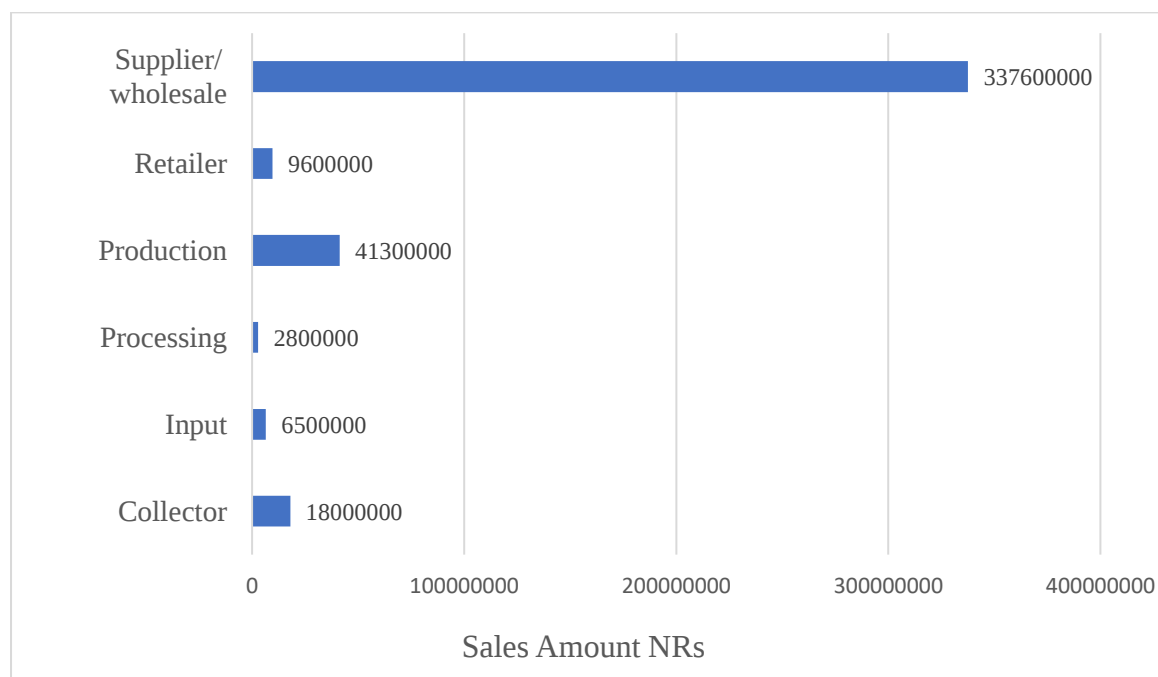
SMEs involved in the vegetable value chain generate revenue from the sales of goods or services. Regarding sales volume of different market actors involved in the vegetable value chain in the 2023, Collectors recorded sales totaling 200,000 units, primarily interacting with processing entities (2 collectors) and production entities (11 collectors), with a total of 13 collectors. For a sale volume of 300,000 units, production entities were the main actors (33 producers), followed by collectors (11 producers), with a total of 33. At a sales volume of 400,000 units, collectors (10 collectors) and retailers (24 retailers) played significant roles, contributing to a total of 68 market actors. A sale volume of 500,000 units involved production entities (16 producers), while a volume of 600,000 units engaged processing entities (4

processors) and suppliers/wholesalers (1 supplier), totaling 16 market actors. For a sales volume of 1,000,000 units, input providers (2 providers) and production entities (1 producer) were involved, totaling 3 market actors. Higher sale volumes, such as 4,000,000 units and above, predominantly engaged suppliers/wholesalers, indicating bulk transactions. In total, there were 158 market actors involved in sales activities in 2023, with production entities being the most active across various sale volume categories, followed by retailers and collectors, demonstrating their crucial roles in facilitating transactions within the vegetable value chain.

Figure 10 highlights the substantial disparity in revenue received by different sectors, with Supplier/wholesale leading by a significant margin.

**Figure 10**

*Total Sales Volume in 2023*



*Note.* Researcher's Compilation from Field Survey Data, 2080.

Considering the sales data of the year 2023 total revenue of supplier/wholesale sector was the highest, amounting to NRs.337,600,000. This is significantly higher than other sectors, indicating a dominant market share. The Production sector follows

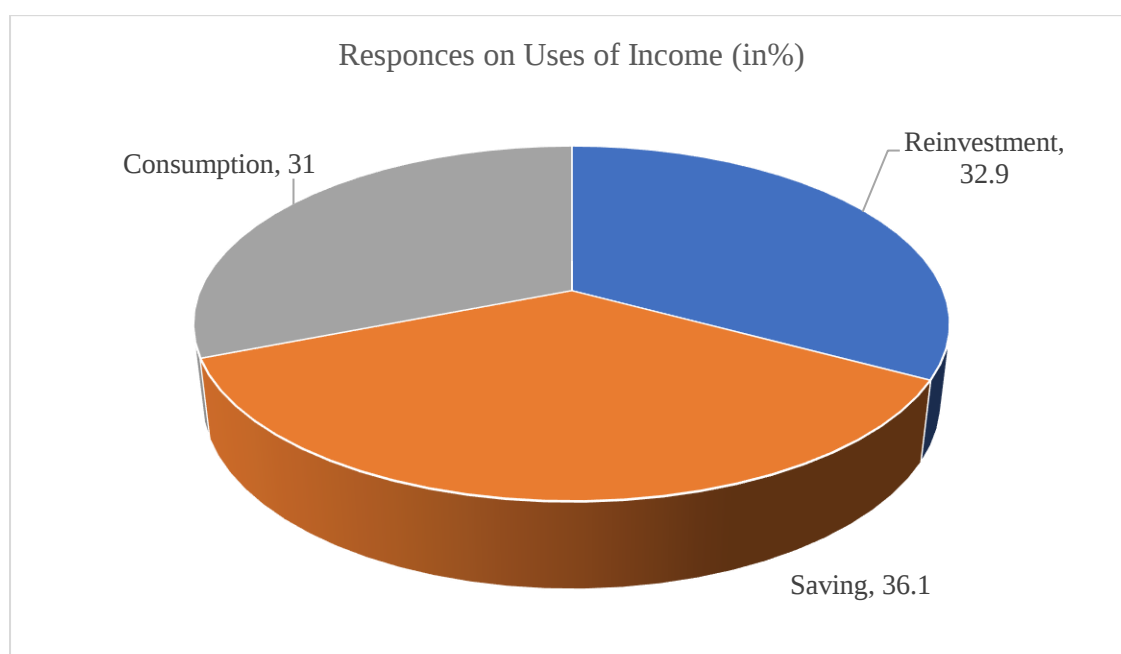
with sales of NRs41,300,000. The Collector sector also shows considerable sales at NRs.18,000,000 in the same year. Retailers generated NRs.9,600,000 revenue from sales, while the Input sector reported NRs.6,500,000 sales volume. Processing had the lowest sales among the listed sectors, totaling NRs.2,800,000.

### ***Uses of Income***

Use of income involves the allocation of funds with the primary goal of generating regular income rather than seeking capital appreciation. Uses of income are shown in Figure 11.

**Figure 11**

*Use of Income*



*Note.* Researcher's Compilation from Field Survey Data, 2080

The pie chart of Figure 11 shows that out of 158 responses, the most common approach to uses of income is saving, with 57 participants (35.6%) preferring this method, accounting for 36.1% of valid responses. Reinvestment follows closely, chosen by 52 participants (32.5%), making up 32.9% of valid responses. Consumption is the least common strategy, selected by 49 participants (30.6%),

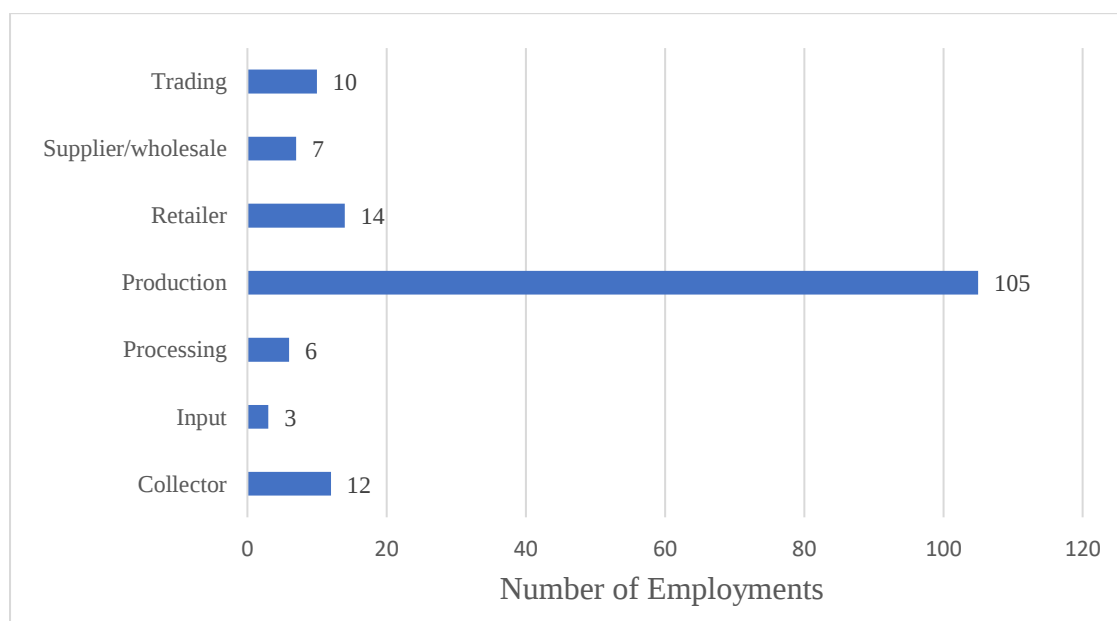
representing 31% of valid responses. Overall, these choices cumulatively account for the entirety of the responses, highlighting the varying strategies individuals employ to manage and grow their income.

### ***Employment Generation***

As SMEs and other stakeholders are involved in the agribusiness of the vegetable value chain, their activities provide employment for themselves and the people. Figure 12 shows the employment status among people connected with the vegetable value chain.

**Figure 12**

*Employment Generation by Market Actors*



*Note.* Researcher's Compilation from Field Survey Data, 2080

Data in Figure 12 shows that the Production sector is the largest employer, generating 105 jobs. This is significantly higher than any other sector. Retailers follow, creating 14 jobs, and Collectors generate 12 jobs. Trading accounts for 10 jobs, while the Supplier/Wholesale sector generates 7 jobs. The Processing sector contributes 6 jobs, and the Input sector generates the fewest, with 3 jobs. This chart

highlights the critical role of the Production sector in employment generation, far outpacing other sectors in the market.

Among them are the number of market actors involved in the vegetable value chain categorized by the number of entities they interact with, ranging from up to 1 to 4 and above. Collectors predominantly interact with 2 or more entities, with 7 interacting with 2 entities, 3 with 3 entities, and 2 with 4 or more entities, totalling 12 collectors. Input providers mainly engage with 2 entities (2 providers) and 3 entities (1 provider), totalling 3. Processors are distributed among 2 entities (2 processors), 3 entities (3 processors), and 4 or more entities (1 processor), totalling 6. The majority of producers interact with 2 entities (57 producers) and 3 entities (39 producers), with a smaller number interacting with up to 1 entity (7 producers) and 4 or more entities (2 producers), totaling 105. Retailers primarily interact with 2 entities (14 retailers). Suppliers/Wholesalers are involved with 3 entities (5 suppliers) and 4 or more entities (2 suppliers), totaling 7. Trading actors predominantly interact with 2 entities (9 traders) and 3 entities (1 trader), totaling 10. Overall, the total number of market actors is 157, with the majority engaging with 2 entities (91 actors), followed by those interacting with 3 entities (52 actors), up to 1 entity (7 actors), and 4 or more entities (7 actors). This distribution highlights that most market actors, especially producers and retailers, typically interact with 2 entities in the vegetable value chain.

### **Analysis of Constraints in Vegetable Value Chain**

One of the prime objectives of this study is to identify constrained faced by different parties involved in the vegetable value chain process. The major constraints considered were related to licensing, corruption, customs regulation, access to finance (A2F), input and input suppliers, labour regulations, certification, demand for the product, entrepreneurial skills, export requirements, supply conditions, internet and

telecommunication connectivity, price competitiveness in domestic and export markets, tax administration, transportation, availability or lack of testing laboratories.

For this purpose, respondents across various points of vegetable value chain were asked to categorize their perceived levels of severity on points like: not applicable, minor problem, moderate problem, serious problem, not a problem, and unknown. This analysis highlights diverse constraints across different areas, varying in severity from minor issues to serious problems, with some areas showing significant challenges impacting operational efficiency and the growth potential of the vegetable value chain. The summary of responses on different constraints is given in Table 10.

**Table 10**

*Analysis of Responses on Different Constraints (in Percent)*

| Major constraints   | Not applicable | Minor problem | Moderate problem | Serious problem | No problem | Do not know |
|---------------------|----------------|---------------|------------------|-----------------|------------|-------------|
| Licensing           | 18             | 13            | 42               | 3               | 18         | 5           |
| Corruption          | 7              | 36            | 7                | 7               | 36         | 7           |
| Customs regulations | 3              | 3             | 29               | 29              | 29         | 6           |
| New buyer           | 3              | 23            | 23               | 23              | 21         | 7           |
| Transportation      | 17             | 26            | 7                | 26              | 17         | 7           |
| Access to Finance   | 14             | 14            | 25               | 2               | 29         | 14          |
| Input               | 9              | 38            | 38               | 3               | 8          | 3           |
| Worker              | 7              | 4             | 11               | 48              | 20         | 11          |
| Input supplier      | 11             | 4             | 11               | 31              | 31         | 11          |
| Labour regulations  | 5              | 8             | 35               | 8               | 35         | 8           |
| Lack certification  | 7              | 4             | 20               | 43              | 20         | 7           |

|                      |    |    |    |    |    |    |
|----------------------|----|----|----|----|----|----|
| Low Demand           | 11 | 11 | 29 | 8  | 29 | 11 |
| Lack entrepreneurial |    |    |    |    |    |    |
| skills               | 16 | 14 | 9  | 16 | 31 | 14 |
| Meeting export       |    |    |    |    |    |    |
| requirements         | 9  | 34 | 20 | 9  | 20 | 6  |
| Poor supplies        | 13 | 13 | 2  | 43 | 23 | 5  |
| Poor internet        |    |    |    |    |    |    |
| connectivity         | 20 | 24 | 7  | 6  | 24 | 20 |
| Price                |    |    |    |    |    |    |
| competitiveness in   |    |    |    |    |    |    |
| domestic markets     | 9  | 28 | 26 | 5  | 26 | 5  |
| Price                |    |    |    |    |    |    |
| competitiveness      |    |    |    |    |    |    |
| export markets       | 14 | 6  | 14 | 14 | 48 | 5  |
| Tax administration   | 4  | 29 | 29 | 5  | 29 | 5  |
| Telecommunications   | 14 | 14 | 33 | 14 | 10 | 14 |
| Transportation       | 7  | 7  | 26 | 26 | 26 | 7  |
| Bad road             | 6  | 36 | 13 | 2  | 36 | 6  |
| High-cost            |    |    |    |    |    |    |
| transportation       | 7  | 12 | 12 | 6  | 57 | 7  |
| Lack testing         |    |    |    |    |    |    |
| laboratories         | 21 | 17 | 17 | 21 | 16 | 7  |

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*Note.* Researcher's Compilation from Field Survey Data, 2080.

The data presents the percentages of perceived constraints in various areas, classified as not applicable, minor problem, moderate problem, serious problem, not a

problem, and don't know. On licensing, 42% responses are on moderate and 18% each for not applicable and not a problem. Corruption has 36% each for minor and not a problem. On customs regulations see 29% moderate and serious, with 29% not a problem. New buyers have a relatively even spread, with 23% each for minor, moderate, and serious. Transportation is a significant issue, with 26% each for minor, serious, and not a problem. Access to Finance (A2F) is seen as moderately problematic by 25% and not a problem by 29%. Inputs face 38% each for minor and moderate. Worker issues are mainly serious at 48%. Input suppliers are mostly serious and not a problem at 31% each. Labour regulations have 35% each for moderate and not a problem. Lack of certification is a serious issue, as 43% of respondents perceive it. Low demand sees 29% each for moderate and not a problem categories. Lack of entrepreneurial skills and meeting export requirements have a mixed perception, with a notable percentage seeing no problem. Poor supplies are serious for 43% respondents. Poor internet connectivity is split, with 24% each for minor and not a problem. Price competitiveness in domestic markets is a moderate problem for 26% and serious for another 26% respondents, while export markets find it not problematic at 48%. Tax administration sees 29% each for minor, moderate, and not a problem. Telecommunications is a moderate issue for 33% respondents. Transportation, again, has 26% each for minor, serious, and not a problem. Bad roads are a minor and not a problem for 36%. High-cost transportation is not a problem for 57%. Lack of testing laboratories is seen as not applicable by 21% and serious by another 21%.

### **Theme-wise Constraints Analysis**

The vegetable value chain in Dhankuta Municipality and Chattar Deurali Rural Municipality of Dhankuta is vital for local livelihoods and regional food security. However, it faces a series of constraints that hinder its full potential. These

challenges are multifaceted, affecting different stages of the value chain. The analysis of these constraints on a theme-wise basis, such as market access, infrastructure, seed availability, and institutional support, would provide a deeper understanding of the barriers that limit the efficiency, profitability, and sustainability of vegetable farming in these regions. The analysis is organized into several subheadings.

### ***Storage Facilities***

In the vegetable value chain, inadequate storage facilities are a significant constraint. Without proper storage, vegetables are prone to spoilage, leading to high post-harvest losses. This limits the ability of farmers to sell their produce at optimal times, often forcing them to accept lower prices. Poor storage conditions also reduce the quality of vegetables, impacting market value and consumer satisfaction. Taken as a whole, the lack of efficient storage facilities disrupts the community and profitability of the vegetable value chain. Table 4.10 outlines respondents' perceptions of various issues within different stages of the vegetable value chain, including collecting, input provision, processing, production, retailing, and wholesaling. In the storage facilities cold storage and warehouse were included.

**Table 11***Availability of Storage Facilities (Respondents in Number)*

| Response                     | Collector | Input | Processing | Production | Retailer | Supplier/<br>wholesale |
|------------------------------|-----------|-------|------------|------------|----------|------------------------|
| Do not know                  |           |       | 1          | 4          | 1        |                        |
| Minor problem                |           |       | 2          | 13         | 1        |                        |
| Moderate problem             | 12        | 3     |            | 76         | 11       | 6                      |
| Not a problem at all         |           |       | 3          | 8          | 11       |                        |
| Not applicable to<br>company |           |       |            | 2          |          |                        |
| Serious problem              |           |       |            | 3          |          | 1                      |
| Total                        | 12        | 3     | 6          | 106        | 24       | 7                      |

*Note.* Researcher's Compilation from Field Survey Data, 2080.

As is obvious from Table 11, there is variation in the number of respondents on the level of severity of the constraint in various levels of the vegetable value chain. The majority of respondents, 76, identify production as a moderate problem, while 12 and 3 respondents see collecting and input provision as moderate problems, respectively. Retailing is also noted as a moderate problem by 11 respondents. Six respondents perceive wholesaling as a moderate problem. Additionally, 13 respondents consider input provision a minor problem, and 3 respondents regard it as not a problem at all. For collecting, 3 respondents see it as not a problem at all. Meanwhile, 2 respondents find processing not applicable to their company. One respondent considers production, retailing, and wholesaling each as not a problem at all. There are also instances where respondents are uncertain, with 1 respondent not knowing about processing, and 4 not knowing about retailing. The total for each category of response across the different stages of the value chain outlines that 12

respondents provided input on collecting, 3 on input provision, 6 on processing, 106 on production, 24 on retailing, and 7 on wholesaling. This data showcases varied perceptions of problems or their absence across different stages of the vegetable value chain, providing valuable insights into areas that may require attention or improvement.

### ***Licensing***

Licensing can be a major constraint in the vegetable value chain, as complicated or costly licensing requirements may hinder farmers, traders, and processors from entering or expanding within the market. These barriers can lead to delays, increased operational costs, and reduced market access, particularly for small-scale producers. As a result, the overall efficiency and competitiveness of the vegetable value chain are compromised, limiting opportunities for growth and development. The status of responses on licensing problems is shown in Table 12. The table provides an analysis of the frequencies of responses regarding licensing problems encountered within the context of the vegetable value chain.

**Table 12**

#### *Response on Licensing Problem*

| Response                  | Frequency | Percent |
|---------------------------|-----------|---------|
| Do not know               | 6         | 3.8     |
| Minor problem             | 16        | 10.1    |
| Moderate problem          | 106       | 67.3    |
| Not a problem at all      | 22        | 13.8    |
| Not applicable to company | 2         | 1.3     |
| Serious problem           | 4         | 2.5     |
| Total                     | 158       | 100     |

*Note.* Researcher's Compilation from Field Survey Data, 2080.

Among the 158 respondents, the majority, constituting 67.3%, perceived licensing as a moderate problem, with a total frequency of 107 respondents. Additionally, 22 respondents, comprising 13.8%, report that they do not encounter any licensing problems at all. Six respondents, representing 3.8%, express uncertainty, indicating that they do not know whether licensing problems exist within their operations. Minor problems are reported by 16 respondents, accounting for 10.1% of the total. Only a small percentage, 1.3%, consisting of 2 respondents, deem licensing problems as not applicable to their company. Lastly, 4 respondents, making up 2.5%, regard licensing problems as serious issues. Cumulatively, these responses illustrate the varied perceptions and experiences of respondents regarding licensing problems, highlighting the prevalence of moderate issues and underscoring the importance of addressing regulatory challenges within the vegetable value chain.

### ***Corruption***

Corruption is a significant constraint in the vegetable value chain, as it discourages fair and transparent business practices. When corruption penetrates areas such as licensing, transportation, and market access, it increases costs and creates obstacles for honest farmers and traders. This leads to inefficiencies, discourages investment, and reduces the overall competitiveness of the vegetable sector. Ultimately, corruption disrupts the flow of goods, hampers growth, and diminishes trust among stakeholders in the vegetable value chain. The status of responses on corruption is shown in Table 4.12. The table presents an analysis of responses regarding the issue of corruption within the vegetable value chain.

**Table 13***Responses on the Corruption Problem*

| Response                  | Frequency | Percent |
|---------------------------|-----------|---------|
| Do not know               | 15        | 9.4     |
| Minor problem             | 1         | 0.6     |
| Not a problem at all      | 6         | 3.8     |
| Not applicable to company | 122       | 77.4    |
| Serious problem           | 12        | 7.5     |
| Total                     | 158       | 100     |

*Note.* Researcher's Compilation from Field Survey Data, 2080.

Among the 158 respondents, the majority, comprising 77.4%, indicated that corruption is not applicable to their company, with a total frequency of 123 respondents. Additionally, 15 respondents, representing 9.4%, expressed uncertainty, stating that they do not know whether corruption is a problem within their operations. Six respondents, accounting for 3.8%, reported that they do not encounter any corruption issues at all. Minor problems related to corruption were reported by only one respondent, constituting 0.6% of the total. On the other hand, 12 respondents, making up 7.5%, identified corruption as a serious problem within the vegetable value chain. Cumulatively, these responses reflect varied perceptions of corruption, with a significant number of respondents either deeming it irrelevant to their company or uncertain about its existence, while others acknowledge its severity as a serious issue.

***Customs Regulation***

Customs regulations can be a big limitation in the vegetable value chain, particularly when they are complex, inconsistent, or too harsh. Lengthy customs procedures and high tariffs can delay the movement of vegetables across borders,

leading to spoilage and increased costs. These challenges limit market access for producers and traders, reduce competitiveness, and hinder the ability to meet demand in international markets. As a result, restrictive customs regulations can stifle growth and efficiency within the vegetable value chain. The status of responses on corruption is shown in Table 14. The table provides an analysis of respondents' perceptions regarding customs regulations problems within the vegetable value chain in the study area.

**Table 14**

*Responses on Customs Regulations Problems*

| Response                  | Frequency | Percent |
|---------------------------|-----------|---------|
| Do not know               | 10        | 6.3     |
| Minor problem             | 100       | 63.5    |
| Moderate problem          | 21        | 13.2    |
| Not a problem at all      | 6         | 3.8     |
| Not applicable to company | 7         | 4.4     |
| Serious problem           | 12        | 7.5     |
| Total                     | 158       | 100     |

*Note.* Researcher's Compilation from Field Survey Data, 2080.

Among the 158 respondents, the majority, constituting 63.5%, identify customs regulations as a minor problem, with 101 respondents reporting such issues. Additionally, 21 respondents, representing 13.2%, perceive customs regulations as a moderate problem. Six respondents, accounting for 3.8%, reported that they do not encounter any customs regulations problems at all. Seven respondents, comprising 4.4%, deem customs regulations as not applicable to their company. On the other hand, 10 respondents, making up 6.3%, expressed uncertainty, stating that they do not

know whether customs regulations pose a problem within their operations. Lastly, 12 respondents, constituting 7.5%, identified customs regulations as a serious problem within the vegetable value chain. Cumulatively, these responses underscore the varied perceptions of customs regulations issues, with the majority acknowledging them as minor concerns, while others recognize their severity as either moderate or serious problems.

### ***New Buyer***

The entry of new buyers can be a constraint in the vegetable value chain if it disrupts existing relationships and agreements between producers and established buyers. New buyers may impose different requirements, such as specific quality standards, payments terms, or delivery schedules, which can be challenging for producers to meet. This can lead to uncertainty and increased pressure on farmers, potentially disrupting the supply chain. Additionally, if new buyers dominate the market, they might apply too much influence, leading to unfavorable terms for smaller producers and reducing overall stability within the value chain. The state of responses on finding new buyers is shown in Table 15. The table outlines respondents' perspectives on the challenge of finding new buyers within the vegetable value chain.

**Table 15***Responses on Finding New Buyers*

| New buyer            | Frequency | Percent |
|----------------------|-----------|---------|
| Do not know          | 11        | 6.9     |
| Minor problem        | 95        | 60.4    |
| Moderate problem     | 36        | 22.6    |
| Not a problem at all | 5         | 3.1     |
| Serious problem      | 9         | 5.7     |
| Total                | 158       | 100     |

*Note.* Researcher's Compilation from Field Survey Data, 2080.

Among the 158 respondents, the majority of them, occupying 60.4%, view finding new buyers as a minor problem, with 96 respondents indicating such concerns. Additionally, 36 respondents, representing 22.6%, perceive this challenge as a moderate problem. Five respondents, accounting for 3.1%, reported that they do not encounter any problems in finding new buyers. Eleven respondents, comprising 6.9%, expressed uncertainty, stating that they do not know whether finding new buyers poses a problem within their operations. Lastly, nine respondents, constituting 5.7%, perceived this challenge as a serious problem within the vegetable value chain. Cumulatively, these responses highlight the varied perceptions of finding new buyers, with a significant portion acknowledging it as a minor or moderate issue, while others recognize its severity as either serious or uncertain.

***Transportation***

Transportation is a critical constraint in the vegetable value chain, as poor infrastructure, limited access to reliable vehicles, and long travel times can lead to significant delays and increased costs. These challenges often result in the damage of

perishable vegetables before they reach the market, reducing both quality and profitability. Inadequate transportation also limits farmers' ability to access distant markets, restricting their opportunities for better prices. On the whole, inefficient transportation hampers the smooth flow of goods, negatively affecting the efficiency and competitiveness of the vegetable value chain. Table 16 provides respondents' perceptions regarding the difficulty of transportation within the vegetable value chain.

**Table 16**

*Responses on Transportation Difficulty*

| Response                  | Frequency | Percent |
|---------------------------|-----------|---------|
| Do not know               | 12        | 7.5     |
| Minor problem             | 99        | 62.9    |
| Moderate problem          | 28        | 17.6    |
| Not a problem at all      | 6         | 3.8     |
| Not applicable to company | 1         | 0.6     |
| Serious problem           | 10        | 6.3     |
| Total                     | 158       | 100     |

*Note.* Researcher's Compilation from Field Survey Data, 2080.

Among the 158 respondents, the majority, constituting 62.9%, consider transportation difficulties as a minor problem. Additionally, 28 respondents, representing 17.6%, perceive transportation difficulties as a moderate problem. Six respondents, accounting for 3.8%, reported that they do not encounter any issues with transportation at all. Twelve respondents, comprising 7.5%, expressed uncertainty, stating that they do not know whether transportation poses a problem within their operations. Only one respondent, constituting 0.6%, thinks transportation difficulties as not applicable to their company. Lastly, ten respondents, making up 6.3%,

identified transportation difficulties as a serious problem within the vegetable value chain. Cumulatively, these responses underscore the varied perceptions of transportation challenges, with a significant portion acknowledging it as a minor or moderate issue, while others recognize its severity as either serious or uncertain.

### ***Access to Finance***

Access to finance (A2F) is a major constraint in the vegetable value chain, as limited availability of credit and financial resources prevent farmers and other stakeholders from investing in necessary inputs, technology, and infrastructure. Without adequate funding, producers may struggle to expand operations, improve quality, or tackle with unforeseen challenges, such as crop failures or market fluctuations. This financial limitation checks growth, reduces competitiveness, and hampers the overall development of the vegetable value chain. Table 17 presents respondents' perspectives on the difficulties associated with accessing finance within the vegetable value chain.

**Table 17**

#### ***Responses on Access to Finance Difficulties***

| Response             | Frequency | Percent |
|----------------------|-----------|---------|
| Do not know          | 3         | 1.9     |
| Minor problem        | 96        | 61      |
| Moderate problem     | 35        | 22      |
| Not a problem at all | 2         | 1.3     |
| Serious problem      | 20        | 12.6    |
| Total                | 158       | 100     |

*Note.* Researcher's Compilation from Field Survey Data, 2080.

Among the 158 respondents, the majority, constituting 61%, perceive accessing finance as a minor problem, with 97 respondents indicating such concerns. Additionally, 35 respondents, representing 22%, view this challenge as a moderate problem. Two respondents, accounting for 1.3%, reported that they do not encounter any issues with accessing finance. Three respondents, comprising 1.9%, expressed uncertainty, stating that they do not know whether accessing finance poses a problem in the operation of their business. Lastly, 20 respondents, making up 12.6% perceived accessing finance as a serious problem within the vegetable value chain. Cumulatively, these responses underscore the varied perceptions of accessing finance difficulties, with a significant portion acknowledging it as either a minor or moderate issue, while others recognize its severity as either serious or uncertain.

### ***Lack of Certification***

Lack of certification is a worth-mentioning constraint in the vegetable value chain, as it limits access to premium markets that demand certified produce. Without proper certification, such as organic or quality standards, farmers may face challenges in gaining consumer trust, commanding higher prices, and entering export markets. This obstacle can also lead to reduced competitiveness and missed opportunities for value addition, ultimately limiting the growth and sustainability of the vegetable value chain. Table 18 presents data on respondents' perceptions of the issue of "lack of certification" within their companies.

**Table 18***Responses on Lack of Certification*

| Response                  | Frequency | Percent |
|---------------------------|-----------|---------|
| Do not know               | 27        | 17      |
| Moderate problem          | 1         | 0.6     |
| Not a problem at all      | 9         | 5.7     |
| Not applicable to company | 108       | 68.6    |
| Serious problem           | 11        | 6.9     |
| Total                     | 158       | 100     |

*Note.* Researcher's Compilation from Field Survey Data, 2080.

Out of 158 respondents, 109 (68.6%) expressed that this issue is not applicable in their company. A notable portion, 27 respondents (17%), reported that they do not know if the lack of certification is a problem. A smaller group, comprising 9 respondents (5.7%) stated that it is not a problem at all. Meanwhile, 11 respondents (6.9%) considered it a serious problem, while 2 respondents (1.3%) viewed it as a minor problem. Only 1 respondent (0.6%) regarded it as a moderate problem. The cumulative percentages show a progressive tally, with 93.1% indicating either non-applicability or uncertainty about the issue, and the remaining 6.9% recognizing it as a significant problem.

***Lack of Entrepreneurial Skill***

Entrepreneurial skill is a key element for business success. Lack of entrepreneurial skills is a key constraint in the vegetable value chain, as it hinders farmers and other stakeholders from effectively managing and expanding their businesses. Without strong business insight, producers may struggle with marketing, financial management, and innovation, leading to unused opportunities for growth and value addition. This gap in skills can result in inefficiencies, limited market access,

and reduced profitability, ultimately weakening the overall competitiveness and sustainability of the vegetable value chain. Table 19 provides data on respondents' views regarding the issue of "lack of entrepreneurial skills" in their companies.

**Table 19**

*Lack of Entrepreneurial Skill*

| Lack of entrepreneurial skills | Frequency | Percent |
|--------------------------------|-----------|---------|
| Do not know                    | 12        | 7.5     |
| Minor problem                  | 96        | 61      |
| Moderate problem               | 23        | 14.5    |
| Not a problem at all           | 10        | 6.3     |
| Not applicable to company      | 8         | 5       |
| Serious problem                | 7         | 4.4     |
| Total                          | 158       | 100     |

*Note.* Researcher's Compilation from Field Survey Data, 2080.

The frequency distribution of the responses indicates that while a majority of respondents perceive a lack of entrepreneurial skills as a minor to moderate issue, a smaller proportion sees it as either a serious problem or not relevant to their company. Out of 158 respondents, the majority, 97 respondents (61%), felt this issue as a minor problem. A significant portion, 23 respondents (14.5%), considered it a moderate problem. Additionally, 12 respondents (7.5%) were uncertain, stating that they do not know whether it is an issue. A smaller group, 10 respondents (6.3%), reported that it is not a problem at all, while 8 respondents (5%) indicated that it is not applicable to their company. Only 7 respondents (4.4%) regarded it as a serious problem which implied that lack of competitive entrepreneurial skill affected business. The cumulative percentages show a gradual accumulation, with 69.8% identifying the

issue as a minor problem or being uncertain about its severity, and a cumulative total of 84.3% recognizing it as at least a moderate problem.

### ***Meeting Export Requirement***

Those SMEs that are involved in exporting vegetables have to meet the export requirements of the produce. Meeting export requirements is a significant constraint in the vegetable value chain, as it involves adhering to strict standards related to quality, safety, packaging, and documentation. These requirements can be difficult for producers to meet, particularly for small-scale farmers with limited resources. Failure to comply can lead to rejected shipments, financial losses, and missed opportunities in international markets. This challenge restricts the ability to scale operations and capitalize on global demand, limiting the growth potential of the vegetable value chain.

Keeping this in view respondents were asked to express their perception on to what extent “meeting export requirement” affected their business of vegetables. Table 20 highlights on respondents' perceptions concerning the challenge of meeting export requirements within the vegetable value chain.

**Table 20**

#### ***Responses on Meeting Export Requirement***

| Meeting export requirements | Frequency | Percent |
|-----------------------------|-----------|---------|
| Do not know                 | 12        | 7.5     |
| Minor problem               | 100       | 63.5    |
| Moderate problem            | 26        | 16.4    |
| Not a problem at all        | 8         | 5       |
| Not applicable to company   | 5         | 3.1     |
| Serious problem             | 5         | 3.1     |
| Total                       | 158       | 100     |

*Note.* Researcher’s Compilation from Field Survey Data, 2080.

The responses shown in Table 20 underline the varied perceptions of meeting export requirements, with a significant portion acknowledging it as either a minor or moderate issue, while others recognize its severity as either serious or uncertain. Among the 158 respondents, the majority, constituting 63.5%, view meeting export requirements as a minor problem, with 101 respondents indicating such concerns. Additionally, 26 respondents, representing 16.4%, perceive this challenge as a moderate problem. Eight respondents, accounting for 5%, reported that they do not encounter any issues with meeting export requirements at all. Twelve respondents, comprising 7.5%, expressed uncertainty, stating that they do not know whether meeting export requirements poses a problem within their operations. Five respondents, making up 3.1%, believe meeting export requirements as not applicable to their company. Lastly, five respondents, also constituting 3.1%, identified meeting export requirements as a serious problem within the vegetable value chain.

#### ***Price Competitiveness in the Export Market***

Price competitiveness in the export market is a critical constraint in the vegetable value chain. Competing with lower-cost producers from other countries can be challenging, especially when factors like higher production costs, inefficient supply chains, and fluctuating exchange rates come into play. If prices are not competitive, it becomes difficult to maintain or expand market share abroad, leading to reduced profitability and limited growth opportunities. This constraint can significantly affect the possibility of exporting vegetables, making it harder for producers to sustain operations in the global market. Table 21 depicts respondents' perceptions regarding the challenge of price competitiveness in the export market within the vegetable value chain.

**Table 21***Responses on Price Competitiveness in the Export Market*

| Response                  | Frequency | Percent |
|---------------------------|-----------|---------|
| Do not know               | 17        | 10.7    |
| Minor problem             | 8         | 5       |
| Moderate problem          | 115       | 73      |
| Not a problem at all      | 6         | 3.8     |
| Not applicable to company | 3         | 1.9     |
| Serious problem           | 7         | 4.4     |
| Total                     | 158       | 100     |

*Note.* Researcher's Compilation from Field Survey Data, 2080.

The summary of responses shown in Table 21 highlight the varied perceptions of price competitiveness, with a significant portion acknowledging it as either a minor or moderate issue, while others recognize its severity as either serious or uncertain. Among the 158 respondents, the majority, constituting 73%, consider price competitiveness as a moderate problem, with 116 respondents indicating such concerns. Additionally, 8 respondents, representing 5%, perceive this challenge as a minor problem. Six respondents, accounting for 3.8%, reported that they do not encounter any issues with price competitiveness. Seventeen respondents, comprising 10.7%, expressed uncertainty, stating that they do not know whether price competitiveness poses a problem within their operations. Three respondents, making up 1.9%, deem price competitiveness as not applicable to their company. Lastly, seven respondents, also constituting 4.4%, identified price competitiveness as a serious problem within the vegetable value chain.

### ***Tax and Administration***

Tax and administrative burdens are significant constraints in the vegetable value chain. Complex tax structures, high tax rates, and burdensome administrative procedures can increase operational costs and create obstacles to efficiency. These challenges often discourage investment and innovation, making it harder for farmers and businesses to grow. Additionally, the time and resources spent on finding the way to bureaucratic processes can divert attention from core activities like production and marketing, ultimately weakening the competitiveness and profitability of the vegetable value chain. Table 22 provides insights into respondents' perceptions regarding tax and administration issues within the vegetable value chain.

**Table 22**

#### *Responses on Tax and Administration*

| Response             | Frequency | Percent |
|----------------------|-----------|---------|
| Do not know          | 8         | 5       |
| Minor problem        | 113       | 71.7    |
| Moderate problem     | 25        | 15.7    |
| Not a problem at all | 9         | 5.7     |
| Serious problem      | 1         | 0.6     |
| Total                | 158       | 100     |

*Note.* Researcher's Compilation from Field Survey Data, 2080.

The summary of the responses in Table 22 highlights the varied perceptions of tax and administration challenges, with a significant portion acknowledging it as either a minor or moderate issue, while others recognize its severity as either serious or uncertain. Among the 158 respondents, the majority, constituting 71.7%, consider tax and administration as a minor problem, with 114 respondents indicating such concerns. Additionally, 25 respondents, representing 15.7%, perceive this challenge

as a moderate problem. Nine respondents, accounting for 5.7%, reported that they do not encounter any issues with tax and administration at all. Eight respondents, comprising 5%, expressed uncertainty, stating that they do not know whether tax and administration pose a problem within their operations. Only one respondent, making up 0.6%, identified tax and administration as a serious problem within the vegetable value chain.

### ***Transportation Facility***

Transportation facilities play a crucial role in the efficiency and effectiveness of the vegetable value chain. In many regions, inadequate transportation infrastructure can significantly constraint the vegetable value chain, impacting the flow of produce from farms to markets. Inadequate transportation causes delay in delivery and spoilage or damage, and limit market access. Table 23 provides data on respondents' views regarding the effect of "Transportation" in their companies.

**Table 23**

#### *Responses on Transportation Facility*

| Response                  | Frequency | Percent |
|---------------------------|-----------|---------|
| Do not know               | 3         | 1.9     |
| Minor problem             | 95        | 60.4    |
| Moderate problem          | 39        | 24.5    |
| Not a problem at all      | 11        | 6.9     |
| Not applicable to company | 1         | 0.6     |
| Serious problem           | 7         | 4.4     |
| Total                     | 158       | 100     |

*Note.* Researcher's Compilation from Field Survey Data, 2080.

The information in Table 23 indicates that while the majority of respondents perceive transportation as a minor to moderate problem, a smaller proportion sees it as a serious concern or not relevant to their company. Out of 158 respondents, the majority, 96 respondents (60.4%), identified transportation as a minor problem. Thirty-nine respondents (24.5%), considered it a moderate problem. Additionally, 11 respondents (6.9%) reported that transportation is not a problem at all to their company, while 7 respondents (4.4%) considered it as a serious problem. A small group, 3 respondents (1.9%), were uncertain, stating that they do not know if transportation is an issue, and only 1 respondent (0.6%) indicated that it is not applicable to their company. The cumulative percentages show that by the time the responses of minor and moderate problems are combined, 88.1% of respondents recognized transportation as at least a minor issue.

#### ***Lack of Testing Laboratories***

The absence of adequate testing laboratories is a significant constraint in the vegetable value chain. Testing laboratories are essential for ensuring the safety, quality, and compliance of vegetable produce with health and regulatory standards. Without these facilities, several issues arise: quality assurance challenges, market access limitations, regulatory compliance, and consumer health risk. Table 24 summarizes respondents' perceptions regarding the lack of testing laboratories within the vegetable value chain.

**Table 24***Responses on Lack of Testing Laboratories*

| Response                  | Frequency | Percent | Valid Percent |
|---------------------------|-----------|---------|---------------|
| Do not know               | 17        | 10.7    | 10.7          |
| Minor problem             | 13        | 8.2     | 8.2           |
| Moderate problem          | 105       | 66.7    | 66.7          |
| Not a problem at all      | 6         | 3.8     | 3.8           |
| Not applicable to company | 1         | 0.6     | 0.6           |
| Serious problem           | 14        | 8.8     | 8.8           |
| Total                     | 158       | 100     | 100           |

*Note.* Researcher's Compilation from Field Survey Data, 2080.

The information in Table 24 highlights the varied perceptions of the stakeholders on the lack of testing laboratories, with a significant portion acknowledging it as either a minor or moderate issue, while others recognize its severity as either serious or uncertain. Among the 158 respondents, the majority, constituting 66.7%, view the lack of testing laboratories as a moderate problem, with 106 respondents indicating such concerns. Additionally, 14 respondents, representing 8.8%, perceive this challenge as a serious problem. Thirteen respondents, accounting for 8.2%, consider the lack of testing laboratories as a minor problem. Six respondents, comprising 3.8%, reported that they do not encounter any issues with the lack of testing laboratories. Seventeen respondents, making up 10.7%, expressed uncertainty, stating that they do not know whether the lack of testing laboratories poses a problem in their operations. Only one respondent, constituting 0.6%, deemed the lack of testing laboratories as not applicable to their company.

### ***Business Incubator***

Business incubation refers to a support process designed to help startups and early-stage companies grow and succeed. It involves providing a range of resources and services to assist new businesses in their development. The lack of business incubators represents a notable constraint in the vegetable value chain. Business incubators provide critical support to emerging agribusinesses by offering resources such as mentoring, funding, and infrastructure. Their absence can lead to several challenges: limited innovation and growth, resource gaps, financial barriers, and operational challenges. Table 24 provides information on the sources of support for respondents' companies in relation to business incubators.

**Table 25**

*Information on Responses to Business Incubator*

| Business incubator service                                                       | Frequency | Percent |
|----------------------------------------------------------------------------------|-----------|---------|
| Did not avail of service                                                         | 31        | 19.5    |
| Family and friends                                                               | 116       | 73.6    |
| Not relevant to company                                                          | 8         | 5       |
| Private business support organizations and public business support organizations | 1         | 0.6     |
| Total                                                                            | 158       | 100     |

*Note.* Researcher's Compilation from Field Survey Data, 2080.

Information summarized in Table 25 highlights the predominant role of informal support networks, such as family and friends, and the relatively low engagement with formal business incubator services among the respondents. Out of 158 respondents, a substantial majority, 117 respondents (73.6%), relied on family and friends for support. A significant portion, 31 respondents (19.5%), did not avail of

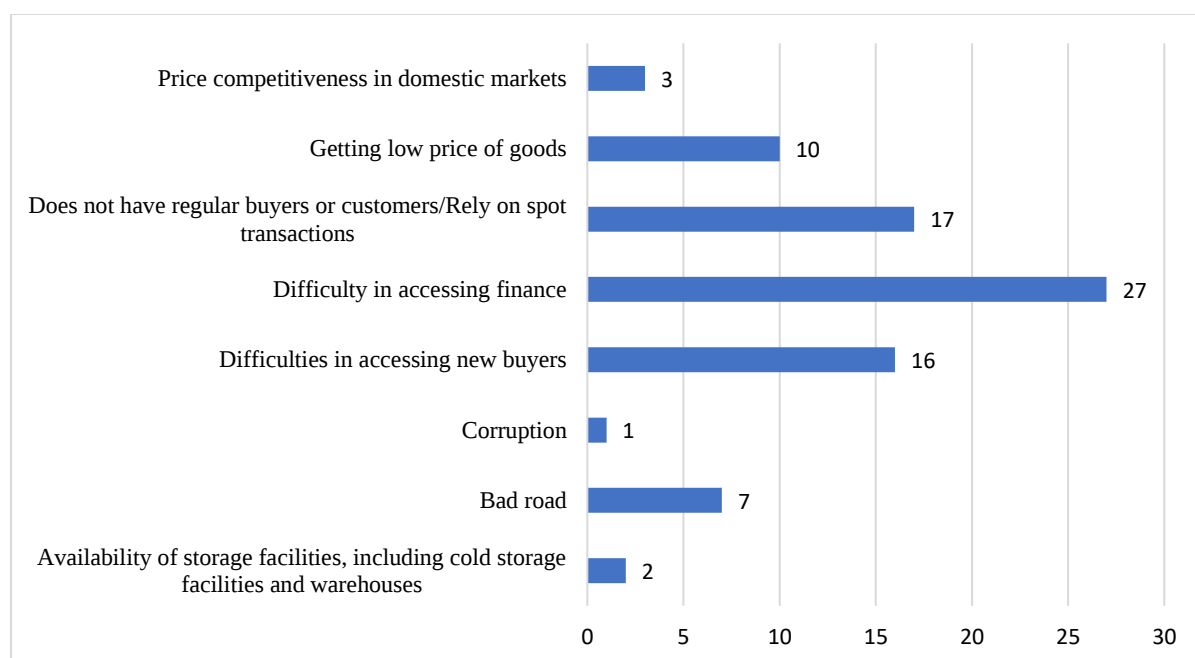
any business incubator services. A smaller group, 8 respondents (5%), indicated that business incubators are not relevant to their company. Only 1 respondent (0.6%) utilized support from private business support organizations, public business support organizations, private equity/venture capital firms, or industry associations. The cumulative percentages show a rapid accumulation, with 94.3% of respondents either relying on family and friends or not using incubator services, and nearly all respondents (99.4%) indicated limited relevance or use of business incubators.

### ***Overall Constraints Perceptions***

In addition to analyzing several constraints individually, this study also analyzed the overall constraints in the vegetable value chain. The bar diagram in Figure 13 reveals the overall perception of constraints.

**Figure 13**

### ***Overall Perception on Constraints***



*Note.* Researcher's Compilation from Field Survey Data, 2080.

Figure 13 highlights various challenges perceived by respondents. The most significant constraint is the difficulty in accessing finance, noted by 27% of

respondents. This is followed by issues such as not having regular buyers or contracts, each identified by 17% of respondents. Difficulties in accessing new buyers are a concern for 16% of the respondents, while getting a low price for goods is noted by 10%. Bad road conditions affect 7% of the respondents involved in vegetable value chain, and the availability of storage facilities, including cold storage, is a concern for 2% of the entities. Price competitiveness in domestic markets is a minor issue, reported by 3%, and corruption is the least concerning issue, with only 1% identifying it as a problem. This data indicates that financial access is the predominant issue, with other notable concerns related to market access, infrastructure, and environmental impact.

## **Chapter V**

### **Summary, Conclusions, And Policy Implications**

#### **Summary of Key Findings and Discussion**

This study aimed to analyze enhancing agribusiness opportunities by optimizing the vegetable value chain in Dhankuta Municipality and Chhathar Jorpati Rural Municipality of Dhankuta District of Nepal. The research objectives were threefold: to analyze the state of vegetable production in Nepal and specifically in Dhankuta, to assess the vegetable value chain and the economic aspects of sampled SMEs in the study area, and to identify the challenges and constraints within the value chain.

The study utilised data collected from both primary sources (field survey) and secondary sources (publications of the Ministry of Agriculture and Local Development, National Statistics Office). The analysis of secondary data revealed that while vegetable production, area under vegetable production, and yield per hectare in Nepal has been increasing, the growth has been uneven over the study period (1991/92-2021/22), with Dhankuta showing significant potential due to favourable agro-climatic conditions. However, this potential is yet to be fully realized due to several systematic issues. This means that although Dhankuta region has favourable conditions and significant potential for vegetable production, there are underlying challenges that prevent the region from fully capitalizing on this potential.

The vegetable value chain is analyzed with the value chain conceptual framework designed for the study. The ingredients in the framework are (i) Supporting factors: Infrastructure, Technology, Market Information, Capacity Building, Policy Environment; (ii) Stakeholders: SMEs, Farmers, Government, NGOs, Financial Institutions, Consumers; and (iii) Core Components of the Vegetable Value Chain:

Input Supply → Production → Processing and Value Addition → Marketing and Distribution → Consumption.

The vegetable value chain analyzed in the context of Dhankuta Municipality and Chhathar Jorpati Rural Municipality is supported by a number of theories like Porter's (1985) value chain model, the global value chain (GVC) theory proposed by Gereffi, Humphery and Sturgeon (2005) along with Gereffi and Fernandez-Stark (2016), Supply Chain Management (SCM) Theory of Mentzer et al. (2001), Resource-Based View (RBV) theory originating from Barney (1991), Transaction Cost Economics (TCE) Theory of Williamson (1981, 1985, 1991), Innovation Systems Theory (IST) described in Lundvall's (1992) edited works, and the Livelihoods Framework generated by the Department of International Development of United Kingdom (DFID, 1999). The SMEs involved in the vegetable value chain have been a source of livelihood for the people involved.

Economic analysis based on primary data showed that SMEs involved in the value chain contribute significantly to local employment and income generation. The role of SMEs involved vegetable value chain have been less focused in previous studies. However, the vegetable SMEs struggle with issues such as limited access to credit, inadequate infrastructure (lack or insufficiency of essential physical or organizational facilities that are crucial for the efficient functioning of vegetable SMEs, and fluctuating market prices.

The analysis of primary data collected from vegetable SMEs and stakeholders in Dhankuta Municipality and Chhathar Jorpati Rural Municipality indicate that while the vegetable value chain is fairly well-established, it faces several bottlenecks. The identified constraints are useful for the policy makers from the local to national level. The study also identified key constraints within the vegetable value chain, including

access to finance, logistical challenges, lack of proper storage facilities, transportation deficits, and insufficient coordination among value chain actors. These challenges hinder the full exploitation of the agribusiness opportunities in the region. Previous studies carried in the context of Nepal that have been reviewed in the review of literature have not analyzed these issues in depth as done in this study.

## **Conclusions**

This study emphasizes the critical role of agribusiness in driving rural development and economic growth in Dhankuta Municipality and Chhathar Jorpati Rural Municipality, Nepal. It highlights that the vegetable value chain has significant potential for enhancing local livelihoods by creating employment, generating income, and strengthening the agricultural economy. However, systemic inefficiencies, such as poor infrastructure, limited financial access, weak market connectivity, and inadequate capacity-building initiatives, impede its optimization.

The vegetable value chain in Dhankuta is supported by a complex framework involving various stakeholders, including SMEs, farmers, government agencies, NGOs, and financial institutions. While the value chain is relatively well-established, its efficiency is hampered by several constraints such as insufficient storage facilities, transportation deficits, and a lack of effective coordination among actors. The findings from primary data collected from vegetable SMEs reveal that these businesses contribute significantly to local employment and income generation, highlighting their importance in the region's economic landscape. However, the struggles of these SMEs in accessing credit and dealing with infrastructural limitations suggest that targeted interventions are needed to address these issues.

Through the application of various theoretical frameworks, including Porter's value chain model and the Global Value Chain (GVC) theory, this study has provided

a comprehensive analysis of the vegetable value chain, incorporating economic, logistical, and institutional perspectives. The findings underscore the need for a more coordinated approach among all stakeholders in the value chain, with an emphasis on improving access to finance, enhancing infrastructure, and fostering better market linkages. Additionally, the role of local and national policymakers is crucial in addressing these constraints through targeted policies and investments in the agricultural sector.

Ultimately, enhancing the vegetable value chain in these areas could have a transformative influence, fostering sustainable agricultural development, reducing rural poverty, and promoting food security. It is, therefore, very important that stakeholders, ranging from local governments to private sector actors and development partners, work together to address the identified constraints and utilize the full potential of the vegetable sector in these regions.

### **Knowledge Contribution**

This study makes a significant contribution to the existing body of knowledge on agribusiness, specifically within the context of Nepal's vegetable value chain. One of the primary contributions is its in-depth analysis of the vegetable value chain in Dhankuta Municipality and Chhathar Jorpati Rural Municipality, which highlights the current state of vegetable production, the economic role of SMEs, and the key constraints hindering the sector's growth. While previous studies have touched on aspects of agricultural production in Nepal, this research uniquely emphasizes the role of small and medium-sized enterprises (SMEs) within the vegetable value chain, which has often been overlooked in past literature. By focusing on the micro-level dynamics of vegetable value chains, the study offers new insights into the challenges

and opportunities faced by SMEs in rural Nepal, adding a crucial layer to the understanding of agribusiness development in developing economies.

This study advances knowledge in the field of agribusiness and value chain optimization by offering a detailed, context-specific analysis of the vegetable sector in Nepal, with particular emphasis on the role of SMEs and the institutional constraints that hinder their growth.

It provides a basis for future research and policy development in the agricultural sector, contributing to both academic scholarship and practical solutions for rural development in Nepal.

The understanding of agribusiness dynamics in the context of Nepal's hilly regions, particularly through its detailed analysis of the vegetable value chain in Dhankuta Municipality and Chhathar Jorpati Rural Municipality. Its most critical knowledge contribution lies in the development of a context-specific value chain map that integrates local realities—such as the pivotal role of road-head traders, the constraints of inadequate infrastructure, and the untapped potential of small and medium-sized enterprises (SMEs)—into a broader theoretical framework grounded in Porter's (1985) value chain model and Gereffi et al.'s (2005) global value chain theory. By meticulously mapping the stages from input supply to consumption, alongside identifying key stakeholders and supporting factors, the study bridges a gap in the literature where generalized value chain models often overlook the nuances of smallholder-dominated, geographically challenging agricultural systems.

Furthermore, the thesis provides actionable insights into optimizing agribusiness opportunities by highlighting inefficiencies, such as post-harvest losses due to limited cold storage and poor transportation networks—and proposing strategies like

enhanced SME capacity building and technology adoption (e.g., drip irrigation), which are tailored to Dhankuta's socio-economic and environmental conditions.

This localized approach not only enriches the academic discourse on agricultural value chains in developing countries, as called for by Trienekens (2011), but also offers practical policy implications for Nepal's agricultural development, aligning with national priorities outlined in the Agribusiness Promotion Policy (APP, 2006). Ultimately, the thesis stands out for its blend of empirical rigor and practical relevance, making it a valuable resource for researchers, policymakers, and practitioners aiming to foster sustainable agribusiness growth in similar contexts.

### **Policy Implications**

The findings of this research have some broader impacts or consequences. The insights from this study highlight the need for a holistic approach to agricultural policy in Nepal, particularly in regions like Dhankuta. Policymakers should consider the different challenges faced by rural SMEs and design interventions that not only address these challenges but also promote sustainable agribusiness development. A focus on improving infrastructure, enhancing market access, and supporting financial inclusion could have far-reaching benefits for the agricultural sector and rural livelihoods.

### **Recommendations**

To optimize the vegetable value chain and enhance agribusiness opportunities in Dhankuta and Chhathar Jorpati, the following recommendations are proposed;

- i. There needs for investment in the development of market and storage infrastructure to reduce post-harvest losses and stabilize market prices.

Primary responsibility for is that of local municipalities, Dhankuta

Municipality and Chhathar Jorpati Rural Municipality. The support for this has to come from provincial government of Koshi Province.

- ii. Equally important is to improve access to credit for agribusiness SMEs by simplifying loan procedures and offering tailored financial products. In essence “tailored financial products” are about recognizing the specific financial needs of vegetable SMEs and designing loan options and financial service that fit those needs, rather than offering generic loans that may not be suitable or accessible for these businesses. This approach helps ensure that SMEs can access the credit they need in a way that is manageable and beneficial to their operations. The primary responsibility for this is of the Federal Government and Financial Institutions such as Banks and Microfinance Institutions. The provincial government has to support this.
- iii. It is of great importance to provide training and support to farmers and SMEs on best practices in production, post-harvest handling, and value addition. The primary responsibility for this is of provincial government of Koshi Province and must be supported by Local Municipalities and Agricultural Extension Services. Capacity-building programmes, such as training on best practices in production, post-harvest handling, and value addition, are often organized and funded at the provincial level, as they require broader coordination and resources. Local communities can play a supporting role by identifying training needs, mobilizing local participants, and providing venues or resources for training sessions. Agricultural extension services (under provincial jurisdiction) is also be essential in delivering training and ongoing support.

- iv. There is need for strengthening market linkages between producers, processors, and retailers to ensure better coordination and market access. The primary responsibility for this is with Local Municipalities. The support from provincial Government and the Private Sector is essential for this. Strengthening market linkages involves improving local market structures, coordinating supply chains, and promoting better connections between producers, processors, and retailers. Local municipalities are well-placed to facilitate these linkages by organizing market events, establishing cooperatives, or supporting local traders. The provincial government can assist by providing a broader platform for regional trade or facilitating partnerships with larger market players.
- v. Local governments have to initiate to formulate policies that support the development of vegetable value chain, including subsidies for infrastructure development and incentives for private sector investment. The primary responsibility for this is of Local Municipalities and Provincial Government. The Federal Government has to support this. Encouraging the development of specific policies that support the vegetable value chain, such as subsidies for infrastructure development or incentives for private sector investment, requires action mostly at the local and provincial levels. Local municipalities can introduce policies and programmes directly within their authorities, while the provincial government can formulate broader policies that create an enabling environment. The federal government may provide principal policy direction or financial support, especially if these policies align with national agricultural strategies.

- vi. Addressing the constraints of “coming across new buyers” in the vegetable value chain involves creating strategies that connect vegetable producers, traders, and SMEs with new markets and potential customers.

The policy recommendations to tackle this issue would be: (a) Organize regional and local market fairs with prime responsibility of Dhankuta Municipality and Chhathar Jorpati Rural Municipality with support from the provincial government of Koshi Province. (b) Develop digital market platforms under the leading role of provincial government in partnership with private sector (tech companies, start-up) and possibly with federal government support for funding and infrastructure. (c) Facilitate farmer cooperatives and aggregation centers under the leading role of local municipalities with provincial support for capacity building and initial funding. (d) Encourage public-private partnerships (PPPs) to establish marketing linkages between local vegetable producers and larger market players such as supermarkets, processing companies, and export firms. This could involve contractual agreements or support for infrastructure that facilitate aggregation, storage, and transport. Responsible parties for this be provincial government and local municipalities working with the private sector.

### **Limitations of the Study**

While this study provides valuable insights in vegetable value chain, it is important to acknowledge its limitations. The reliance on cross-sectional primary data limits the ability to assess changes over time. Additionally, the focus on only two municipalities means the findings may not be fully generalizable to other regions in Nepal. Furthermore, access to comprehensive and up-to-date secondary data sources was limited as there is scarcity of publication of government reports and industrial statistics on vegetable production, constraining the depth of the analysis. Finally, the

study may not comprehensively address the long-term impacts of climate change and environmental degradation, which are critical for the sustainability of agribusiness opportunities. Further research could address these limitations by incorporating longitudinal data and expanding the geographical scope.

### **Suggestions for Future Research**

Future studies could build on this research by exploring the impact of specific interventions in the vegetable value chain, such as the introduction of cold storage facilities or market information systems. Additionally, there is need for research that examines the long-term effects of policy changes on the economic performance of SMEs in the agricultural sector. Expanding the analysis to other agricultural value chains could also provide a more comprehensive understanding of agribusiness opportunities in Nepal.

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## APPENDICES

### Appendix-I

#### Summary Statistics of Nepal's Fresh Vegetables for the Last 31 Years

| Year    | Area (Ha) | Production (Mt.) | Yield (Mt./Ha.) |
|---------|-----------|------------------|-----------------|
| 1991/92 | 140,500   | 1,127,884        | 8.03            |
| 1992/93 | 140,500   | 1,179,000        | 8.39            |
| 1993/94 | 140,500   | 1,197,496        | 8.52            |
| 1994/95 | 140,500   | 1,211,507        | 8.62            |
| 1995/96 | 144,368   | 1,327,298        | 9.19            |
| 1996/97 | 146,503   | 1,357,435        | 9.27            |
| 1997/98 | 149,979   | 1,449,472        | 9.66            |
| 1998/99 | 140,177   | 1,342,567        | 9.58            |
| 1999/00 | 149,030   | 1,489,665        | 10.00           |
| 2000/01 | 157,162   | 1,652,979        | 10.52           |
| 2001/02 | 161,048   | 1,738,086        | 10.79           |
| 2002/03 | 165,988   | 1,799,973        | 10.84           |
| 2003/04 | 172,586   | 1,890,100        | 10.95           |
| 2004/05 | 180,823   | 2,065,193        | 11.42           |
| 2005/06 | 189,864   | 2,190,122        | 11.54           |
| 2006/07 | 191,922   | 2,298,689        | 11.98           |
| 2007/08 | 208,108   | 2,538,904        | 12.20           |
| 2008/09 | 225,154   | 2,754,406        | 12.23           |
| 2009/10 | 235,098   | 3,003,821        | 12.78           |
| 2010/11 | 244,102   | 3,203,563        | 13.12           |
| 2011/12 | 245,037   | 3,298,816        | 13.46           |

|         |         |           |       |
|---------|---------|-----------|-------|
| 2012/13 | 246,392 | 3,301,684 | 13.40 |
| 2013/14 | 254,932 | 3,421,035 | 13.42 |
| 2014/15 | 266,937 | 3,580,085 | 13.41 |
| 2015/16 | 280,807 | 3,929,034 | 13.99 |
| 2016/17 | 277,393 | 3,749,802 | 13.52 |
| 2017/18 | 286,864 | 3,958,230 | 13.80 |
| 2018/19 | 297,195 | 4,271,270 | 14.37 |
| 2019/20 | 281,132 | 3,962,383 | 14.09 |
| 2020/21 | 284,121 | 3,993,167 | 14.05 |
| 2021/22 | 289,839 | 4,153,157 | 14.33 |

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*Note.* Statistics Years Books various years. MoALD. <https://moald.gov.np/>

## **Appendix-II**

### **Questionnaire of the Study**

This study by Ramesh Bhandari, MPhil/PhD, third semester, Central Department of Rural Development, Kritipur, Kathmandu, Nepal.

Field study questionnaire

Date:

Name of respondent:

Enterprise name:

Cell no:

#### **Section 1: SMEs Introduction and Situation**

How old are you? Select age group.

- 18 to 39
- 40to 59
- 60 and above

Position in the enterprise:

Address:

Name of Enterprise:

Address:

How many years has the enterprise/firm been operating?

- Less than 1 year
- 1 to 3 years
- p to 5 years
- 5 to 7 years
- Above 7 years

What is the current legal status of the company?

- Shareholding company with shares traded in the stock market
- Shareholding company with non-traded shares or shares traded privately
- Sole proprietorship
- Partnership
- Limited partnership
- Not registered

**Your company is owned by**

- Female only
- Male only
- Both female and male

**In which vegetables does your company belong?**

- Cauliflower/ Cabbage
- Tomato
- Potato/cauliflower/cabbage
- All of them
- Other (specify)

If you answered "other" in the sector, please indicate the sector.

In which areas are your SMEs engaged?

- Production
- Processing
- Collector
- Aggregating
- Whole sheller/Exporter
- Retailer

- Other (specify).....

How many full-time staff members did the business have in the previous FY 2079/080?

- 1-9
- 10-49
- 50-300
- More than 300

How much was your total sales in 2022?

- Less than NRs1000,000
- NRs 1000,000 to NRs 2M
- Above NRs 2M but less than NRs 5M
- NRs 5M but less than NRs 15 M
- NRs15 Mand above
- Do not know

**What do you spend/invest the income?**

- Reinvestment
- Saving
- Consumption
- All of them
- Other (Specify)

Which of these comprise the biggest percentage of your sales?

- Domestic sales: within the province
- Domestic sales: within the country
- Indirect export sales: sold domestically to third party that exports products

- Direct exports

Which of these countries do you sell to either directly or indirectly?

- India
- Afghanistan, Pakistan, Bhutan, Bangladesh, Sri Lanka, Maldives China and Hong Kong
- United Kingdom
- Europe and America and Canada Other countries (specify)
- Not applicable - sell only to domestic market

## **Section: 2 : Opportunity Analysis**

What are the main market opportunities you see for your business within the next five years? Checked one

To what degree does each of the factors hinder the growth of your company or from taking advantage of the market opportunities? Please rate each factor as:

Serious Problem, Moderate Problem, Minor Problem, Not a problem at all, Do not know, Not applicable to Company/Firm

### **Availability of storage facilities, including cold storage facilities and warehouses**

- Serious problem
- Moderate problem
- Minor problem
- Not a problem at all
- Do not know
- Not applicable to Company

### **Business licensing and permits**

- Serious problem
- Moderate problem
- Minor problem
- Not a problem at all
- Do not know
- Not applicable to company

**Corruption**

- Serious problem
- Moderate problem
- Minor problem
- Not a problem at all
- Do not know
- Not applicable to company

**Customs and trade regulations**

- Serious problem
- Moderate problem
- Minor problem
- Not a problem at all
- Do not know
- Not applicable to company

**Difficulties in accessing new buyers**

- Serious problem
- Moderate problem
- Minor problem
- Not a problem at all

- Do not know
- Not applicable to company

**Does not have regular buyers or customers/Rely on spot transactions**

- Serious problem
- Moderate problem
- Minor problem
- Not a problem at all
- Do not know
- Not applicable to company

**Difficulty in accessing finance**

- Serious problem
- Moderate problem
- Minor problem
- Not a problem at all
- Do not know
- Not applicable to a company

**Disaster preparedness and management**

- Serious problem
- Moderate problem
- Minor problem
- Not a problem at all
- Do not know
- Not applicable to Company

**Existing financial products in the market do not meet the requirements**

- Serious problem

- Moderate problem
- Minor problem
- Not a problem at all
- Do not know
- Not applicable to Company

**High cost involved in sourcing material inputs or supplies**

- Serious problem
- Moderate problem
- Minor problem
- Not a problem at all
- Do not know
- Not applicable to company

**High domestic price of material inputs or supplies compared to competitor countries**

- Serious problem
- Moderate problem
- Minor problem
- Not a problem at all
- Do not know
- Not applicable to company

**Import regulations, quotas, and non-tariff barriers in the export markets**

- Serious problem
- Moderate problem
- Minor problem
- Not a problem at all

- Do not know
- Not applicable to company

**Inadequately educated or skilled workforce**

- Serious problem
- Moderate problem
- Minor problem
- Not a problem at all
- Do not know
- Not applicable to company

**Insufficient supply of material inputs or supplies**

- Serious problem
- Moderate problem
- Minor problem
- Not a problem at all
- Do not know
- Not applicable to company

**Labour regulations**

- Serious problem
- Moderate problem
- Minor problem
- Not a problem at all
- Do not know
- Not applicable to company

**Lack of certification (e.g., ISO, HACCP, GAP, etc.)**

- Serious problem

- Moderate problem
- Minor problem
- Not a problem at all
- Do not know
- Not applicable to company

**Low demand for products/services**

- Serious problem
- Moderate problem
- Minor problem
- Not a problem at all
- Do not know
- Not applicable to company

**Lack of staff with management and/or entrepreneurial skills**

- Serious problem
- Moderate problem
- Minor problem
- Not a problem at all
- Do not know
- Not applicable to company

**Meeting domestic market product specifications and requirements**

- Serious problem
- Moderate problem
- Minor problem
- Not a problem at all
- Do not know

- Not applicable to company

**Meeting export market product specifications and requirements**

- Serious problem
- Moderate problem
- Minor problem
- Not a problem at all
- Do not know
- Not applicable to company

**Poor quality/inconsistent quality of material inputs or supplies**

- Serious problem
- Moderate problem
- Minor problem
- Not a problem at all
- Do not know
- Not applicable to company

**Poor internet connectivity**

- Serious problem
- Moderate problem
- Minor problem
- Not a problem at all
- Do not know
- Not applicable to company

**Price competitiveness in domestic markets**

- Serious problem
- Moderate problem

- Minor problem
- Not a problem at all
- Do not know
- Not applicable to company

**Price competitiveness in export markets**

- Serious problem
- Moderate problem
- Minor problem
- Not a problem at all
- Do not know
- Not applicable to company

**Production capacity to meet order quantities and delivery dates**

- Serious problem
- Moderate problem
- Minor problem
- Not a problem at all
- Do not know
- Not applicable to company

**Tax rates and administration**

- Serious problem
- Moderate problem
- Minor problem
- Not a problem at all
- Do not know
- Not applicable to company

**Telecommunications**

- Serious problem
- Moderate problem
- Minor problem
- Not a problem at all
- Do not know
- Not applicable to company

**Transportation and delivery of raw materials and inputs used in production**

- Serious problem
- Moderate problem
- Minor problem
- Not a problem at all
- Do not know
- Not applicable to company

**Transportation and delivery of the exported goods**

- Serious problem
- Moderate problem
- Minor problem
- Not a problem at all
- Do not know
- Not applicable to company

**Bad road/farm-to-market roads**

- Serious problem
- Moderate problem
- Minor problem

- Not a problem at all
- Do not know
- Not applicable to company

**High cost of transportation**

- Serious problem
- Moderate problem
- Minor problem
- Not a problem at all
- Do not know
- Not applicable to company

**Lack of reliable logistics providers**

- Serious problem
- Moderate problem
- Minor problem
- Not a problem at all
- Do not know
- Not applicable to company

**Lack of testing laboratories**

- Serious problem
- Moderate problem
- Minor problem
- Not a problem at all
- Do not know
- Not applicable to company

**Unreliable electric/power utilities**

- Serious problem
- Moderate problem
- Minor problem
- Not a problem at all
- Do not know
- Not applicable to company

Other (specify)

Specify.....

- Serious problem
- Moderate problem
- Minor problem
- Not a problem at all
- Do not know
- Not applicable to company

### **Section: 3: Facility**

If you answered "Other" in previous question, please specific constraint/s you are facing

Below is a list of business development services. If you have availed of the service during the last three years, indicate the provider. If you have not availed of the service, check "did not avail of service" or "not relevant to company", whichever is applicable

#### **Accounting services**

- Family and friends
- Private business support organizations

- Private equity/venture capital firms Industry association
- Company suppliers (equipment, technology, materials, etc.)
- Other
- Did not avail of service Not relevant to company

#### **Business incubator**

- Family and friends
- Private business support organizations Public business support organizations Private equity/venture capital firms Industry association
- Buyers
- Company suppliers (equipment, technology, materials, etc.) Providers outside of the country
- Other
- Did not avail of service Not relevant to company

#### **Feasibility studies and business plans**

- Family and friends
- Private business support organizations Public business support organizations Private equity/venture capital firms Industry association
- Buyers
- Company suppliers (equipment, technology, materials, etc.) Providers outside of the country
- Other
- Did not avail of service Not relevant to company

#### **Information about domestic and export markets**

- Family and friends

- Private business support organizations Public business support organizations Private equity/venture capital firms Industry association
- Buyers
- Company suppliers (equipment, technology, materials, etc.) Providers outside of the country
- Other
- Did not avail of service Not relevant to company

#### **Linkage with buyers**

- Family and friends
- Private business support organizations Public business support organizations Private equity/venture capital firms Industry association
- Buyers
- Company suppliers (equipment, technology, materials, etc.) Providers outside of the country
- Other
- Did not avail of service Not relevant to company

#### **Linkage with suppliers**

- Family and friends
- Private business support organizations Public business support organizations Private equity/venture capital firms Industry association
- Buyers
- Company suppliers (equipment, technology, materials, etc.) Providers outside of the country
- Other
- Did not avail of service Not relevant to company

If you have availed of business support services not listed above, please specify.

- Accounting services
- Very satisfied
- Satisfied
- Fairly satisfied
- Not satisfied
- Did not avail of service
- Do not know

**Section 4 satisfaction level**

- Advertising/promotion services
- Very satisfied
- Satisfied
- Fairly satisfied
- Not satisfied
- Did not avail of service
- Do not know

**Assistance in improving IT capabilities**

- Very satisfied
- Satisfied
- Fairly satisfied
- Not satisfied
- Did not avail of service
- Do not know

**Business incubator**

- Very satisfied
- Satisfied
- Fairly satisfied
- Not satisfied
- Did not avail of service
- Do not know

**Design services**

- Very satisfied
- Satisfied
- Fairly satisfied
- Not satisfied
- Did not avail of service
- Do not know

**Feasibility studies and business plans**

- Very satisfied
- Satisfied
- Fairly satisfied
- Not satisfied
- Did not avail of service
- Do not know

**Financial and taxation advice**

- Very satisfied
- Satisfied
- Fairly satisfied

- Not satisfied
- Did not avail of service
- Do not know

**Information about domestic and export markets**

- Very satisfied
- Satisfied
- Fairly satisfied
- Not satisfied
- Did not avail of service
- Do not know

**Linkage with buyers**

- Very satisfied
- Satisfied
- Fairly satisfied
- Not satisfied
- Did not avail of service
- Do not know

**Linkage with suppliers**

- Very satisfied
- Satisfied
- Fairly satisfied
- Not satisfied
- Did not avail of service
- Do not know

**Quality assurance and management programs**

- Very satisfied
- Satisfied
- Fairly satisfied
- Not satisfied
- Did not avail of service
- Do not know

**Storage/warehouse/cold room facilities**

- Very satisfied
- Satisfied
- Fairly satisfied
- Not satisfied
- Did not avail of service
- Do not know

**Technical assistance in meeting laws and regulations (e.g., labour standards, national enterprise laws)**

- Very satisfied
- Satisfied
- Fairly satisfied
- Not satisfied
- Did not avail of service
- Do not know

**Testing and certification laboratories**

- Very satisfied
- Satisfied
- Fairly satisfied

- Not satisfied
- Did not avail of service
- Do not know

#### **Training of workers**

- Very satisfied
- Satisfied
- Fairly satisfied
- Not satisfied
- Did not avail of service
- Do not know

#### **Section : 4: Business Support and Financing Services**

If your company has not availed of any business support services from an external provider during the last three years, please cite reasons. Check all that apply.

- No need for business support services from external providers
- Lack of external agencies that can provide needed services Lack of relevant services related to business
- The quality of existing services is low High cost of services
- Do not know of external providers Other (specify)

Banks: private and state-owned

- Very satisfied
- Satisfied
- Fairly satisfied
- Not satisfied
- Did not avail of service
- Do not know

#### Non-bank financial institutions

- Very satisfied
- Satisfied
- Fairly satisfied
- Not satisfied
- Did not avail of service
- Do not know

#### Purchases on credit from suppliers and advances from customers

- Very satisfied
- Satisfied
- Fairly satisfied
- Not satisfied
- Did not avail of service
- Do not know

#### Microfinance institutions

- Very satisfied
- Satisfied
- Fairly satisfied
- Not satisfied
- Did not avail of service
- Do not know

#### Other (specify.....)

##### Very satisfied

- Satisfied
- Fairly satisfied

- Not satisfied
- Did not avail of service
- Do not know

### **Section: 5: Closing remarks**

Which of the following represents the biggest obstacle faced by this company?

Select only one.

- Availability of storage facilities, including cold storage facilities and warehouses
- Business licensing and permits
- Corruption
- Customs and trade regulations
- Difficulties in accessing new buyers
- Does not have regular buyers or customers/Rely on spot transactions
- Difficulty in accessing finance
- Disaster preparedness and management
- Existing financial products in the market do not meet requirements
- High domestic price of material inputs or supplies compared to competitor countries
- Import regulations, quotas, and non-tariff barriers in the export markets
- Inadequately educated or skilled workforce
- Insufficient supply of material inputs or supplies
- Lack of certification (e.g., ISO, HACCP, GAP, etc.)
- Low demand for products/services
- Lack of staff with management and/or entrepreneurial skills
- Meeting domestic market product specifications and requirements

- Meeting export market product specifications and requirements
- Poor quality/inconsistent quality of material inputs or supplies
- Poor internet connectivity
- Price competitiveness in domestic markets
- Price competitiveness in export markets
- Production capacity to meet order quantities and delivery dates
- Tax rates and administration
- Telecommunications
- Transportation and delivery of raw materials and inputs used in production
- Transportation and delivery of the exported goods
- Bad road/farm-to-market roads
- If top constraint faced by your company is not listed above, please specify

### Appendix-III

#### Definition of Terminologies

This section provides definitions of some specific terms and terminologies used in the context of this study.

**Agribusiness:** The term refers to the entire spectrum of agricultural production, processing, distribution, and marketing activities, including input supply, primary production, agro-processing, and the delivery of agricultural products to consumers. It encompasses both farm and non-farm activities that contribute to the production and distribution of food and agricultural products.

**Agricultural Holding:** In agricultural census, the term “agricultural holdings” refers to an economic unit of agricultural production under single management comprising all livestock and poultry kept, and all land used wholly or partly for agricultural production purposes. It represents a unit of agricultural operations, regardless of whether the land is owned or rented.

**Assessment:** Assessment refers to a systematic and comprehensive examination of key components within the agribusiness value chain. This involves gathering and analyzing relevant data to evaluate the current status, strengths, weaknesses, opportunities, and threats within the value chain. The assessment aims to provide a clear understanding of the performance and efficiency of the agribusiness processes.

**Enablers:** These are the external factors and policies that create an enabling environment for the value chain to thrive. They include government regulations, trade policies, legal frameworks, and institutions that influence market access, investments, and overall competitiveness in the agribusiness sector.

**Government and Regulatory Bodies:** They are enablers of public entities responsible for formulating and implementing policies, regulations, and standards related to

agriculture and agribusiness. Enablers set guidelines, standards, and regulations to ensure the smooth functioning and sustainability of the value chain.

**Processors:** Entities involved in the transformation of raw agricultural products into processed goods, including milling, refining, and manufacturing. The role of these actors, add value to raw materials, preparing them for distribution and consumption.

**Research and Extension Services:** Organizations involved in agricultural research, development, and extension services, providing knowledge and technology transfer to farmers. They contribute to innovation, best practices, and improved productivity in the agribusiness value chain.

**Road-head Traders:** Road-head traders are individuals or businesses that operate at the junction or “road head” where transportation from rural or remote areas transitions to larger, more accessible road networks. These traders typically serve as intermediaries in the supply chain, purchasing goods, often agricultural products like vegetables, fruits, or other commodities, from producers in remote or rural areas and then transporting these goods to larger markets

**SMEs:** Small and Medium-sized Agricultural Businesses. These are businesses with turnover and investment below a certain threshold. SMEs comprise both service and manufacturing enterprises. They are categorized by the government according to a mix of equipment investment and yearly turnover.

**Support Functions:** These are the services and inputs that help improve the efficiency and effectiveness of core functions. Examples include financial services, technology provision, logistics, business advisory, and infrastructure, which facilitate smooth operations along the value chain.

**Transporters/Logistics Providers:** Entities responsible for the transportation and logistics of agricultural products throughout the value chain. They ensure efficient and timely movement of products from producers to consumers.

**Value Chain:** The term involves the systematic improvement and enhancement of processes, relationships, and activities within the agribusiness value chain. This includes optimizing production, processing, marketing, and distribution to increase the overall value of agricultural products and improve the competitiveness and sustainability of the entire value chain.

**Wholesale Mandis:** The term refers to large, centralized markets where agricultural products, including vegetables, fruits, grains, and other commodities, are bought and sold in bulk. The word “mandi” is derived from Hindi, meaning “marketplace”. Wholesale *mandis* are key hubs in the agricultural supply chain, especially in South Asian countries like India, Pakistan, and Nepal.

These terminologies are useful to follow the analysis within the agribusiness value chain.

## Appendix-IV

### Field Photographs



Interviewing with vegetable traders in Dhakuta



Interview taking with Input supplier/vegetable traders



Vegetable Farming Area Chatter Jorpati Rural Municipality



Vegetable retailer in Dhankuta vegetable market