

STUDY OF FRUIT AND VEGETABLE MARKET SUPPORT NETWORK IN FEDERAL NEPAL

A study conducted as a part of the Daayitwa Nepal Public Policy Fellowship 2024, together with
the Ministry of Agriculture and Livestock Development

Researcher:

Udyan Devkota

Daayitwa Nepal Public Policy Fellow 2024

Government Supervisor:

Ms. Sabnam Shivakoti Aryal

Joint Secretary, Ministry of Agriculture and Livestock Development

Mentor:

Dr. Shrinivas Gautam

University of Notre Dame, USA



TABLE OF CONTENTS

TABLE OF CONTENTS.....	2
LIST OF TABLES.....	3
APPENDICES.....	4
ACRONYMS AND ABBREVIATION.....	4
1. INTRODUCTION.....	1
1.1. Background.....	1
1.2. Research Question.....	2
2. LITERATURE REVIEW.....	3
2.1. Agriculture Market Coordination in South Asian countries.....	4
2.2. Fruits and Vegetable Marketing in Nepal.....	6
2.3. Value Chain Study of Fruit and Vegetables in Nepal.....	6
2.4. Federalism and Agriculture Development in Nepal.....	7
2.5. Agriculture Market Support Network in Federal Nepal.....	7
2.6. Intergovernmental Relations in Federal Nepal.....	8
2.7. Road transportation and agriculture marketing.....	8
2.8. Role of Farmer’s Organization in Agriculture Markets.....	9
2.9. Review of Government Policies on Agriculture Marketing.....	10
2.9.1. Agriculture Marketing Act and Directives.....	10
2.9.2. Policies and Strategies.....	10
3. RESEARCH DESIGN AND METHOD.....	12
3.1. Commodity and Study Area:.....	13
3.2. Data Collection, Analysis and Limitation.....	14
4. FINDINGS AND ANALYSIS.....	17
4.1. Value Chain Analysis of Mango and Bitter gourd.....	17
4.2. Research Question 1.....	22
4.2.1. Authority, Autonomy, and Accountability in Agriculture Marketing.....	23
4.2.2. Fragmentation of Agriculture Market Governance.....	24
4.2.3. Role of three tiers of government in fruit and vegetable Marketing.....	26
4.2.4. Inter-governmental relations (IGR).....	30
4.3. Research Question 2.....	34
4.3.1. Fruit and Vegetable Markets in Nepal.....	34
4.3.2. Transportation and Road Infrastructure in Nepal.....	42
4.3.3. Cold Chain Infrastructure for Fruits and Vegetables.....	44
4.4. Research Question 3.....	45
4.4.1. Farmer’s Organization and Fruits and Vegetable Marketing.....	45
4.4.2. Role of FNCCI/AEC.....	48
4.4.3. Private sector and value chain integration.....	49

4.5. Research Question 4.....	52
4.5.1. Digital Agriculture and Digital Fruit and Vegetable Marketing in Nepal.....	52
4.5.2. Feminization of Agriculture and Digitalization.....	57
5. CONCLUSION & RECOMMENDATIONS.....	60
REFERENCES.....	64
APPENDICES.....	71

LIST OF FIGURES

Figure 1: Map of Nepal showing districts in the study area	13
Figure 2: Major marketing channels of mango in the study area	17
Figure 3: Major marketing channels of bitter gourd in the study area	19
Figure 4: A diagram showing the structure and linkage of three tiers of government in the agriculture sector	22
Figure 5: A diagram showing the fragmentation of agriculture marketing-related functions in the Federal Government	25
Figure 6: Graphs showing the wholesale price of Mango and Bitter gourd at Kalimati and Lalbandi Fruit and Vegetable Market	37
Figure 7: Map of Nepal showing a network of national highways	38

LIST OF TABLES

Table 1. Study Area	14
Table 2: Key stakeholders in the study	15
Table 3: Schedule of powers within the agriculture sector across three tiers of government according to the 2072 Constitution	22
Table 4: Three tiers of government on fruit and vegetable marketing	26
Table 5: Federal restructuring and its implications for agriculture (fruits and vegetable) marketing governance in Nepal	30
Table 6: Agriculture market structures in different districts of Madhesh Province	33
Table 7: Details of studied wholesale markets	34
Table 8: Post-harvest loss of vegetables and fruits	35
Table 9: The inter-regional flow of fruits and vegetables from Lalbandi, Sarlahi (kg) in 2079 B.S.	37
Table 10: Expansion of road networks by the federal government	39
Table 11: Expansion of Provincial and Local Roads	39
Table 12: Length (kilometers) of major highways in the study districts	39
Table 13: Digital Agriculture Tools in Nepal	49

APPENDICES

Appendix A: Trend of Vegetable and Fruit Production in Nepal from 2000 to 2020.	65
Appendix B: Cost of production of Mango	65
Appendix C: Marketing Margin of Mango	65
Appendix D: Cost of production for Bitter gourd	66
Appendix E: Marketing margin for Bitter gourd	67
Appendix F: Role of three tiers of government in marketing of fruits and vegetables	67
Appendix G: Maps of Bagmati province, Chitwan and Makwanpur districts with road networks	71
Appendix H: Maps of Madhesh province, Sarlahi and Dhanusha district with road networks	73
Appendix I: List of Cold stores in Bagmati Province (capable of storing apples at 0 degrees Celsius for 15 days)	74

ACRONYMS AND ABBREVIATION

%	: Percentage
ADO	: Agriculture Development Office
ADS	: Agriculture Development Strategy
AEC	: Agro Enterprise Center
AKC	: Agriculture Knowledge Center
ALBPD	: Agriculture and Livestock Business Promotion Division
APMC	: Agriculture Produce Marketing Committee
DFTQC	: Department of Food Technology and Quality Control
CAIDMP	: Center for Agricultural Infrastructure Development and Mechanization Promotion
DOA	: Department of Agriculture
DOLS	: Department of Livestock Services
e-NAM	: Electronic National Agriculture Market
FANSEP	: Food and Nutrition Security Enhancement Project
FGD	: Focus Group Discussion
FNCCI	: Federation of Nepalese Chamber of Commerce and Industries
FY	: Fiscal Year
GDP	: Gross Domestic Product
GGGI	: Global Green Growth Institute
GRAPE	: Green Resilient Agricultural Production Ecosystems
GON	: Government of Nepal
ICT	: Information and Communications Technology
IGR	: Inter-governmental Relations
INR	: Indian Rupees
IT	: Information Technology

JICA	:	Japan International Cooperation Agency
KII	:	Key Informant Interview
KOICA	:	Korea International Cooperation Agency
MIS	:	Market Information System
MOALD	:	Ministry of Agriculture and Livestock Development
MOLMAC	:	Ministry of Land Management, Agriculture and Cooperatives
MSP	:	Minimum Support Price
NFCL	:	Nagarjuna Fertilizer and Chemical Limited
NRs.	:	Nepali Rupees
ODOP	:	One District One Product
OVOP	:	One Village One Product
PMAMP	:	Prime Minister Agriculture Modernization Project
POP	:	Package of Practice
POS	:	Point of Sale
PPP	:	Public-Private Partnership
REED	:	Rural Enterprise and Economic Development Project
SFAC	:	Small Farmer's Agribusiness Consortium
SOP	:	Standard Operating Procedure
SWOT	:	Strength, Weakness, Opportunity, Threat
TAECF	:	Terai Agribusiness and Enterprise Challenge Fund
USAID	:	United States Agency for International Development
USDA	:	United States Department of Agriculture
VC	:	Value Chain

ABSTRACT

This study examines the fruit and vegetable market support network in federal Nepal, focusing on the dynamics and challenges faced by value chain stakeholders. Apart from exploring the impact of the transition to federalism on market support systems, including institutions, policy, and implementation, it also studied the state of market, transport, and logistical infrastructure affecting the marketing of fruits and vegetables. Similarly, it also studied the role played by agriculture cooperatives/farmer's groups, business federations (FNCCI/AEC), and private enterprises in strengthening fruit and vegetable markets and value chains. Moreover, it also looked at the adoption of digital tools in fruit and vegetable marketing.

The findings highlighted the existence of a dysfunctional supply-driven value chain, weakening and fragmentation of marketing governance and institutions, low autonomy of sub-national government, and lack of harmonized policies and regulations owing to federal transition, which has been constraining inter-regional marketing of fruits and vegetables. Apart from operational challenges of logistics and infrastructures, the suboptimal performance of agriculture cooperatives/farmer's groups and the slow uptake of digital marketing tools have stifled the growth of fruits and vegetable markets.

The study also presents a set of policy recommendations, such as formulating an agricultural marketing act to remove the ambiguity in terms of authority and autonomy in the marketing of fruits and vegetables and harmonizing trade regulations, taxes, and duties to facilitate interregional marketing of agricultural produce. Similarly, improvement of transportation and logistical infrastructure, investment in capacity development of farmer's organizations, and promotion of private enterprises for value chain development are also suggested. Finally, greater collaboration with digital technology companies to promote the digitalization of the agriculture sector, initiation of electronic auctions at fruit and vegetable wholesale markets to enable better price discovery and transparency, and gradual development of a unified digital national agriculture market like e-NAM in India are also recommended.

1. INTRODUCTION

1.1. Background

Agriculture is the mainstay of the Nepali economy, employing more than 60% of the population in the country. Despite its dwindling share in Nepal's economy, its contribution to Nepal's Gross Domestic Product (GDP) still stands at around 24%. Horticulture makes up about 38.59% of the agricultural GDP (Thapa et al., 2019). Vegetables, including potatoes, contribute around 31%, while fruits and spices contribute around 7.5% of the total agricultural GDP (ibid.) The government of Nepal is actively promoting the cultivation of fruits and vegetable crops as cash crops across the country, demonstrating a commitment to poverty alleviation and sustainable livelihood for farmers.

The increase in demand, especially by middle-income households, has fueled an increase in the production of fruits and vegetables in recent years (see Appendix A for the trend of production of fruits and vegetables in Nepal). Despite some growth in recent years, the per capita consumption of fruit and vegetables lies much lower than the minimum requirement prescribed by nutritionists and dieticians (Gautam & Bhattarai, 2006), and the demand for fruits and vegetables is poised to grow in the future as well. This increase in demand and production has improved fruit and vegetable farmers' livelihoods across Nepal. Still, relatively less agricultural land is under vegetable and fruit production in Nepal. Fruit and vegetable cultivation is labor intensive and can generate additional employment opportunities.

The transformation of Nepali agriculture from a subsistence-based system into a modern, intensive, and business-oriented one requires an assured and efficient market system (Aryal et al., 2018). The significant agroecological variation within the country gives Nepal a distinct advantage in fruit and vegetable production. However, marketing fruits and vegetables is challenging due to geographic terrain coupled with perishability, seasonality, and bulkiness of fruits and vegetables (Hagos et al., 2019). The current market system is traditional in nature, and farmers face numerous challenges, such as inadequate prices, storage, processing, post-harvest losses, and lack of quality and reliable transport infrastructure. The post-harvest loss for fruits and vegetables remains concerning, ranging from 20-35% for fruits and 15-30% for vegetables (Gautam & Bhattarai, 2012). Despite the immense potential and opportunities in the fruit and vegetable sector, Nepal imports fruits and vegetables from neighboring countries, which can be partly attributed to the poor marketing infrastructure and system existing in Nepal.

Overcoming these challenges requires programs and policies that support farmers' access to the market and efficient flow of commodities from producers to consumers. This includes market integration and coordination across different stakeholders along the value chain. Fruits and vegetable market support networks comprise interconnected entities, services, and systems that

enable these agricultural commodities' production, distribution, and marketing (Khanal et al., 2024).

Promotion of agriculture marketing infrastructure and activities is key to agricultural development. The Government of Nepal (GON) has formulated different policies to promote agriculture marketing over time. In the past (before 2016), the central government, in most cases, dictated agricultural marketing policies, development and operation of marketing infrastructure. However, Nepal has transitioned from a unitary to a federal state, three different tiers of government have emerged, and the new constitution devolved the power to formulate and implement their agriculture marketing policies within their jurisdiction (Khanal et al., 2024). The devolution and decentralization of governance can have profound implications for agriculture and fruit and vegetable marketing in agroecologically and geographically diverse countries like Nepal. NGOs, cooperatives, and private entities also play pivotal roles in establishing and promoting fruit and vegetable markets. However, the public sector must facilitate this process by creating an enabling environment that encourages their investment and active participation.

There is a considerable corpus of literature focused on the decentralization and devolution of agriculture extension services and their impact in Nepal (see Kyle & Resnick, 2019; Dahal et al., 2020; Tamang et al., 2020; Bishwakarma et al., 2022; Burlakoti & Nettle, 2023). Most of them have highlighted that though the devolution and decentralization before and after federalism have led to the growth of farmers' ability to gain extension services from field-level institutions, the problem of ambiguity regarding roles and responsibilities, low accountability, limited resources, and low coordination between the government institutions has hindered efficient service delivery

However, studies have scarcely delved into federalism's impact on agriculture marketing, mainly fruit and vegetable marketing in Nepal. In this context, this research seeks to understand the impact of federalism on fruit and vegetable marketing in Nepal with the emergence of three tiers of government. Similarly, it also seeks to understand the impact of existing logistical and transportation infrastructure in market coordination of fruit and vegetables and value chain efficiency. Moreover, it also seeks to investigate the role of cooperatives, farmer's groups, private agribusinesses, enterprises, and federations in supporting fruit and vegetable markets. Furthermore, it seeks to study the prevalence of digital agriculture tools, their role in decision-making and improving marketing efficiency, and the perceived barriers to adoption.

1.2. Research Question

- 1. How has the institutionalization of federalism in Nepal impacted the market support networks, and how has it affected the coordination and efficiency of vegetable and fruit markets in Nepal?**

This question will be answered with the help of the following sub-questions:

1. What has been the impact of federalism on fruit and vegetable marketing in Nepal (institutions, policy, and implementation) with the emergence of three tiers of government?
2. How have existing agriculture marketing, logistical, and transportation infrastructure affected the market coordination and efficiency of the vegetable and fruit value chain?
3. What roles have cooperatives, farmer's organizations, and private sector/traders/federations played in supporting fruit and vegetable markets?
4. How prevalent is the use of digital tools (who provides and uses them), how/why are they used, how do they help decision-making, and does it improve efficiency? What are the perceived barriers to the adoption of these technologies?

2. LITERATURE REVIEW

2.1. Agriculture Market Coordination in South Asian countries

Though countries have different governance structures, fruits and vegetable value chains or markets across South Asia are fragmented, mismanaged, and inefficient, with numerous intermediaries in the chain. India and Pakistan are federal states in South Asia, with agriculture as the provincial/state subject. Agricultural markets in both countries have their roots in colonial-era laws dating from the 1930s (Ahmed & Ali, 2024; Saha et al., 2023).

Agriculture Marketing in India: Historically, Indian agriculture markets have been decentralized and fragmented due to agriculture being a state subject. The Agricultural Produce Marketing Act of 1954 established state-controlled physical markets (APMC *mandis*) managed by farmer-led committees to ensure fair trade and protect farmers from exploitation (Singh & Alagawadi, 2021). However, over time, issues like monopsony markets and high entry barriers emerged, which prompted the Union government to introduce the Model APMC Act in 2003, advising states to liberalize markets by removing licensing requirements, market restrictions, and market fees while promoting private markets and contract farming (Saha et al., 2024; Singh & Alagawadi, 2021).

The state of Karnataka pioneered these liberal reforms, introducing an e-tender system in 2006 and later launching the Unified Market Platform (UMP), connecting over 100 markets all over the state (Bisen & Kumar, 2018). This success prompted the Union government to create a national platform, the Electronic National Agricultural Market (e-NAM), in 2016 to integrate APMC markets across India and facilitate electronic trading (ibid.). It sought to connect farmers and traders across the country in the digital platform, allow a seamless flow of agricultural commodities throughout the country, and ensure that farmers are not prisoners of local markets (Gupta & Badal, 2018). Further reforms, including the Agricultural Produce and Livestock Marketing Act (2017), aimed to create a more competitive market but fell short of establishing a unitary national marketing structure (Singh & Alagawadi, 2021).

In 2020, the Indian government introduced three farm laws to privatize and deregulate agriculture, enabling trade outside the APMC markets, allowing stockpiling without limits, and facilitating greater interstate trade. However, these laws were repealed amid strong opposition from farmers (Kumar, 2022)

Agriculture Markets in Pakistan: In Pakistan, agriculture is primarily a provincial subject, granting provinces autonomy over agricultural marketing. Each province has enacted its own Agriculture Produce Markets Act, influenced by the 1939 Punjab Agriculture Produce Marketing Act. Despite recent legislative reforms, such as the Punjab Agricultural Market Regulatory

Authority Act (2018) and the Sindh Wholesale Agricultural Produce Markets Act (2010), the wholesale market system (mandis) still largely follows a century-old model (Ahmed & Ali, 2024).

While provincial approaches to agriculture marketing differ due to varying priorities and needs, there is little inter-provincial coordination. At the federal level, institutions like the Agricultural Policy Institute (API) and the Department of Agricultural and Livestock Product Marketing and Grading (DALPMG) provide guidance on marketing policies, standardization, and export competitiveness. The Pakistan Horticulture Development and Export Company (PHDEC), which is under the Ministry of Finance, addresses marketing issues for horticultural crops (Pakistan Planning Commission, 2009). Provincially, bodies like the Directorate of Economics and Marketing in Punjab province manage agriculture marketing, while the Food Department oversees the procurement of crops, especially wheat, at prices set by the federal government (ibid.).

Forward Contracting and Agriculture Commodity Futures Market in South Asia: South Asian countries like India, Pakistan, Bangladesh, and Sri Lanka have sought to promote forward contracting as an alternative to government intervention in agriculture markets (Wijesooriya & Champika, 2015; Dhillon & Singh, 2006; Gulati et al., 2008). Outgrower schemes have been playing important roles in Sri Lanka in integrating producers (mostly of plantation crops, fruits, and vegetables) into the value chain created by large and medium-sized agribusiness companies through contract agriculture (Stamm et al., 2006; Chandrabose, 2017). Small farm units are connected with the enterprises that provide production and marketing services to the producers, such as seeds, fertilizers, knowledge, and technology that producers find challenging to obtain independently (Stamm et al., 2006). Private companies commonly use this scheme to source agricultural produce for export or processing, and such schemes organized and monitored by private companies are more successful than farmers' organization projects promoted by the government (Stamm et al., 2006).

Along with promoting forward contracts, India and Pakistan have developed agricultural commodity exchange markets (agriculture future markets), but they have yet to yield noticeable success in both countries. Futures contracts allow buyers and sellers to hedge against the volatility of prices of agricultural commodities by agreeing to exchange commodities at a predetermined price on a future date. In India, future trade of agricultural commodities was discouraged due to fear of speculative trading and shortage of essential commodities and the Essential Commodities Act of 1955 (Jha & Chakravarty, 2021; Singh, 2012). The future trade of select agricultural commodities began in 2003. The Securities and Exchange Board of India (SEBI) regulates the futures trading in agriculture commodities, while the National Commodity and Derivatives Exchange (NCDEX) is the primary exchange for agriculture futures trading

(ibid). While it is allowed for many agricultural commodities, mostly food grains, oilseeds, spices, pulses, and fibers, it is practiced for only a few (ibid).

In Pakistan, a federal authority called the Securities and Exchange Commission of Pakistan (SECP) regulates the Pakistan Mercantile Exchange (PMEX), which functions under the Futures Market Act 2016 (Ahmed & Ali, 2024). Despite the considerable growth of trade volumes of currency, precious metals, and crude oils under future contracts in Pakistan, the agriculture commodities futures trade has failed badly (ibid.). One of the reasons is the lack of coordination between federal and provincial authorities and SECP's lesser priorities in developing agricultural futures (ibid).

2.2. Fruits and Vegetable Marketing in Nepal

Nepal's agriculture market systems are traditional, and unfair trading practices compel farmers to accept lower and unfair prices while consumers pay exorbitant prices (Marahatta et al., 2019). The weak bargaining power of farmers makes them susceptible to harassment and cheating by market intermediaries and traders (Pokhrel & Thapa, 2007). The lack of adequate transportation networks, input availability, infrastructure, and credits are some of Nepal's most significant challenges to fruit and vegetable markets' effective or efficient functioning (Amgai et al., 2015; Gurung et al., 2016; NHPC, 2017). Poor access to the market hinders the commercialization of Nepal's fruit and vegetable sub-sector. In several instances, farmers dump their produce on the farm or destroy it rather than sell it on the market as it fails to fetch a fair price (Shrestha, 2017; Paudel, 2019). While the smallholder farmer's access to the market is poor across Nepal, the situation is worse in hills compared to plains (Thapa, 2014). Weak physical market access also stymies private sector involvement in agriculture trade in remote hills and mountains (UNFP& FAO, 2007).

2.3. Value Chain Study of Fruit and Vegetables in Nepal

While Nepal has a high potential for vegetable production, a lack of quality inputs, inadequate post-harvest facilities, and unavailability of agricultural loans have led to a slow growth in vegetable productivity (Simkhada, 2019). The burgeoning gap between the import and export of vegetables suggests that the production of these horticultural crops in India is more cost-effective than in Nepal, severely impacting Nepal's competitiveness (Adhikari & Pokhrel, 2020).

A high level of post-harvest loss was responsible for the high marketing costs and lower prices received by farmers (Poudel, 2013). Similarly, a study on the marketing of tomatoes by Marketing Development Division & Winrock International (2003) showed that inadequate infrastructures (storage, market yard, weighing machine) at local assembly markets create difficulty for farmers and traders (retailers and wholesalers).

Khatriwada et al. (2021) found that though there is high potential for the development of the market of Kiwi inside and outside Nepal, the sector is constrained by the lack of quality saplings and variety for cultivation, low level of adoption of improved technology, and ‘limited access to market information and unorganized market center.’ A value chain analysis of mango in Saptari district revealed that farmers faced problems associated with irrigation and pests in mango production (Shrestha et al., 2020). Moreover, middlemen's monopolized system and lack of significant value-addition practices like packaging, cleaning, storage, and processing meant that farmers were forced to accept low farmgate prices (ibid.). Some farmers also produced *achaar*, *aamil*, and *chutneys* from the mango (ibid.).

2.4. Federalism and Agriculture Development in Nepal

The Constitution of Nepal 2015 envisioned the transformation into a federal system by creating seven provinces and 753 local-level governments. The constitution has distributed the power among different tiers of government, with each level provided with authority over different policy areas. Still, there is a lack of clarity regarding its implications for the agriculture policy. Schedule 5 of the constitution delineates a few functions like national ecology and forestry management, water use policy, land use policy, large irrigation projects, and quarantine as exclusive federal government domains. Provinces are given the authority over provincial-level agriculture and livestock development and environmental and forest management as per schedule 6 of the constitution. Similarly, federal and provincial governments have concurrent authority over agricultural research as per Schedule 7 of the constitution. Moreover, as per Schedule 8 of the constitution, local-level governments are given exclusive authority over agriculture production management, local roads, local irrigation projects, livestock health and management, and control of agriculture extension. Nonetheless, Schedule 9 of the constitution lists agriculture as the concurrent function of all three tiers of government without stating which among the three has precedence over different facets of agriculture policy (Kyle & Resnick, 2019). While agriculture extension is listed as a function of local government, there is no clarity over what roles different levels of government would play in support of agriculture marketing as agriculture marketing is an interregional activity that also has an international dimension to it, thus requiring concerted and coordinated efforts of multiple tiers of government, generating complexities and confusion.

2.5. Agriculture Market Support Network in Federal Nepal

Different organizations under three levels of government, boards, federations, trader's organizations, farmer's groups, and cooperatives, are actively working to achieve greater efficiency in the market system. However, unity and coordination are lacking (Khanal et al., 2024). Besides that, there is a dearth of literature on market support networks in federal Nepal. Burlakoti and Nettle (2023) studied the devolution of agriculture extension services to the lower

levels after federalism, which enabled farmers to gain extension services from field-level organizations. It has also facilitated the development partners and private sector to support the government's initiative as the purveyor of extension services. However, they also discuss the lack of accountability to the farmers, lack of human resources, and low level of coordination between different government bodies hindering service delivery.

2.6. Intergovernmental Relations in Federal Nepal

Federalism Intergovernmental relations in the federal system consist of different dynamics between different government tiers, including competition, collaboration, conflict, negotiation, and coercion. It is integral to the federal system and determines the success of the system. Article 232 of Nepal's constitution mentions, ' The relations between the Federal, Provinces and Local Levels shall be based on the principles of cooperation, co-existence and coordination.' The prevailing configuration of federal Nepal's intergovernmental relations demonstrates a hierarchical/vertical orientation rather than a horizontal one. IGRs are generally informal, but formal constitutional norms and forums are also created to help in the process. The federal government's reluctance to transfer power to sub-national governments, lack of clarity on issues of shared jurisdiction, and disinterest in enacting necessary laws have negatively impacted cooperation, coordination, and collaboration between three tiers of government (DRCN, 2023). Many provisions for the smooth functioning of provinces and local government are yet to be implemented. Provinces cannot exercise their authority based on Schedule 6 of the Constitution (Ghimire, 2024). Nevertheless, the Federal, Province, and Local Level (Coordination and Interrelation) Act 2020 was enacted by the federal government, which provided guidelines for intergovernmental relations. It made provisions for thematic committees, National Coordination Council, Provincial Coordination Council, and District Coordination Council for proper coordination and collaboration between three tiers of government. While there is a need for regular and intensive interaction and discussion between three tiers of government through formal forums and mechanisms, this is lacking in reality. Many provinces regularly face challenges convening Provincial Coordination Council meetings (Subedi, 2023). Even when these meetings occur, there are significant difficulties in achieving consensus on coordinating vertical and horizontal relations among different tiers of government. This lack of effective coordination hinders the development of cohesive policies and the smooth functioning of intergovernmental relations.

2.7. Road transportation and agriculture marketing

Growth in agriculture and inter-regional trade depends upon access to markets that are made possible through different hard and soft infrastructures. Distance increases transport and marketing costs; thus, the importance of good transport infrastructure can never be underestimated. The absence of efficient transportation and distribution networks increases the

price of commodities. It hampers the quality and quantity of agricultural produce, reducing the profitability for actors in the supply chain of fruits and vegetables. Evidence worldwide indicates that farmers receive better prices when they have access to roads. In Papua Guinea, the price received by farmers decreases by 7% for every mile distance away from the most proximate transport facility (Gibson & Rozelle, 2002, as cited in World Bank, 2015). Similarly, the quality of roads is also important. In East Africa, the upgradation of the quality of transport corridors from fair to good (as per the International Roughness Index) slashed transport costs by 15% (Teravaninthorn & Raballand, 2009).

2.8. Role of Farmer's Organization in Agriculture Markets

Farmer's Group and Agriculture Cooperatives have significantly improved Nepal's agricultural landscape. Recognizing their importance, the National Agriculture Policy 2004 emphasized the need to strengthen cooperatives and promote the cooperative movement to accelerate agricultural development. There are about 35000 cooperatives in Nepal, of which 7,230 are agricultural cooperatives (Singh, 2022). Among these, 200 agriculture cooperatives specifically focus on vegetables and fruits (Saavedra et al., 2021).

Studies show that cooperative farmers generally achieve higher crop yields and income than their non-cooperative counterparts (Bhattarai & Pandit, 2023). For example, maize and vegetables marketed through cooperatives received 15% and 20% higher prices than their non-cooperative counterparts (ibid.). The predominance of small-scale subsistence farming systems in Nepal means that they lack economies of scale in production and marketing. Grouping farmers together as producers of specific crops can generate a critical economy of scale at the farm gate level, help better manage farm inputs, provide care for the cultivation, and make the post-production handling of agricultural produce economically viable for the farmers. The rise in the quantity of produce does not necessarily lead to higher incomes for farmers as it can lead to higher supply than demand in the local markets. Farmer's Group/Agriculture Cooperatives can adopt the following strategies built on supply to ensure better market access and fairer prices for its members (Lothore & Delmas, 2009):

- Lowering the per unit production cost of fruit and vegetables
- Strengthening Supply management: Grouping of supplies (gathering and economies of supplies enable produce to reach better prices). Similarly, the sale of fruits and vegetables can be deferred to ensure better prices through storage or spreading out of production to produce for a longer period.
- Searching for distant, interregional markets in order to sell the excess after the products are sold on the local markets
- Improvement in the quality of the fruits and vegetables through the promotion of adoption of improved production and post-harvest technology among the members,

including grading, sorting, and quality control. This will help to create produce that is marketable and attractive to traders as well as consumers

- Supply vegetables and fruits with a higher level of value addition.

Each type of activity that farmer's organizations like agriculture cooperatives or farmer's groups engage in (storage, credit, collection, value addition, and marketing) has many risks, difficulties, and limitations. Farmers and their organizations operate in diverse production and marketing environments, and farmers and their organizations have their own objectives, approaches, and constraints. Thus, one organization's approach to marketing one product cannot be emulated entirely by others and has to be tailored based on reality (Lothore & Delmas, 2009)

2.9. Review of Government Policies on Agriculture Marketing

2.9.1. Agriculture Marketing Act and Directives

In order to implement agricultural marketing policies and assist in the development of programs for Agricultural marketing, the Ministry of Agriculture and Livestock Development (MOALD) and the Agriculture and Livestock Business Promotion Division (ALBPD) have come up with technical and management guidelines such as:

- Agricultural Marketing Development and Management Directives-2073
- Kalimati Fruits and Vegetables Market Development Board, 2058
- Directives on construction and operation of agriculture marketing infrastructure on a partnership basis, 2068
- Directives on the provision of subsidy to agriculture cooperatives for buying and selling agriculture products, 2070
- Directives on the provision of subsidy on the construction of cold store, 2070

However, these acts, guidelines, and directives that were prepared before the federal restructuring failed to capture the realities of federal governance, and most of them require revisions and amendments for greater effectiveness. A few of these directives are also in the process of revision and amendments.

2.9.2. Policies and Strategies

Some of the major policies and strategies formulated by MoALD and other agencies that are pertinent to the promotion of agriculture marketing are:

- National Agricultural Policy, 2004
- Agribusiness Promotion Policy, 2006
- Agriculture Development Strategy, 2015-2035
- National Planning Commission 16th Plan (FY 2081/82-85/86)
- 2019 Digital Nepal Framework

National Agriculture Policy, 2004

National Agriculture Policy formulated in 2004 has the following three objectives:

- i) Improving agriculture production and productivity
- ii) Development of a base of competitive and commercial farming systems to make it competitive in regional and world market
- iii) Conservation, promotion, and utilization of natural resources, environment, and biodiversity

Agribusiness Promotion Policy, 2006

The Agribusiness Promotion Policy was formulated to fulfill the objective of the National Agriculture Policy through the enhancement of competitiveness of Nepali agriculture in regional and global markets by promoting commercial agriculture. Major policies for agriculture market development include establishing special production pockets based on feasibility, ensuring access to farm inputs, services, and infrastructure, and promoting partnerships across sectors. The policy document prioritized the development of highways and local roads, the promotion of public-private partnerships for the development of wholesale and retail markets, and the strengthening of e-commerce and market information systems.

Agriculture Development Strategy (ADS)

ADS is a long-term strategic document prepared by the Government of Nepal for the development of agriculture. Developed with the assistance of several bilateral and multilateral development partners, it succeeded the earlier Agriculture Prospective Plan (1995-2015). ADS has a 20-year strategic plan, a 10-year action plan, and a roadmap for the country's agriculture development. ADS has identified four strategic components. They are improved governance, higher productivity, profitable commercialization, and increased competitiveness. To achieve profitable commercialization, it envisions creating a congenial environment for investment in agriculture commercialization, provision of contractual arrangements for commercial agriculture, tax policy to assist efficient commercialization, competitive and demand-driven agriculture finance and insurance services, strengthening the agriculture value chain to benefit small farmers and agro-enterprises, expansion of rural roads, provision of market intelligence through efficient agriculture market information and ICT products, and rural electrification. Similarly, it aims to increase the agriculture sector's competitiveness by developing market infrastructure, innovation, export promotion, and enhanced quality and safety. To achieve market infrastructure development, it has envisioned five activities, viz. promotion of market infrastructure development, implementation of public-private partnership (PPP) financing supporting mechanisms, capacity building programs for market infrastructure development, identification of strategic locations for market development and undertaking feasibility studies, development of rules and regulations and standard operating procedure (SOP) for improved market management.

ADS was prepared before the promulgation of the constitution of Nepal in 2015, which institutionalized federalism in the country. Thus, it is based on the non-federal administrative structure that existed then. While the constitution of Nepal 2015 does not clearly specify linkages between three tiers of government, the effective implementation of ADS at the provincial and local levels demands effective linkages and coordination between agriculture development programs at all levels of government¹. The new context requires the revision of the ADS to ensure that it is adopted and owned by all tiers of government. All seven provinces are at different stages of preparing a Provincial Agriculture Development Strategy (PADS) based on

¹ [|| CEAPRED ||](#)

their potentials and priorities (MOALD, 2023a). Similarly, the ADS also needs to be revised to enable Nepal to cope with adversities raised by global warming and disruptions caused by pandemics (ibid.).

National Planning Commission 16th Five-year Plan

16th Plan puts forward a strategy to increase production and productivity by developing agricultural infrastructure like roads, electricity, and irrigation while ensuring access to improved technologies and techniques through coordinated efforts of three tiers of government. It prioritizes developing infrastructure for the transportation, storage, processing, and marketing of farm produce. Furthermore, the plan seeks to improve the effectiveness of the Minimum Support Price (MSP) and also attracts skilled and educated young population to the agriculture sector, developing it as a competitive sector with a comparative advantage. Additionally, it aims to secure markets by boosting domestic consumption and exporting fresh fruit and vegetables to Middle Eastern countries. Alongside, it also seeks to promote agro-based industries and establish agro-industrial parks in all seven provinces.

2019 Digital Nepal Framework

It was published by the Ministry of Communication and Information Technology and has included the agriculture sector as one of its key focus areas. The framework identified poor access to markets, transport, and distribution facilities as one of the pain points in Nepal's agriculture sector (MOCIT, 2019). Digital initiatives in agriculture marketing can play a pivotal role in overcoming those weaknesses and bottlenecks. It envisions using sensors and logistics solutions to track trucks and obtain location updates. Similarly, digital technologies could be helpful in grading, packaging, and big data analytics to evaluate product quality. The framework has identified the E-Haat Bazaar as a means of unlocking Nepal's potential in the agriculture sector (ibid.). It is envisioned as a pan-Nepal electronic trading portal connecting the existing *haat bazaars* to build a unified national agricultural commodity market. It is expected to provide a single window service for services and information related to the country's *haat bazaars* and make the supply and value chain transparent to all stakeholders (ibid).

3. RESEARCH DESIGN AND METHOD

3.1. Commodity and Study Area:

This study focuses on Mango and bitter gourd. The choice was shaped partly because the study period coincided with the production/harvesting of mango and bitter gourd. Mango is the most produced fruit in Nepal in terms of volume and is rich in nutrients (MoALD, 2023b). There is a high demand for mangoes in Nepal. They are widely produced in Nepal's Terai region and some mid-hill districts. It is also imported in huge quantities from India. Similarly, bitter gourd is one of Nepal's most widely consumed vegetables and is produced all over the country, making it one of the ten largest vegetables in terms of production (MoALD, 2023b). Many farmers are involved in bitter gourd cultivation, and different development organizations have identified it as a potential cash crop to uplift the livelihood of rural farmers. Thus, mango and bitter gourd markets can be representative of fruit and vegetable markets in Nepal and are best suited to understanding the interregional coordination of fruit and vegetable markets.

This study covers two provinces (Bagmati and Madesh) and five districts that are important in terms of the production and marketing of mango and bitter guard. A total of 10 municipalities across five districts were purposively selected, and four representative wholesale markets (2 regional and 2 terminal) were purposively selected (Table 1) considering the number of stakeholders and volume of production and trade of these two selected commodities:

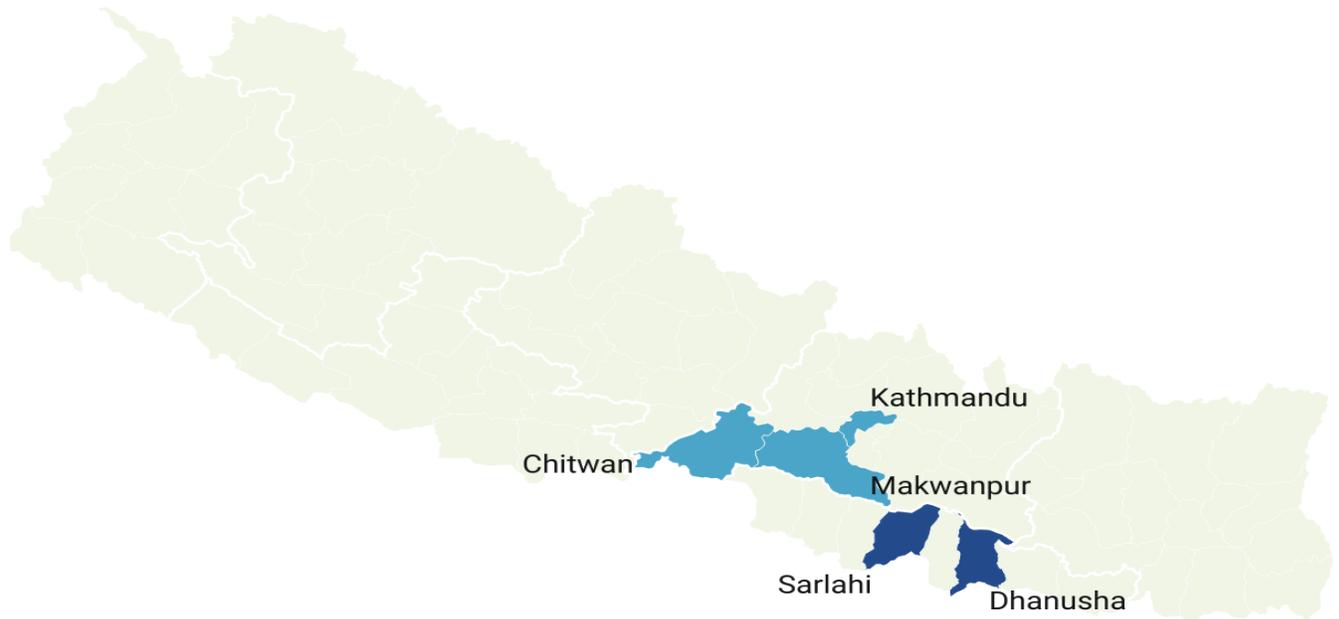


Figure 1: Map of Nepal showing districts in the study area

Table 1. Study Area

Province	Study Districts	Study Municipalities	Wholesale Markets Visited	Focus Commodity
Bagmati	Chitwan	(2) Bharatpur, Madi	Bharatpur market (regional market)	Mango, Bitter gourd
	Makwanpur	(2) Thaha, Hetauda	X	Bitter gourd
	Kathmandu	(2) Kathmandu, Chandragiri	Kalimati market and Jadibuti market (both terminal markets)	Mango, Bitter gourd
Madhesh	Sarlahi	(1) Lalbandi	Lalbandi market (regional market)	Mango, Bitter gourd
	Dhanusha	(3) Kshireshwornath, Mukhiyapati Musaharniya, Janakpur	X	Mango, Bitter gourd
2	5	10	4	X

3.2. Data Collection, Analysis and Limitation

This research employs qualitative methods to study Nepal's fruit and vegetable market support networks. It adopts a value chain analysis framework. Both primary and secondary data were collected.

- Secondary data: The secondary data collection involved a review of grey literature, government reports, policies, strategies, articles, journals, and books on vegetables and fruit value chain and marketing in Nepal.
- Primary data: These data were collected through Key Informants Interview (KII), and Focus Group Discussions (FGD) of key stakeholders with farmers, intermediaries, different levels of governments, associations, and consumers, as listed in Table 2. While the districts and market centers were purposely selected, snowball sampling was used to select critical actors in the fruit and vegetable value chain for FGD and KII. Other than that, key stakeholders like the Ministry of Agriculture and Livestock Development and the Department of Agriculture in Kathmandu and Lalitpur were also interviewed. Focus group discussions and interviews were conducted with the help of an interpreter in some municipalities where the researcher was unfamiliar with the local language.

Table 2: Key stakeholders in the study

Type of Stakeholder	Number of KIIs	Number of FGDs (XX) and participants	District/ Municipality/ Wholesale markets
Farmers	20	3 (7-8 participants each)	Mukhiyapati Musaharniya, Kshireshwornath, Lalbandi, Bharatpur, Madi, Thaha Municipalities
Intermediaries (Contractors/Collectors/Traders/Commission Agents/Wholesalers, Retailers, Processors)	30	X	Dhanusha, Sarlahi, Chitwan, Kathmandu
Wholesale market Executives	4	X	Lalbandi, Bharatpur, Kalimati, Koteshwor
Local Government (Agriculture and Livestock Section)	5	X	Mukhiyapati Musaharniya, Kshireshwornath, Lalbandi, Bharatpur, Madi, Thaha Municipalities
Provincial Government	4	X	Dhanusha, Chitwan, Makwanpur districts
Federal Government	5	X	Dhanusha, Chitwan, Kathmandu, Lalitpur districts
Farmer's Group and Agriculture Cooperatives	10	X	Dhanusha, Sarlahi, Chitwan, Makwanpur districts
Federation of Nepalese Chamber of Commerce and Industries/ Agro Enterprise Centre (AEC)	4	X	Dhanusha, Sarlahi, Chitwan,

			Kathmandu districts
Digital Technology Companies	2	X	Kathmandu, Chitwan districts
Consumers	20	X	Kathmandu, Chitwan, Dhanusha, Sarlahi districts

The qualitative data for this report was derived from detailed notes taken during Focus Group Discussion (FGD) and Key Informant Interview (KII). The notes from FGD and KII were meticulously translated into qualitative data. Then, these translated responses were grouped based on the specific research question in MS Excel. The grouped responses were thematically analyzed to identify critical insights, patterns, and trends.

The research findings are limited in their generalizability due to the use of purposive and snowball sampling techniques and a focus on qualitative data. The short three-month timeframe restricted the data collection depth, and some key stakeholders in fruit and vegetable markets were not included, which affected the study's comprehensiveness. Additionally, the potential for researcher bias and subjectivity exists due to the use of in-depth interviews and focus group discussions, with language barriers possibly leading to misinterpretations, although an interpreter was used to address this issue.

4. FINDINGS AND ANALYSIS

4.1. Value Chain Analysis of Mango and Bitter gourd.

Value Chain Analysis of Mango

Mango is one of the world's most important tropical and subtropical fruits. It is the most widely produced fruit in Nepal. Mango accounts for 56% of the area of summer fruits and 42% of production (Pandey et al., 2017). The country's total mango production area is about 40,570 ha, and the annual production is 498,859 tons (MOALD, 2023b). Mango is produced in Terai districts and some of the mid-hill districts of Nepal. The cost of Mango production in the study area is detailed in Appendix B.

The supply chain of mango

Mango is often forward contracted during the blossoming and fruit-setting stage. Thus, ownership of fruits on the tree and orchard can shift from producers to traders or contractors during that time. There are multiple actors involved in the production and marketing of Mango. The supply chain represents the actors involved in the flow of agricultural produce from farm to market. The study identified major channels operating in the study area (both Bagmati and Madhesh province). Mango produced in Nepal is marketed mainly during three months i.e., June, July, and August.

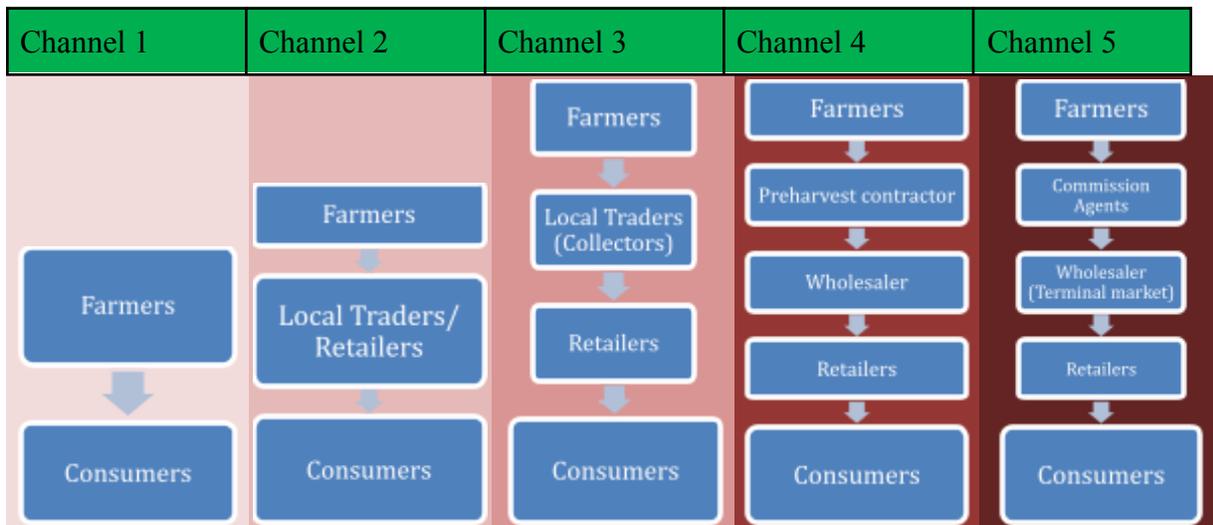


Figure 2: Major marketing channels of mango in the study area

The marketing margin of Mango for farmers and different actors in marketing channels is detailed in Appendix C

Farmers: Farmers often source their inputs from agro-vets in the nearby town. Some farmers also source it from the dealer established by the nearby agriculture cooperative. The saplings are

either bought from nearby nurseries or received from government agencies. Farmers in borderlands (Mukhiyapati Mushaharniya) were found to procure their inputs from Indian markets.

The most popular varieties are Calcuttia, Bombay Green, Malda, Dasherri, and Amarpali. Few mango orchard owners reported receiving any credits or training for the mango cultivation. Most of the mango orchard owners felt happy over the income generated through the sale of mangoes. It was observed that many of the mango orchards are contracted to pre-harvest contractors every year or for multiple years at once. These contractors perform all the farm operations at the orchard, such as fertilizer application, irrigation, and plant protection. Major problems faced by producers were biennial bearing, disease and pest, and inadequate input availability. Farmers were also found to prepare *aamil*, *chutney* etc, from mango. Unlike vegetables, mango was generally marketed without the assistance of cooperatives.

Intermediaries: Different types of intermediaries operate in the mango value chain. Generally, collectors buy the produce from the farm gate and sell it in wholesale or retail markets. Sometimes, preharvest contractors and farmers also sell them directly in the wholesale markets. The most significant problem faced by intermediaries is the high level of post-harvest loss. Some traders also lamented the lower quality of Nepali mangoes and the unstable supply. While few processors of mango who produce dehydrated mango products exist, their numbers are still very low.

Consumers: Consumers generally buy mangoes from local retailers or vendors. During the study, consumers' purchases of mangoes were also witnessed directly from Farmgate. It was revealed that taste, freshness, cleanliness, juiciness, seasonality, and safety were considered the most important attributes when purchasing mangoes. While price moderately influenced the consumer decision in urban areas, its importance was much higher in the case of rural markets. Thus, there was a difference in varieties being traded in local rural markets and urban markets. Calcuttia was the most widely traded variety in the rural markets, while Maldaha, Dasherri, and Amarpali were more dominant among the affluent urban population.

Value Chain Analysis of Bitter Gourd

Bitter gourd is an important vegetable crop grown widely in the Terai and Hills of Nepal. It thrives in warm tropical and subtropical climates; thus, it is cultivated during the summer and monsoon seasons. The crop also has good market demand due to its health benefits. In the Fiscal year 2021/22, a total of 134,112 tons of bitter gourd was produced in a 9,728 ha area of land in Nepal (MOALD, 2023b). The cost of production of Bitter gourd is detailed in the Appendix D.

There are multiple channels through which Bitter Gourd is marketed across Nepal, and each channel functions differently. Some marginal and smallholder farmers prefer to take their produce to the nearest village market and sell it immediately. This is due to low production, lack

of storage facilities, and need for immediate cash. Other farmers sell it to different market intermediaries. Major marketing channels in the study area are as follows:

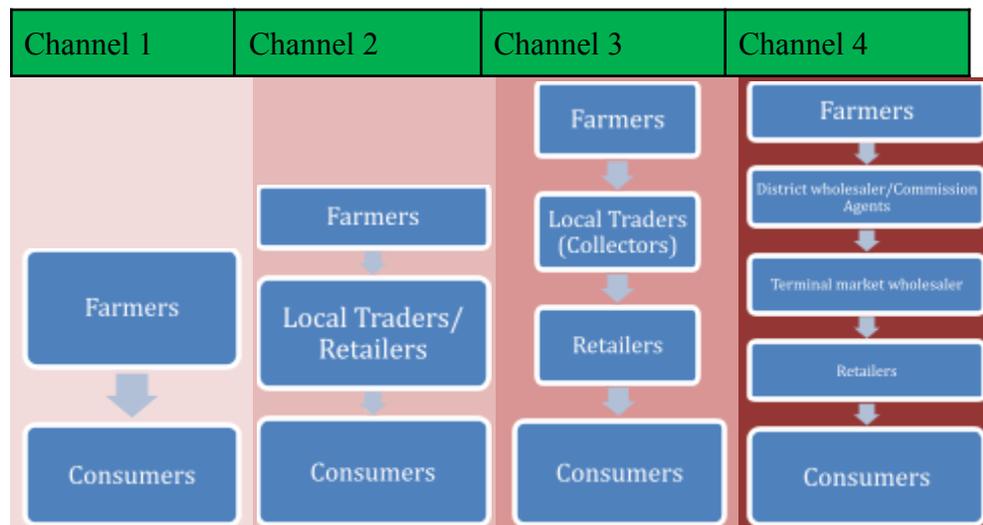


Figure 3: Major marketing channels of bitter gourd in the study area

The period of Marketing

Bitter gourd produced in Nepal is marketed generally from March to August, and price varies significantly during this period based on the supply and demand of the produce. The marketing margin of bitter gourd for different market actors are detailed in Appendix E.

Farmers: The production of bitter gourd is dominated by resource-poor smallholder farmers. They operate within supply-driven value chains and often miss the windows that offer higher prices. The study suggests that vegetables are pushed through value chain channels, and there is little coordinated action in the value chain. Farmers do not think much about markets when beginning production, and the search for markets generally starts during harvest season only. Farmers' production decisions are also driven by the preceding year's experiences and the government/development project's push for particular produce through input assistance. Many were also found to be influenced by the production decisions of other farmers in the neighborhood.

Farmers' margins are decent when they sell directly to consumers at the farm gate or in local rural markets. However, it is only possible for small/subsistence farmers with low production and time to spare for marketing. Local markets also benefit smallholders who cannot easily access distant markets but need immediate sales of their produce for cash. Farmers have to depend upon local collectors in the absence of local markets. These collectors sometimes travel through

different villages to collect vegetables. Some farmers also sell their produce to district-level commission agents/wholesalers.

A higher level of coordination was observed in the case of large commercial farmers and those who sell their produce through the cooperative-led marketing channel compared to other subsistence and small commercial farmers. Large commercial farmers also benefited from the technical advisory from the input, machinery, and farm-technology suppliers. Similarly, contracts with intermediaries were also found to improve supply chain coordination to an extent, as intermediaries may serve as sources of market information for farmers. In some places, agricultural cooperatives also improved coordination in the value chain through collection centers and collective marketing. Intermediaries, agriculture cooperatives, and media like newspapers were important sources of market information for the farmers.

During the course of the study, farmers also complained of weather extremes and pest infestation that destroyed or affected the crops, significantly affecting their production and income. Many farmers expressed the need for an adequate supply of fertilizers and other inputs, greater subsidies for them, and minimum support prices (MSP) to encourage them with remunerative prices. Furthermore, many believed restricting the import of vegetables from India and other foreign countries could help farmers develop stable production and guarantee fair prices. In the borderlands, farmers also mentioned the informal flow of fruits and vegetables across the border from India, which interferes with their ability to receive fair and remunerative prices for their produce.

Intermediaries:

Few small farmers, mostly in rural areas, sell their produce directly to consumers or even retailers. Most of the vegetables are marketed through local collectors or traders in nearby wholesale markets. Traders handle activities like buying, aggregation, and transportation, thus playing the most critical role in the distribution and marketing of produce within the country. Traders faced problems like a lack of a stable supply of vegetables, proper storage facilities, proper packaging materials, and transportation facilities. Road obstruction, mostly during monsoon season, also causes losses for some of the intermediaries. Intermediaries like aggregators are indispensable in remote regions of Nepal, which are inaccessible to other market actors. Many traders in Kathmandu argued that they prefer to buy from local aggregators instead of farmers directly because aggregators generally guarantee a stable supply of produce and quality. Local intermediaries also provide farmers with money and input supplies during production season for an agreement to supply the produce during harvest season. Thus, intermediaries are important financiers of vegetable production in Nepal. Intermediaries also serve as important sources of market information for farmers. Many intermediaries (aggregators) are deeply entrenched and influential in the local socio-economic milieu of the rural

communities. Some traders also complain of farmers' default on contracts/agreements, causing losses to the traders. They point to a lack of trust among market actors as one of the causes behind ineffectual coordination between value chain actors.

Consumers:

Consumers mostly buy bitter gourd from local retailers or vendors. Consumer's preference for attributes in bitter gourd varies from place to place. During the course of the study, it was revealed that the attributes most valued by consumers in Nepal were freshness, cleanliness, price, and seasonality. The focus on the seasonality of vegetables was also due to the belief that off-season produce has high pesticide residue levels. While size and color were considered moderately important attributes by consumers in general, consumers in Madhesh province attributed greater importance to size and preferred larger bitter gourds. The reason for this preference was the use of larger bitter gourds to prepare a popular delicacy called *Karela Bharwa* (bitter gourd stuffed with spices and onions).

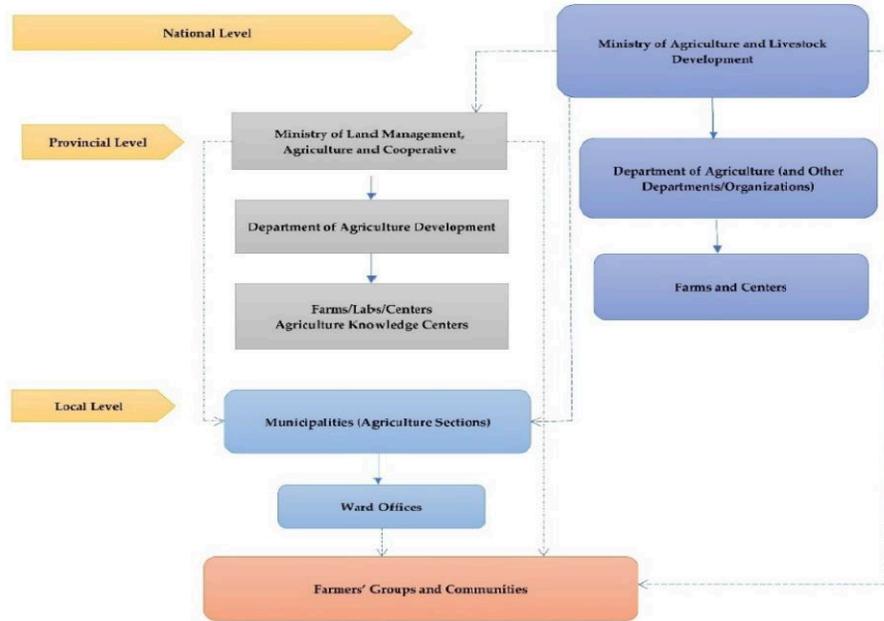
Nature of Fruit and Vegetable Value Chain and the Role of Government: The value chain of fruits and vegetables in Nepal is mostly supply-driven. Farmers first produce and then search for the market instead of producing based on market demand. While smallholder farmers are responsible for most production, they face power asymmetry relative to intermediaries. These farmers often lack economies of scale and depend upon intermediaries for marketing as they do not have the capacity to access the market without relying on them. These intermediaries are sources of market information, credits, and agriculture advisory for many farmers.

The role of government is much lower when fruits and vegetables are sold to consumers at Farmgate or nearby markets. Local governments have sought to improve the local marketing infrastructure by creating and promoting local *haat bazaars* where local produce is sold. The fact that many farmers also received fair or remunerative prices on the proximal markets is a testament to the importance of developing local market infrastructure and marketing. The study area found that apart from the provincial government, which operates in the district through AKC/DAO, the federal government has contributed to value chain development and market promotion of fruit and vegetables through projects like PMAMP, REED, and FANSEP. However, as the marketing channel gets longer and more complicated, the role of provincial and federal governments becomes more critical. The significance of the federal government increases as we move toward more complex marketing channels associated with inter-regional or inter-provincial marketing. This shift reflects the imperative of coordinated efforts across different tiers of government to support fruit and vegetable markets and value chain development.

4.2. Research Question 1

The first research question, “What has been the impact of federalism on fruit and vegetable marketing in Nepal (institutions, policy, and implementation) with the emergence of three tiers of government? was answered through both desk review and field study.

The authority on agriculture has been allocated across different tiers of government, generating some ambiguities as well.



(Note: the solid line represents direct command while dotted lines are coordinating linkages, but most of these coordinating linkages do not exist in formal legal terms across three levels of government)

Figure 4: A diagram showing the structure and linkage of three tiers of government in the agriculture sector

(Source: Dahal et. al, 2020)

Table 3: Schedule of powers within the agriculture sector across three tiers of government according to the 2072 Constitution

Authority	Government tier
<i>Regulatory services</i>	
Food safety	Federal, Province
Livestock quarantine	Federal
Plant quarantine	Federal

Seed Safety	Unspecified
Research and development	Federal, Province
Agricultural and livestock extension	Local
Agricultural and education	Unspecified
<i>Environment Protection and Conservation</i>	
Soil health	Federal, Province, Local
Water use	Federal, Province, Local
Forests	Federal, Province, Local
Land use, land tenure, land reform	Federal, province
Rural Infrastructure	Federal, Province, Local
Irrigation	Federal, Province, Local

(Source: Kyle & Resnick, 2019)

There is no mention of agriculture marketing in the schedule of powers across the agriculture sector in the 2072 Constitution of Nepal. However, the study revealed that all three tiers of government are working on agriculture (marketing) in Nepal and perceive different levels of authority and autonomy over agriculture marketing.

4.2.1. Authority, Autonomy, and Accountability in Agriculture Marketing

Authority

The Constitution of Nepal 2015 specifies that agricultural development is the jurisdiction of the local and provincial governments. Similarly, agriculture is also listed as a concurrent function of all three tiers of government. However, considerable ambiguity exists in agriculture marketing and trade because the constitution also lists business, trade, and agriculture development as the authority of the provincial government. Agriculture trade and marketing also have inter-provincial or interregional dimensions, which the constitution has failed to address clearly. However, the inclusion of agriculture as a concurrent function of three tiers of government provides the federal government with leeway to act in this sector. All three tiers of government have enacted laws, developed policies, and implemented programs to develop agriculture markets.

Autonomy

Autonomy does not naturally follow from authority over agriculture for the local government as they cannot effectively oversee and ensure responsiveness from extension agents/staff. This is

because the Provincial Civil Service Commission has authority over hiring civil servants at the local level. Most of the agriculture and livestock sections in local government in the study were understaffed, significantly impacting their service delivery. Currently, local governments also complain of budgetary constraints. Local governments generally have relatively lower budgetary autonomy than other government tiers. Even if the budgetary autonomy of local government rises, a municipality's agriculture and livestock section may not gain autonomy as the local government budget might diverge away from agriculture (marketing) to other priorities like infrastructure development. This can further weaken the agriculture and livestock section of the local government. The idea of autonomy has also created contention between some local governments and other market actors since some municipalities have imposed export taxes (*nikasi kar*), citing their autonomy. Provincial government (agriculture ministry) generally has higher autonomy since budgetary and staff constraints were not as severe in their case. Still, the provincial government felt constrained by federal laws and regulations like land use policy. Madhesh province agriculture officials reported their inability to implement the program for market development due to the federal government's land use policy. Similarly, officials from the Agriculture Knowledge Center/Agriculture Development Office, which are arms of provincial governments in the district, complained of budgetary constraints in formulating and implementing programs on agriculture market development. There was a strong perception among most of the officials of the sub-national government that the allocation of the budget was not fair as per the responsibility accorded to different tiers of government.

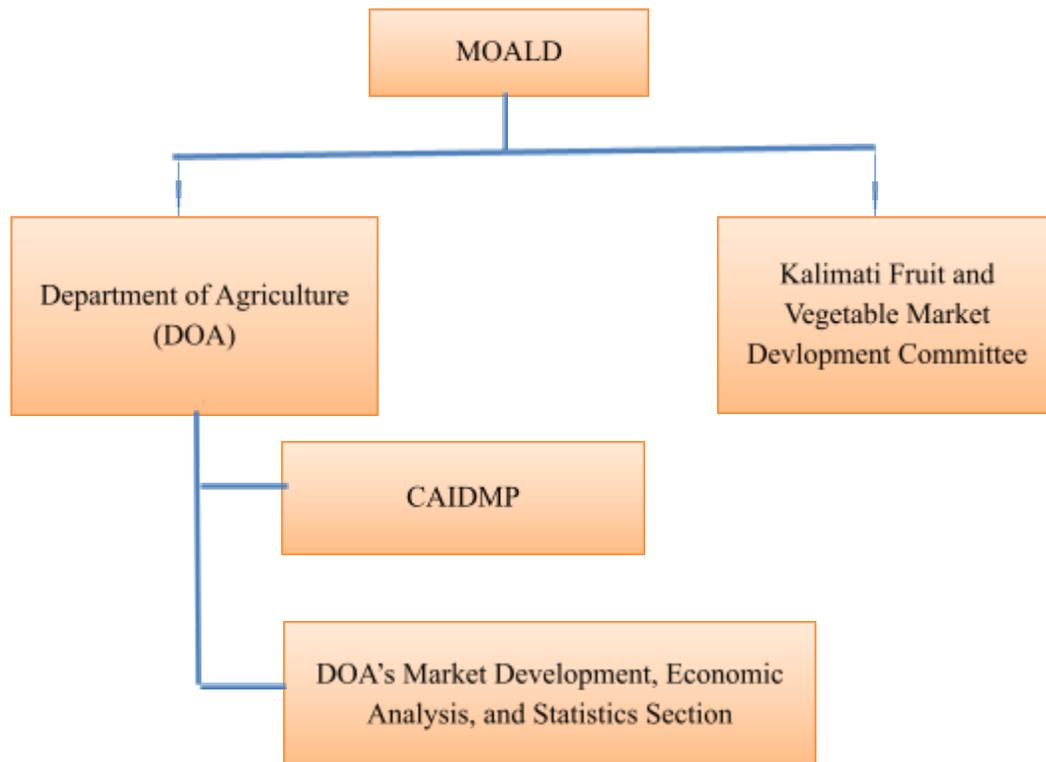
Accountability

Despite great optimism, there has been little improvement in service delivery at local levels, and many of the locals' agriculture market-related needs are still unfulfilled. Farmers, traders and FNCCI executives mostly perceive low accountability from local and provincial governments. Officials at the local Agriculture and Livestock section complain of high levels of political pressure and political interference from the elected representatives, negatively impacting service delivery. Officials at provincial levels perceived a lower level of political pressure and interference. While many farmers and officials perceived the growth of transparency in service provision, they attribute it to digitalization, better access to information and awareness rather than federal restructuring.

4.2.2. Fragmentation of Agriculture Market Governance

Nepal's Government began promoting agriculture enterprises and market development by establishing the Food and Agriculture Market Services Department in 2029 B.S. After organizational restructuring, the Agribusiness Promotion and Market Development Directorate (ABPMDD) was created in 2061 B.S., mandated with market development, monitoring, and

regulation throughout the country. The Directorate was responsible for regulating and monitoring 1,767 market structures (553 collection centers, 1,038 *haat bazaars*, 149 retail markets and 27 wholesale markets) in Nepal developed over time (Aryal et al., 2018). The organizational restructuring after the promulgation of the Constitution of Nepal in 2072 has led to a significantly reduced role and responsibility of the federal government in agriculture market governance. After 2075 Bhadra 1, the merger of the Agriculture Enterprise Promotion and Market Development Directorate’s Market Research and Data Management Program, Agriculture Commodities Export Promotion Program, and Agriculture Enterprise Promotion Program with Agriculture Engineering Directorate led to the creation of the Center for Agricultural Infrastructure Development and Mechanization Promotion (CAIDMP) (CAIDMP, 2022). CAIDMP is responsible for developing, improving, and upgrading market infrastructure. Similarly, the Market Development, Economic Analysis, and Statistics Section of the Department of Agriculture also monitors and regulates 11 federal agriculture markets. Currently, most of the agriculture marketing-related functions are exclusive and concurrent rights of the other two tiers of government.



Note: MOALD: Ministry of Agriculture and Livestock Development; CAIDMP: Center for Agriculture Infrastructure Development and Mechanization Promotion.

Figure 5: A diagram showing the fragmentation of agriculture marketing-related functions in the Federal Government

The Federal Ministry's role is circumscribed to international treaties about international agriculture trade, quarantine, etc. MoALD plays an important role in coordinating agriculture marketing/trade between provinces. Nepal is a geographically diverse country with different potentialities in agriculture production. Some provinces like Madhesh and Lumbini have a large tract of fertile Terai Plains suitable for producing fruits, vegetables, and grains, creating a surplus, while Karnali often suffers from a deficit. Similarly, Bagmati province, which consists of large population centers such as Kathmandu Valley, also depends on other provinces and foreign countries to supply agricultural produce. Recognizing the importance of interregional trade of agricultural produce, the federal government's Department of Agriculture has brought eleven public wholesale markets under its jurisdiction based on the Agriculture Market Development and Management Directive. Similarly, there is the Kalimati Fruits and Vegetable Market in Kathmandu, which falls under the jurisdiction of MoALD under the Kalimati Fruit and Vegetable Market Act. Apart from these 12 markets, the fate of about 1700 market structures are unclear under the federal system. These markets scattered all over the country are practically outside the purview of regulation and monitoring of any tier of government currently, even though the federal government still has de jure authority over them. While local and provincial authorities are demanding these markets to be placed under their jurisdiction, no laws or acts facilitate this transfer of ownership.

4.2.3. Role of three tiers of government in fruit and vegetable Marketing

All three tiers of government and their agencies are engaged in fruit and vegetable marketing. Their role in policy formulation and implementation is discussed in brief in the table below (Details on Appendix F).

Table 4: Three tiers of government on fruit and vegetable marketing

Issue/Program	Performance/Implementation
Budget Allocation	<ul style="list-style-type: none"> a) The federal budget allocation for agriculture has revolved around 3-4% in recent years (3.08% in FY 2081/82). 92% of the agriculture budget is allocated to the Federal government, about 2% to the provincial government, and 11% to local government in FY 2082/82. b) In Madhesh province, most of the budget for agriculture is allocated to fisheries and livestock, with other sub-sectors like fruits and vegetables receiving lower priority.

	<p>c) Both provinces and local governments focus relatively less on market development and governance.</p>
<p>Legal Framework for Agriculture Marketing</p>	<p>a) No legal framework at the federal level like the Agriculture Marketing Act to govern agriculture marketing in the country. Similarly, neither Bagmati province nor Madhesh Province has formulated such an act.</p> <p>b) Bagmati Province has formulated Agribusiness Promotion Act, 2076, Agriculture, Livestock and Fisheries Produce Value Chain Development Program Implementation Directive, Agriculture SuperMarket (Establishment & Operation) Directives, Agriculture Roads Construction, Repair and Operation Directives, Integrated Cold Storage Construction and Operation Directives, Integrated Fruits Processing Center Establishment Program Implementation Directive, 2076.</p> <p>c) Madhesh Province has Agriculture Market Infrastructure Development Program Technical Standard and Operation Directive 2080, Agricultural Road Construction Program Technical Standard and Operation Directive 2080, and Directive on Cold Storage Construction Grant Provision, 2075 relevant to agriculture marketing infrastructure development</p> <p>d) Some local governments also have formulated the Agribusiness Promotion Act and other acts</p>
<p>Master Plan for Agriculture Marketing Development</p>	<p>a) Neither the federal nor any provincial government has rolled out a comprehensive master plan for developing agriculture marketing in their jurisdiction. Thus, there is a lack of strategic vision of agriculture marketing at all levels.</p>
<p>Agriculture Marketing Policies</p>	<p>a) Federal, provincial and local government policies do not have details on agriculture (fruit and vegetable) marketing.</p>

<p>Research Studies on Agriculture Markets</p>	<ul style="list-style-type: none"> a) Very little research on agriculture marketing is carried out by all tiers of government. While the federal government has information regarding the price trends of various fruits and vegetables in the federal markets, there are no studies regarding the determinants of price trends that could benefit farmers/producers for production planning. Similarly, studies regarding the effectiveness of different interventions on agriculture marketing are lacking. The situation is much worse for sub-national governments. b) Lack of data on market structures/infrastructure, their conduct, and performance within the government's jurisdiction at all levels of government.
<p>Human Resource Management</p>	<ul style="list-style-type: none"> a) Many local governments faced staff shortages when implementing their projects and programs, as many positions were left vacant. Even federal projects suffered from a shortage of permanent employees and relied on contractual staff. b) Mukhiyapati Mushaharniya rural municipality had no staff in the Agriculture and Livestock section till a year ago. c) In Lalbandi Municipality, some of the staff from the agriculture and livestock sections were working for other sections of the municipality, owing to staff shortages in those sections. d) The problems of human resources also impacted the implementation of several market and value chain-related programs. e) There was a perception among the officials that the agriculture bureaucracy could not implement and oversee the construction of infrastructure like agriculture roads and cold storage as they lacked knowledge about the construction and operation of these infrastructures.

<p>Subsidies</p>	<ul style="list-style-type: none"> a) Most of the agriculture budget is spent on subsidies and grants. b) The federal government subsidizes chemical fertilizers, and the local government provides subsidies for organic fertilizers like vermicompost. c) Grants for delivery (pick-up) vehicles and other farm machinery as well d) The government's Output-based subsidies (Price support) are for the dairy sector but not for fruits and vegetables.
<p>Market Infrastructure Development</p>	<ul style="list-style-type: none"> a) There is relatively little focus on agriculture marketing and market infrastructure development, as the focus is generally on improving production and productivity across all three tiers of government b) Most local governments spend money on building cold storage, managing <i>haat bazaars</i>, and developing a demand-based market, collection centers, and agricultural roads. While the provincial government's wing, AKC/ADO, had earlier allocated a budget for agriculture roads, it was found that the budget is no longer allocated for it. Similarly, through several projects like PMAMP, REED, and FANSEP, the federal government has tried to develop market infrastructure by constructing market sheds, cold storage, and ripening chambers. Downsizing of the REED project has led to the removal of programs on the development of regional market centers and other value chain infrastructures. c) Many fruit and vegetable markets have been constructed without proper feasibility studies, impacting long-term operation of such markets d) Madi Municipality has refrained from developing <i>haat bazaar</i> despite demand and budget allocation, fearing the non-viability of such markets in the long run. e) Some infrastructure is created through partnerships and collaboration between provincial and local governments, including wholesale markets and cold storage (see Appendix XXX).

	<p>f) Madhesh province had no program for market development for FY 2081/82, citing the Federal government's Land Use Policy.</p>
<p>Value Chain Development</p>	<p>a) Federal government projects like PMAMP and REED also aim to develop and strengthen the value chain of fruits and vegetables.</p> <p>b) Around 25% of REED Bardibas' productive partnerships (start-up grants) targeted fruits and vegetables, mostly Banana, Ole, Cauliflower, Cabbage, and Mushrooms, while the livestock sector remains the major focus.</p> <p>c) Attempts to promote grading, packaging, and processing of fruits and vegetables at all levels through training and other technological (equipment) support at all levels</p>

4.2.4. Inter-governmental relations (IGR)

The ambiguities, conflicts, and contention during the transition into federalism have also affected agriculture market governance and the implementation of agriculture marketing strategies. After federalization, agriculture and agriculture marketing no longer remained the core function or authority of the federal government, as agriculture (marketing) was mainly a provincial and local government subject. However, agriculture is also listed as a concurrent power of all three tiers of government. As the authority was decentralized and devolved, causing significant fragmentation, multiple entities overseeing the market's development, monitoring, and regulation emerged. Even within the federal government, the Department of Agriculture's Market Development, Economic Analysis, and Statistics section oversees 11 federal markets across the country, while the Center for Agriculture Infrastructure Development and Mechanization Promotion (CAIDMP) is responsible for the development, upgradation, and improvement of agriculture market infrastructure. CAIDMP is also responsible for developing cold storage infrastructure and promoting the development of agriculture market infrastructure with public-private partnerships. CAIDMP also engages with local and provincial authorities. It develops proposals for market infrastructure development based on the demand of local government, which are then forwarded to MOALD, which approves and provides the budget for the construction. CAIDMP then hands over the ownership of the market infrastructure to the local government after the completion. It has been helping sub-national governments in agriculture market infrastructure development and upgradation along with technical advisory and capacity development.

In districts, a mechanism has been developed to coordinate the activities of the tiers of government. Every three months, meetings are held between authorities of PMAMP (a federal project), AKC/ADO (an arm of the provincial ministry), and the agriculture and livestock section of local governments in the district. This is intended for coordination, collaboration, and eliminating duplication of activities. However, the officials have differing opinions about its effectiveness.

Table 5: Federal restructuring and its implications for agriculture (fruits and vegetable) marketing governance in Nepal

Indicator	Before Federalization	After Federalization	Impact
State Structural Units	National Government, five development regions, 75 districts, more than 4000 local bodies	Federal Government, seven provinces, and 753 local governments	Local government at the root level, better access to various services, economically costlier, politically complex system of governance
Government Tiers	National and Local (2)	Federal, Provincial, and Local (3)	Weak linkages and coordination between different levels of government, which are autonomous and independent from each other
Agriculture Marketing functions	Led by the Agribusiness Promotion and Market Development Directorate (ABPMDD) while regional directorates and district agriculture offices played an important role in the facilitation and implementation	Fragmentation of agriculture marketing governance. Agriculture (Marketing) is placed under the province and local government domain. The policies from all three tiers of government do not have details on agriculture marketing. Local governments have also formulated their own Agribusiness Promotion Act and Agriculture Marketing Act, exercising their authority and autonomy. Marketing in agriculture is no longer seen as a core function of the federal government. Still, the federal government plays an important role in the development of market infrastructure and operation, regulation, and monitoring of 12 federal markets	Subnational government's authority over agriculture marketing allows these governments to formulate policies, plans, and programs according to the needs of the area under their jurisdiction. It can also lead to differing priorities between three tiers of government. Agriculture and agriculture marketing have not been a priority for the local government. Despite the authority over agriculture (marketing), the agriculture budget is thinly distributed to the sub-national government, hindering their autonomy to act
Coordination	Strong coordination along the line of command led by ABPMDD	No line of command over local and provincial government. Mechanisms have been developed to coordinate activities between federal	Ambiguous distribution of authority among different tiers of autonomous government makes coordination difficult primarily due to differing

		government projects, AKC, and local government (Agriculture and Livestock section) to avoid duplication.	priorities. It is difficult to harmonize the policies of different tiers of government. For example, The federal government's land use policy had constrained Madhesh province's ability to implement its market development programs. Similarly, many local governments impose an export tax (<i>nikasi kar</i>) on the export of agricultural produce out from the municipality, which is against the spirit of the new constitution and federal policies.
Regulation and Monitoring of Market Structures	Along the line of command from ABPMDD to lower levels, 1767 market structures were operated, regulated, and monitored	No line of command exists. Regulation, supervision, and monitoring of agriculture markets within the area of jurisdiction and it ends in each government body only.	About 1700 market structures across the country remain unmonitored and unregulated. No data or information regarding their functioning are available

The transition of Nepal from a unitary to a federal government and subsequent organizational restructuring has created several ambiguities regarding the authority of different tiers of government in agriculture (marketing). Similarly, issues of low autonomy and accountability also persist. Agriculture marketing/trade has a significant inter-regional/inter-provincial dimension about which the constitution is silent. Moreover, the mechanism for promoting intergovernmental relations is not robust enough. Strengthening the agricultural markets by improving the local, provincial, and inter-regional marketing/trade of fruits and vegetables also requires a legal framework that removes the persisting ambiguity regarding the authority and autonomy of different tiers of government and improves coordination and collaboration between them.

4.3. Research Question 2.

The second research question, “How has the existing market infrastructure, logistical and transportation infrastructure affected the market coordination and efficiency of the value chain?” was answered through both desk reviews of the field visits, including visits to four wholesale markets. Market infrastructure, logistical, and transportation infrastructure are dealt individually.

4.3.1. Fruit and Vegetable Markets in Nepal

Even though there are limited marketing facilities for fruits and vegetables in Nepal, different types of markets can be identified in the study area.

Temporary rural markets (*Haat Bazaar*): These are open-air markets comprised of farmers and local traders who trade locally produced fruits and vegetables and operate once or twice weekly. The local community often manages it. Some smallholders prefer to trade in these markets, which provides much-needed cash to these farmers. Though small quantities of produce are sold, farmers receive relatively fair prices for their produce when it is sold directly in these markets rather than marketing the produce through intermediaries. *Haat bazaars* were prevalent in the rural plains of Nepal (mostly eastern and central Terai) but have now spread to semi-urban areas of the hills. In the study area, haat bazaars were observed in Dhanusha and Sarlahi in Madhesh province while some haat bazaars were operational in Bharatpur, Chitwan. Madi Municipality in Chitwan and Thaha Municipality in Makwanpur had no *haat bazaar* operating. Many of these markets are now registered with the local government and have received some support from local government and federal government projects.

Permanent/Semi-permanent rural markets: These markets are found in areas with larger populations. Besides local produce, fruits and vegetables imported from other regions within or outside the country are traded. Often, traders form a committee that looks after the management of such markets. It also levies market fees from those traders who trade in the market.

Assembly Markets/ District wholesale market: These markets are located in major agricultural surplus areas in the country and supply produce to deficit regions nearby or more distant consumption centers like Kathmandu and Pokhara. These markets are larger than rural markets in terms of scale of trade. Mostly accessible through the roadway networks, sites of these markets are also evolving into major population centers on their own. Traders and collection agents mostly buy fruits and vegetables independently or on behalf of wholesalers at terminal wholesale markets. The wholesalers in these markets serve as commission agents and supply the produce to other distant markets within the country.

Regional/Terminal Wholesale Markets: These are the market hubs in large urban centers where different fruits and vegetables are brought from different producers and suppliers for bulk transactions. They are major distribution centers through which retailers, exporters, processors, and other institutional buyers get the produce. These markets play a central role in price determination and dissemination based on the demand-supply dynamics of the particular produce. There are many such wholesale markets within Nepal. The federal government manages some major wholesale markets in the country, while the private sector also runs some of them. Few markets also operate through public-private partnerships. Some local and provincial governments are also investing in building wholesale markets within their jurisdiction.

Table 6: Agriculture market structures in different districts of Madhesh Province

S.N	District	Collection Centers	Haat Bazaar	Wholesale Markets	Retail Markets	Total
1	Saptari	10	76	5	35	126
2	Siraha	2	56	4	26	88
3	Dhanusha	18	49	5	29	101
4	Mahottari	3	60	4	23	90
5	Sarlahi	8	52	6	29	95
6	Rautahat	16	30	3	22	71
7	Bara	14	47	4	24	89
8	Parsa	9	41	3	17	70
	Total	80	411	34	205	730

Four wholesale markets, Lalbandi, Bharatpur, Kalimati, and Jadibuti, one rural semi-permanent market at Matihani in Mukhiyapati Musaharniya Rural Municipality, and one *haat bazaar* at Bharatpur, Chitwan, were studied.

Current situation of Wholesale markets in Nepal

Four wholesale markets were analyzed, namely (i) Lalbandi, managed by the federal government; (ii) Bharatpur, managed by the private sector; (iii) Jadibuti, managed by the private sector; and (iv) Kalimati, managed by the federal government. These major wholesale markets in Madhesh and Bagmati provinces play an important role in the interregional marketing of fruits and vegetables.

Name of Wholesale market	Established	Area	No of stalls	Source of produce	Major destination markets	Market Information System	Auction of fruits and vegetables	Cold storage/ ripening chamber
Agriculture Market Management Committee, Lalbandi, Sarlahi	2054 B.S	4 kattha	44 stalls (61 traders)	Sarlahi, Makwanpur, Dhankuta, Chitwan, Sunsari, Dhading, India (Siliguri, Patna)	Kathmandu, Pokhara, Narayangarh, Sindhuli, Sunsari, Janakpur,	AMPIS website	No auction yard for formal auctioning	None
Mahanagar Fruit and Vegetable Market, Bharatpur, Chitwan	2075 B.S.	3 bighas	170 stalls	Chitwan, Rautahat, Dhading, Kavre, Makwanpur, Kathmandu, Sarlahi, India	Chitwan, Kathmandu, Nawalparasi, Pokhara, Butwal, Lamjung, Gorkha, India	Website for MIS non-functional . Through digital notice boards in market	No auction yard for formal auctioning	Ripening chamber
Manohara Fruit and Vegetable Market, Jadibuti, Kathmandu	2071 B.S.	7 ropani	210 stalls	Dhading, Kavre, (dependent on Kalimati and Balkhu markets for produce from other distant sources)	Kathmandu valley	None	No auction yard for formal auctioning	None
Kalimati Fruit and Vegetable Market, Kathmandu	2043 B.S.	45 ropani	322 stalls	Makwanpur, Dhading, Kavre, Chitwan, Sarlahi, India (38%)	Kathmandu valley	Website, newspapers, notice boards	No formal auctioning despite having an auction yard	Cold storage/rooms and Ripening Chamber

Table 7: Details of studied wholesale markets

Limitations of Wholesale Markets in Nepal

All the markets studied faced basic infrastructural problems regarding transportation, storage, quality control, waste management, and market information. While some markets are better managed than others, most face similar issues like lack of infrastructure and inadequate investment.

Transport and logistics of Fruits and Vegetables

Logistics have a huge impact on the cost structure of fruits and vegetables being sold at the markets. Improved logistics and transport reduce marketing costs, improve economic returns to the value chain actors, and lower consumers' prices. Transportation of farm produce through different stages of the value chain has been a major concern for farmers and traders. In Nepal, transport infrastructure for agricultural produce is inefficient, unstandardized, and unpredictable. The vehicles used are regular rather than specialized ones equipped with refrigeration facilities. The lack of adequate cold storage facilities in and around the wholesale markets of Nepal makes the matter worse. Other than Bharatpur Wholesale Market, which had a ripening chamber for bananas, other wholesale markets lacked it. While some stalls are equipped with cold rooms in Kalimati Fruit and Vegetable Market, lack of technical expertise meant that traders struggled to operate those rooms properly. This prevents the product from getting the desired price and increases the wastage in these wholesale markets.

Auction Facilities

Auctions in a physical marketplace where buyers and sellers gather can enable better price discovery. Despite having an auction yard at the Kalimati Fruit and Vegetable Market, no formal auctioning of fruits and vegetables occurs. None of the other wholesale markets studied had auction yards or auction halls. The informal, private, and fragmented auction at shops or other areas in the market will have fewer participants than a consolidated formal auction conducted by neutral market committee staff. Due to the informal nature of auctions or sales, real transaction information is not publicly available. This leads to suboptimal price discovery and inefficiency in the market.

Post-harvest Loss and Waste Management

While some farmers and traders have shifted to using plastic crates to package their produce, traditional packaging methods like doko (bamboo baskets), sacks, etc., are still widely prevalent while handling and transporting. It can cause high post-harvest losses during and after transportation in the market. The post-harvest losses of fruit range from 20- 35%, while those of vegetables range from 15- 30% (Gautam & Bhattarai, 2012).

Table 8: Post-harvest loss of vegetables and fruits

Commodity	Loading, unloading, and transportation (%)	Storage (%)	Wholesale & retail market (%)	Total (%)
Vegetables	10	-	20	15-30
Fruit	15	-	20	20-35

Source: Gautam & Bhattarai (2012) as cited in Bhattarai (2018)

The food and vegetable loss and wastage were found to be much lower in the Lalbandi compared to Bharatpur, Jadibuti, and Kalimati markets because almost all of the produce purchased by the commission agents/traders in the market is shipped to other wholesale markets, and buyers all over the country as quickly as possible. On the other hand, terminal markets from which other retailers, institutional buyers, and consumers source their produce hold fruits and vegetables for much longer periods of time and generate more post-harvest loss and wastage without proper storage facilities. Cold storage technology cannot be fully exploited to prolong the post-harvest shelf life of both mango and bitter melon (and many other tropical and subtropical fruits and vegetables) as they are susceptible to chilling injury. However, using suitable packaging, proper transportation, and storage at lower temperatures and appropriate humidity can improve the shelf life of both commodities significantly (see Mann & Singh, 1976; Mohammed & Wickham, 1993)

All of the markets studied struggled with effective waste management as farmers, traders, and buyers discarded fruits and vegetable waste and packaging materials in the market. They depend on the local municipal authority to manage waste. Since organic waste can be easily converted into compost and other useful products, private markets plan to install modern waste management technologies, which can be beneficial and sustainable.

Market Price Information System:

The information asymmetry between traders and farmers characterizes agriculture markets. Farmers generally have better access to information about markets and their actors due to their activities, networks, and frequent market visits. Farmers are generally isolated and lack essential information. Market Information System was developed worldwide to ensure greater transparency and ameliorate the existing information asymmetry. It was expected to help farmers achieve fair prices in the market, improve their sales, and tailor production to price and demand (Lothore & Delmas, 2009).

Market Price Information System (MIS) is not well-developed in Nepal. The price data, which mostly consists of the minimum, maximum, and average prices of commodities in the wholesale market, is disseminated through different channels like newspapers, Facebook pages, websites, and notice boards in the market. The limitation of MIS is that it only describes the current

agriculture market situation. However, it gives no information about trends and forecasts, which is necessary for farmers to plan production and make marketing decisions. Similarly, as the markets of fruits and vegetables are highly volatile, price information can quickly lose its value for farmers and traders selling in the market. Moreover, farmers also have little freedom to choose where to sell their produce. They are forced to sell their produce immediately owing to the perishability of the produce and the scarcity of money.

The Department of Agriculture maintains a website to provide information on the agricultural market by displaying the daily wholesale prices of various fruits and vegetables at different federal wholesale markets across the country. This system is intended to enhance transparency and reduce the asymmetry of information that currently exists in agriculture markets. However, in practice, the price data on the website is often patchy, with frequent instances of incomplete or missing data for several days (see figure). This inconsistency undermines the website’s objective of maintaining transparency and providing reliable market information. Farmers in the Lalbandi area complained that the price information released by the market often did not serve as a proper guide for the farmers as traders in the market often traded at much different market rates than stated. The website that provides the market price information for Mahanagar Fruit and Vegetable Market, Bharatpur, developed by Prime Minister Agriculture Modernization Project, Chitwan, is now defunct due to budgetary constraints. The market now displays the wholesale price of the different agriculture commodities on the digital notice board installed in the market. The information is updated every five days. Manohara Fruit and Vegetables market has no system for disseminating price information.

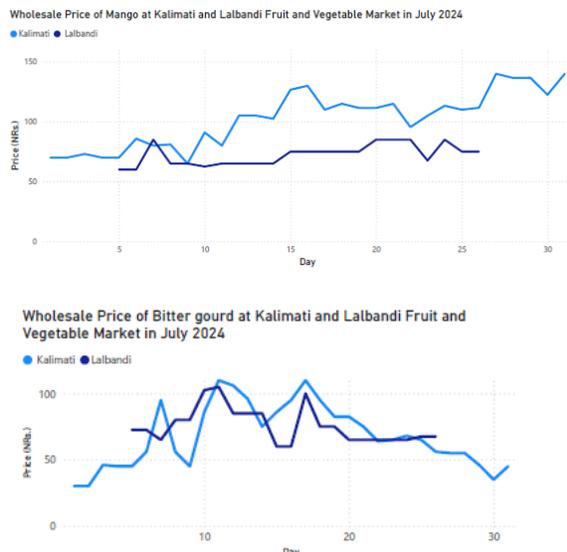


Figure 6: Graphs showing the wholesale price of Mango and Bitter gourd at Kalimati and Lalbandi Fruit and Vegetable Market

(price data of Lalbandi market is patchy)

(Source: [Welcome | Agriculture Market Price Information System \(AMPIS\)](#) and kalimatimarket.gov.np)

MIS has not been able to replace traditional information systems that rely primarily on traders. The goals of MIS are integrated into public services and in line with the state functions of market regulation and transparency. However, states often struggle to finance the operation of MIS after the withdrawal of international development or financial partners.

Coordination between the major wholesale agriculture markets

There is a lack of formal coordination between the wholesale agriculture markets, even those under federal jurisdiction. However, informal coordination between those markets' staff, committee members, and traders has been instrumental in the flow of fruits and vegetables among these wholesale markets from surplus to deficit market regions.

Table 9: The inter-regional flow of fruits and vegetables from Lalbandi, Sarlahi (kg) in 2079 B.S.

Origin	Destination markets (volume in Kg)			
	Kathmandu	Pokhara	Narayangarh	Total
Lalbandi	11912200	1003400	1324539	22240139

Source: CAIDMP (2023)

4.3.2. Transportation and Road Infrastructure in Nepal

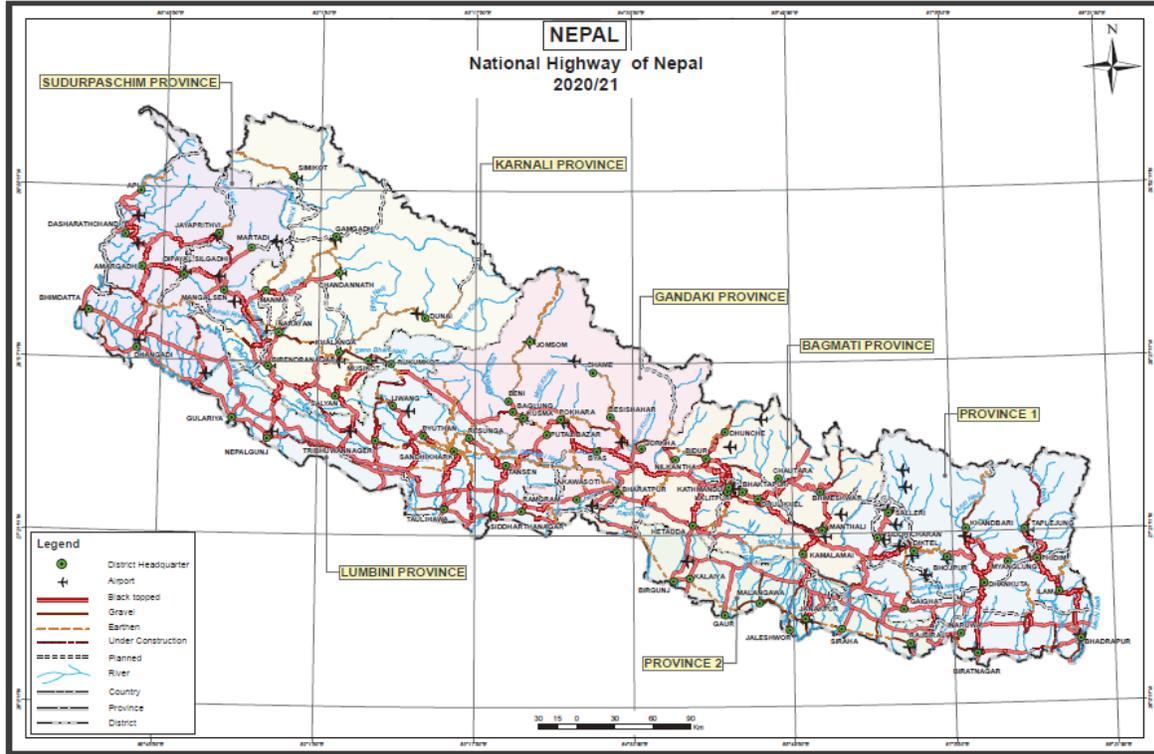


Figure 7: Map of Nepal showing a network of national highways

(Source: Department of Roads, 2021)

Roads are essential for the inter-regional trade of fruits and vegetables between surplus and deficit regions, which is vital for the food security of Nepal.

Growth of road and transport networks in Nepal

Nepal has one of the lowest road densities in South Asia, and many Nepalese in the mountains and hills endure geographically and economically isolated life as most of the roads are concentrated in Terai (UNFP & FAO, 2007). Thus, Nepal, like many other underdeveloped countries, struggles with poor transportation infrastructure, mainly outside the urban area. However, efforts have been made to link these remote parts of the country with all-weather roads, enabling Nepal to expand its road network significantly. While Nepal's road network amounted to 2,700 km in the early 1970s²Nepal's total road network is currently more than 1,00,000 km, including strategic, local, and rural road networks (MoF, 2023).

Table 10: Expansion of road networks by the federal government

² [Strengthening Connectivity in Nepal \(worldbank.org\)](https://www.worldbank.org/)

Description	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
Black-topped	13,707	14,695	15,424	16,614	17,232	17,480
Gravel	7321	8,594	8,622	8,171	7,888	7,956
Earthen	9150	9,590	9,198	8,931	8,876	8,664
Total	30,088	32,879	33,244	33,716	33,996	34,100

Source: MoF, 2023

Table 11: Expansion of Provincial and Local Roads

Description	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
Black-topped	43,190	43,950	45,959	45,959	46,562	47,320
Gravel	13,160	13,560	13,392	13,392	13,689	14,000
Earthen	2,735	3,963	4,212	4,345	4,603	4,737
Total	59,085	61,473	63,321	63,696	64,854	66,057

Source: MoF, 2023

The recent expansion of road networks can be attributed to the efforts of all three tiers of government. However, many of these roads are unpaved and need to be upgraded to allow for easy, efficient vehicle operation all year round.

Table 12: Length (kilometers) of major highways in the study districts

District\Highway	Mahendra	Postal	B.P	Prithvi	Kanti
Sarlahi	30.23	43.34	-	-	-
Dhanusha	28.58	32.16	3.87	-	-
Chitwan	36.06	30.85	-	16.68	-
Makwanpur	50.58	-	-	-	44.01

Source: Department of Roads, 2021

Road and Transport Networks in the Study Area

In Nepal, agriculture market development largely depends on the road network, and most developed markets are situated in locations where road networks are strong (UNFP & FAO, 2007). All the districts chosen for the study are considered well-connected by the national highways and have relatively better transportation infrastructure than other districts of Nepal. Sarlahi and Dhanusha are districts of the Terai Plain, while Chitwan and Makwanpur are districts of the inner Terai of Nepal, where the development of roadways is relatively straightforward. Chitwan and Makwanpur (Appendix G for maps of Bagmati, Chitwan, and Makwanpur) are well connected to Kathmandu and other major cities of Nepal through the Mahendra (East-West)

Highway, Madan-Aashrit Highway, Prithvi, Tribhuvan Highway, and Kanti Highway. Dhanusha and Sarlahi (Appendix H for maps of Bagmati, Sarlahi and Dhanusha) are also connected to other parts of the country, including Kathmandu, through Mahendra, BP, and Postal Highway. These districts can partially attribute their success as hubs for producing fruits and vegetables to easy access to major market centers via roads and highways. Good quality roads enabling access to agricultural markets are fundamental to effective transport in agriculture.

Even in these districts, it was observed that feeder roads connecting rural areas to highways were not well-developed. This made farmers' access to markets in district headquarters/urban areas difficult, forcing them to rely on intermediaries/aggregators for marketing who would collect the produce from their farmgate. Farmers' ability to sell directly to buyers in urban areas is inversely proportional to the time required to reach the city from their villages. The quality of roads was a more significant concern in the study area. While most villages in the study area had all-weather roads, their condition deteriorated during the rainy season, making transportation of fruits and vegetables difficult. Similarly, a shortage of well-equipped delivery vehicles forced farmers to use bicycles, motorcycles, and public transport like buses to transport fruits and vegetables to the markets. All these have caused high post-harvest loss, high marketing costs, and difficult market access for the farmers in the study area.

Mountainous topography means that transportation of fruits and vegetables through the Nepali highway takes longer, and the situation worsens during monsoon season when most of the highways are regularly blocked by landslides. This causes delays in the delivery of fruits and vegetables, sometimes by days, causing significant losses for the actors in the market. Even vehicles are not best suited for transporting perishables like fruits and vegetables. Special permits or licenses at the truck level instead of the company level for operating a domestic trucking company in Nepal; thus, low competition exists between truckers.

As discussed earlier, all three tiers of government have been working to improve the road infrastructure in Nepal. Provinces and local governments (agriculture section) earlier had some programs for building agriculture roads. Some municipalities like Madi also faced the obstruction of Chitwan National Parks in accessing markets through roads, and road infrastructure there is not well developed. Rivers often complicated the access to markets for many farmers, and there was a demand to construct bridges in these rivers to ease transportation.

4.3.3. Cold Chain Infrastructure for Fruits and Vegetables

Cold chain infrastructure can be considered a weak link in Nepal's supply of fruits and vegetables. The dearth of such infrastructure is also a cause of high post-harvest loss of horticultural crops in Nepal, which has led to several inefficiencies and losses. A cold chain is the logistics system that seeks to provide suitable conditions for agricultural produce from the

source of production to the point of consumption through refrigerated and thermal packaging methods, thus maintaining the quality of the produce and improving its shelf life (Negi & Anand, 2015). Refrigerated trucks are not used to transport fruits and vegetables in Nepal.

Cold storage can help keep perishable fruits and vegetables fresh for longer, helping build a buffer against seasonal variation. Apart from reducing post-harvest losses, farmers can achieve a better price by selling produce in periods of stronger demand. It is a paradox that while Nepal lacks sufficient cold storage to support fruit and vegetable marketing in Nepal and there is demand for cold storage, many cold stores and cold rooms remain underutilized or completely non-operational for various reasons (Appendix I has a list of cold stores in Bagmati province). Different tiers of the government, cooperatives, and private businesses have invested in cold storage, but most of them are built without proper feasibility studies. These cold storage have high operating costs and, despite subsidies for electricity by different governments, have failed to sustain themselves. Many cold storage facilities have failed to attract farmers. Farmers say that their produce stored in cold storage does not fetch a fair price because cheaper fruits and vegetables can be imported during the off-season. Some farmers shared that they had stopped using cold store services as they found their produce decayed when they were taken out. This completely destroyed their faith in cold storage and their operators. Lack of technical expertise means that operators often struggle to maintain temperature and humidity as per the needs of the produce. Cold storage operation requires a reliable power supply, but frequent power outages also make cold storage lose its usefulness. Several collection centers in Nepal have also suffered a similar fate. It was observed that collection centers in different study areas were being used for other purposes, such as office space and meeting places for local women's groups and cooperatives.

4.4 Research Question 3.

The third research question is “What roles have cooperatives, farmer’s organizations, and private sector enterprises, associations/federations played in supporting fruit and vegetable markets?” It is answered through primary data collected through field visits (interviews) along with secondary data. This is answered by exploring the role of farmer’s groups/agriculture cooperatives in fruit and vegetable markets and studying the role of FNCCI/AEC. Finally, it also delves into the role of private enterprises in the vegetable fruits and marketing and value chain development with a focus on the organic market ventures and processors

4.4.1. Farmer’s Organization and Fruits and Vegetable Marketing

The study area has seen a considerable increase in the establishment of farmer’s groups and agriculture cooperatives. Many of these farmer’s organizations were formed as government projects such as PMAMP, FANSEP, REED, Agriculture Knowledge Center, and Local

Government channel their grants, subsidies, and other programs through these organizations rather than directly engaging with individual farmers. While some cooperatives and farmer's groups have successfully enhanced the living standards of their members, a considerable number remain dormant. Nonetheless, even farmers associated with the dormant groups informally collaborated on production decisions, including crop selection and bulk procurement of inputs. Many agriculture cooperatives operated dealers of Salt Trading Corporation and Krishi Samagri Company Ltd, through which they provide subsidized agricultural inputs like fertilizers and seeds to the farmers. Despite their potential to enhance the quality, quantity, and consistency of vegetable supplies while ensuring better prices for the producers, few cooperatives engage in marketing these produce.

Strengthening Market Access

Farmer groups and cooperatives enhance access to fruit and vegetable markets through several mechanisms. They often improve trading conditions by providing better tools for weighing and measuring produce, enhancing market information systems, consolidating supply at single locations, seeing buyers, and facilitating transactions between parties. These organizations effectively improve market dynamics between farmers and traders even without directly engaging in direct purchasing.

Additionally, cooperatives engage in value-added activities such as processing, stabilizing markets, and creating new opportunities by supplying processed goods. The government and development partners have actively encouraged cooperative participation in agricultural marketing throughout Nepal. Over the years, numerous cooperatives have established collection centers specifically for fruit and vegetable marketing while also playing a crucial role in agriculture/rural credit provision, extension services, and input supply.

Government Support and Market Participation

Cooperatives in the study area have received various government grants to enhance marketing, such as pick-up vehicles and cold storage facilities. This support has significantly reduced marketing costs for cooperatives. Moreover, cooperative managers typically possess greater market information and knowledge than individual farmers, enabling them to secure better prices for produce and increase farmers' share of consumer prices. About 10% of stalls in public wholesale markets for fruits and vegetables in Nepal are allocated to farmer's organizations like cooperatives to facilitate direct marketing efforts while minimizing the role of other intermediaries. Cooperatives in Chitwan and Makwanpur who market fruits and vegetables charge lower commissions (1-2%) compared to traditional traders who charge up to 15% commissions on fruits and vegetables.

Challenges in Marketing and Value Addition

Despite their potential advantages, many cooperatives face challenges in effectively marketing fruits and vegetables. While they engage primarily in financial services and input provision,

marketing is often perceived as a challenging task. Consequently, some cooperatives that previously participated in agricultural marketing have retreated from this sector

Even those who continue to engage in marketing struggle to eliminate intermediaries or achieve significant success. For example, cooperatives from Chitwan and Makwanpur that own stalls at Kalimati Wholesale Market aspire to sell directly to consumers but often find themselves compelled to sell to traders instead, significantly impacting farmers' prices. One cooperative in Chitwan had established an outlet in Kathmandu to sell directly to the consumers, attempting to bypass other intermediaries.

Low adoption rates of farmer organization-led marketing channels stem from a lack of necessary business acumen among cooperative executives and leaders. Successful marketing requires commitment from cooperative members; however, many farmers belong to multiple such organizations or face opposition from competing market actors. One of the executives of a cooperative in Chitwan reported that they had faced threats from traders when they tried to market their produce at the local *haat bazaar* directly

Furthermore, youth's declining interest in agriculture emigration also exacerbates the challenges for cooperatives as villages struggle to find motivated individuals willing to take the initiative in marketing activities.

Various government initiatives have sought to encourage farmers' engagement in the processing and post-harvest grading and packaging of fruits and vegetables by providing training and essential equipment. These efforts aim to help farmers secure higher prices through added value while also avoiding sales at low cost. However, many farmer's groups and cooperatives remain reluctant to pursue these activities despite receiving initial support from the government due to doubts about the profitability of engaging in those value-added activities. Farmers and cooperative executives reported not getting higher prices for the value-added products despite additional costs and labor.

Moreover, in many cases, cold storage facilities established with government assistance have remained non-operational due to high operational costs or lack of technical skills.

In summary, while farmer's groups and agricultural cooperatives hold significant potential in boosting fruit and vegetable markets and value chain development, their performance has been suboptimal overall. Many face significant challenges that hinder effective engagement in this sector despite some notable exceptions where cooperatives have successfully navigated those challenges to a great extent.

4.4.2. Role of FNCCI/AEC

The Federation of Nepalese Chambers of Commerce and Industry (FNCCI) plays an important role in promoting agriculture markets in Nepal through the Agro Enterprise Center (AEC), established in 1991 with the support of USAID. AEC has been trying to develop a market-oriented and private sector-driven approach to agriculture, focusing on high-value agriculture products, including fruits and vegetables. It seeks to create an environment conducive to private sector participation in agribusiness.³

AEC seeks to improve market access for Nepali farmers and producers by promoting agri-business and strengthening linkages between producers and markets. AEC has been advocating for policies that are conducive to the growth of the agriculture sector and benefit the actors involved in it. AEC is an important stakeholder in agriculture market regulation and management. Its executive director remains a member of the Agriculture Market Management and Regulation Committee headed by the Director General of the Department of Agriculture.

AEC also provides training, advisory, and other support to farmers and agribusinesses, helping to strengthen the productivity and competitiveness of Nepali products. They seek to encourage producers to adopt crops, technologies, and practices that match market demands.

Earlier, AEC also led projects like One Village One Product (OVOP) and One District One Product (ODOP), which sought to promote specific products based on competitive advantage or local essence and sought to promote local entrepreneurship. Fruits like Sweet Orange and Lapsi were the focus of the OVOP, which began as a 5-year pilot project in 2006 with the support of the Ministry of Agricultural Development and the Japan International Cooperation Agency (JICA). While 17 products were promoted in 22 districts in the earlier phase, it was extended to incorporate 48 agricultural produce in 75 districts of Nepal. As the program was extended, mango was also promoted in Siraha and Mahottari districts.⁴ The project was discontinued in 2017/18 as it failed to achieve the expected success for various reasons, including failure in marketing.

AEC also collaborates with various stakeholders, including government organizations, non-government organizations, international organizations, and local businesses, to develop an environment conducive to agribusiness development. It takes leadership in organizing different trade fairs and exhibitions promoting Nepali fruits and vegetables.

AEC has also been researching market trends of fruits and vegetables and good agriculture practices, seeking to provide valuable information to farmers and agribusiness that can help in crop selection and marketing. AEC managed the Agricultural Price Information System, which

³ <https://www.fncci.org/agro-enterprise-centre-141.html>

⁴ <https://iovop.org/mdl/content/action/newsdetail/newsid/302>

provided information regarding the wholesale price of agricultural produce from 40 wholesale markets in Nepal.

Agro Enterprise Center also launched a digital marketing application called Krishi Udhyam Bazar with the assistance of the Asian Development Bank, which sought to connect producers and buyers of agricultural produce electronically.⁵ Similarly, the app could also be used to gain market price information from 40 major agriculture markets across Nepal, helping farmers gauge price trends.

The Agro Enterprise Center (AEC) has been instrumental in advocating for creating a favorable environment for agribusiness in the country. However, most of the initiatives undertaken by AEC, like OVOP/ODOP, Market Information System, and digital agriculture marketing platform, have largely failed to achieve sustained success in strengthening markets and the value chain of fruits and vegetables. These projects often lack transformative impact, as they tend to falter once funding from development partners and government agencies ends. At the provincial and local levels, the role of the AEC has been considerably weaker, with few initiatives launched independently of the federal organization of the AEC. Similarly, limited collaboration with government bodies at the sub-national level has also constrained the effectiveness of the AEC.

4.4.3. Private sector and value chain integration

The government of Nepal's Value chain approach in agriculture over the years has created several positive impacts: support to farmers and agribusiness networks and another multi-stakeholder platform; creation of public infrastructures like roads, markets, irrigation, logistics, and processing facilities; utilization of private sector investment in boosting agri-food sector and creation of policy environment congenial for Value Chain development (Adhikari, 2019). However, there is an increasing realization that the public sector alone cannot lead the value chain development process. Similarly, smallholder farmers lack enough capacity to steer the value chain process (ibid). Nepal's Agriculture Development Strategy recognized the value chain (VC) development to promote private sector growth in Nepalese agriculture by improving the effectiveness and efficiency of food systems, enhancing the collaboration of value chain actors, and augmenting the competitiveness of the value chain (ibid). The formulation of ADS has provided an opportunity to transform Nepalese agriculture with the transition towards a more significant role for the private sector in VC development (ibid.).

Activities in the value chain can be divided into value-adding, necessary-but-not value-adding, and waste activities. Value-adding activities create those attributes in the produce that the consumer values; necessary activities are indispensable in the existing supply chain but do not enhance the value of the produce, and wasteful activities are those that are redundant or

⁵ <https://kathmandupost.com/money/2016/08/18/krishi-udhyam-bazar-app-released>

unnecessary which can be reduced or avoided (Collins et al., 2015). Our study revealed that most of the product value of fruits and vegetables is created at the farmer/producer level, and other value chain actors, despite providing necessary services, could not add significant value to the produce. At the farm level, the fruit and vegetables marketed often possess attributes that are even prized by all segments of consumers, including high-value ones. However, it was noticed that mishandling by the aggregators, lack of proper logistics, and transportation often reduce the value of the fruit and vegetables.

Our study observed that consumers in Nepal attribute the greatest value to the freshness and price of fruits and vegetables (Mango and Bitter gourd). Adhikari (2019) observed that about 40% of consumers (the largest segment) focused on credence attributes like pesticide residue, production location, organic production, and traceability while placing minimal importance on price. Most of them were educated and belonged to the high-income bracket. Our study also found that while consumer purchases were based mainly on price and freshness, most of the consumers were aware of the pesticide residue and the benefits of organic fruits and vegetables. While they wanted to buy such fruits and vegetables, most thought organic produce was too expensive and not readily available. Many also doubted the authenticity of the fruits and vegetables being marketed as organic. In Nepal, even the supermarkets source fruits and vegetables from the wet markets, and they can hardly be differentiated based on the credence attributes of the produce. Many packaged their produce in plastic boxes and bags, which did not necessarily add value for most of the high-end consumers seeking credence attributes. The private sector hitherto has been unable to play a noticeable role in the value chain development and marketing of agricultural produce. There are complaints from the private sector that the environment is not conducive for the participation of the private sector, and very few new entrepreneurs are attracted to the value-adding and marketing of agricultural produce. When private sectors have invested in agriculture markets, the same old model of public markets is emulated, failing to remove existing problems and inefficiencies. The state of private wholesale markets and supermarkets is a testament to the failure of the private sector to capitalize on the newly created d

4.4.3.1. Rise of Organic and Local Marts/Processors

A limited number of organic enterprises, such as Kathmandu Organics, Organic Venture Mart, Khetipati Organics, Taja Farms, Munaa Bazar, etc., are operating in Kathmandu Valley to capitalize on this demand for organic and local produce. These enterprises mainly source their agricultural products, including fruits and vegetables, directly from organic farmers. These enterprises engage in activities like grading, processing, and packaging these produce before selling them through their outlets.

It was observed that while these markets mainly sourced the vegetables from nearby districts, fruits like Mango and Apple were often procured from more distant locations. Since few farmers are engaged in organic fruit and vegetable production, these enterprises collaborate with the

farmer's group and agriculture cooperatives, encouraging their members to adopt organic farming practices and assisting them in the organic certification process. Farmers are also trained and provided technical advisory support for organic farming. Although they strive to minimize the role of intermediaries, executives of these enterprises acknowledge that intermediaries remain crucial in sourcing produce from remote areas where direct procurement is challenging.

Some problems faced by the private organic market enterprise are:

- 1) The demand for organic fruits and vegetables is still low, though it is continuously growing, which is apparent through these markets' sales/trade volume. The perception that organic products are too expensive for consumption has also hindered the growth. Even among high-value consumers, there is greater demand for local, high-altitude products rather than organic produce.
- 2) Farmers frequently send low-quality materials to these markets/processors despite charging higher prices. Executives also argued that it is better to source the produce through aggregators/mediators as they can better guarantee quality and a stable supply of vegetables and fruits. Finding organic produce for some commodities like Mango is also challenging, as almost all commercial production is not organic.
- 3) The organic certification process and standards are cumbersome for small farmers, discouraging them from engaging in organic agriculture.

These enterprises have sought to overcome the challenges by creating consumer awareness to create demand. Similarly, on the supply side, they have either collaborated with farmer's groups or cooperatives to train the farmers on organic production and post-harvest processes to ensure high-quality produce. As mentioned earlier, they actively assist farmer groups in the certification process. Overall, their efforts have helped some farmers in Nepal to get dependable markets and stable prices. These enterprises also produce many fruits, vegetables, and grains on their own organic farm to ensure a consistent produce supply. This study shows that since many consumers in Nepal, especially in urban centers, value credence attributes, a collaborative and coordinated value linking local, organic farmers with these enterprises chains can better respond to this market demand. Apart from these, some enterprises in Kathmandu own processing facilities to dehydrate seasonal fruits like mango and avocado and create chips and other delicacies.

4.4.3.2. Role of Agribusiness Incubators

Traditional financial institutions like Banks and Cooperatives in Nepal have been struggling to meet the needs of agriculture startups and agribusinesses. Some private business incubation companies fill this gap by supporting agriculture entrepreneurs through investment and mentorship programs, aiming to strengthen the entrepreneurial ecosystem in Nepal. These companies provide support services, including training, mentorship, networking opportunities, and market research, so that the agriculture entrepreneurs receive a suitable environment to focus on business ideas without thinking immediately about the financial sustainability of their

venture. Some of the important agriculture-focused incubators are Antarprerana and Nepal Agribusiness Innovation Center. Antarprerana is one such organization that seeks to empower enterprises, including agribusinesses, through mentorship and investments. Over the years, it has supported agriculture producers and processors, including fruits and vegetables. Apart from that, there are programs like Green Resilient Agricultural Productive Ecosystems (GRAPE) funded by the European Union, providing support to agribusiness in Karnali and Sudurpaschim province, while Global Green Growth Institute (GGGI) with the assistance of KOICA has also launched Terai Agribusiness and Enterprise Challenge Fund (TAECF) in Madhesh province to support 67 agriculture enterprise including private agriculture firms, agriculture input suppliers, cooperatives, traders, processors, and information communication technology companies through grant.

Partnership between Government, Cooperatives and Private sectors: During the study, we noticed that local government authorities were also seeking to strengthen markets for the agricultural produce (fruits and vegetables) produced in their region and trying to market the produce through these niche markets. Local government authorities can also help brand these local, organic produce. Some fruits, vegetables, and grains indigenous to particular areas can be promoted by the local government and sold in niche markets. Thus, the local government must coordinate with these enterprises and farmer's groups in this endeavor. Sustained partnerships between agriculture enterprises, cooperatives, and the government can lead to better value chain development in the country.

4.5. Research Question 4

The fourth research question is, "How prevalent is the use of digital tools (who provides and uses them), how are they used, how do they help in decision making, and does it improve efficiency? What are the perceived barriers to the adoption of these technologies?" It is answered through a review of existing literature on digital technologies and in-depth interviews with technology companies and farmers.

4.5.1. Digital Agriculture and Digital Fruit and Vegetable Marketing in Nepal

A remarkable shift in the global economy is underway, impacting almost every sector of trade, business, and services through digitalization. Gradual advancements in connectivity and networking tools for digital communication mean that Nepal can also embark on the pathway toward a robust digital economy, increasing productivity, even though the progress currently remains insignificant when compared to the global pace of digitization. As per the Nepal Telecom Authority, Nepal's internet penetration is 131% of the population, while fixed broadband is accessible to only 33% of the total population (Rana, 2023). This is a sign that

Nepali society is at the cusp of digital transformation that can also have implications for the agriculture sector.

Digital technology has the potential for a paradigm shift in Nepali agriculture production and marketing. It can generate economic benefits through improved cost efficiency, agricultural productivity, and better market opportunities. Better market information through digital tools can offset information asymmetry that exists in traditional markets, improving the bargaining power of farmers. It can also help farmers develop relationships with government, non-government, and private institutions and help create a network that provides information from sowing to harvesting, including weather forecasts and plant protection. Thus, it has the potential to play a pivotal role in attracting the young population into the agriculture sector, as tech-savvy youths can leverage these digital technologies to make agriculture less labor-intensive and more profitable. Similarly, it can also be a stepping stone towards sustainable development of the overall agriculture sector.

But agriculture globally falls behind other sectors in adopting new technologies as the agricultural sector is more complex than many other sectors (Geng et al., 2007). This also includes various social, political, economic, and educational problems that imperil rural communities (ibid.). Poor Nepal also faces many such challenges in adopting digitalization in agriculture. One of the most daunting challenges is low digital literacy among the population, which currently hovers around 31%. Nepal has recognized the importance of digital skills and their role in the digital economy.⁶ However, there is a lack of coordinated efforts and a structured framework to boost digital literacy within the country (World Bank, 2022).

Currently, most digital applications/platforms focus on agriculture advisory and extension services, including information on crop production, soil testing, disease/pest screening and treatment, market information systems, and irrigation. Government organizations like the Ministry of Agriculture and Livestock Development (MOALD), the Department of Agriculture, and the Ministry of Communication and Information Technology (MoCIT) implement many of these digital interventions, often supported by donor agencies and development partners. Apart from that, there are some private service providers as well.

Table 13: Digital Agriculture Tools in Nepal

S.N.	Initiative	Key services	Initiated/Implemented by	Downloads
1.	Smart Krishi	Agriculture advisory, Market information, Agriculture news, Weather forecasting	Smart Krishi Nepal (Private service provider)	More than 100,000 downloads

⁶ [Digital Divide threatens Nepal's vision for a tech-driven future - OnlineKhabar English News](#)

2.	Geokrishi (Geokrishi Farm, Geokrishi Agrovet, Samuhik Bazar, Geokrishi Partner)	Agriculture advisory, market information, agriculture inputs supply, agriculture produce marketing, production planning, business model development	Pathway Technologies (Private service provider). Some apps are developed by the company but implemented by the local government	About 200,000 downloads including all Geokrishi platforms and about 80,000 active users
3.	Nepali Krishi	Agriculture produce marketing connecting farmers with traders, input supply		More than 1,000 downloads
4.	Digo Krishi	Advisory on conservation agriculture	DreamWork Solutions (Private service provider).	X
5.	Bhimad Krishi	Agriculture production and market management	Developed by DreamWork Solutions and implemented by Bhimad Municipality, Tanahun	More than 100 downloads
6.	Pokhara Krishi	Agriculture Market Management	Developed by DreamWork Solutions and implemented by Pokhara Metropolitan, Kaski	More than 5,000 downloads
7.	Hamro Krishi	Advisory on weather-based Package of Practice (POP) for major cereals; fertilizer calculator	A pilot program of the Climate Resilience Project, World Bank, and MOALD developed by InfoDevelopers	Non-functional
8.	Krishi Udhyam Bazar	Agriculture marketing (Buy-Sell) and the market price of 40 wholesale market	It was implemented by the Agro Enterprise Center (FNCCI), and the application was built under the Raising Incomes of Small and Medium Farmers Project (MOALD)	Non-functional
9.	Krishi Guru	Agriculture advisory, input supply, market price information	ICT For Agri Pvt. Ltd	More than 100,000 downloads

Source: Author's compilation

In the study area, we encountered a few farmers who used digital tools for agriculture advisory while making decisions about fertilizer, pesticide application, and pest management. Vegetable farmers in Chitwan and Makwanpur used digital agriculture applications more than in Janakpur or Sarlahi. This may be due to technology companies' awareness campaigns and educational programs in the Chitwan and Makwanpur vegetable production zones. However, none of the farmers in the study used digital platforms for their fruit and vegetable marketing.

Fledgling Digital Fruit and Vegetable Marketing

While there have been public and private initiatives on digitizing Nepali agriculture, most of them have not been directed towards agriculture produce marketing. According to the United States Department of Agriculture (USDA), there are four different functions for e-commerce platforms in agriculture: i) input supply, ii) information distribution, iii) commodity floor trading, and iv) logistics supply chain management (Geng et al., 2007) Some pilot programs have been implemented by government and development agencies for agriculture marketing in Nepal. Recently, private sector technology providers have also ventured into digital marketing of agricultural produce, including fruits and vegetables. These online marketplaces link farmers, buyers, input suppliers, and other fruit and vegetable value chain stakeholders. Providing ecosystem services connecting producers, traders, suppliers, and consumers in one platform with real-time monitoring and management is also a formidable challenge for technology companies. The typical process of using an online platform for agriculture marketing is discussed briefly below:

1. **Platform Registration and Access:** Farmers, buyers, and suppliers register and create their profiles on the platform. Farmer's profiles provide their location, details of products they offer, and production capacity. Similarly, buyers also sign up specifying their needs for agricultural produce, while suppliers register specifying the inputs they supply. Registration is usually free of cost.
2. **Product listing:** Farmers list their produce, providing descriptions regarding quantity, prices, and images. The platform checks the listing's authenticity to ensure the product is available for sale before posting it on the platform. Platforms usually categorize the listings according to product type for the ease of buyers.
Matching and Transactions: Buyers can search for produce based on their preference. If their search matches the farmer's description regarding the produce, quantity, and availability, the transaction occurs through negotiation or bidding. Sometimes, produce even has fixed prices.
3. **Logistics, Payment, and Settlement:** While farmers and buyers are expected to manage the logistics and delivery themselves, the platforms try to monitor the movement of goods from farmers to buyers, along with the status of payment and settlement. The payments can be made through the platform with options like digital wallets, bank transfers, etc.

Causes of low adoption of digital agriculture marketing tools

Despite the growth of digital agriculture marketing platforms, actual transactions through these platforms are pretty low and much lower for fruits and vegetables. While farmers are willing to sell through these platforms, buyers/traders hesitate to purchase. The reasons for the buyer's unwillingness to transact through these platforms.

1. **Quality Uncertainty:** Buyers are uncertain about the quality and freshness of the produce. As farmers often have differing standards for quality, there is a fear that purchasing subpar produce
2. **Trust issues:** Buyers often hesitate to buy from farmers they do not know. They would instead buy from other traditional aggregators/collectors/commission agents with whom they have

developed long working relations and trust. These aggregators can assure them a reliable or consistent supply of fruits and vegetables throughout the year, which the online platform cannot guarantee. Similarly, there are concerns regarding fraud, such as non-delivery of purchased produce, which can dissuade buyers.

3. **Logistical Challenges:** Concerns with reliable and timely delivery and high transportation costs for produce from distant farms nudge buyers to prefer local or traditional markets. Since buyers must buy from individual farmers in lesser quantities, it often does not meet the minimum quantity for a full truckload. It increases transportation costs per unit of produce. Similarly, if produce from multiple farmers is combined often from different areas, more resources and time are required, further complicating the logistics.
4. **Payment risks:** There are concerns regarding online payment security as the online payment infrastructure is not adequately developed.
5. **Technology barriers:** Low digital literacy in Nepal means that users find them complicated or intimidating. Moreover, most of the online platforms are not user-friendly
6. **Concerns regarding fair pricing:** Buyers are unsure if they are getting fair prices, and farmers are found to charge higher prices while selling to distant and unknown buyers.
7. **Cultural and behavioral preferences:** Many buyers prefer to have face-to-face interaction that traditional market transactions provide, and they are also resistant to changing their long-standing habits.

There is a significant gap between people based on the accessibility, availability, and affordability of modern information communication technology or digital services in Nepal. Rural Nepal has struggled with the digital infrastructure shortage and poor digital literacy, causing a severe rural-urban digital divide. Similarly, there are also generational differences in digital literacy as it is mainly limited to the younger generation. Nepali farmers, mostly from rural communities and part of the older generation, face a severe problem of low digital literacy.

Digital financial systems in Nepal are less mature compared to other South Asian countries like India, Bangladesh, and Sri Lanka, even though some progress has been made in the digital Government to Person (G2P) and Person to Government (P2G) payments (World Bank, 2022). Robust digital financial systems are indispensable for digital agriculture marketing.

Marketing of fruits and vegetables either through traditional markets or digital markets is challenging owing to the bulkiness and perishability of these produce. Farmers do not ascertain the market while producing fruits and vegetables, and marketing problems arise when the supply exceeds the demand for produce. Farmers seek alternative markets (digital markets) only after harvest when they struggle to get fair prices from traditional markets.

Attempts at enhancing uptake of digital marketing tools

Digital agriculture marketing platforms are working to resolve these issues, which are hampering the adoption of digital agriculture marketing. There is no dedicated government institution or section that oversees digital agricultural transformation. They complain that despite the rhetoric, there is no policy or long-term vision on the part of the Ministry of Agriculture and Livestock Development to promote digital agriculture marketing. Some attempts to rectify these issues and promote digital agriculture (marketing) platforms are discussed below:

- 1) Improving digital literacy through community learning centers: Digital platforms have launched community learning centers to advance digital literacy and improve confidence among rural farmers to use these platforms. Training and orientation are organized through the facilitator, who provides knowledge about the app's utility and ways to use it. These facilitators often belong to the same community or village. Geokrishi, one of the digital platforms, has established e-Chautari as a community learning center that tries to improve digital literacy in rural communities and induct farmers into the platform. These learning centers also provide those farmers who do not have access to smartphones the opportunity to gather, discuss their problems and learnings, and get advisory information from facilitators.
- 2) Involving local-level institutions to build trust: Digital platforms also collaborate with local governments to provide digital agriculture services to farmers and traders, which can help create trust on the platform. Many also try to work through local cooperatives to create awareness about the digital platform and develop credibility. Many digital agriculture facilitators for digital platforms are members of local cooperatives or local NGOs who already have relationships with the community.
- 3) Attempts at involving local government and cooperatives to create a tentative listing of agricultural produce in the region before harvest, giving ample time for marketing.

4.5.2. Feminization of Agriculture and Digitalization

Modern technologies, including digital technologies, have the ability to support women's participation in higher-value activities in agriculture value chains, generating greater economic benefits and social impact (Murray et al., 2016; Sinyolo, 2020.). Digital technologies ease farmers' and particularly women's access to knowledge and information, help decision-making and facilitate their incorporation into the global value chain (Thakur, 2023). This can create new opportunities for entrepreneurship and employment (ibid). While the agriculture sector has been feminized, they need expert advice on agriculture crop production, such as planting, pest management, and marketing. Most of the agriculture extension workers in Nepal are male, and socio-cultural norms constrain these women farmers' interaction with those "unfamiliar men." Digital agriculture apps make accessing the required information more accessible for women farmers (Alnesany, 2023). There is anecdotal evidence from Nepal where digital agriculture

technologies have improved the life and livelihood of rural women⁷. However, there is a dearth of studies that have actually looked into the socio-economic impact of such technologies on women.

Challenges for ensuring women's access to digital agriculture tools

Several technological interventions through extension advisory services associated with the green revolution in India, despite their success in raising crop production, failed to uplift the rural poor and marginalized population, particularly women (Sharma, 2012). Men and women often have different needs and demands owing to different levels of assets and access to markets, information, credit, and other services, and a lack of proper attention to this can exacerbate the gender divide in society (Jafry & Sulaiman, 2013). Thus, it is a challenge for extension advisory services to address the gap to benefit the lives and livelihood of rural women farmers. New digital technologies that aim to provide services to farmers face challenges similar to and different from those faced by earlier extension advisory services and technologies due to gender bias (ibid.). Only 19.7% of all women in Nepal own approximately 5% of land throughout the country, while only 11% exercise effective control over their land.⁸

92% of women in Nepal have access to mobile phones, and 41% have access to internet services⁹, only 3% of women have used Internet or mobile banking services. Only 15% of women transact through digital payment platforms compared to 23% of males. While the number of new female entrepreneurs doubled from 2014 to 2018, most of them were in non-digital sectors, signaling low female participation in digital sectors (World Bank, 2022). Rural women also face difficulties like the unaffordability of data to access the Internet due to financial constraints (Ofisi & Lukamba, 2020). This shows the divide between men and women regarding access and use of digital technologies, which hinders women's ability to utilize digital agricultural technologies, including digital marketing applications. Many women farmers in rural Nepal do not understand Nepali and are comfortable in their mother tongue or regional languages. The lack of content in these languages may have dissuaded women farmers' use of these digital platforms. It is concerning as women risk being left behind by the ongoing digital revolution.

Attempts to boost women's access to technology

Digital technology companies express their strong commitment to social inclusion and their attempts to incorporate women, youths, the marginalized, and the disabled into their platforms, making them accessible to all. Most of these apps can be used free of cost so that cost does not

⁷ [Empowering women through a #DigitALL Nepal \(worldbank.org\)](https://www.worldbank.org/en/feature-story/2020/07/20/empowering-women-through-a-digitall-nepal)

⁸ [Securing Women's Land and Property Rights in Nepal | International Organization for Migration \(iom.int\)](https://iom.int/newsroom/2020/07/20/securing-women-s-land-and-property-rights-in-nepal)

⁹

<https://www.unicef.org/nepal/media/16251/file/Nepal%20MICS%20Statistical%20Snapshot%20-%20%20Mass%20Media%20Communications%20and%20Internet.pdf>

become prohibitive. Most users in one of the apps were women, and women's participation was promoted through partnerships with women-led farmer's groups and agriculture cooperatives. Since most of the digital agriculture facilitators in the community are women, social-cultural mores do not restrain them from interacting and learning from these facilitators about the use of digital technology in agriculture. This can help build confidence among women in using digital technologies. On the other hand, digital technology companies are also trying to incorporate women into the app-designing process to create women-friendly applications.

Thus, digital technologies can be pivotal in bridging the gender divide if these technological interventions are appropriately implemented and serve as a force multiplier in development efforts. There is a need for gender mainstreaming in agriculture and related sectors. In the absence of such efforts, most rural women farmers risk falling further behind in this digital age.

5. CONCLUSION & RECOMMENDATIONS

Agriculture is the backbone of Nepal's economy, with the fruit and vegetable sector playing an important role in the livelihoods of millions of farmers nationwide. Owing to the country's diverse agroecology, Nepal has tremendous potential in fruit and vegetable production all year round. Similarly, demand for them has continuously risen in recent years. Marketing significantly stimulates production and consumption and bolsters economic development, primarily in agricultural countries. The success of the fruit and vegetable marketing system ultimately rests on a robust market support network, which includes the services and infrastructure that enable market access and the efficient flow of resources and information.

The institutionalization of federalism in Nepal has also generated both opportunities and challenges for fruit and vegetable marketing in Nepal. This study sought to understand the impact of federalism on fruit and vegetable marketing, focusing on institutions, policies, and their implementation under the new three-tier governance system. It also studied the existing marketing structures, logistical, transportation, and digital infrastructure that affect market efficiency and assessed the role of farmer organizations and the private sector in supporting fruit and vegetable markets.

As federalism is getting institutionalized, fragmentation of agriculture market governance has created uncertainty and contentions between different actors involved in marketing fruits and vegetables. In such an environment, markets remain primarily inefficient, and the progress toward strengthening fruit and vegetable markets and value chains has been limited. Apart from logistical and physical infrastructural challenges, Nepal's poor digital infrastructure has also hindered the growth of this sector.

Some recommendations for strengthening the cooperation of fruit and vegetable markets in Nepal are given below:

1. **Formulate an Agricultural Marketing Act:** The federal government should formulate an Agricultural Marketing Act to clearly define the rights and responsibilities of all three tiers of government. The new act must also try to harmonize trade regulations, taxes, and duties across the country to ensure the smooth flow of fruits and vegetables between regions. The new act will help resolve contentious issues regarding agriculture market governance, like export tax and land use for infrastructure construction, and enhance coordination and collaboration among government levels and agencies. Similarly, market guidelines and directives must be amended to suit the new federal system of governance of agriculture markets
2. **Improve transportation and logistical infrastructures:** Nepal still lacks transportation facilities connecting rural regions with urban markets. Dedicate resources for developing rural roads and feeder roads connecting rural villages to highways. Similarly, clear guidelines for

transporting fruits and vegetables should be developed. Properly monitoring logistical infrastructure like cold storage and collection centers and assessing reasons for the failure and non-operation of many logistical infrastructures is necessary. Consistent oversight of the market and market infrastructure is necessary. Similarly, the federal wholesale market infrastructure also needs to be upgraded.

- 3. Strengthen the agriculture market information system:** It is necessary to take steps to create greater transparency in pricing and transactions to ensure that farmers are not exploited. Real-time price information dissemination through digital mediums can help farmers negotiate better deals with traders. The government must maintain supervisory oversight over federal markets so that market information is updated regularly in the AMPIS platform. The government can invest to incorporate other major wholesale markets into the AMPIS platform. Market information on major wholesale markets should also be disseminated through other media, such as newspapers and radio.
- 4. Focus on agriculture marketing extension:** Farmers should be educated about the post-harvest treatment of fruits and vegetables, their market conditions like market prices, potential buyers, and quality requirements, which can bolster their ability to sell their products effectively. Similarly, these agriculture extension programs should provide knowledge to the farmers about utilizing market information like price trends to get better prices for their produce.
- 5. Invest in the capacity development of farmer's organizations:** As all tiers of government implement their programs through farmer's groups and agriculture cooperatives, resources should be allocated for the capacity building of these farmer's organizations. The role of the farmer's organization will remain extremely important in the context of the digitalization of agriculture and agriculture markets. The government should help empower these organizations to utilize logistical and marketing infrastructure, engage in value-added activities, and effectively market fruits and vegetables. There is a need to improve the managerial and entrepreneurial skills of the executives of farmer's organizations to enable them to engage in fruit and vegetable marketing.
- 6. Improve access to credit and agriculture inputs:** Many farmers are forced to sell their produce to market intermediaries partly because of contractual agreements to supply to them in exchange for financial support and inputs for planting and cultivation. They also serve as a support system during farmers' domestic emergencies. Thus, the government must focus on improving farmers' access to adequate credit facilities and ensure the supply of fertilizers and other agricultural inputs to free farmers from unequal power relations with intermediaries.
- 7. Encourage private enterprises for value chain development:** As objective knowledge of markets and consumer preference is required for the value chain development process, the

government can help private sector enterprises by creating knowledge about new market opportunities through research. Niche markets for high-value agricultural produce in supermarkets and marts in Nepali cities have emerged, which value credence attributes rather than price.

8. **Deepen collaboration with private digital technology companies:** The government's involvement can enhance the trust of market actors on digital marketing platforms. Local governments can create digital haat bazaars for agriculture marketing in collaboration with digital technology companies. Similarly, these apps can help farmers plan production based on market price and demand, weather, and edaphic factors to improve profitability. A section dedicated to digital agriculture promotion can be established under the Department of Agriculture to accelerate digital transformation in the agriculture sector.
9. **Make digital tools and platforms inclusive:** Steps should be taken to make digital platforms socially more inclusive, incorporating women, disadvantaged, marginalized, and disabled into the platform to benefit from these tools. Attempts should be made to improve the digital literacy of rural farmers, traders, and other stakeholders, create awareness about the benefits of digital tools in agriculture, and develop confidence in using them.
10. **Initiate auctions/electronic auctions at wholesale markets:** The auction does not occur at fruit and vegetable wholesale markets. Markets should initiate auctions, preferably e-auctions, which can facilitate better price discovery and transparent and efficient transactions between farmers and traders/buyers operating in the marketing yard of a wholesale market. These intra-wholesale market e-auctions can be a starting point for broader adoption as they can be expanded to connect multiple wholesale markets through e-auctions later.
11. **Create a Unified Digital Agriculture Market:** The federal government must initiate efforts to create a digital National Agriculture Market that links federal wholesale markets across the country, which can later be expanded to incorporate wholesale markets and cooperatives across Nepal. India's e-NAM can serve as the model, but its structure must be tailored to Nepal's needs and capacity. Creating a unified digital agriculture market requires the development/upgrade of infrastructure like e-auction halls, storage, warehouses, etc. One reason for Nepal's slow uptake of digital agriculture marketing tools is the lack of trust among value chain actors in these applications to deliver quality services. Government-owned market platforms can capitalize on this opportunity owing to the trust and credibility of the government
12. **Encourage fruit and vegetable production:** Local governments should promote fruit and vegetable crops based on regional comparative and competitive advantages, facilitate organic production, certification, and branding, and help create a market for organic produce. Organic production will help promote sustainable agriculture and market differentiation as well.

13. **Facilitate coordination between buyers and sellers:** Often, actors are blind to the existence of each other owing to a lack of coordination in the marketing chain. The government can help farmers by providing contacts of potential buyers of their produce in advance, but the government should refrain from getting involved in actual agreements. Similarly, forums should be created where producers and buyers meet.

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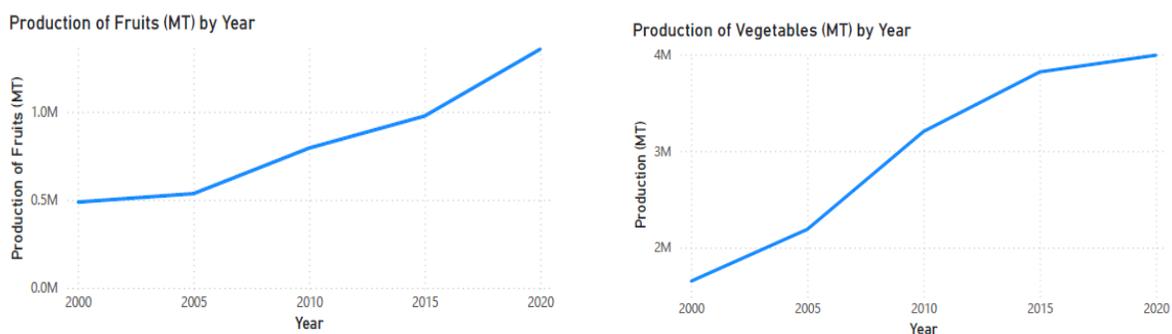
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APPENDICES

Appendix A: Trend of Vegetable and Fruit Production in Nepal from 2000 to 2020.



Appendix B: Cost of production of Mango

Orchard establishment cost (per hectare): The cost of orchard establishment varies from place to place based on the needs of the place. Mango plants need about five years to produce economic yield, which is called the gestation period. Typically, orchard establishment cost includes the cost incurred during the gestation period. However, establishing a mango orchard (Dasheri, Amarpali, Malda) on one hectare of land requires NRs. 4 lakh is required on average. Assuming that the economic life span of a mango tree is around 40 years,

Annualized establishment cost: 4 lakh/40: Rs. 10,000 per ha

Annual rent: NRs. 30000

Orchard maintenance costs include irrigation, manure, labor, and plant protection costs, which are around NRs. 1,50,000 per ha

The total annual cost of production in 1 ha orchard: Annualized Establishment Cost, Orchard Maintenance Cost, and Annual rent : Rs. 1,90,000

Annual annual production: 10 tonnes/ha

Total revenue: $10 \times 1000 \times 40 =$ NRs. 4,00,000

The benefit-cost ratio is 2.10

Appendix C: Marketing Margin of Mango

For Chitwan (major varieties: Dasheri, Amarpali, Malda). Proximal markets mean markets within the district or in the neighboring municipalities. While proximal markets for Chitwan are Bharatpur and other urban centers within the district. Similarly, distant markets are faraway markets in different regions altogether. Kathmandu and Pokhara are major distant markets through which interregional trade of fruits and vegetables occurs.

Table: Producer's share in consumers' price of Mango in Bagmati and Madhesh province

Particulars	Proximal Market (NRS/Kg)		Distant Market (NRS/Kg)	
	Bagmati Province (Chitwan)	Madesh Province (Dhanusa and Sarlahi)	Bagmati Province (Chitwan)	Madesh Province (Dhanusa and Sarlahi)
Retail Price	85	75	95	95
Farmgate Price	50	40	45	40
Market Margin	35	35	50	60
Producer's share	59%	53%	47%	42%

Table: Gross Margin (NRs.) for different actors in the Mango marketing chain in Bagmati province

Gross Margin					
Channel	Province	Farmer and Contractors	Commission Agents	Wholesalers	Retailers
Channel 1	Bagmati	75	-	-	-
Channel 2		50	-	-	25
Channel 3		50	12		18
Channel 5		45	15	15	20
Channel 1	Madesh	65	-	-	-
Channel 2		50	-	-	20
Channel 3		40	15	-	20
Channel 5		40	-	25	30
		40	15	20	25

Note: Commission agents also include traders and collectors

Source: Author's estimation

Appendix D: Cost of production for Bitter gourd

Table: Cost of production for Bitter gourd

Description	Cost (NRs.)
Seeds	20,000
Manure and fertilizer (seedling)	13,000
Nursery plantation-labor	22,000
Labor (field)	2,00,000
Manure, fertilizer, micronutrient	90,000
Plant protection	10,000
Irrigation	13,000
Land	15,000
Packaging and transportation	16,000
Total cost	3,99,000
Yield is 15 ton/ ha & Selling price (Rs.47/kg)	
Total selling price (yield* selling price)	7,05,000
Benefit: Cost ratio	1.76

Source: Author's estimation

Appendix E: Marketing margin for Bitter gourd

Table: Producer's share in consumer's price of Bitter gourd in Nepal

Particulars	Cost (NRs/kg)	
	Proximal market	Distant market
Retail Price	82	90
Farmgate price	47.5	40
Market Margin	34.67	50
Producer's share	57.92%	44 %

Source: Author's estimation

Table: Gross Margin for different actors in Bitter Gourd Marketing in Nepal

Channel	Farmer's Margin	Commission Agents/traders/collectors Margin	Wholesaler's Margin	Retailer's Margin
Channel 1	45	-	-	-
Channel 2	47	12.5	-	22.5
Channel 3	50	15	-	25
Channel 4	40	15	12	23

Source: Author's estimation

Appendix F: Role of three tiers of government in the marketing of fruits and vegetables

Agriculture and Livestock Section of Local Government

There are 753 local-level governments in Nepal based on the Constitution of Nepal 2015, and each of these local governments has an Agriculture and Livestock section under the Economic Development Committee led by the deputy mayor/vice chair of the municipal authority (DT Global, 2022). However, these elected representatives generally lack the ability to discharge their responsibilities regarding project development, planning, budgeting, and monitoring (ibid). Agriculture and Livestock sections within municipalities and rural municipalities are expected to promote agriculture marketing through policy formulation, implementation, monitoring, and evaluation in their area (Khanal et al., 2024). Similarly, they play an important role in agricultural marketing extension, supervision, monitoring, and evaluation of local markets. Finally, they also coordinate with other tiers of government and non-governmental agencies to promote agricultural marketing in Nepal (ibid). Local governments have formulated several policies, acts, and directives for agriculture market development.

The focus of local government has been increasing the production and productivity of fruits and vegetables in the region. Thus, they have mainly prioritized providing subsidized agricultural inputs, mechanization, and capacity development for farmers. Since the federal government has subsidized chemical fertilizers, local governments have mostly subsidized organic and bio-fertilizers. While their focus on marketing their products has been scant, these efforts mainly focus on developing market infrastructure. The vegetable and fruit sector has been a priority for the local government as it fetches better prices than traditional agronomic crops. Local governments have introduced programs to strengthen the capacity of farmers, build cold storage facilities, promote demand-based markets, manage haat bazaars, and improve agriculture roads. Some municipalities were also building large wholesale markets in partnership with the provincial government. Bharatpur Metropolitan was found to provide price support for milk; there was no such provision for fruits and vegetables. There were some value chain additions and

strengthening programs through the processing of vegetable produce as well. They sought to train and equip cooperatives and farmers' groups with machinery and technologies for processing. Local government has also subsidized the delivery vehicle for agriculture cooperatives, farmer's groups, and agriculture firms.

Many of the agriculture officials in the municipalities interviewed complained that agriculture was not a priority sector for the political representatives in the local government, and the focus is generally on infrastructure development. Officials grieved not having enough autonomy in dealing with policy and program formulation and implementation at the local level. Their autonomy was constrained not only by the interference of political representatives but also due to a lack of budget and enough manpower to implement the policy and program. Similarly, there were rampant complaints regarding misuse of grants and subsidies favoring the rich and well-connected within the municipality. The officials even conceded that some of the training programs, grants, and subsidies were provided to those who are politically connected even though they did not qualify or were not best suited for the program.

Some municipalities in Madhesh province and Bagmati province impose export tax (*nikasi kar*) on agricultural produce (fruits and vegetables) when they are transported to other parts of the country. Such action at the early stage of trading can have a cascading effect on the prices as the commodity passes through various stages in the supply chain.

Provincial-level Ministry of Land Management, Agriculture and Cooperatives (MOLMAC)

Ministry of Land Management, Agriculture and Cooperatives, along with its wings, including the district-based Agriculture Knowledge Center (AKC), are responsible for formulating annual plans and budgets to satisfy the agricultural needs of the province. Effective policies, strategies, and programs are vital to help farmers obtain remunerative prices for their horticultural produce, easing market access for the market actors and supporting the country's overall economic development. The provincial government has authority for market development and promotion within its jurisdiction. The Agriculture Development Directorate under the ministry is responsible for formulating and implementing policies on agriculture market organization and development in the provinces. While Provinces have focused on creating larger markets and providing grants for projects too large to be funded by the local government and having significance at the provincial level, the level lacked a clear strategic roadmap/masterplan for market development and coordination in the region. These provincial ministries do not deal directly with farmers and locals; having the Agriculture Knowledge Center (AKC)/ Agriculture Development Office (ADO), which is a wing of provincial ministries in the new federal structure, plays a vital role in this regard. AKC is mandated to improve the agriculture system through the growth of production and productivity within the country. It also plays a vital role in market infrastructure development and linkage between different market actors and provides better services to farmers and agri-entrepreneurs. They have programs aimed at market scoping

and market development for agriculture products through coordination with other stakeholders like local government, entrepreneurs, and development partners. These programs are reviewed annually, and suggestions are sought from the provincial ministry on improving them.

Bagmati province has plans to achieve self-sufficiency in fruits and vegetables and has a policy of promoting their production within the province. In the past few years, both provincial governments have invested in developing agricultural roads, cold storage, and collection chambers. Bagmati province has been building a modern provincial-level wholesale market in Hetauda in partnership with the Hetauda Sub-metropolitan city. However, Madhesh province has no program for market development, citing difficulty in creating infrastructure due to the federal government's land use policy for the current fiscal year. This suggests a low level of coordination between different provincial and federal governments. Similarly, there is little coordination with local government units within the province, which also play an essential role in developing and implementing agriculture market promotion and development programs. Agriculture market promotion/monitoring/development requires linkages and coordination with other line ministries and institutions within provinces and other stakeholders such as financial institutions, private sectors, cooperatives, and farmer and product associations.

Federal Ministry of Agriculture and Livestock Development

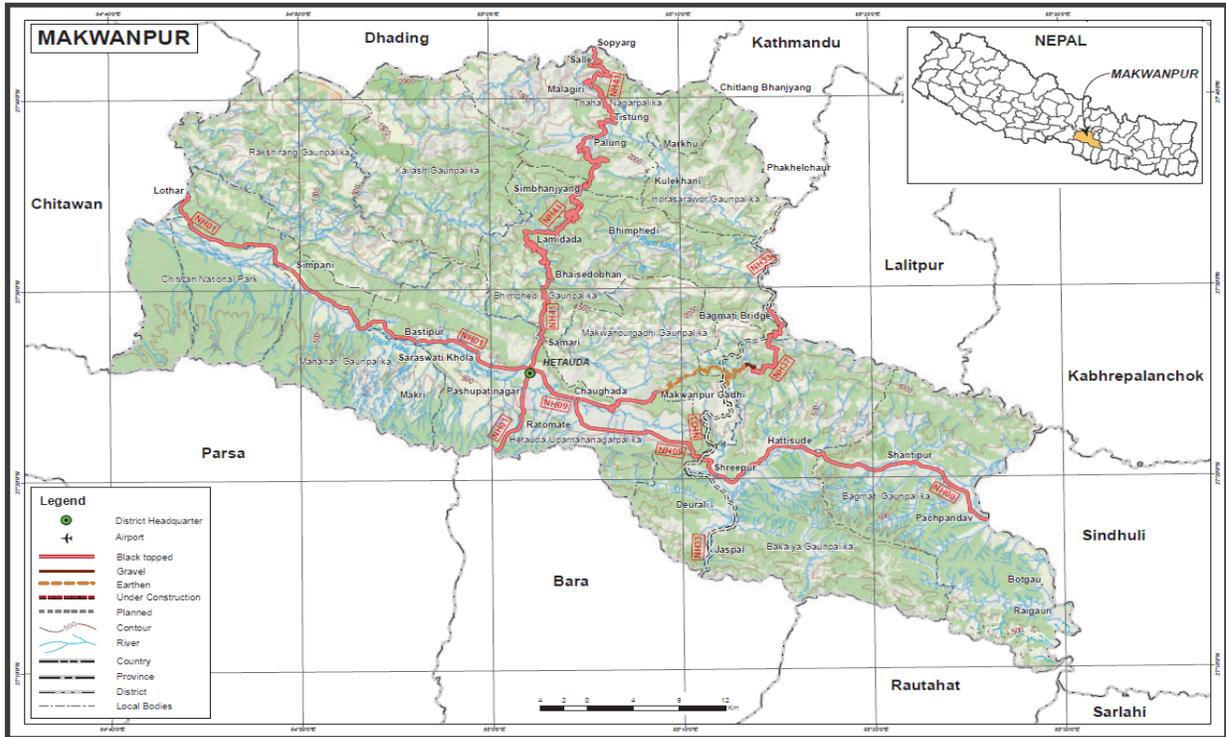
The federal government has also made provisions for minimum support price (MSP) for agricultural commodities like paddy, sugarcane, etc., but no such provision for fruit and vegetables exists. Several MOALD projects operate throughout the country and have played an important role in improving agricultural production/productivity and marketing. Prime Minister Agriculture Modernization Project and REED are two significant projects that have strengthened fruit and vegetable value chains and promoted regional agriculture markets. PMAMP seeks to modernize the agriculture sector in Nepal by improving agricultural production and productivity by providing necessary technology and inputs, as well as the mechanization and development of infrastructure for processing and marketing agricultural produce. Vegetable zones in Chitwan and Makwanpur encouraged farmers at various places to take up commercial vegetable farming, providing them with initial training and support with grants and subsidies for the modernization of farming. While the program has successfully improved the production and productivity of vegetables in the region, it has failed to adequately support marketing the commodities produced. While the PMAMP program on marketing ranged from creating market infrastructures like market sheds, cold storage, and ripening chambers to providing grants on delivery vehicles, it has failed to impact the aspect of marketing and value chain significantly. Much of the market infrastructure created by the project remained under-utilized as cooperatives and farmers groups who were provided with grants to build such infrastructure generally lacked the technical capacity to operate infrastructure such as cold storage on their own. Similarly, farmers were reluctant to practice proper grading and packaging because it does not fetch better prices even though more significant costs are incurred in the process. PMAMP Dhanusha has also failed to

create adequate market opportunities for mangoes and other commodities produced within its jurisdiction. While the production of mango has increased in the command area of the Mango Superzone in Dhanusha partially due to the support provided by the superzone, not much work has been done in marketing, value addition, and value chain strengthening. Apart from some help to reduce postharvest wastage through improved packaging on the plastic crates, there is very little effort on value addition through grading, processing, etc. While farmers and traders in the neighboring Siraha district have branded the mango produced in their district with relative success, Dhanusha has failed to achieve similar success.

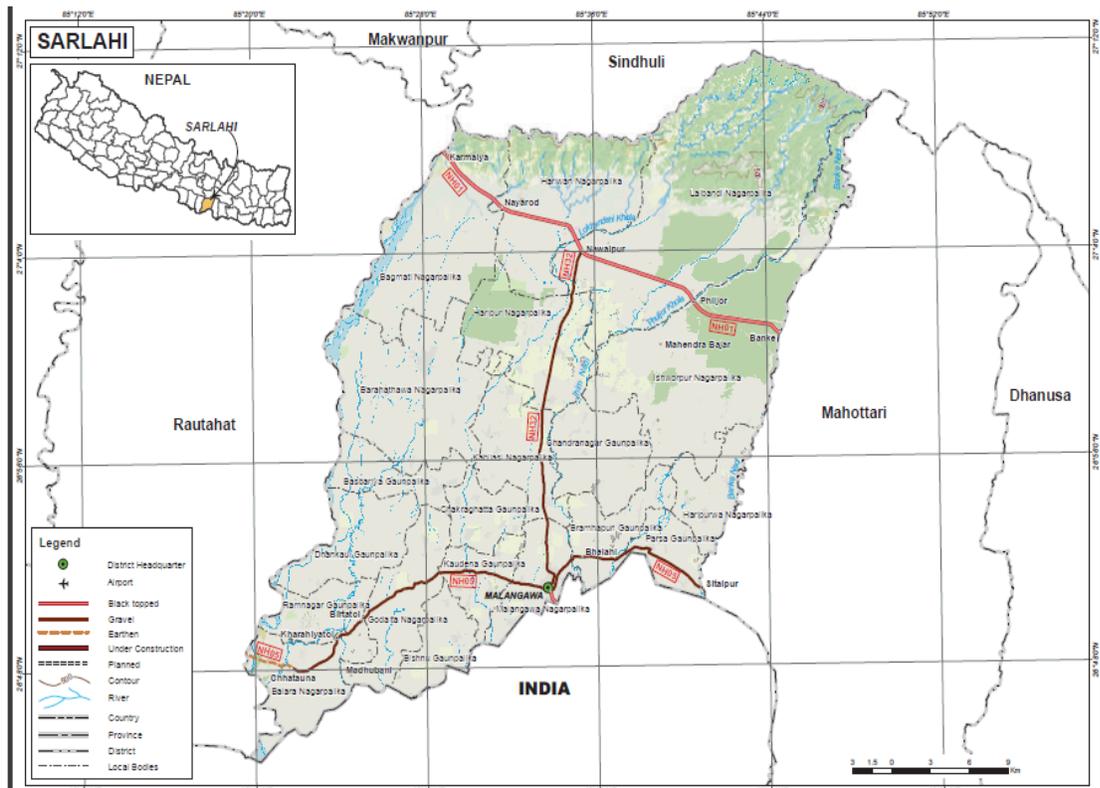
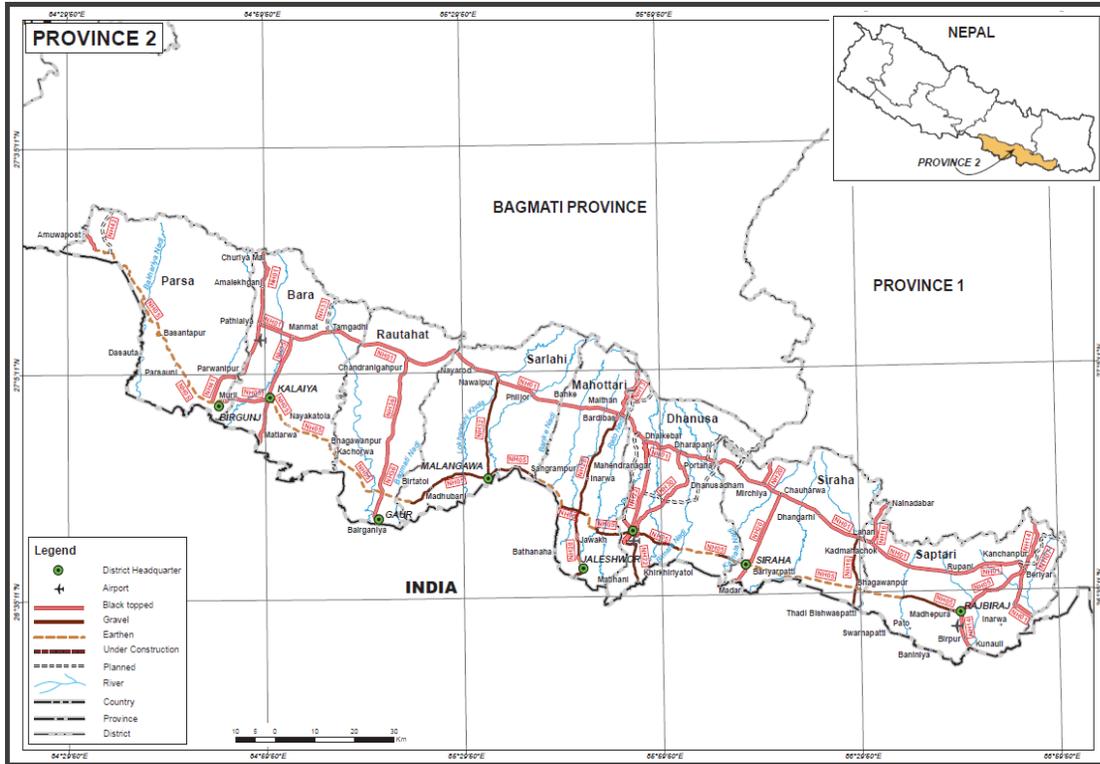
Similarly, the Rural Enterprise and Economic Development Project (REED) is another MOALD project that seeks to boost Nepal's agriculture sector by promoting market linkages and the rural entrepreneurship ecosystem in the federal structure. While the project was quite ambitious when it was initiated, delays in field implementation and low disbursement led to a revision of its objective after a mid-term review, reducing the number of beneficiaries and infrastructure to be created through the project. The components that aimed to restore and strengthen the food supply chain and local economy after the Covid-19 pandemic by creating and upgrading regional market centers and value chain infrastructures were dropped from the project completely. The restructured project seeks to strengthen market linkages through productive partnerships, providing start-up grants to farmers' groups, agriculture cooperatives, and agricultural firms based on their proposals. Similarly, the project aims to strengthen the entrepreneurial ecosystem in the federal structure through capacity building of provinces and local government and boost rural infrastructures. For this, the project is creating municipal agriculture centers, which will also ease the availability of agriculture inputs in the project area. In districts of Madhesh province, the REED Economic Corridor Office Bardibas has supported the building of Agriculture Service Centers in 35 municipalities¹⁰. While livestock production has been prioritized, around 25% of productive partnerships that provide start-up grants to cooperatives, farmer's groups, and firms are for fruit and vegetable production, mostly Banana, Cauliflower, Ole, Cabbage, and Mushroom. For those grants, producers apply along with the buyer of the produce, ensuring a market for the commodities produced.

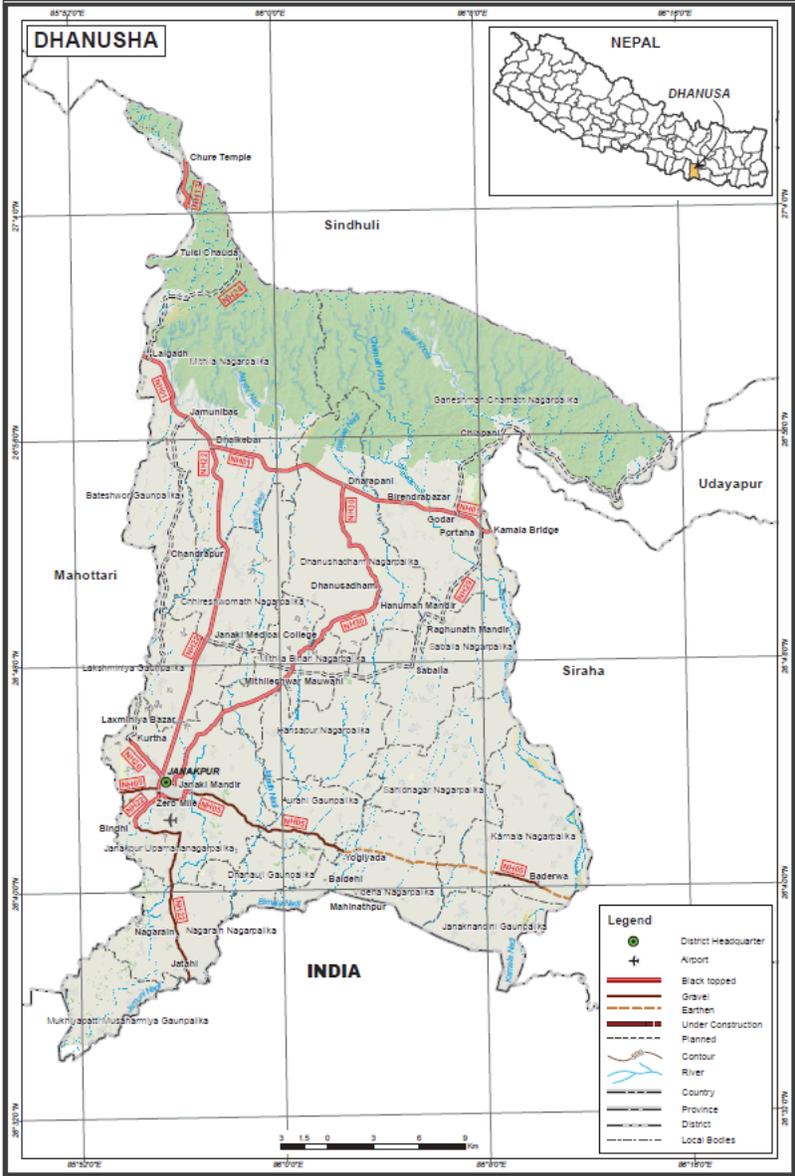
Appendix G: Maps of Bagmati province, Chitwan, and Makwanpur districts with road networks

¹⁰ Interview with an official in REED Bardibas office



Appendix H: Maps of Madhesh province, Sarlahi, and Dhanusha district with road networks





Appendix I: List of Cold stores in Bagmati Province (capable of storing apples at 0 degrees Celsius for 15 days)

S.N.	Name of Cold Storage	Address	Remarks
1.	Nuwakot Cold Storage Pvt. Ltd	Nuwakot	
2.	Himalaya Cold Storage Pvt. Ltd	Nuwakot	
3.	Devighat Cold Storage Pvt. Ltd	Nuwakot	
4.	Budhathoki Cold Storage Pvt. Ltd	Nagrajun-4, Sitapaila	
5.	Kohinoor Cold Storage Pvt. Ltd	Kathmandu-16, Balaju	

6.	Quality Cold Storage Pvt. Ltd	Kathmandu-16, Balaju	
7.	Himalayan Cold Storage	Bhaktapur-8, Bhaktapur	
8.	Bagmati Cold Store	Bhaktapur-8, Bhaktapur	
9.	Himshikhar Cold Store	Manohara-4, Kathmandu	
10.	Pradhan Cold Storage	Bharatpur-2, Chitwan	
11.	Chanuli Cooperative Cold Store	Bharatpur-20, Chitwan	
12.	Durga Cold Storage	Hetauda-10, Makwanpur	
13.	Sana Kishan Sahakari Cold Store	Hetauda-19, Makwanpur	
