GRAPE
Green Resilient Agricultural Productive Ecosystems

RAPID ASSESSMENT OF AGRICULTURE VALUE CHAINS

In Selected Municipalities of Karnali & Sudurpashchim Provinces

iDE Nepal

2022

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The GRAPE Project is jointly funded by the European Union (EU), the Ministry of Foreign Affairs of Finland and the German Federal Ministry for Economic Cooperation and Development (BMZ) and implemented by GIZ. LPED/GRAPE contributes to green, resilient, and inclusive development approach. GRAPE's mission is to promote climate-resilient, green economic growth in Karnali and Sudurpashchim provinces.

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A crop field at Bajura District, Karnali Province. By Shradha Bhatta.

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Kathmandu, 2022

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Thank you!

ABOUT IDE

iDE is a global team of 1,300 changemakers coming from diverse backgrounds within international development and the private sector. What we all have in common is the belief that one entrepreneur can change their community, and millions can change the world.

iDE Nepal creates income and livelihood opportunities for poor rural households.

iDE has worked in Nepal since 1992, from irrigation and good-quality seeds to, more recently, rural collection centers where farmers can sell their produce. We provide simple innovations that help rural communities get out of poverty and adapt to climate change.

We continue to develop low-cost, appropriate climate-smart technologies for smallholders, including crop science, integrated pest management (IPM), irrigation and water storage technologies and farm mechanization. iDE Nepal invests in the design and initial promotion of these technologies and engages local private sectors to ensure that the supply chain of these products is well established. iDE Nepal has been working towards promoting modernization and risk mitigation strategies throughout three thematic areas, including agriculture, water and sanitation (WASH) and access to finance.

iDE uses a human-centered design approach, focusing on market system creation, working to understand the dynamics of actors across the environment to build solutions and strategies that overcome issues and provides a roadmap for how individuals who seek to participate in the market can move through a process of growth, establishing profitable livelihoods.

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LIST OF ABBREVIATIONS

ABPSD	Agri-Business Promotion and Statistics Division
ADS	Agriculture Development Strategy
AKC	Agriculture Knowledge Center
ANSAB	Asia Network for Sustainable Agriculture and Bioresources
ASDP	Agriculture Sector Development Project
BMOs	Business Membership organizations
CBS	Central Bureau of Statistics
CDCAN	Central Dairy Co-operative Association Ltd. Nepal
COVID	Coronavirus Disease
CSA	Climate Smart Agriculture
DAGs	Disadvantaged Groups
DCCIs	District Chamber of Commerce and Industries
DDC	Dairy Development Corporation
DFO	District Forest Office
DFTQC	Department of Food Technology and Quality Control
DRR	Disaster Risk Response
EU	European Union
FGD	Focus Group Discussion
FGDs	Focus Group Discussions
FNCCI	Federation of Nepalese Chambers of Commerce and Industry
FY	Fiscal Year
GESI	Gender Equality and Social Inclusion
GRAPE	Green Resilient Agricultural Productive Ecosystems
HPPCL	Herbs Production and Processing Company Limited
INF	International Nepal Fellowship
JABAN	Jadibuti Association of Nepal
KII	Key Informant Interview
LPED	Local and Provincial Economic Development
MANE FILS	MANE Flavor & Fragrance Manufacturer
MoALD	Ministry of Livestock and Agriculture Development
MoFE	Ministry of Forest and Environment
MoICS	Ministry of Industry, Commerce and Supplies
MoLMAC	Ministry of Land Management, Agriculture & Cooperatives

MSD	Market Systems Development
MT	Metric Ton
NARC	Nepal Agriculture Research Council
NCDB	National Cooperative Development Board
NDDB	Nepal Dairy Development Board
NGO	Non-governmental Organization
NGPTA	Nepal Ginger Producers and Traders Association
NLBO	National Livestock Breeding Office
NPDP	National Potato Development Program
NTFPs	Non-timber Forest Products
NTIS	Nepal Trade Integration Strategy
PCR	Polymerase Chain Reaction
PH	Post-Harvest
PMAMP	Prime Minister Agri Modernization Project
PQPMC	Plant Quarantine and Pesticide Management Center
RM	Rural Municipality
RVWRMP	Rural Village Water Resources Management Project
SMP	Skimmed Milk Powder
SNF	Solid-Not-Fat
SWOT	Strength Weakness Opportunity and Threat
VC	Value Chain
VCA4D	Value Chain Analysis for Development
VHLSEC	Veterinary Health and Livestock Service Expert Center
WHO	World Health Organization

EXECUTIVE SUMMARY

The project is jointly funded by the European Union (EU), the Ministry of Foreign Affairs of Finland and the German Federal Ministry for Economic Cooperation and Development (BMZ) and implemented by GIZ. LPED-GRAPE contributes to green, resilient, and inclusive development approach. GRAPE's mission is to promote climate-resilient, green economic growth in *Karnali* and *Sudurpashchim* provinces. The initiative aims to strengthen Nepal's capacity to adapt agricultural practices best suited to climate change and ensure the participation of the socially disadvantaged groups in value chains that are incorporated into sustainable, climate-resilient agricultural ecosystems. iDE Nepal undertook this assessment to identify agriculture-based value chains that have highest market potential and support climate-resilient and water-efficient production practices. The assessment identified 11 value chains from a list of 29 in 19 selected municipalities of the *Karnali* and *Sudurpashchim* provinces. These 11 value chains—vegetables, potato, citrus, apple, walnut, ginger/turmeric, timur, indigenous crops, dairy, goat and honey—were selected based on their potential to provide increased and sustained income and benefits to the higher number of associated value chain actors.

The findings and recommendations from this report are expected to add value to the ongoing development of the LPED-GRAPE initiatives. Although the rapid assessment is based on an extensive desk review of project documents, publicly available data, and relevant secondary literatures, key informant interviews (KIIs) and focus group discussions (FGDs) with relevant stakeholders were carried out to analyze the field situation. The primary data collected from field interactions and observations was utilized to validate the secondary assessment findings and comprehend the existing conditions, challenges, constraints, and opportunities persistent to the selected value chains in respective municipalities.

The assessment focused on three broadly categorized value chain functions—core supporting services and business environment; as well as two cross-cutting considerations—gender equality and social inclusion (GESI) and climate and environment. The capacity, constraints, opportunities, and incentives for each category of actors involved in the value chain functions were analyzed in order to understand their growth drivers and strengths for leveraging the market resources and potentials.

Findings

The findings from the assessment show the growth and market potential of the selected value chains relating to their local and market contexts. Various factors are driving the growth of value chains. The most notable one has been the development of road corridors connecting rural municipalities with trading hubs thereby creating market opportunities for agricultural production and sales. Vegetables, potatoes, citrus, apple, walnut, dairy, goat, and indigenous crops, among the selected products, are mostly produced to cater to the local market demands. However, ginger/turmeric, honey, and timur have high export potential to the international markets although the volume of export is limited at present. Along with the potential to increase production and sales, numerous issues and challenges were uncovered at different levels of market functions pertaining to most of the selected value chains.

Most of the producers across the value chains face challenges of timely supply of quality inputs in desired quantity to boost the productivity and increase the output volume. Agricultural products do not meet even the local market demand, as production volume and productivity are low. Some of the major causes of low productivity identified during the assessment are absence of production methods resilient to climate change, new pests and diseases, limited irrigation supply, poor adoption of technologies and practices in farm management. Imports of agricultural products, corresponding to selected value chains, are high due to unmet local market demand. Yet the local products cannot compete with imported ones in terms of quality and price, which is primarily due to inadequate production and post-harvest practices. Apart from the on-farm challenges, there are several market-related issues, that includes limited market access due to poorly functioning collection centers, unorganized marketing channels, insufficient market information, monopolies of commission agents, and, on occasions, unavailability of transportation services.

The most potential value chain in each of 19 municipalities is presented in Table 1 below:

Table 1 Most potential value chain in each municipality

Municipality	Value chain
Birendranagar UM	Vegetable
Bheriganga UM	Goat
Barahtal RM	Goat
Bhagawatimai RM	Potato
Naumule RM	Goat
Bhairabi RM	Vegetable
Dullu UM	Citrus
Kharpunath RM	Vegetables
Simikot RM	Apple
Dhangadi UM	Vegetables
Godawari UM	Potato
Chure RM	Orange
Badikedhar RM	Goat
Jorayal RM	Vegetable
Amargadhi UM	Vegetable
Alital RM	Dairy
Swamikartik RM	Apple
Himal RM	Indigenous crops
Budhinanda UM	Potato

Vegetables [1] are among the most important value chains in Nepal, with over 78 percent of agricultural households growing varieties of vegetables for domestic consumption, contributing more than Rs 36 billion annually to the economy. Vegetables were one of the most common and high potential value chains found in all the assessment areas. Vegetable production can assist low-income households, generate significant income and benefit a large number of actors throughout the value chain. Existence of a reliable growing market, increased access to inputs, and support provided by the government and non-government organizations has been driving the sector's growth. Despite various supportive measures, volume of production is insufficient to meet local market demand of vegetables in all the municipalities. This means a substantial amount is still imported from other countries. Low yield, farmers limited to seasonal vegetable farming, unavailability of quality inputs, and difficult market access due to poor road and transportation in the high-hills and mountain regions remain the key challenges. Vegetables have been among the most attractive agriculture value chain for women. Women are not just involved in farming but are highly engaged in selling, and even processing. Many agriculture cooperatives and development programs have been encouraging women to engage in vegetable farming to secure their livelihoods.

Despite increases in production area and yield, **Potato** continues to be one of the Nepal's most imported food crops. Over the years, the need for potatoes for domestic consumption and industrial purposes has increased significantly. Only 20 percent of market demand is fulfilled by the domestic production. Increased market demand is the key driver to increase potato production and supply. However, local production is impeded by post-harvest losses due to a lack of transportation facility and proper storage, unavailability of seeds and fertilizers to scale up production, inadequate dedicated storage facilities, and rising production costs. The potential of potatoes to grow even in a harsh climate makes it a crop suitable for even most remote and marginal hills of the country, and therefore this value chain involves majority of the marginalized population. However, the production of potato is labor intensive and requires more physical work compared to other vegetables. In terms of impact of climate change, the higher amount of summer rain has been beneficial in cooling the soil and therefore increasing the productivity of potatoes in the mid-hills.

Oranges are among the most widely produced and commercialized **citrus** fruits in the assessment areas. Oranges from Kailali (*Chure*), *Dailekh*, *Dadeldhura* and *Bajura* account for most of the citrus fruit production and have a strong brand and market value. Citrus is a highly commercial product that can significantly contribute to increase income of the locals. As a result, producers are encouraged to expand its cultivation compared to vegetables and cereal crops. Interestingly, even though the production area is expanding, production volume of the fruit is declining. This is primarily due to chronic diseases brought by the climate change, poor orchard management, limited extension services, and substantial post-harvest losses. It is high time to follow climate adaptive measures to increase the productivity of citrus.

Road connectivity has been a major challenge to find better markets for the **Apples** produced in *Bajura* and *Humla*. Similarly, storage facility is important extend the shelf life of the apples. . Processing facilities are equally essential, particularly during the peak season when majority

1 For this assessment, the vegetables assessed were cauliflower, cabbage, tomato and beans.

of the produce is wasted as the local market can't consume the entire production. Given the availability of improved varieties and a stable market, many farmers are willing to expand their orchards. Apple's productivity as well as quality are susceptive to climate change. Therefore, this assessment has identified the need of climate adaptive farming methods and climate resilient varieties to tackle problems such as low productivity and declining quality of fruits.

After realizing the high monetary return and increasing market demand, **Walnut** producers have recently started to plant the commercial-grade, thin-shelled walnuts. This variety of walnut will bear fruit only after 3-4 years. As of now, hard-shelled nuts (non-commercial) are abundantly available compared to soft-shelled nuts. However, farmers are not interested to collect them due to unavailability of the processing technologies. There is enough land in the respective municipalities to expand commercial production of the thin-shelled walnut. Additionally, because motorways connecting local municipalities are under construction, there possibility of better market access soon.

Ginger/Turmeric is one of the most commercially attractive crops in the assessment areas providing income and employment opportunities to the marginalized people. But according to the assessment findings, ginger production trend is declining, while turmeric production has remained relatively stable over the last five years, due to disease and pest infection and decreased raw ginger export to India. While there is still a considerable demand for processed ginger (dries, *sutho*) in the international market, there are only a few processing enterprises that process ginger for export. It is therefore important to find market for ginger by encouraging processing. There is also a need to find for alternative markets India to sell raw and processed ginger, before increasing the production.

Timur can be a good source of income to the poor and landless as it is collected from state and community owned forests, and barren lands where it grows naturally. Karnali is one of Nepal's highest timur producing regions, contributing significantly to the country's export volume. On the other hand, timur production in *Sudurpashchim* is limited as people collect only during the season and only a small amount is sold in the market. Commercial timur plantation and production are necessary to meet increased international demand for raw timur, timur oil, and other timur based products. There is an opportunity for producers and traders to take advantage of the growing market demand. However, farmers/collectors struggle to scale up their collection due to unavailability of quality planting materials and modern harvesting tools.

Indigenous crops[2] native to the higher hills of Nepal including *Humla* and *Bajura* are gaining popularity among urban population within the country and beyond. These products grown in high hills of Nepal are considered to be much flavorful compared to other imported varieties of similar products. Despite the increasing demand, the production of these crops is declining due to low productivity because of poor seed quality, climate shifts, and inefficient production practices. Poor storage and post-harvest processes have made the shelf-life of the products shorter. If more marginalized communities involved in the production function of the value chain and undertake resource efficient production, it can promote economic growth and social and environmental sustainability even in the most remote municipalities of the project clusters.

Dairy involves a lot of actors in the chain , which provides space to create employment opportunities for women and other marginalized groups. Milk production has increased significantly in *Alital* rural municipality of *Dadheldhura* cluster. *Surkhet* on the other hand contributes 21 percent to the province's total milk production. The milk collected from these clusters has local as well as national markets, as it is supplied to dairy processors in Pokhara and Kathmandu in some cases. Access to markets due to the roads connecting the municipalities, easy access to inputs, advisory services, and market information has highly encouraged dairy farmers to produce more milk. However, farmers have limited understanding of forage varieties to increase milk production. Dairy product diversification at the municipal level is minimal confining the value chain potential to raw milk supply at small-scale local markets.

Honey production, which was increasing till 2014, has been stagnant ever since. There was no large-scale commercial production in the

2 Indigenous crops include barley, millet, buckwheat, and beans.

assessment areas, but some areas like Dojhang in *Humla* and *Chure* in *Kailali* were identified as potential for honey production, due to a conducive natural environment for beekeeping. Inadequate support to research programs, poor quality management, colony migration, inadequate processing and product diversification are identified as key constraints to increased honey production in the assessment areas. Producers are not fully aware of the need to start climate adaptive beekeeping practice to increase productivity. In addition, overuse of pesticides in other crop production has an adverse effect on beekeeping. Despite trade barriers for export, honey from mountain regions like *Humla*, is recognized as a medicinal product and fetches a premium price in the market.

The growing demand for **goat** meat has brought plenty of opportunities to commercial goat farmers. Almost every rural household in Nepal rear goat as it provides significant return with little investment. Bheriganga, Barahtaal, Naumule, and Badikedar municipalities have high potential in goat production due to availability of abundant grazing areas and access to forests for fodder. Farmers rely on private agrovets and government veterinary clinics for inputs like medicines, feed additives and technical services while forests are the primary source of goat fodder. Although most municipalities have allocated a significant portion of their agriculture budget to goat farming, commercialization appears to be slower than deemed. Commercialization can increase income of goat value chain actors with effective disease control mechanisms, improved feed composition, and access to and management of high meat yielding breeds. Traditionally, goat rearing has been recognized as women led farming profession in Nepal, with all the decisions of income and spending made by women. However, with commercialization taking place, larger goat farms, though owned by women[3], are mostly managed by men, and the decisions are also taken by men.

The issues of **Gender equality and social inclusion (GESI)** varies in different value chains and geographic clusters, indicating exclusions in terms of the caste system, gender, ethnicity, and disability in some cases. There are also informal and inexplicit exclusions due to feudalism and patriarchy which influence the social mobility, health, and wellbeing of the local people. In the last decade, increasing migration of male members of the family to foreign employment has increased women's participation in agriculture in Nepal and has led to the "feminization of agriculture". Among the value chains, small scale goat rearing has been traditionally led by women. However, it was also found that as the farms commercialize, the decisions of production, sales, and even farm management shift to men. Commercial vegetable farming on the other hand has been attracting women farmers due to lesser land requirement compared to other value chains. Despite increasing participation, marginalized women still possess limited access to economic activities and low influence in decision making. Efforts have been made by the government and development agencies to increase engagement of women in decision making roles through many incentives and opportunities at women cooperatives. There are only a few programs and opportunities for people with disabilities in agriculture sector. To create an inclusive agriculture, LPED/GRAPE needs to ensure effective participation of marginalized groups; orientate inclusive demand-responsive agriculture practices to both marginalized and power holders, enhance business negotiation skills. It is important to design and incentivize both 'farm' and 'off-farm' activities that are compatible to women and people with disabilities. Additionally, LPED/GRAPE needs to ensure strong incorporation of GESI activities and strengthen financial management capacity of the marginalized groups.

Climate change has posed many problems and prevented farmers from scaling up their production. For example, increased disease and pests in citrus and vegetables have been observed; changes in vegetation and livestock feed have slowed the growth rates and milk production volume; and migration of bees due to excess heat or cold temperatures has reduced the reproduction of bees and honey production. Disruption of roads due to floods and landslides caused by excessive rainfall has also hindered the transportation of goods including agricultural products and inputs. Adoption of climate-smart practices and technologies as referred to in this assessment findings and recommendations are

3 Most commercial farms are registered in the name of women because of the availability of subsidies and subsidized loans for women led businesses.

needed to combat climate change-related challenges and enhance climate resilience.

Potential intervention areas

Given the identified market drivers, key leverage points and existing challenges, the following intervention areas are recommended to address constraints and challenges, and facilitate the growth of selected value chains in the respective municipalities:

- Strengthen the **capacity of input suppliers** (quality, quantity) and ensure timely supply of the inputs in project clusters. This intervention aims to increase the production and supply of high-quality inputs by increasing the capacity of existing input suppliers. It will also contribute in the research and development of new varieties that provide higher yields and are more climate-resistant. The main goal is to provide producers with timely high-quality inputs that will help them produce more, meet market demand, and increase their incomes.
- **Improve producers' capacity** (technical skills and business orientation) to increase production, productivity and follow demand-responsive production patterns. The goal of this intervention is to build farmers' knowledge and skills related to Good Agricultural Practices (GAP) for demand-based production, reduce post-harvest loss, and increase the competitiveness of their products. Identified stakeholders will provide technical knowledge to producers through technical service providers or government extension workers. They will disseminate information like what to grow, when to grow, how much to grow, how to reduce post-harvest loss, how to gain economies of scale, and how to fetch appropriate market price for the product. Producers are incentivized to align their cultivation practices based on such information and increase their income.
- **Promotion of low-cost (efficient) storage technology/practices suitable for local context.** Existing local storage facilities are inadequate to store products for an extended period while maintaining the quality. Producers cannot store their products during the flush season barring them from selling it during the lean season, when market demand is high, and supply is low. Existing warehouses or storage units needs upgradation while there is also demand for new storage that meets the local needs and are affordable. Low cost, zero energy storage systems can encourage producers to increase production and traders to collect more locally produced items.
- **Build the capacity of the existing processing companies** and provide technical skills as well as business-related knowledge to the companies willing to start a processing business. In general, the look, standardized packaging, labelling, and quality of Nepali agro-processed products are inferior to imported ones. There is little uniformity in product quality in terms of flavor and contents. Enterprises need technical assistance to maintain quality control, improve packaging, get certification, and scale up. Private service providers might also need incentives to expand their operations in the target areas and assist processors in scaling up their business. Cross-learning and skill sharing of better processing practices from across the country can be promoted in the project clusters.
- **Introduce climate-smart technologies** to minimize the effect of climate change and/or help actors adapt to changing environment. Climate-smart agricultural technologies such as mulching, drip irrigation, semi-protected house cultivation, climate adaptive seeds and saplings are required to mitigate the negative effects of climate change. These technologies are not only for addressing environmental change and build resilience against climate hazards but also to increase production volume and productivity.
- **Improve the existing trade linkage** to bring the market down to the producer's level for improving producer's access to the output market. In the assessment areas, a sustainable market linkage can be built either through establishing commercial pockets or building reliable trade networks. These networks will help to build a sustainable market for the producers, encouraging them towards commercial production.
- **Improve information sharing mechanisms through promotion of ICT** or digital technologies among the value chain actors. Digital technologies in agriculture are used for information dissemination on cultivation practices, disease and pest management, product tracing (blockchain) and financial services. Even if the number of service providers is limited and concentrated around Kathmandu and urban areas, these service providers can be incentivized to expand their services in the rural markets. Local

governments and other enablers can also collaborate with digital service providers to incorporate these technologies into their information generation and dissemination systems and thus link them to support in value chain development.

- **Design financial and insurance products that are more suitable to farmers** and service providers. Customized loan products for small scale farmers are unavailable due to the small loan size, repayment risk, and high operating costs for service providers. Measures to reduce the risk of repayment, on the other hand, will make banks and financial institutions more inclined to lend to producers and agri-businesses. Various stakeholder meetings and customized programs can be organized to bridge the information and knowledge gap between BFIs, producers, agribusiness, and other relevant stakeholders, facilitating effective access to finance. Financial institutions can help develop appropriate loan products or scale-up/diversify existing products/services. Similarly, agri-insurance is not well adopted despite the incentives from government. Both farmers and insurance companies find agri-insurance not beneficial. Insurance products that can address the changes in environment, and stronger monitoring mechanisms can make the products more attractive to both parties.
- **Introduce better agri-logistics service** and service providers in the assessment areas. Farmers and traders in the hills, upper hills and mountain regions face numerous challenges due to lack of dedicated logistics service providers. Piloting new service models with dedicated transport service providers in the assessment areas can provide better and safer transportation of agricultural produce. In places where dedicated transport service providers are not feasible, dedicated space for agri-products in public transport could be more reliable, as reasonable rates would be set, and producers and traders would be able to transport their products at affordable rate. The transport services along with improved packaging technology/practices can help in reduction of losses during transport.
- **Improve availability of agri-machineries and technologies** that are affordable, effective and efficient to target clusters and value chains. Though there have been many efforts from the government and non-government agencies to promote mechanized technologies like tillers, sowers, and harvesters, the effectiveness and feasibility at target areas have not been seen. Moreover, many agri-machines are heavy and not user-friendly to women producers. Customized agri-machineries that suit the requirements of the value chain, geography, topography, are required, such as small hand-held tillers and other customized tillers.
- **Facilitate to create an inclusive and relevant business environment** that is accessible to all actors involved in the value chain. Some of the key issues raised during the assessment by relevant value chain actors in terms of business environment included limited accessibility to incentives and provisions provided by the government on agriculture and business; dependency on subsidized products among farmers and lower efficiency due to lack of ownership of the subsidized products; private market actors compelled to compete with subsidized products leading to reduced market opportunity; limited platforms for actors of the value chain to network for idea and information sharing; and limited coordination among government agencies and private companies to scale up seed production and technology transfer. It is important to create The creation of a conducive business environment that can promote incentives from enablers without distorting markets for private businesses (rather involving private businesses in their subsidy model); an inclusive platform led by market actors that can gather ideas, , problems and information from all levels of actors and coordinate among public and private actors for promoting value chain is strongly recommended (example; stakeholder forums of specific value chains that may be hosted by associations or business membership organizations).

The interventions suggested above are expected to expand economic opportunities for low-income producers, improve agricultural productivity, and strengthen existing value chain linkages, benefiting all market actors involved. To bring changes in the market system, involvement of all market actors, service providers and enablers is required while executing the above interventions. The assessment findings show an increasing dependence of producers on assistance from government and development programs which can distort the market and disincentivize private

sector engagement. Private sector led development is vital to the sustainable growth of any market systems. Therefore, a balance between government's engagement and market forces is required for the sustainable growth of these selected value chains. Also, the implementation of the above-mentioned interventions will require considerable engagement of additional market actors and facilitators, particularly from the private sector followed by local entities, associations, and donor organizations with similar goals, as well as the support of the federal government for effective implementation.

BACKGROUND

Around two-third of the rural population of Nepal continues to remain either actively involved or reliant on agriculture for income generation despite the transformation of economic structure from subsistence agriculture to services and industries. Nepal is home to a wide range of agri-businesses, from small family-run businesses to major companies employing hundreds of people. The sustainability and growth of commercialized agriculture in Nepal depends on the expansion of small, medium, and large businesses that employ more than just family members. In Nepal, the emergence of such a commercial agri-enterprise model is still in its early stages, particularly in rural areas. Even successfully operating value chains face challenges that hinder their optimal productivity and development, particularly in terms of industry knowledge and overall integration.

While farmers continue with indigenous farming methods, producers and buyers have limited information about the value scope, processing and marketing. This is primarily due to the limited coordination between various actors within the value chains. Enhanced agricultural practices alone is not enough to elevate existing small-scale agriculture to a more advanced level. Lately, attention has shifted from farming systems to targeting agricultural value chains to promote smallholder production and engagement at the market level. The value chain context, however, should be carefully studied and analysed before adopting interventions to ensure meaningful and sustainable impact.

iDE Nepal contributes with the understanding of value chains to create knowledge in Nepal and supports the sustainable and inclusive development of value chains as well as supports the analytical capabilities of national colleges and universities.

Local and Provincial Economic Development (LPED) / Green Resilient Agricultural Productive Ecosystems (GRAPE) is a development cooperation initiative that contributes to the green, resilient, and inclusive development approach. As such GRAPE is designed to foster climate-resilient, green economic growth of Karnali and *Sudurpashchim* provinces. Under this objective, the initiative will support Nepal's ability to adapt agricultural practices to climate change and strengthen the income generation of marginalized households. Socially disadvantaged groups and women, in particular, will benefit from strengthened participation in value chains, which are integrated into sustainable and climate-resilient agricultural ecosystems.

iDE Nepal conducted this assessment to assess and analyze different types of value chains ranging from production to engagement of various levels of market actors in 19 municipalities of *Karnali* and *Sudurpashchim* provinces. The assessment concentrated on the collection of the ground-level information and identified the high potential agriculture-based value chains with the highest market potential and need for climate-resilient and water-efficient production approaches.

OBJECTIVES OF THE ASSESSMENT

The objective of this assessment is to identify agriculture-based value chains with the high market potential and need for climate-resilient and water-efficient production approaches, in the LPED/GRAPE project clusters by conducting a **rapid assessment of the value chains**. The specific objectives of the assessment are to understand;

- ✓ The contribution of the value chain towards economic growth.
- ✓ If the economic growth contributed by specific value chains include gender, social inclusion, people with disability, and disaster risk reduction (DRR) aspects.
- ✓ The social feasibility of the value chains and their functions.
- ✓ The sustainability of value chains in terms of climate and environment.
- ✓ The agriculture value chains with high potential in the identified clusters.
- ✓ The growth potential and challenges, in light of climate change and inclusion of disadvantaged groups.

SCOPE OF THE ASSESSMENT

A rapid assessment was conducted in 19 municipalities of terai/inner terai/*Chure*, mid-hills and high mountain clusters of both the Karnali and *Sudurpashchim* provinces. The service providers determined the highest potential value chains for the clusters using a participatory field-based method, and undertook a rapid appraisal of the

identified value chains, encompassing the following components to achieve the objective:

- Determine the most viable value chains for the selected municipalities based on the agreed-upon parameters, taking into account the three key aspects of sustainability (economic, environmental, and social).
- Administer analysis for key functions of each of the selected value chains in each municipality, and value chain analysis for GRAPE clusters, as relevant and feasible.
- Evaluate the vertical and horizontal relationships between value chain actors and stakeholders, and the possibility for collaborations.
- Assess the value chain's supporting services, including both existent and deficient support functions (e.g., infrastructure, information, and related services).
- Analyse the supply and demand of the commodity along with market dynamics.
- Explore the effects of climate change on every value chains.
- Evaluate the selected value chains from the perspectives of gender, social inclusion and disabilities.
- Suggest ways to create competitive advantages of the value chains in the context of climate change and local socio-economic conditions.
- Determine the areas that demand in-depth assessment in the future.

The current situation, constraints, challenges, and most importantly, the growth potential of the actors along the value chain are the main emphasis of this assessment. The assessment strives to include all the value chain actors and is not biased towards any one group or community. The major factor driving value chain growth is market actors' commercial incentives which sometimes exclude the marginalized community. The assessment focuses mostly on market systems, of which targeted groups (producers) make up a small, yet important, segment. As a result, the recommended interventions may not be solely aimed at beneficiaries, but rather, are designed to make the market systems more inclusive for beneficiaries.

Area and location

The rapid value chain assessment was conducted in the identified urban and rural municipalities of six clusters in *Karnali* and *Sudurpashchim* provinces.

***Karnali* Province:**

Cluster 1: Birendranagar Urban Municipality (UM), Bheriganga UM, Barahtal Rural Municipality (RM),

Cluster 2: Dullu UM, Bhagawatimai RM, Naumule RM, Bhairabi RM,

Cluster 3: Kharpunath RM, Simkot RM

***Sudurpashchim* Province:**

Cluster 4: Dhangadi UM, Godawari UM, *Chure* RM,

Cluster 5: Aalital UM, Amargadhi UM, Badikedhar RM, Jorayal RM,

Cluster 6: Himali RM, Swamikartik RM and Budinanda UM

NOTES FOR THE READERS:

This report is prepared after a rapid assessment of the value chains, with additional information sourced from secondary sources.

- ✓ Field assessment was primarily used for validation of the findings from the desk assessment/research.
- ✓ The field assessment team only had limited hands-on previous experience on value chain approach. The core team leading the assessment however provided an orientation to the research assistants and maintained regular contact with field researchers even when not present in the field.
- ✓ Statistical data of specific value chains could be obtained only for national, provincial, and district levels. Municipality level data could not be obtained during the time of assessment.
- ✓ While a limited sample size was covered, the team ensured representation of all types of actors in the value chains in every cluster. As a result, the findings are reasonably representative but may need deeper analysis.

METHODOLOGY

The target group for LPED/GRAPE are socially excluded group and women, and they have been identified as the target beneficiaries of this assessment. Hence, the assessment framework was designed to capture the challenges and opportunities of the agriculture value chains to benefit the target groups from the 19 municipalities of *Sudurpashchim* and Karnali Provinces. The assessment is based on the secondary data received from literature review, and from primary data collected through field assessment of each municipality. The secondary and primary information were cross validated for detailed assessment of the value chains in relevant clusters. The assessment was carried out between February to May 2022, by following the steps illustrated in Figure 1 below.

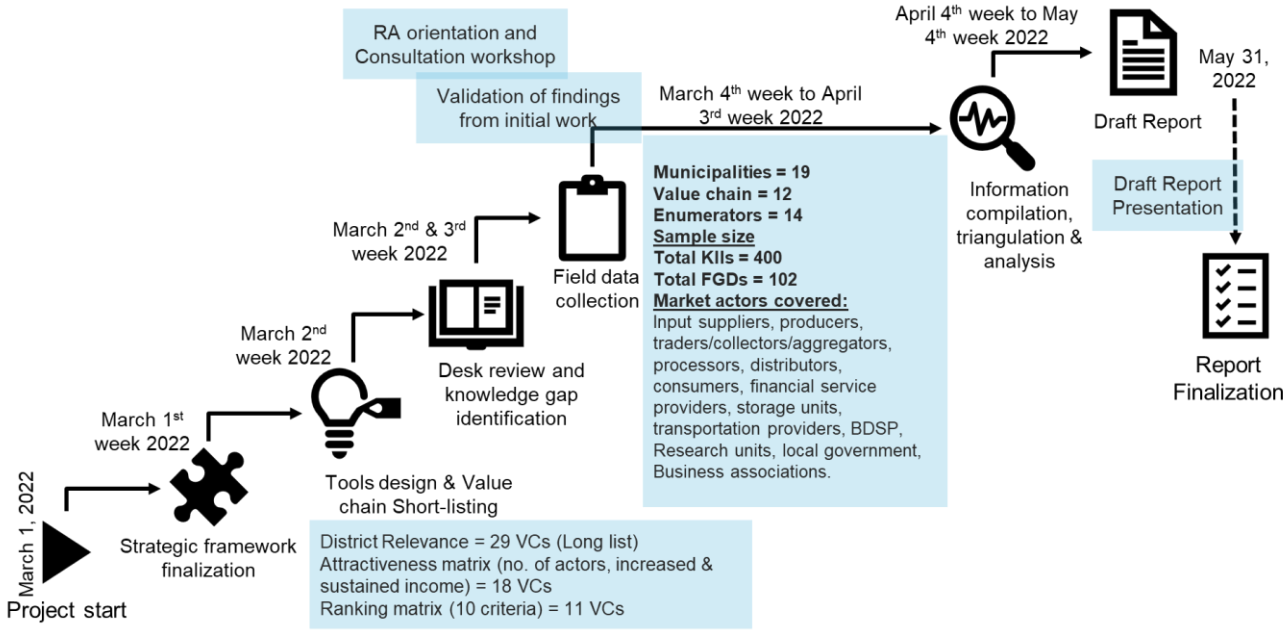


Figure 1 Steps and methodology of the assessment

VALUE CHAIN LONGLISTING AND SHORTLISTING

The assessment was initiated with a long list of 29 value chains that demonstrated the highest potential for income and employment opportunities in the pre-identified assessment area. The long list was identified using the information from the literature review, consultation with various stakeholders, government planning and budget allocation, and the value chain listing exercise. The value chains were selected based on their relevance to the target group, production trends, supply and demand trends, and growth potential. To narrow down the list of potential value chains, three matrices were used—district relevance, attractiveness and the ranking as described below.

Long list of value chains:

Potato, Vegetables (Cauliflower, cabbage, tomato, pea, bean), Paddy, Goat, Vegetable Seeds, Citrus Fruits, Maize, Buckwheat, Millet, Barley, Indigenous crops (Chino, Kaguno, Marsi), Soyabean, Maize Seeds, Ginger/Turmeric, Chilli, Mustard, Timur, Honey, Milk, Apple, Walnut, Banana, Sugarcane, Olive, Beans, Jorayal, Rice, Onion, Garlic, Allo.

ATTRACTIVENESS MATRIX

Attractiveness matrix indicates how convenient or difficult it is for a value chain to have a competitive advantage. The matrix uses the number of smallholders and other market actors involved in the value chain, and the potential of the value chain for increased and sustained income, as the key criteria for short listing.

Greater number of smallholders farmers and market actors involved in a value chain means it can benefit more people. Similarly, if a value chain has possibilities of increased and sustained income, it will provide better economic opportunities for the actors involved in it, giving the value chain and its actors a competitive advantage. The attractiveness of value chains was measured with the focus on how the market system will change in the long run rather than just in the immediate future dependent on the two above-mentioned parameters.

Figure 2 Tools used for shortlisting value chains

In the Figure 3, the value chains placed on the dark shaded region are considered first priority, while those on the lightly shaded region are second priority, and the remainder on the non-shaded regions are the third priority.

A total of 18 value chains from the dark (high priority) and light (low priority) shaded boxes were selected using the attractiveness matrix.

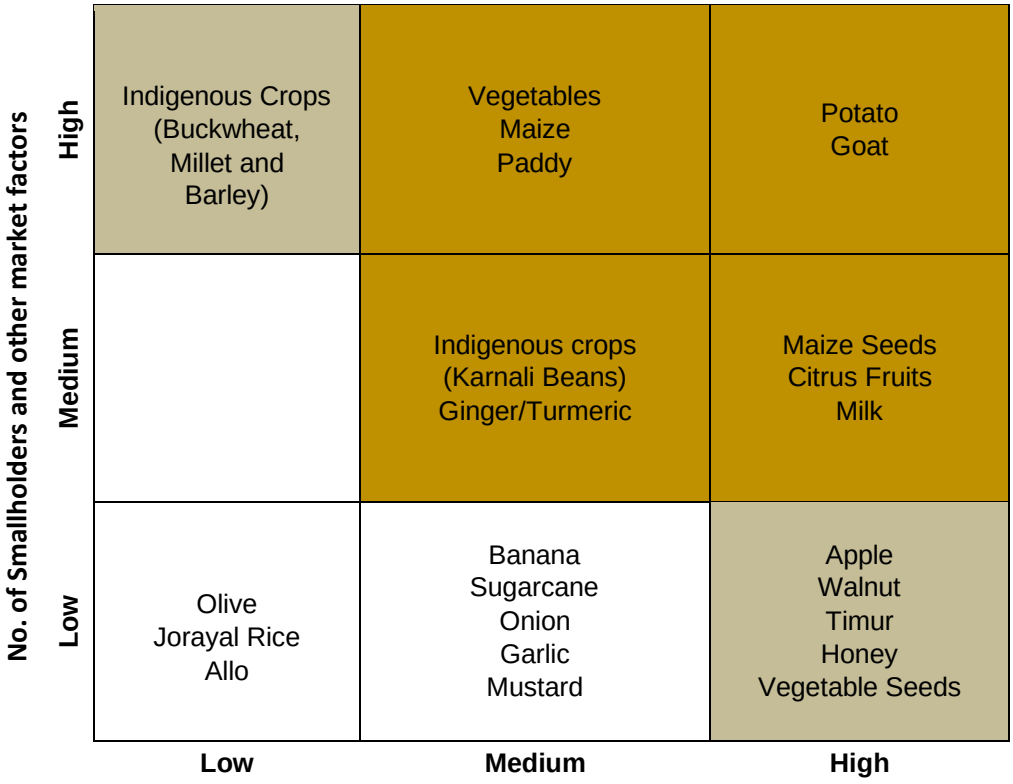


Figure 3 Value chains in attractiveness matrix

RANKING MATRIX

The 18 value chains shortlisted from the attractiveness matrix were further assessed in the Ranking Matrix, that used a numeric scoring for 10 different indicators of sustainability under broader economic, social, and environmental criteria. Weights were assigned in each criterion according to their relevance and importance for value chain selection. In theory, the value chain with the greatest score has the best chance of meeting the above criterion.

The ranking matrix with weights is represented in the table below.

Table 2 Selection criteria of the ranking matrix

Category of selection criteria		Selection criteria	Weight
Economic Sustainability	**Growth potential**	1. Strength of demand and supply side growth / improvement potential	5.0
		2. Value addition opportunities	4.0
		3. Investment Potential (Existing and Future Potential)	3.0
	Feasibility of MSD approach	4. Presence of enough private and public sector actors and service providers/ Presence of 'lead firms' and appropriate incentives	4.0
		5. Comparative advantage of the VC	3.0
		6. Alignment with government plans and policies	2.0
Social Sustainability	**Relevance**	7. Potential to create jobs across the value chain and impact incomes	5.0
		8. Relevance for poor and marginalized, women, minorities, and people with disabilities (relevance also signifies inclusion)	3.0
		9. Risk of increasing women's workload	2.0
Environmental Sustainability	**Environmental Impact**	10. Has less negative impact on the soil and environment.	2.0
		11. VC has resource-efficient production (use of less water, chemical fertilisers etc.)	2.0
		Total	35.0

The value chains scoring more than 80 percent in the ranking matrix were selected for detailed assessment. Among the 18 value chains, 11 value chains were short listed for assessment, which were; vegetable, potato, citrus, apple, walnut, ginger/turmeric, indigenous crops, dairy, honey and goat.

RAPID ASSESSMENT OF SHORTLISTED VALUE CHAINS

The 11 short listed value chains were taken for rapid assessment, and their relevance to each cluster were validated during the cluster level stakeholder workshop.

Field assessment was conducted immediately after the stakeholder consultation workshops. The field assessment team comprised of research coordinators and research associates who visited each municipality to validate and gather additional information from the field. The team conducted interaction meetings with the local government stakeholders, private sector actors, producers/collectors, and other related value chain actors.

Field data collection and consultative meetings in each municipality were considered crucial for finding out local situation and preparing the GRAPE project for implementing value chain development interventions. Local government stakeholders, private sector actors, farmers, and other related value chain actors were invited in these meetings. The stakeholder consultation meeting is a crucial part of the assessment and is conducted with a twofold strategy—to gather the

information needed for the value chain assessment and validate initial findings as well as creating awareness, and far as possible inculcating ownership among the stakeholders on identified challenges and potential activities for leveraging the opportunities during upcoming GRAPE project implementation. Field findings helped to establish a clear actor-centric function-wise market system map, their constraints/opportunities, and required interventions of the value chains in question. The assessment of the value chain was driven by the strategic framework of market system mapping illustrated in Figure 2 below.

Strategic Framework of Market System Mapping

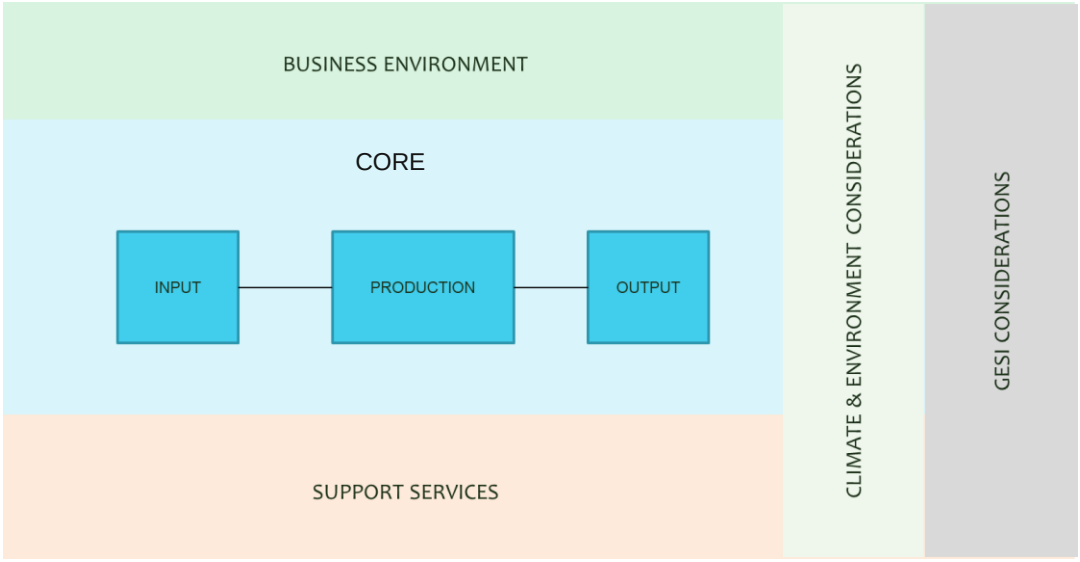


Figure 4 Strategic framework of market system mapping

The market systems map is fundamental to market systems analysis as it is the way of systemic thinking that helps to break down each key element and function of the market system to investigate, understand and address the root causes of the failure or underperformance and identify areas for interventions. The market systems map imitates engineering of the market functions, key actors and stakeholders, and their relationships. It shows how the product, process, and services flow horizontally and vertically to make the system functional. The vertical linkage between actors and support functions is necessary to ensure the movement of the product to the end market and benefiting the actors involved within the chain. Similarly, horizontal linkages within the core market function make the pathway smooth by creating an environment favourable for the actors to operate effectively.

For this assessment, the agriculture market systems of different sectors in the selected municipalities were investigated under three broad categories of key functions of the value chain--core function, supporting services, and business environment. Cross-cutting functions including GESI, and climate and environment were also analysed as part of the assessment in each function. A brief description of each category of key functions is provided below.

Core:
The core shows the trajectory of the product flow, from inputs, production, collection, and other processes until it reaches the end consumer. It also depicts the relationships between market actors and the interdependencies among each actor involved in input, production, and output. We can define interdependence as the relationship between producers, buyers, and sellers who are linked together by functions, incentives, and benefits and whose behaviour changes depending on their roles, motives, and capabilities. In the end, this behaviour change regulates the product availability, quality, market price, consumer choice, services and facilitations required. The three key functions under the core category are defined as follows:

Input: It helps to map out the actors involved in the supply of inputs required for production, along with understanding the dynamics of input supply, input suppliers, and the market, which is essential

to understand as it provides necessary ingredients to the whole production process.

Production: The production function generally depicts the picture of how the production process is going on, what are the driving factors of production, how the inputs (materials and technical knowledge) are utilized, and how producers economically benefit from this.

Output: The output function incorporates a series of other processes after production (immediately after post-harvesting) which could be collection, trading, processing, distribution, and sales. This series might change depending on the dynamics of the value chain. It maps the actors, their activities at different levels along with their interrelationships, both forward and backward.

Support Services:
Proper functioning of value chains depends on several services related to soft-skills, resources and infrastructures that support the functioning of the value chain actors. The providers of these services, resources, and infrastructure have business models and perform their business activities for commercial incentives. These functions are vital for the activities to operate effectively at core market function level. Some examples of supporting services include transportation, financing, research and development which can serve more than one actor and contribute to one or many functions in the core chain activities.

Business Environment:
The external business environment is a crucial factor that can enable or disable the functioning of the actors within the market systems. Since the actors involved in core and support services are business entities, they can be influenced by a change in the business environment (laws, regulations, standards, social rules, and behaviours that influence when, where and how exchanges take place).

Government agencies, development organizations, civil society organizations, business associations and other associations are the most common enablers which create and enforce rules, regulations, and policies to facilitate business processes and advocate for the rightful distribution of benefits to all groups and people engaged in the respective market system. The actors in the business environment function category do not operate for commercial incentives, but rather possess institutional or regulatory responsibilities to enhance performance of the market system to make it more competitive.

While assessing the market system, it is critical to identify factors limiting and supporting market actors as they strive to reach their full potential. As such the existing capacity, opportunities, and incentives of market actors in value chains is assessed to understand drivers of growth while being mindful of leverage points needed to utilise the capacity and opportunity markets present. On the other hand, constraining factors of growth are identified with improvement requirements in the existing functions, services, and business environment.

Cross cutting factors:

Gender Equality and Social Inclusion
An inclusive market system means that vulnerable and disadvantaged groups can reap equal benefits as other market actors by being part of the market systems. It is therefore critical to observe the changing roles and dynamics of these groups, how they played their roles, and how they change. Identification of potential opportunities to ensure the inclusion and increase the involvement of these groups in various functions of the value chains will be more relevant after understanding their current roles and dynamics. Benefits to the group can include better income and employment opportunities, food and nutritional security, or resilience against economic vulnerability.

Climate and Environment
Global warming and climate change pose a direct threat to agricultural value chains. At the same time harmful farming practices have continued to jeopardise ecosystems. Natural resource-based market systems, particularly agricultural value chains fuelled by food and nutritional security, are most sensitive to the immediate consequences of climate change. Acknowledgement of how climate change affects the various value chains and operations of a market system is critical for developing climate resilience and ensuring that the VC is to a maximum degree adapted to climate change according to the current availability of technology and research.

When assessing value chains, interconnection between the social, environmental, and economical factors are also assessed in order to gain information on the impact of these factors in the value chain. Understanding the interconnection helps to strategize in a way to identify constraints, minimize threats and maximize opportunities within the value chain.

STAKEHOLDER CONSULTATION

Stakeholder consultation workshops were organised in every cluster after the shortlisting exercise. The main objective of the consultation workshops with relevant value chain stakeholders was to present the shortlisted value chain and seek validation from the respective stakeholders. The stakeholders consisted of representatives from municipality, local government, chamber of commerce and industry, lead farmers/producer group, and lead actors/influencers in the agriculture value chain. The idea of the consultations was also to discuss the important, but missing value chains in the shortlist that needed prioritization in respective municipalities.

The consultation workshops provided an idea and understanding related to the important actors, market centres and trade routes, and helped the team to prioritise the value chains according to the assessment clusters and municipalities, as depicted in Table 4. Additionally, the workshop also identified an additional value chain--onion and garlic for detailed assessment in the clusters.

Table 3 List of value chains and their relevance to each cluster

Final List of Value Chains for assessment				
	District	**Municipalities**	**Number of Value Chains**	**List of Value Chains**
Cluster 1	*Surkhet*	Birendranagar UM Bheriganga UM Barahtal RM	7	**Potato, Vegetables, Citrus, Ginger/Turmeric, Dairy, Honey, Goat**
Cluster 2	Dailkeh	Bhagawatimai RM Naumule RM Bhairabi RM	7	**Potato, Vegetables, Citrus, Ginger/Turmeric, Onion and Garlic, Timur, Goat**
Cluster 4	*Kailali*	Dhangadi UM Godawari M *Chure* RM	4	**Potato, Vegetables, Honey, Onion and Garlic, Citrus, Honey**
Cluster 5A	*Doti*	Badikedhar RM Jorayal RM	6	**Potato, Vegetables, Citrus, Ginger/Turmeric, Onion and Garlic, Goat**
Cluster 5B	*Dadeldhura*	Amargadhi Alital	9	**Potato, Vegetables, Citrus, Ginger/Turmeric, Onion and Garlic, Timur, Dairy, Honey, Goat**
Cluster 6	*Bajura*	Swamikartik RM Himal RM Budhinanda UM	6	**Potato, Vegetables, Citrus, Timur, Indigenous crops, Apple, Walnut**
Cluster 3	*Humla*	Kharpunath RM Simikot	6	**Potato, Vegetables, Timur, Indigenous crops, Apple, Walnut**

Some potential value chains that were not selected for the assessment and the reasons for not selecting

Value chain	Reason for not selecting

Onion/Garlic	Though onion and garlic did not score as high potential in the ranking matrix, the value chains were added as high potential after the recommendation from the stakeholder's consultation workshop in the clusters. However, during the field assessment, the field team found that the production of onion and garlic was only at subsistence base and the potential of growth is very low. So, the value chains were not assessed further after initial field findings.
Olive	Olive value chain was of a high interest due to its value and potential to reduce poverty in rural communities of *Bajura*. Even though *Bajura* district is a zone for olive production, the value chain was not selected because it was practiced by only a few numbers of farmers, and increasing the volume is not yet feasible.

1. Vegetables

4. Apples

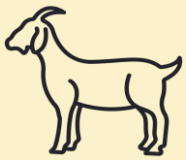
7. Dairy

10. Honey

2. Potato

5. Walnut

8.Timur



11. Goat

3. Citrus

6. Indigenous Crops

9. Turmeric

VALUE CHAINS FINDINGS

VEGETABLE VALUE CHAIN

Photo 1 Vegetable nursery (by Shradha Bhatta)

SECTOR OVERVIEW

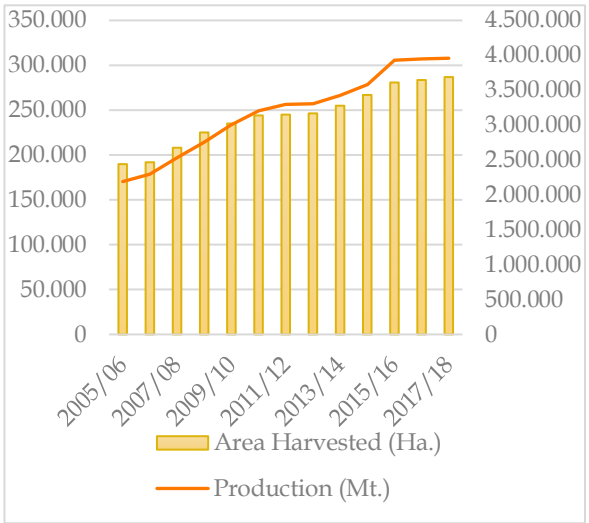


Figure 5 Vegetable production trend in Nepal

With around 78 percent of total farming household involved, subsistence farming dominated the larger part of Nepal's agriculture sector. These households grow different kinds of vegetables, mostly for their own consumption. The vegetable sector with value of Rs. 36 billion accounts for 9.71 percent of agriculture GDP. Cauliflower, tomato, and cabbage are the lead contributors with values of Rs. 4.9 billion, Rs. 4.4 billion and 2.8 billion respectively (Central Bureau of Statistics (CBS), 2010). Cauliflower with around 33,172 ha covers 14% of the total vegetable cultivation area. It is followed by tomato (19,724 ha) and cabbage (14,306 ha)[4].

Over the past 20 years, the annual per-capita consumption of vegetables has surged from 60 kg to 114 kg[5]. The demand has increased as a result of population growth, economic growth, and growth of disposable income from remittances. Such growth in demand of vegetable has made the sector an important source of income and an

4 Ministry of Agriculture & Livestock Development, 2019/20

5 Our World in Data

effective means of poverty reduction in the hilly areas of Nepal.

The production area, quantity, and productivity of vegetables are also increasing due to higher domestic demand and return on per unit of land from vegetable cultivation. Geographically, productivity as well as sales are better in Terai than in the hills, mid-hills and mountain region. However, the vegetables grown in the hilly region fetch better value as it is produced during rainy season when the price are relatively higher (Prasain, 2011).

Over the last five years, vegetable imports have been increasing, while there is continuous fall in export. The import of vegetables soared to NPR 33 billion in 2019/20 from NPR 23 billion in 2017/18 with the national consumption growing at 20 percent annually. Most of Nepal's vegetable trade happens with India and China, although the share of imports from India is much larger than that of China, mainly due to improved connectivity with the southern neighbour.

Under this value chain assessment, more common vegetables—**tomatoes, cabbage, cauliflower, and beans** were taken into consideration. Among the seven provinces of Nepal, the area under vegetable cultivation and production is highest in Madhesh Province followed by Province Number 1. In case of vegetable productivity, Bagmati Province is at the top followed by Province Number 1 and Lumbini Province with *Sudurpashchim* and Karnali Province at the bottom. Karnali produces 145,375 MT in 12,998 ha and contributes 3.7%, whereas, *Sudurpashchim* produces 350,031 Mt in 25,850 Ha and contributes 8.8% to the total national production of vegetables. [6] The average productivity of both provinces (Karnali: 12.16 MT/ha and Sudurpashchim 13.54 MT/ha) is lower than the average national productivity (14.09MT/ha) ...

6 Statistical Information in Nepalese Agriculture, MoALD 2019/20

GEOGRAPHICAL MAP

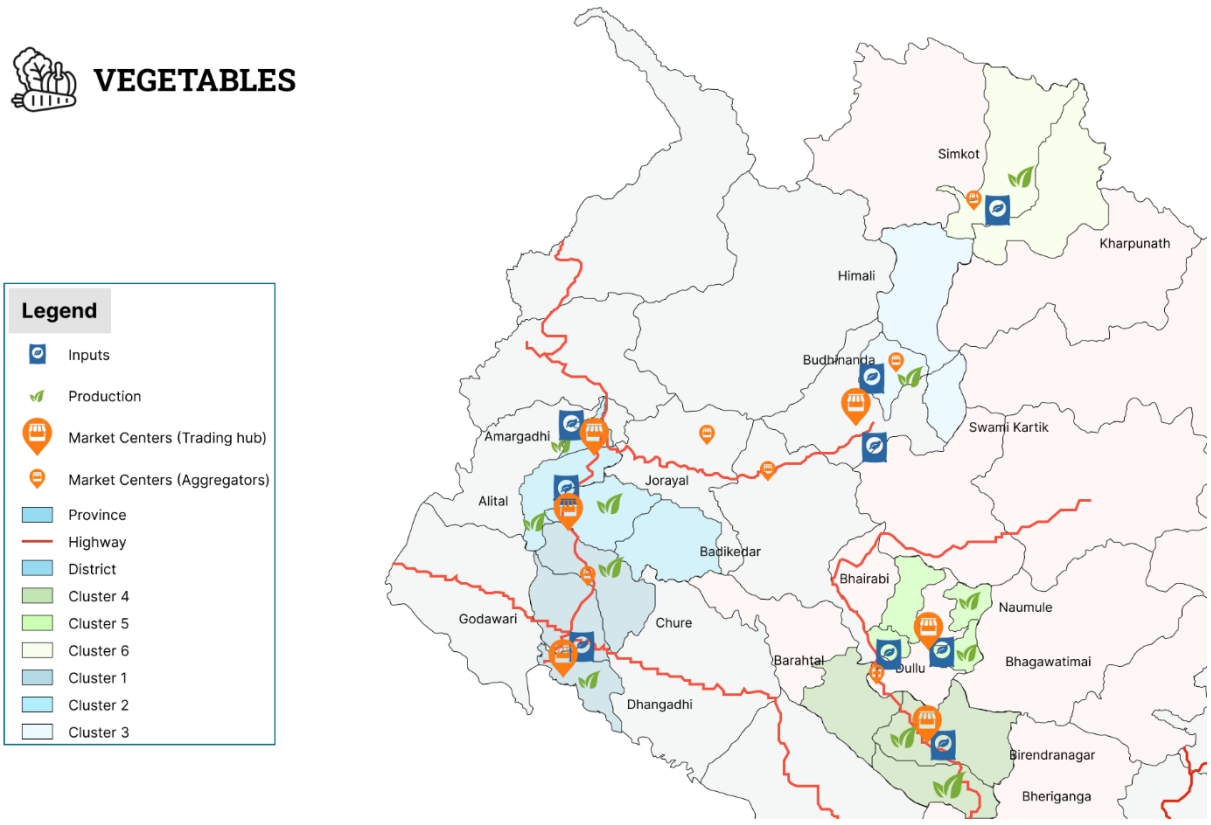


Figure 6 Vegetable production and market centers in project clusters

According to the geographic map listed above, the primary vegetable-producing districts under GRAPE's assessment areas in *Sudurpashchim* Province are *Kailali*, *Doti*, *Dadeldhura*, and *Bajura*. Similarly, *Surkhet* and *Dailekh* are the area of commercial production in Karnali Province. The cultivation area and productivity of vegetables including cauliflower, cabbage, and radish are increasing in all of the assessment areas due to high consumption of these vegetables in households, restaurants, and hotels among others.

While Birendranagar and Bheriganga municipalities produce the most vegetables in *Surkhet*, Birendranagar is also the largest vegetable market connecting the district's produce to markets in other regions. *Dailekh*'s production areas of Naumule and Bhagwatimai account for more than half of the district's vegetable production. Vegetable production in Dullu is limited to kitchen gardens, but a group of farmers in Dullu is involved in the production of vegetable seeds for the SEAN seed company[7]. *Dailekh* produces vegetables only during the summer season with 95 percent of the vegetables during off-season coming from *Surkhet* via the *Surkhet-Dailekh* road corridor. Likewise, farming in *Humla* district often succumbs to the harsh climatic conditions and economic challenges. In most cases, vegetables are flown-in or transported from the terai towns like Nepalgunj and *Surkhet* selling at excessively high prices. Recently, farmers around Simikot (the district headquarter of *Humla*), Kharpunath, Sarkegad, Namkha, Changkheli, Adanchuli, and Tanjakot villages have been involved in commercial vegetable farming. Although cultivation of seasonal and non-seasonal vegetables has come up as a reliable source of income in the villages close to Simikot, farmers in the majority of the villages outside the district headquarters are facing difficulties due to lack of market for their produce.[8] Finding market for the vegetables outside the district still remains out of the question due to low production volume and lack of market intermediaries like local traders

7 https://www.seanseed.org.np/

8 https://english.headlinenepal.com/details/5706

to aggregators. Poor road access and high transportation cost are not helping either.

Due to favourable soil conditions, topography, easy access to inputs, and market access, *Kailali* district in *Sudurpashchim* is the largest producer of vegetables. *Kailali* produces approximately 233,000 tonnes of vegetables per year on 15,300 hectares of land, according to the District Agricultural Office. Riverbed vegetable farming, which is best suited for cultivating cucurbits (laharey baali) such as beans, cucumber, and many others, is currently gaining popularity in *Kailali*. *Kailali* is also one of the largest vegetable market centers in western Nepal, in addition to its production. Because of its proximity to India, it is also one of the districts that facilitates vegetable import and export. The majority of the produce from hilly and mountain regions is gathered at Attariya, Dhangadhi district's largest wholesale vegetable and fruit market, including vegetables from *Doti* (Jorayal) and *Dadeldhura* (Amargadhi and Alital). Vegetables grown in Jorayal are also collected in Amargadhi by traders before transporting it to Attariya. During the off-season, vegetables are transported uphill to several market centers in the hills and even the mountains.

Sudurpashchim has three major transit markets—*Kailali* (Attariya), *Dadeldhura* (Amargadhi), and *Bajura* (Martadi), which serve as an aggregation and distribution point for the terai, hilly, and mountain regions. Vegetables and other products are also transported from and to the neighbouring districts such as Bajhang, Baitadi, and Accham via these transit points.

MARKET MAP

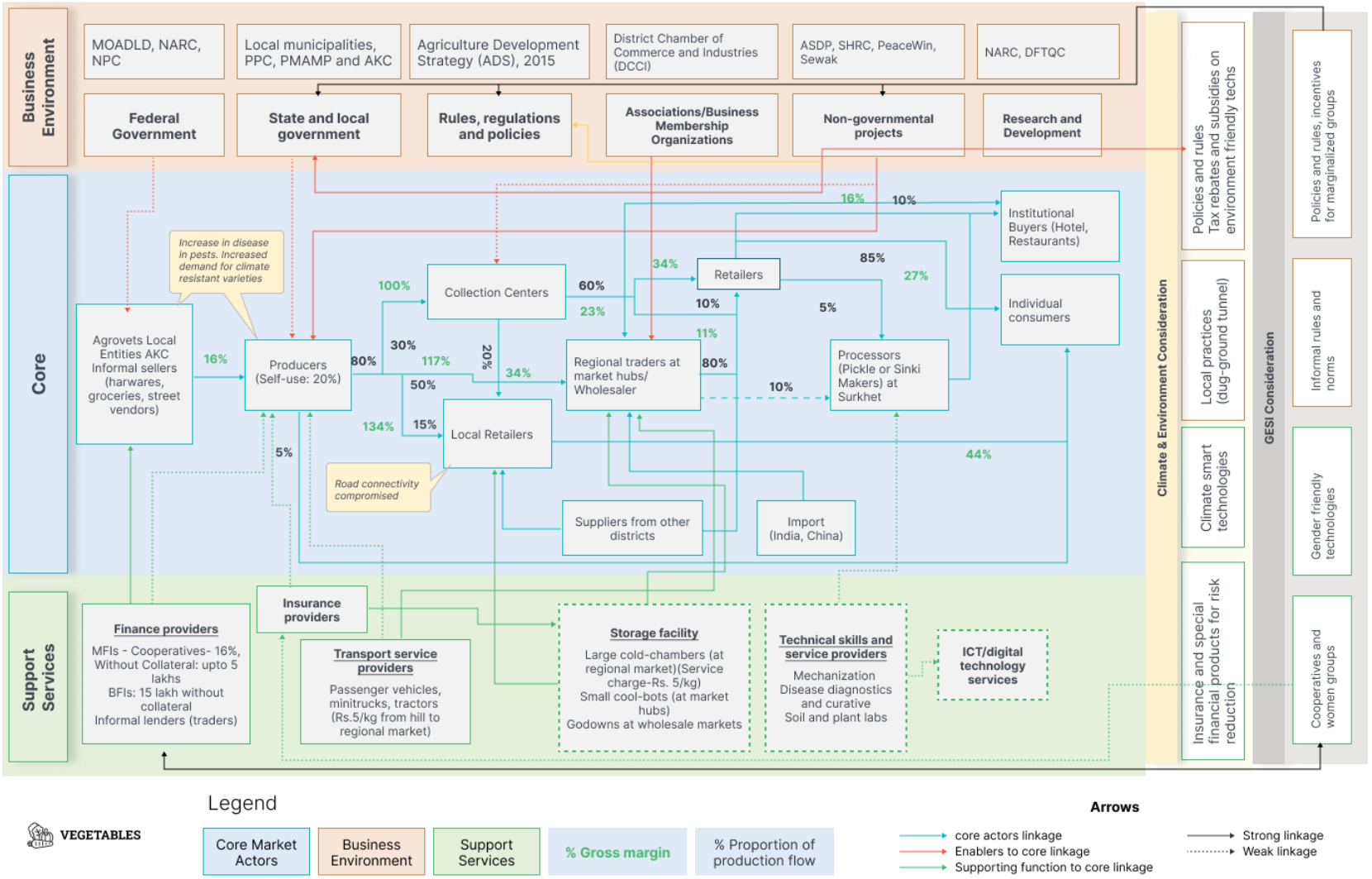


Figure 7 Market map of vegetable value chain

Inputs (seeds, fertilisers, irrigation, agri-tools and machinery, labour)

Photo 2 Inputs displayed at an agrovet (by Shradha Bhatta)

Seeds and fertilisers, as well as irrigation, agricultural equipment and tunnels, are some of the essential inputs for vegetable cultivation. While smallholder farmers buy seeds, fertiliser, and crop protection inputs from local agro-vets, large scale producers source seeds, as well as other inputs such as machinery, minerals, fertilisers, and pesticides from regional markets such as Nepalgunj, Dhangadhi, Amargadhi, and *Surkhet*. Many commercial and non-commercial farmers obtain inputs/information from the local agricultural office, NGOs, farmer groups, and cooperatives, in addition to agro-vets. Even when the seeds given by local entities are of poor quality, they place a lot of trust in subsidised seeds rather than seeds sold by private enterprises[9]. Contrary to that, one of the studies done by Sahaj-NAMDP in 2018 showed that around 72% of commercial vegetable farmers now depend on retailers (agro-vets) for inputs and advice related to vegetables' cultivation and cultivation practices (Sahaj-NAMDP, 2018).

The desired variety and quantity of agri-inputs are scarce in both the provinces, particularly in the areas at higher hills and mountains. Seeds with attractive packaging do not necessarily yield desired productivity which is another discouraging factor for farmers to buy inputs from private agro-vets[10]. Farmers in the rural municipalities often prioritise low-cost or subsidised seeds, thus agro-vets respond by bringing low-cost, low-quality inputs. In the remote areas, often in rural municipalities, inputs like seeds are sold by unlicensed small retailers, grocery stores, and even street vendors without technical knowledge on inputs. Agro-vets and street vendors also repackage seeds in smaller packages based on the demand of the local market. Gross profit margin per agrovet was calculated in each cluster through the interviews with input suppliers and farmers. Average gross margin on vegetable inputs was found to be 16% which did not vary significantly among the clusters. Besides the cost of goods, rent of outlet, transportation cost and staff expenses (only in some cases as most of the agrovets are family run) were other costs.

In the hills and the mountains, input supply relies on a single supply chain, with large agro-vets situated in regional markets and trade centers serving as the sole source of stock (inputs) for small retailers at rural locations. The small input sellers are obliged to sell products on credit increasing the length of cash conversion cycle for the agri-input industry. Due to the dependency on a sole supplier and prolonged cash conversion cycle in the agri-inputs industry, input providers are unable to restock their products as frequently as required and often fail to meet the demand on time.

Over the last ten years, farmers have become more aware of the impact that high-quality inputs have on yield and overall productivity, allowing better prospects for agri-input providers and manufacturers in both provinces. However, there has been very little improvement on the supply side. Despite the fact that demand for inputs (seeds, fertilisers, agri-equipment, technology, and so on) is increasing as a result of greater access to information, input suppliers and farmers appear to remain still disconnected. The input producers/suppliers do not prioritise regular engagement with potential clients, as well as marketing and demonstration of the varieties. It is hard to see changes over the traditional ways of doing business by agri-input producers/suppliers anytime soon.

9 Mentioned by agrovets in Doti/Dadheldhura, Bajura, Surkhet and Dailekh.

10 As mentioned by commercial farmers during the field assessment.

Production *(Vegetable and vegetable seed)*

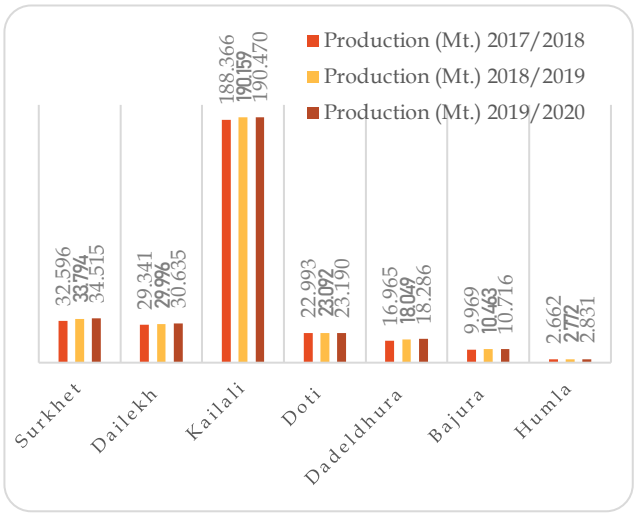


Figure 8 Vegetable production trend in project cluster

Vegetable production is the main source of their income and employment for the people residing in the assessment areas. Homestead production of vegetables to meet the household requirement is done by almost all farmers, but the commercial production is typically limited to the periphery of road corridors, market centers, cities, and emerging towns and in the accessible areas only.

The presence of reliable market and supply chain actors plays a major part in driving commercial vegetable farming. As vegetables are highly perishable commodities, having access to transportation or a nearby market to sell them as soon as they are harvested is essential.

Average gross margin for a producer in the assessment areas was found to be 100% while selling the produce through local collectors. Gross margin can increase to as high as 134 %, if they can sell the produce directly to wholesalers or consumers, but cost of packaging, transportation, and storage may be added to the total cost. The gross margin is the difference between selling price of the produce and the cost of inputs bought from input suppliers for production. Entire costs of labor, land preparation and loss (if any) should be deducted from the gross margin to obtain a net profit for farmers, which again is considerably high due to quick returns and multiple harvest seasons of vegetables

Farmers near the market center have better access to inputs, extension and advisory services, market-related information, and an effective supply network to reach even to the local market. In simple terms, farmers involved in commercial farming are the ones with better exposure to the market. These farmers also include the ones that are a part of farmer groups and cooperatives. Farmers without association to such groups, co-operatives, far from the roads-corridors, market centers, and those lacking access to inputs, markets, and other services are still restricting themselves to subsistence farming.

Vegetable production in all the assessment areas shows an increasing trend over the last three years but the average productivity of vegetables (except *Kailali* and *Surkhet*) is lower than the national average (14.09mt/ha). The productivity of *Humla* is almost 50% less than national productivity, which signals a dire need for improvement in vegetable production practices in the district. Although vegetable production is increasing, only Kailali has a sufficient production that can meet 60% of the local market demand during the season. In the rest of the assessment areas, the local production only meets an average of 25% of the market demand, with rest met by import.[11]

Why did the collection centres fail in *Bajura*?

With the support from PeaceWin *Bajura* (a non-governmental organisation working in the far-western development region), three collection centres (Pandusain Collection Centre, Budhinanada, Bohora Vegetable Collection Centre, Budhinanda and Himali Collection Centre, Dhulachaur) were established in Budhinanada and Himali RM of the *Bajura* district. However, all three collection centres were out of operation in less than a year. of establishment.

The most prominent cause of this failure was a lack of human resources to manage the collection centre, or weak management. PeaceWin handed over all the collection centres to either co-operative or farmers' groups, but neither of these had a sustainable business modelorientation, which led to the failure of the collection centres.

Farmers in *Bajura* and *Humla* have limited access to inputs, extension services, farm machinery, and market. At times when Sometimes the market cannot absorb the vegetables produced in the

11 Field survey with farmers and traders.

district, consume the produced vegetables, and transporting them to other districts doesn't become is not an option due to expensive and unreliable difficult transportation service. Lack of knowledge regarding the market demand, price, modern farming practices, and technologies in the districts are some other causatives to less productivity compared to other assessment

Trading

The local market consumes 70% of the vegetables produced in hilly areas such as *Dailekh*, *Doti*, and *Dadeldhura*, while the remaining 30% is sold to the regional market in *Kailali* and *Surkhet* through local traders or wholesalers. Vegetables produced in the mountains and high hills of *Bajura* and *Humla* are insufficient to meet even 20% of local demand, hence trading out to the wider market is a rare case.

Collectors and traders are the key actors in the vegetable value chain, responsible for trading up to 70% of vegetables from production pockets to wholesale markets. The first contact of farmers is with the local collectors/traders or collection centers. These actors then assemble, repackage, sort, and sell it to large traders of the wholesale markets. In Terai, however, some of the farmers directly connect with the larger (wholesale) market. Average gross margin of a collector ranges from 23% – 34%, while the margin of regional traders buying produce from collectors and selling to wholesalers' lies between 10-20%.

In the commercial pocket areas, traders have a verbal agreement with the farmers regarding what to produce and how much price farmers will get after the harvest. This practice is quite common in all the assessment areas, mostly in *Surkhet* and *Dailekh*. While collection centers have a vital role to play in bridging the gap between producers and market, such centers established by NGOs and managed by farmers groups or cooperatives have not been fully functional. Two main reasons behind the non-operating collection centers are inadequate business volume for regular operation, and failure of management.

Wholesalers are other another important actor in vegetable trading. They buy vegetables from producers, collection centers, and/or traders and supply them to retailers at an average gross margin of 16 – 33%. They have their outlets at market hubs with infrastructure like office buildings, open stores, transaction sheds and shop sheds and are mainly located in the regional market like *Surkhet* and *Kailali*. where there are market hubs with some infrastructure such as office buildings, open stores, transaction sheds, and shop sheds. These se market hubs are usually established and run with government support and are operated by the local committee. The market is operated run by the market management committee which, the committee invests in market infrastructures and rents out the stalls, storage, and other facilities to the traders. They also provide market price information to the producers and traders by displaying it in digital boards, this a practice however that has not been very effective in communicating the daily price.

Vegetable retail in Nepal and project cluster is diverse in nature. Vegetables are retailed by farmers at local weekly markets (*haat bazaars*), or by street vendors on a mobile cart or fixed vegetable outlets. Supermarkets and new businesses specializing in clean packed vegetables are also emerging as retailers in the clusters and beyond. The gross margin for vegetable retail ranges between from 16 – 44%, and the major costs incurred are the costs for packaging, loss, and transportation.

Due to the lack of a proper market information system and minimal bargaining power, farmers are forced to sell their product at the price offered by traders. Traders usually refer to Indian markets to fix price. Overall, the governance of the vegetable value chain is buyer-driven with minimum level of trust between various actors. While traders are always complaining about the that the farmers for are not providing quality products, while farmers are blaming the traders for offering low prices. Vegetables brought from India have a longer shelf life than that of Nepal. It is partly because of bad post-harvest practices in Nepal that includes like inappropriate packaging, lack of grading sorting, and poor handling during transportation. Post-harvest loss is often around 20-25% in case of vegetables. Most of the vegetable markets are also not organised, and existing markets are congested with inadequate storage facilities which further contributes to post-harvest (PH) loss.

Processing

Traders are also involved in semi-processing like grading, sorting, drying, and packaging of vegetables at collection centers or the regional markets. Apart from this, few micro and small-scale vegetable processors are involved in making pickle and *sinki* (dried vegetable). These

processing units are usually unregistered and are managed by a family or an individual.

There are only a few high-level value-adding companies like ketchup processors. A ketchup processing company at *Surkhet* discontinued its operation and shifted to another venture as it was difficult to secure a regular supply of raw materials to make the venture profitable.

Supporting Services

Transportation service providers: Traders normally use mini trucks for transportation from the commercial production sites to markets, though around 40 percent of the product is transported via passenger vehicles. Traders estimate that they incur loss 5 to 8 percent during transportation from collection centers to wholesale markets. An exclusive transportation service provider is not available, even in the commercial pockets. Cost of transportation which keeps on fluctuating is another issue raised by the actors. It affects both producers and traders as it also contributes to the final price of the product.

Financial service providers: Vegetable producers do not have adequate access to formal financing mediums, compared to traders, who have better access. The financial service providers are usually national, sub-national banks, and microfinance institutions. Co-operatives are active in providing loans to the farmers. Farmers need a small loan that they can get without collateral from co-operatives. A similar loan process in commercial banks is full of hassles. Most of the input suppliers and large-scale traders get financial services from commercial banks. The informal practice of traders offering credit to farmers to encourage production is also quite popular, which, however, is not sustainable due to high interest.

Storage service providers: Small and large-scale cold storages are present in Birendranagr (*Surkhet*), Attariya (*Kailali*), Amargadhi (*Dadeldhura*), and other interconnected markets like Pahalmanpur (Dhangadi). The practice of using a small chamber cold storage called cool-bot has become quite popular in *Surkhet* and *Dhangadi*. Traders say that it is more efficient, practical as well as cost-effective. But these storages are rarely used for vegetables as the supply volume is not enough to store them. Maximum storage period required for vegetables is one to two days, therefore, instead of vegetables, 90% of this storage capacity is used for storing imported fruits.

Market information providers: Market information is provided to the farmers through retailers, wholesalers, and government agencies. Agribusiness Promotion and Marketing Development Directorate and Agro-enterprise center are displaying wholesale and retail prices of different wholesale and other markets on their websites. However, access to these websites has been limited due to lack of technology adoption from the producers, and traders in the assessment areas.

Business Environment

Federal and Provincial Government:

- The Ministry of Agriculture and Livestock Development bears overall responsibility for the growth and development of agriculture and livestock sector. Under the ministry, Department of Agriculture regulates the policies, funds, and programmes related to agriculture in Nepal including vegetable production and markets; and Department of Food Technology and Quality Control (DFTQC) regulates the safety and quality of vegetables.
- The Agriculture Development Strategy 2015 (ADS) has recognized vegetable seed as a high-value and exportable commodity and has prioritized vegetable seed production within the country. There are emerging vegetable seed companies in the project clusters especially in *Kailali* and *Surkhet*.

State and Municipal Government:

- Municipalities and Rural Municipalities mainly support production activities by providing seeds and inputs to producers.
- The Prime Minister's Agriculture Modernization Project (PMAMP), and the Agriculture Knowledge center (AKC) in each district has a planned agenda for each agriculture sector including vegetables. The AKC also provides extension services to farmers and has programmes subsidizing production inputs such as seeds, technologies, and agri-machineries.

Non-Governmental organizations:

- Off-season vegetables are one of the 12 selected VCs of the ASDP[12] area. ASDP is helping in production management, market linkages, and business facilitation.
- Peacewin, INF [13] , RVWRMP [14] in *Sudurpashchim* also support the vegetable producers by easing their access to inputs, extension services, and sometimes also finance.
- SHIP[15] Nepal in *Humla* is providing inputs and advisory services to vegetable farmers.

Associations/Business Membership organizations:

- DCCIs work for the facilitation and implementation at the local level for projects working in agriculture especially for promotion of agriculture products in the market.

GESI Consideration

Input: According to agrovets in most of assessment areas, customers visiting input sellers to buy agri-inputs like seeds and fertilisers were predominantly women (more than 60%), indicating increased participation of women in production activities and decision making. The assessment team also discovered growing women's participation in input selling. Even though the women do not own most of the businesses, they were involved in operation of sales outlets.

Production: Male and female participation in production activities was found to be equal during the assessment. The division of work was based on the magnitude of physical labour required. For example, males were involved in labour intensive jobs such as ploughing and land preparation, whereas women carry out nursery management, sowing, and harvesting. A study conducted in *Surkhet* to understand the gender participation in activities and decisions of vegetable cultivation discovered similar results, with males participating in more laborious activities such as land preparation and women participating in less laborious activities such as sowing and weeding. Vegetable cultivation decisions were made in mutual consent by both male and women family members. However, the male had more authoritative power on deciding the types of vegetables, land use and time management, while the women played a supportive role. Similarly, when it comes to the involvement of marginal and low-income households in vegetable farming, the findings are coherent to the national context, where disadvantaged groups[16] are heavily involved in small scale vegetable production.

Output: Small-scale road-head traders were from marginalized or low-income groups, but disadvantaged groups were found in less numbers in large scale trading and wholesaling. This is primarily due to disadvantaged groups' lack of technical and business capacities and access to available resources.

Similarly, males dominate large scale wholesaling, whereas small scale women retailers are found in several markets. Women are more involved in vegetable production and trading through cooperatives. In remote parts of *Humla*, production and trade were predominantly done by women. They are the major decision makers both in production and trading activities in these areas. But due to the lack of local collection centers in *Simikot*'s neighbouring municipalities, the women would carry their produce in bamboo baskets and walk uphill for three to four hours to reach the district headquarters and sell their products. They are not compensated adequately for the additional labor of carrying their produce throughout the *Simikot* market for the entire day. This means that the women producers are facing a significant increase in their workload due to the lack of aggregators or collection centers at nearby areas, and reasonable transportation facility.

Climate and Environment Consideration

Vegetable production is highly sensitive to climate change as low or high rainfall combined with changing temperatures has a negative impact on vegetable production. Climate change also has an impact on farmers, particularly in hilly areas where rain-fed vegetable cultivation is the primary source of income and food. This year, as the winter became slightly warmer, the pest problem in

12 ASDP – Agriculture Sector Development Program

13 INF – International Nepal Fellowship

14 RVWRMP – Rural Village Water Resources Management Project

15 SHIP – Self Help Initiative Promotion Centre

16 Disadvantaged group: Here it is defined as people from marginalized caste and low-income households.

vegetables increased all over the country. [17] Temperature plays a large role in multiplying pest attacks, with faster mutation and more damage to the crops. Hence, farmers tend to use more pesticides as pests multiply faster and become more powerful, which affects both human and soil health. This issue is more prevalent in assessment areas in *Sudurpashchim* Province. Use of chemical pesticides is gradually decreasing because of the emphasis of the government in promoting organic agriculture production in *Karnali* Province. [18] Similarly, waterlogging during monsoon and flash flood due to prolonged rainfalls in the terai district like *Kailali* has negatively affected the vegetable farmers, making it impossible for them to produce vegetables during monsoon.

It was evident from the field interviews that, the producers are affected by climate change in some way. In major vegetable producing parts of the country (such as *Sindhupalchowk*, *Kavre*, Eastern belts like *Dhankuta*), farmers are adopting Climate Smart Agricultural technologies including mulching, drip irrigation, cultivation of vegetables under the semi-protected house, quality seeds, etc. to mitigate the negative impacts of climate change. In the assessment areas there is an immediate need for the adoption and scaling up of such successful CSA practices, its extension, and proper implementation which will help to overcome the farmer's problems from climate change. Farmers are affected by climate change, particularly in *Dailekh*, *Doti*, *Dadeldhura*, *Bajura* and *Humla* where rain-fed vegetable cultivation is the primary source of income and food. Climate change and shifting weather patterns is necessitating the adoption of technologies that can withstand such changes in vegetable cultivation. Climate-resilient vegetable technologies and practises allow vegetable farming on both irrigated and waste land. As a result, vegetable farming provides not only economic benefits but also environmental benefits. Farmers require irrigation, material support, technology, and, most importantly, the organized farmer groups to share knowledge and practices to increase profits. These practices assist farmers in mitigating the risk of climate change and variability, resulting in climate resilient farming.

Riverbed farming in *Dhangadhi* is gaining popularity, and it is also a way of adapting/coping to the negative effects of climate change. Crops grown on riverbeds can withstand harsh climatic conditions such as minimal rainfall and high temperatures. The riverbed soil is fertile and suitable for growing vegetables and requires less use of chemical fertilizers. Similarly, use of chemical pesticides is also minimal in the vegetables grown on riverbeds [19] . Cucurbits, which are commonly cultivated in riverbeds, require less water and can withstand high temperatures. Although riverbeds are more susceptible to flooding, it usually remains dry from September to May when farmers use the land for growing vegetables of cucurbits family. This creates a potential opportunity to increase the resilience of poor farming households by adapting to the effects of climate change.

In the case of the output market, consumer awareness of the harmful effects of pesticides on human health is growing, particularly in urban areas. They are gradually becoming aware of the pesticides used in vegetables and prefer to buy pesticide-free vegetables, which is why organic vegetables are gaining some market traction and possess higher market value than regular vegetables. This provides an opportunity for vegetable growers to benefit more from responding to the changing market preferences.

CAPACITIES, CONSTRAINTS, INCENTIVES, AND OPPORTUNITIES ANALYSIS

Capacities	• **Input suppliers are dependent on a single supply chain:** There are only a handful of private input suppliers in the rural municipalities, and they are dependent on a single wholesaler (regional trader at trading hubs like *Surkhet*, and *Kailali*) for inputs. Therefore, when the main wholesaler (regional trader at trading hubs like *Surkhet*, and *Kailali*) runs out of stock, the whole chain of the

17 Climate Response Analysis for Nepal, WFP, 2022

18 Inter Provincial Dependency for Agricultural Development. 2018.

19 As mentioned by vegetable producers in Chure-Kailali and Amargadi-Dhangadi

	private agro-vets in the rural areas also runs out of stock failing to supply inputs to the farmers. • **Farmers involved in commercial farming are the ones with better exposure to the market:** As these farmers are near the road corridors or market centers, they have good connectivity with the market and have better access to inputs and the market. Farmers associated with farmer groups and cooperatives also receive such privileges.
Constraints	• **The existing seed supply system (quantity, quality and timely supply) is weak:** Informal sellers dominate the inputs sale in the rural municipalities, and informal input sellers and private businesses do not have the technical capacity and reach to create awareness, do promotion, and provide information to the farmers. Large agro vets provide advice or information to customers, but they are only limited to regional markets and are not accessible to rural customers. Farmers also demand cheap inputs in *Bajura*, *Humla*, and rural municipalities of other assessment areas. Hence, adhering to the market demand, the input suppliers also bring cheap inputs with low quality. In some cases, input sellers also sell unregistered and illegal varieties. Input sellers, even the larger formal ones also do not have any clear promotion or marketing strategy to create awareness, increase demand, and grow their business. All these factors constrain the productivity and production of vegetables. • **There is a lack of knowledge and awareness amongst farmers to improve crops production and consider production for commercial benefit.** Most of the smallholder farmers produce for their own consumption and produce little to sell in the market. As a result, they don't invest in quality seed and pesticides and don't follow good agricultural practices. This constraint is mostly visible in *Bajura* and *Humla*. Similarly, farmers also do not know about resource-efficient production—for example—cultivating varieties that require less water in hilly and mountain areas during winter when irrigation becomes a major issue. • **Post-Harvest Loss of vegetables:** 20-25% of the vegetables are lost during harvesting and transporting to the market centers. Limited information related to post-harvest management and unsuitable transporting means are the main causes of this loss. • **Increase in pests' infestation due to climate change:** Many farmers during the assessment reported the emergence of new kinds of pests that are more infectious and resilient to pesticides. They believe that climate change is the prime contributor to this factor. • **Increased risk on environment due to over-use of chemical fertilizers and pesticides**: Over-use of pesticides and chemical fertilizers are the issues of growing concern associated with vegetable production. With increasing pest infestation due to climate change, the use of pesticides is likely to increase posing higher risks on the environment and the health of producers and consumers. • **The existing government extension system is weak and insufficient.** Producers rely heavily on the government, non-governmental organizations, associations, and co-operatives for extension services but are not receiving enough to improve their productivity. The local entities like AKC and local municipalities also lack enough resources to reach all the farmers. When

	farmers do not receive such services, they fail to produce according to market demand, produce quality products and gain economies of scale.
Incentives	• **Vegetables from the hilly areas receive a higher price** in the terai belts because, during monsoon, vegetable production in terai is low due to heavy rainfall and waterlogging in most lands. • **Vegetables have a higher market price, and the productivity of vegetables is also higher** than cereal crops hence providing a higher return compared to the latter. Many farmers in the assessment areas are also switching to vegetables from cereal crops.
Opportunities	• **Expansion of market and road corridors** connecting the rural and urban municipalities has provided better exposure to the farmers in terms of market accessibility and market assurance. It has motivated the farmers to get into commercial production. Road expansion and increased connectivity between municipalities has also made the supply chain more resilient. As a result, farmers can sell their products in the local markets even if they cannot reach regional markets. • **Unmet market demand for vegetables:** The current production of vegetables is not enough to meet the market demand. A large quantity of vegetables is still imported from India and is supplied to the hills and mountains when the production of vegetables is low in these regions. • **Access to inputs, extension, advisory services, and market-related information** has improved due to the presence of NGOs/INGOs. These institutions have been giving a push to vegetable farming in the rural parts by providing inputs, advisory services and driving more farmers into commercial vegetable farming.

POTENTIAL INTERVENTIONS:

(Please refer to annex for details on the interventions derived and which cluster each intervention is applicable to)

1. Facilitate the proper implementation of seed import rules and regulations through SQCC (Seed Quality Control centre)
2. Strengthen the monitoring mechanisms of the seed providers.
3. Facilitate associations of seeds and fertilisers and other stakeholders like cooperatives, producers' group to lobby with the federal government to bring relevant changes in existing regulations.
4. Output-based subsidy or partial subsidy to the producers to reduce the dependency on inputs by mobilizing private input sellers.
5. Subsidizing agencies like NGOs, and local entities (AKC, local municipality) need to encourage and facilitate private input sellers to establish the business and market.
6. Encourage improved farming and demand stimulation for improved production practices by introducing GAP (Good Agriculture Practice) through lead producers.
7. Introduce a forum called PSPM-Production Sales Planning Meeting.
8. Promote the off-season farming (CSA) technology by partnering with the private suppliers along with helping them build a strong supply chain network in both rural and urban municipalities.
9. Partner with financial institutions to introduce loan products
10. Incentivize the irrigation technology providers to demonstrate and promote the technologies among the prospective buyers(producers).
11. Encourage lead producers, or local co-operative to uptake the collectors' role. They can provide a full-service package starting from input supply to collection/aggregation.
12. Encourage a participatory approach between private sectors and farmer's groups or co-operatives to manage the collection centers. Facilitate the non-profit organizations, local municipalities, CBOs, cooperatives to assess the market needs, and location accessibility before establishing a collection centre.
13. Encourage and incentivize Traders/Collectors to provide PH handling, cost-efficient production knowledge to the producers.
14. Partner with local bodies and AKCs to disseminate these technologies and train the extension service providers who can assist and orient digitally illiterate producers or the one who needs support using such technology. Demonstrate the benefits of these technologies through local resource persons of AKC, local municipalities, co-operatives, CBOs and NGOs.
15. Incentivize the ICT service providers to extend their services in the targeted areas.
16. Introduce different loan products and explore alternative financing options through traders, input suppliers.
17. Use of Multistakeholder platforms to encourage co-ordination and build synergy.

Figure 9 List of recommended interventions for Vegetable value chain

POTATO VALUE CHAIN

Photo 3 Potato stored in a cold store (by Narendra Dhami)

SECTOR OVERVIEW

Potato, a staple crop is considered as one of the most important crops in Nepal. According to recent statistics, potato ranks fifth in the area (185,342 ha), second in production (2517696 MT), and first in productivity (16.65 MT/ha) among the major food crops grown in Nepal. It is also the most common food and cash crop produced in the *Sudurpashchim* and *Karnali* Province. Its cultivation is popular among farmers due to its wider adaptability, high yield potential, and high demand. Potatoes are now the second most important staple crop after rice with per capita consumption of 51 Kg/Year.[20] Demand for potato is not just increasing because of household consumption, but also because of its increased use for industrial purposes. Potato is not only consumed as a vegetable but also as raw materials to make chips, crackers, and other processed products.

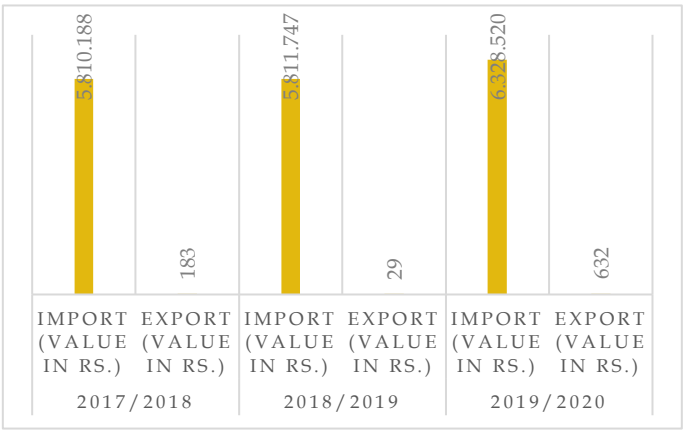


Figure 10 Value of Import and export trend of Potato in Nepal ('000)

Domestic production of potatoes only fulfils 20% of the total market demand in Nepal.[21] With increasing consumption, the potato import is surging every year. After two encouraging years

20 Rhoades R. Traditional Potato Production and Farmers' Selection of Varieties in Eastern Nepal. Potatoes in Food Systems Research Series, Report No. 2. Lima, Peru: International Potato Centre; 1985.

21 DAO & DADO, 2018

in FY 2013/14 and 2014/15, export of potato has steeply decreased to around 2,000 kg, which might be due to increasing processing companies in Nepal. Meanwhile the import of potato has increased by 24-fold within a year in the FY 2015/16[22]. It has been rising gradually ever since. As shown by the import and export figures, the export value of potatoes is negligible in comparison to the import.

Both the provinces—*Karnali* and *Sudurpashim* are known for potato production. The potato is one of the major crops in all the assessment areas, and more than 90% of the farming household is cultivating potatoes. Both provinces contribute equally (almost 7%) to the national production, but the average productivity of *Sudurpashchim* province (15.7 mt/ha) is lower than the national average (16.65 mt/ha). [23] Even within these provinces, the local production cannot fulfil the local market demand, hence potato is imported in a huge quantity from *Dhangadi* and *Mahendranagar*. The imported potatoes also reach the hilly (*Doti*, *Dadeldhura*) and the mountain (*Bajura*) regions when there is a short supply in the market.

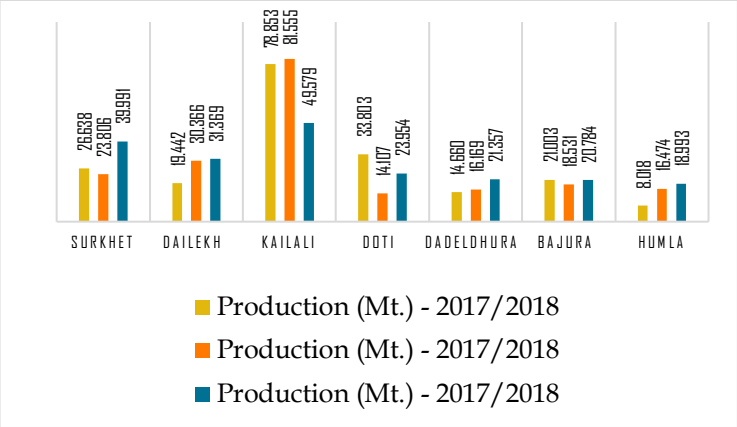


Figure 11 Potato production trend in GRAPE project clusters

GEOGRAPHIC DYNAMICS

Figure 12 Vegetable production and market centers in project clusters

The assessment areas, which include *Godawari* (*Kailali*), *Amargadi* (*Dadeldhura*), *Budinanda* (*Bajura*), and *Bhagwatimai* (*Dailekh*), have potato pockets, blocks, zones, and super-zones declared

[22] Trade and Export Promotion centre

[23] Statistics on Nepalese Agriculture by MoALD, 2019/20

by the Prime Ministers Agriculture Modernization Project (PMAMP). Potatoes are produced in all the assessment areas, but the aforementioned ones are the most productive ones. *Kailali* is also one of the highest contributors to potato production in both provinces, followed by *Surkhet* and *Dailekh*.

In terms of input, *Sudurpashchim* is self-sufficient in potato seeds, while other inputs such as fertilisers and pesticides are imported from outside. Seed produced in Aamargadhi is supplied throughout *Sudurpashchim* province's hilly and mountainous districts because of the easy road access. *Dailekh* and *Humla*, on the other hand, receive input from *Surkhet*'s input supplier, who collects potato seeds from neighbouring districts and sometimes even outside the province.

In case of the market, the trade route corridors, collection and market centers are different in both provinces, as shown in the map above. While the produce flows downhill in Karnali, it also flows sideways to *Sudurpashchim*'s surrounding regions. In the higher hills, the local market consumes the production, and only excess is collected in Martadi and transported to Amargadhi. Only a small portion of the potatoes produced in *Doti*, *Dadeldhura*, and *Bajura* make it to the Dhangadhi market as it is mostly consumed in the local market. The market center for *Chure* (Dhangadhi) is Sahajpur, from where the produce normally moves downhill to Dhangadhi market

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MARKET MAP

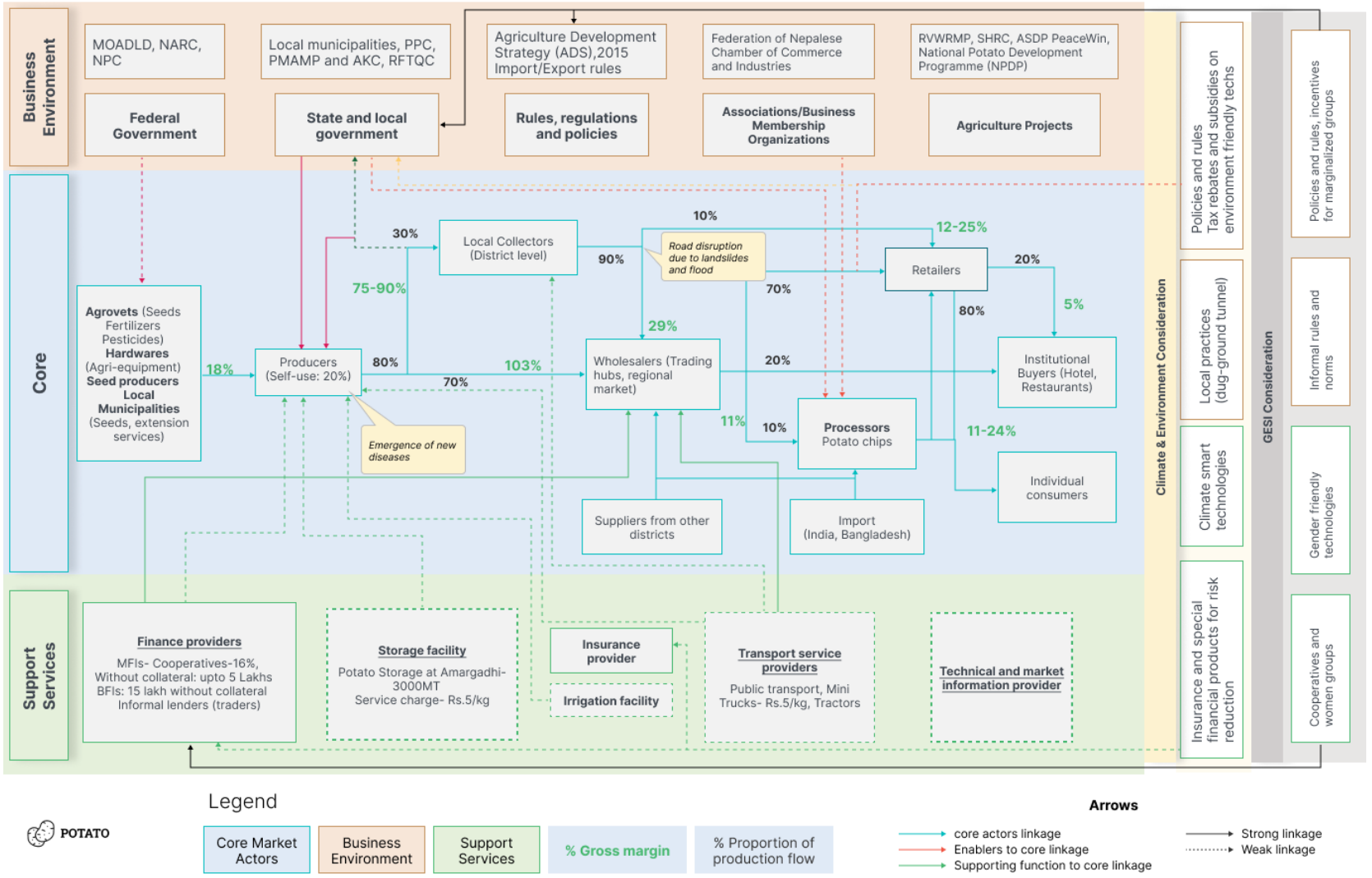

Figure 13 Market map of potato value chain

Inputs Supply *(Potato seeds, fertilisers, pesticides, labour)*

Farmers retain almost 50% of the seeds required while purchase the rest from local agro-vets, co-operatives, and even traders. Farmers also receive subsidised seed from the agriculture unit of the municipality and AKC. The quality of the potato seeds provided by the local government is poor, and as a result, they do not give the desired yield. Even private input suppliers are unable to deliver high-quality seeds due to inefficient production processes, and the lack of adequate seed storage facilities. A few farmer's groups and cooperatives produce seed but not in sufficient quantities.

Assessment areas in Karnali Province suffer more than the assessment areas in *Sudurpashchim* Province. Seed produced in Amargadhi, is almost sufficient for the whole province. Dissatisfaction related to supply and quality is also low in all the assessment areas of *Sudurpashchim* Province. The cold storage facility at Amargadhi plays a vital role in maintaining the consistency in supply because 80% of the potato stored in the cold storage is used as seed.

Potato seeds are in high demand due to increased potato production. Farmers are substituting cereal crops like maize, and millet with potatoes. The cultivation pattern has changed, and farmers have started cultivating potatoes two to three times a year due to increased demand for seeds. There are a lot of untapped markets in the rural parts where farmers still use retained seeds that provide low yield.

Production *(Potato seeds and table potato)*

Potato production area and yield have increased dramatically in recent years and is attributable to the increased consumption and demand for potatoes. Depending on the altitude, potatoes can be cultivated two to three times a year. While producers are increasing the area of cultivation and production responding to the increased demand in the market.

In the assessment area, 70% of the farmers producing potatoes are commercial. While there are pockets, blocks, zones, and super-zones of potato present all over the assessment areas, Dhangadhi in *Kailali*, Amargadhi in *Dadeldhura*, and Budinanda in *Bajura*, are the main production zones. Although there are two main seasons—winter and summer, farmers these days have also started to cultivate

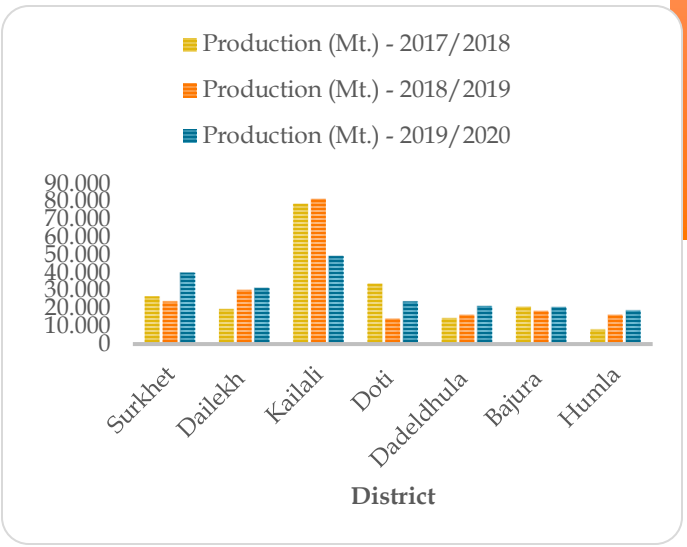

Figure 14 Potato production trend in project clusters

potatoes between summer and winter. However, the cultivation area during the winter is lower than that of summer due to lack of irrigation. Amongst the assessment areas, Kailali, *Dadeldhura*, and *Surkhet* are ahead in potato production due to better access to inputs, storage, and transportation services. The producers also have better access to inputs, advisory, and storage services due to the support provided by PMAMP through AKC in these areas.

The average productivity in all the assessment areas is higher than the national average except for *Surkhet*, *Dailekh* and *Humla*. Although this indicates a potential to improve productivity across the clusters, major hindrance is the timely availability of quality inputs, and the absence of storage facilities. In addition, potato production requires heavy labour compared to other crops which increased the cost of potato production. In the case of *Bajura*, high transportation cost and high post-harvest loss (10%) also increases the price of potato (GB1, 2020). Therefore, lack of fair price or inability to compete with the price of imported potatoes have always remained a challenge for producers. While farmers are still following the traditional means; use of technology or machineries to substitute the labour can support both production and economies of scale.

Potatoes can be grown over all areas of Nepal from Terai to the mountains and is a staple for many people. Given that there is a high productivity, good price, and better access to market, average gross revenue from potato production can be as high as Rs.

268,047 per hectare per season.[24] Potato farming provides a gross margin between 75% to 115% to the farmers, depending upon where the farmer sells its produce, and the number of supply chain actors involved.

Trading

There are different scales of potato traders at different geographical clusters (Terai, hills, and mountains). The first contact point of the farmers is small-scale traders, who then sell it to the large-scale traders in the wholesale market. This practice is quite prevalent in the hills and mountains, whereas commercial farmers directly sell to the large traders in the regional markets.

Traders also enter into an agreement with the farmers before the production season and provide them with inputs, advisory services, and a buy-back assurance. Such practice has solved the financing problems of the farmers. However, it is discouraging for the traders when the farmers sell to other traders even for a slightly higher price, when the market demand is high. Usually, a local trader secures a gross margin of 26-29%, while the gross margin is lower for regional traders and wholesalers (11 to 15%). Retailers on the other hand manage the gross margin of 11 to 24%, depending on who they purchase from.

Potatoes are one of the most imported food crops, and the wholesale and the retail market price is highly influenced by the Indian market. Nepali potatoes cost more than the imported ones, and trading imported potatoes is more beneficial for the traders. Nepali potatoes, the ones produced in *Bajura*, *Humla*, and *Dailekh* cost more due to the higher cost of production and transportation. The trading margin is low and post-harvest loss is also high for the potatoes in these areas. These traders sometimes face a huge loss due to poor handling during transportation, lack of storage, and fluctuating market prices and demands.

Although the potatoes from *Dadeldhura*, *Dailekh*, *Bajura* cost more, they have a good brand value among consumers, and they are willing to pay a higher price for the potatoes produced in these regions encouraging both trader and producer.

Processing

Simple value addition that involves grading, sorting, and packaging of potatoes in large bags is carried out at the producer level, farmer groups, or co-operatives (if they are involved in production). Primary processing, grading, and sorting have helped to reduce post-harvest loss and farmers receive better prices. Likewise, it has also encouraged them to produce better products. High-level value-adding companies involved in chips-making are a few in number and are concentrated in *Kailali*, but these companies prefer using imported potatoes because the locally produced variety doesn't meet the varietal requirement of the processing companies (esp., for potato chips).

Supporting Services

Storage:

> The key informants confirmed by that the production and trade of potatoes in *Doti*, *Dadeldhura*, and other neighbouring districts in *Sudurpashchim* Province have improved after the cold storage was established at Amargadhi-*Dadeldhura*.

Storage facility is one of the crucial aspects of the potato value chain. It plays a vital role in supporting input, production, and trading. Large storage facilities (cold storage) are available only at the trading hubs and are not made exclusive for potatoes. Traditional storage practices such as storing in pits is practiced in clusters at higher altitude such as *Bajura* and *Humla*, but it does not meet the storage demand for commercial purpose. In other parts of the assessment area, only one storage facility at Amargadhi, *Dadeldhura* is exclusively dedicated to potato storage. The key informants also confirmed that the production and trade of potatoes in *Doti*, *Dadeldhura*, and other neighbouring districts in *Sudurpashchim* Province have improved after the cold storage was established at Amargadhi, *Dadeldhura*. Similarly, inadequate storage facilities in *Surkhet* and *Dailekh*

24 Profitability and productivity of potato in Baglung district, Nepal, Mahima Bajracharya & Mahesh Sapkota,2017)

are posing problems in input supply, potato production, and trade in Karnali Province..

Transportation:

Traders normally use mini trucks for transportation from the commercial production sites to markets, and

Photo 4 Potato Cold Store at Amargadhi, Dadeldhura (by Rakesh Kothari)

in some cases, product is transported in passenger vehicles. An exclusive transportation service provider is not available, even in the commercial pockets. Transportation price that keeps on fluctuating is another issue raised by the actors. It affects both producers and traders as it is crucial to determine the final price of the product.

Financial Service:

Producers do not have adequate access to formal financing mediums, although traders are in better position to have such services. The financial service providers are usually national, sub-national banks, and microfinance institutions. Co-operatives are active in providing loans to the farmers. Farmers need a small loan that they can get without collateral from co-operatives. A similar process in commercial banks is full of hassle. Most input suppliers and large-scale traders get financial services from commercial banks. The informal credit to producers by traders is also quite popular.

Business Environment

Federal and Provincial Government:

- Department of Agriculture the Ministry of Agriculture and Livestock Development is responsible for the regulation and implementation all the programmes and budget related to agriculture including potato. The programmes usually focus on research and input distribution.
- National Potato Development Program: National Potato Development Program (NPDP) has been reorganised as a responsible national organization for the development of the sector. It is an entity under NARC for varietal improvement, cultivation technology generation, and dissemination throughout the country.

State and Municipal Government:

- Municipalities and Rural Municipalities mainly support producers and production activities by providing subsidies on inputs and extension services to the producers.
- PMAMP is implementing Potato Super Zone Program in *Dadeldhura*-which includes all wards of Amargadhi Municipality, Aalital Rural Municipality, and is supporting the potato production zones by providing inputs and extension services.

Non-Governmental Organizations:

- Potato seeds are one of the 12 selected VCs of the ASDP area. ASDP is helping in production management, market linkages and business facilitation.
- Peacewin, INF, RVWRMP in *Sudurpashchim* also support the producers by easing their access to inputs, extension services, and sometimes also finance.

Associations/Business Membership Organizations:

- DCCIs work in the facilitation and implementation at the local level for the projects working in agriculture or forest resource management

GESI Considerations

Notes on GESI considerations are more or less similar to vegetables, hence, only prominent differences are highlighted as below:

Production: Potato production is labour intensive compared to other crops. So, many marginalized communities including women are involved in potato

production as daily wage workers for sowing, weeding, and harvest.

Output: Decision making authority of women is mostly limited to crop production while men enjoyed decision-making power in managerial and trading functions. It was also found that men had better access to and control over resources compared to women.

Climate and environment considerations

Although the assessment does not provide an exact estimate of how much economic loss is caused by climate change at various levels of the value chain, an overall analysis has been drawn from the interviews with different relevant stakeholders. According to field interactions with Agriculture Knowledge Center, producers and traders; erratic and prolonged rain has affected production. Unpredictable weather patterns have affected farmers' planning during plantation and harvest. Similar to vegetables, there are problems like the diversity and frequency of pest, insect(red-ants), and disease infestation. While climate change has many negative effects on the overall ecosystem, arguably, it has resulted in a higher yield in potatoes[25].

The interviewees reflected that the increased summer rain has a cooling effect resulting in better yield of potatoes in *Kailali* and *Surkhet* and farmers in the hills of *Doti, Dadeldhura* and *Bajura* have started cultivating potatoes three times a year as the increasing temperature has been suitable for potato production even during winters.

Climate change, however, has increased the frequency of natural disasters such as floods and landslides. Such disasters obstruct transportation, market activities and trade too. This problem is more severe in mountainous regions like *Bajura* and *Humla* than in the Terai and hills like *Kailali*, *Surkhet*, and *Doti*/*Dadeldhura* which have relatively better road conditions. Such changes will have a bigger economic impact and more severe consequences on the communities living in ecologically vulnerable zones, such as *Bajura* and *Humla*, who rely directly on the natural environment for farming to sustain their livelihoods.

As far as effect of potato on the soil and environment is concerned, potatoes are known as a crop that generates low carbon emissions and is less harmful to the environment compared[26] to other cereal crops. Potato, though considered a resource-intensive crop [27] , provides opportunities for utilising the resources used by intercropping with other cereal crops like maize without additional fertilisers and pesticides, making it a resource-efficient production.

25 Joshi, Niraj Prakash and Maharjan, Keshav Lall and Piya, Luni (2011): Effect of climate variables on yield of major food-crops in Nepal -A time-series analysis-. Published in: Journal of Contemporary India Studies: Space and Society, Vol. 1, (March 2011): pp. 19-26

26 Greenhouse gas emissions by crop, climate credentials; https://www.vegetableclimate.com/climate-credentials/greenhouse-gas-emissions-by-crop/

27 Crops that require more resources like water, pesticides, fertilizer and land.

CAPACITIES, CONSTRAINTS, INCENTIVES, AND OPPORTUNITIES ANALYSIS

Capacities	• Most farmers in the assessment areas have landholdings, but the lands are underutilized due to various reasons like lack of commercial orientation, unavailability of farm labour, and sometimes also due to lack of market guarantee.
Constraints	• **Unavailability of required quantity and quality of seeds and fertilizers:** During the season when there is a very high demand, farmers often struggle to get the desired quantity of quality seeds on time. This case is more prominent in *Surkhet* and *Dailekh*. Even the private inputs suppliers cannot source the desired quantity of quality seeds and fertilizers. It is mostly because of the lack of production and storage of seeds. • **Low productivity and high cost of production:** The productivity of potatoes is low in most of the assessment areas, and according to the field survey, the major reasons responsible are low yielding seeds, inappropriate production practices, and costly inputs and labour. Farmers still follow traditional farming techniques that require high cost but give low yield. Extension service providers (AKC, local municipalities) are not able to reach all farmers and provide adequate and effective services. • **Increasing occurrence of pest infestations**: Changing climatic conditions such as increased humidity in many areas have increased the frequency of pest infestations such as late blight. There is a risk of fungal disease during storage if the relative humidity of the stores is not optimally maintained. • **Price Competition with Imported products from India:** Imported products highly influence the market of potatoes as it one of the main determinants of the price. In the regional markets like *Kailali*, both—imported and locally produced potatoes are traded. These traders are the price setters who use the Indian market as their benchmark. It negatively affects the Nepali producers because sometimes the price is set so low that the farmers cannot even recover their cost of production. When farmers demand a higher price, it also becomes difficult for traders to sell locally produced potatoes in the market. • **Post-Harvest Loss:** Post-harvest loss is high in *Bajura* (10%), mainly because of inappropriate medium of transportation (tractors) and packaging, and lack of nearby market to sell the produce. Post-harvest loss is relatively lower in places with better roads and nearby markets. Also, the post-harvest loss in Nepal is higher compared to that in India due to poor post-harvest handling practices like cleaning out the mud and maintaining dryness during storage.
Incentives	• **The market demand for potato is increasing** due to surge in consumption by individual and industrial consumers. With increased consumption, it has become one of the highly imported food crops in Nepal. This presents ample opportunities for Nepali producers to fulfil the gap. • **Potatoes of hills and mountain regions are considered of better quality and taste**; hence consumers are willing to pay premium prices if potatoes are branded and marketed as a produce from high altitude region like *Dadeldhura*, *Humla*, and *Bajura*.
Opportunities	• **Potato promotion has been prioritised by the federal and local governments**. Exclusive national-level scheme like the National Potato Development Program have

been implemented to boost the potato production. NPDP is working to disseminate technologies, create and support the potato production zones in different parts of the country, conduct research on new and improved varieties and introduce new potato storage technologies like rustic storage, etc.

- **Expansion of block, zone, and super zone programs by PMAMP** has proven very successful in boosting production volume and improving economies of scale.
- **Improved road networks within municipalities and connecting districts**. With **increased access to road infrastructure and transportation facilities**, farmers can sell their entire produce. Road connectivity has given farmers more opportunity to reach regional, if not, the local market. This assurance is very motivating for producers to increase their production volume. Similarly, it has also enhanced the access to inputs, extension, advisory services, and market-related information.

POTENTIAL INTERVENTIONS:

(Please refer to annex for details on the interventions derived and which cluster each intervention is applicable to)

1. Partner with traders or local entities to explore and promote technologies (low-cost warehouses, brick storage, rustic storage, etc.) suitable for the local context.
2. Partner with local municipalities and zonal offices to create a seed-producing zone, blocks, and groups.
3. Loan Products
4. Introduce a forum called PSPM
5. Increase and improve the production and supply of quality seeds.
6. Incentivize and encourage traders, input providers, cooperatives to provide embedded services to the producers.
7. Partner with traders or local entities to explore and promote technologies (low-cost warehouses, brick storage, rustic storages etc.) suitable for the local context.
8. Partner with private input suppliers to introduce low cost-technology, tools and equipment to replace labor.
9. Demonstrate such technologies by coordination with AKC and zone office.
10. Partner with service providers like Upaya City Cargo, Pickup and Drop Ltd. To facilitate the piloting of new service models in the targeted areas.
11. Facilitate local entities to intervene and determine standard transportation rates or provide a dedicated space in public vehicles for agriculture produce at a subsidized rate.
12. Assess production situation, need, cost-benefit, and market before building cold storage.
13. Incentivize and facilitate the technology providers to promote and introduce low-cost technologies at strategic locations.
14. Use of multistakeholder platforms to encourage co-ordination and build synergy between multiple actors involved in the value chain.

Figure 15 Potential interventions for potato value chain

CITRUS VALUE CHAIN

Photo 5 Lime sold in market (by Roshan Shrestha)

SECTOR OVERVIEW

Production of citrus in Nepal in mid-hill region dates back to antiquity. However, the modern cultivation practice has encouraged commercial citrus farming in Terai too. It is one of the most important fruit crops of Nepal in terms of area coverage, production, and export potential. It is grown in more than 54 out of the 77 districts. Citrus fruits in the mid-hill region have now become a business proposition with the development of 339 pockets of citrus in 51 districts. Citrus fruits having commercial potential in Nepal are mandarins (*citrus reticulata blanco*), sweet oranges particularly Junar (*citrus sinensis osbeck*), lime (*citrus aurantifolia swing*), lemon (*citrus lemon Lin*), and hill-lemon (*Citrus pseudolemon*). The share of citrus in total fruit production is 37 percent with lion share held by mandarin. Its share in total production is nearly 25 percent.

Citrus is grown in 46,328 ha of land, out of which only 26,759 ha is productive area, and it accounts total production of 239,773 Mt with average productivity of 8.96 Mt/ha (MoALD, 2017). While the production area of Citrus over the last three years has increased by 79% (approximately), the production has only increased by almost 12%[28]. This could be because farmers have planted citrus trees, but fruiting has not yet started. The sub-tropical agro-ecological diversity of Nepal provides a comparative advantage for citrus production.[29] Similarly, good temperature, sunlight, well-distributed rainfall, and fertile soil has favored the production of citrus with good quality and taste compared to neighboring country (Nepal Horticulture Promotion Center, 2017; Acharya, 2016). However, the productivity of citrus fruit in Nepal is continuously decreasing since 2012/13 (Kaini, 2019). *Karnali* and *Sudurpashcim* provinces also share a similar story which is illustrated in the figures in the table below.

Table 4 Citrus fruits production trend

		National	*Karnali*	*Sudurpashchim*
2017/18	**Area (Ha.)**	25,964	2,543	1,856
	Production (Mt.)	245,176	22,387	16,500
2018/19	**Area (Ha.)**	46,412	4,909	
	Production (Mt.)	271,908	22,653	
2019/20	**Area (Ha.)**	46,715	4,564	4,528
	Production (Mt.)	274,140	26,631	25,412

National production of citrus is not increasing as it should have been, but due to increased demand in the market, in 2019/20 alone citrus fruits worth NPR. 2 billion were imported. Both import quantity and value

28 Statistical Information on Nepalese Agriculture 2017 - 2020

29https://www.helpforag.app/2018/02/agro-ecological-zoning-of-nepal.html

of citrus fruits, witnessed an increasing trend during the period from 2009 to 2018. The quantity of imports had jumped by 5,086 % and the value of imports had jumped by 2,978 %. While the quantity exported had increased by 89 %, the value of export had decreased by 3 % during the period. This concludes that the production of citrus fruits is increasing, although the increased production is not sufficient to meet the demand within the country, leading to an increase in import. The top Citrus trading partners of Nepal are India, Thailand and China. Amongst these partners India accounts for 99% of the trade volume which is equivalent to 13 million USD. Value of trade with Thailand and China is equivalent to 2.18 and 1.92 thousand USD, which is quite insignificant compared to the trade with India.[30]

Karnali and *Sudurpashim* also have plenty of potential areas for citrus production. Both provinces contribute (9% approximately) a substantial amount to the total national production with average productivity more or less similar to the national average (10.03 mt/ha).[31] Even the national productivity is lower compared to citrus-producing areas of the neighboring country, mostly because of poor orchard management, decreasing productivity of citrus trees due to an increase in disease, and pests.

GEOGRAPHIC DYNAMICS

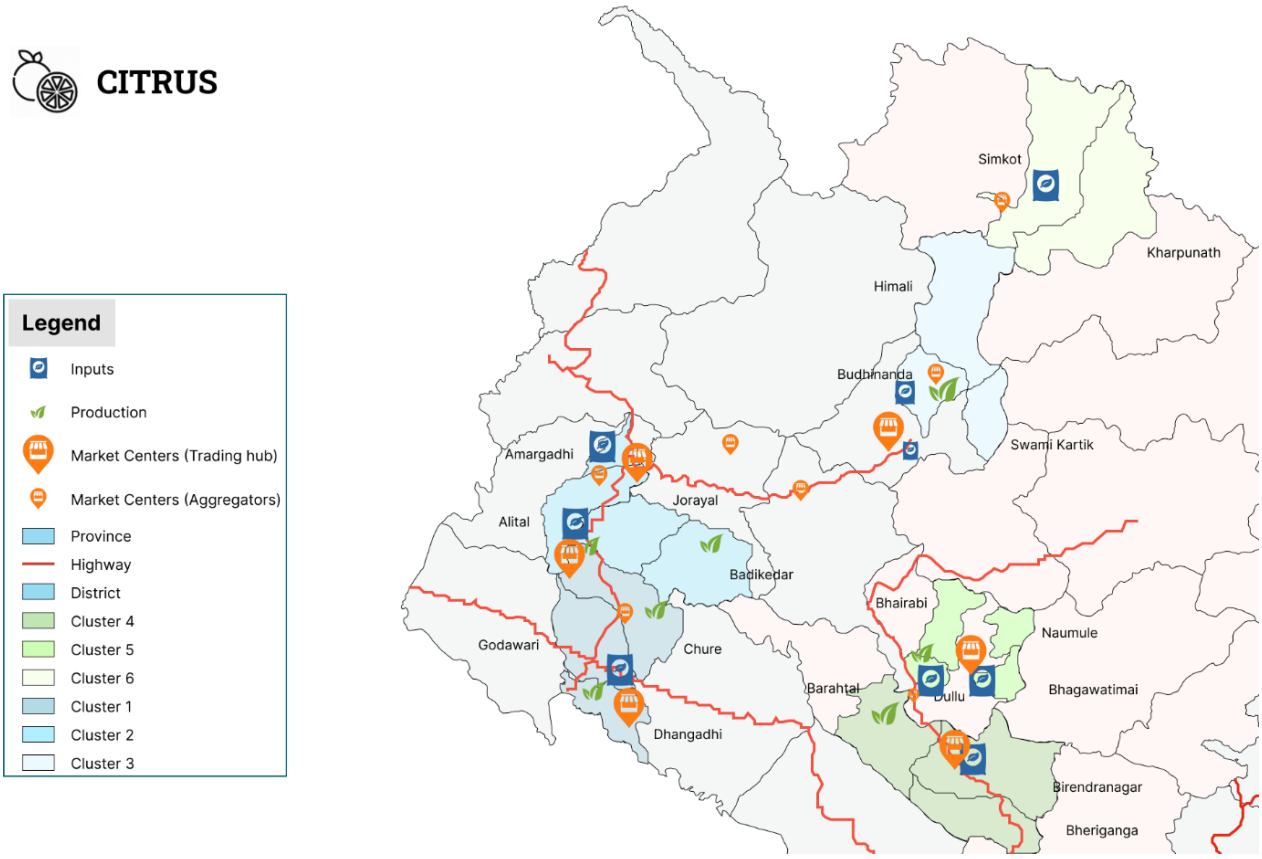

Figure 16 Citrus production and market centers in project clusters

Oranges mostly dominate the citrus fruit production, while the amount of lemon and other citrus fruits produced in these regions is insignificant compared to oranges. It is grown in numerous places across *Kailali* and *Sudurpashchim* province. Citrus-producing municipalities in the assessment areas are Barahtal(*Surkhet*), Dullu (*Dailekh*), *Chure* (*Kailali*), Badikedar (*Dadeldhura*), and Budinanda (*Bajura*). Majority of the citrus is produced in the mid-hills i.e., *Dailekh*, *Dadeldhura*, *Doti*, and *Kailali* (*Chure*).

30 Annual International Trade Statistics by Trade Trend Economy; https://trendeconomy.com/data/h2/Nepal/0805

31 Statistics on Nepalese Agriculture by MoALD, 2019/20

According to the recent data provided by the Ministry of Agriculture, *Dadeldhura* is ahead on production volume followed by *Dailekh* and *Doti*. The case was different two years back when *Dailekh* was on top followed by *Dadeldhura* and *Doti*. This shows an increasing productivity trend along with land size in *Dadeldhura*. Findings related to the productivity of citrus further support the above-mentioned statement as productivity in *Surkhet*, *Kailali* (*Chure*), *Doti*, and *Bajura* is lower than the national average productivity of citrus (8.97mt/ha), whereas productivity in *Dadeldhura* and *Dailekh* is high than the national average.

Majority of the oranges produced in the hills of Karnali Province come to Birendranagar (*Surkhet*), and products from Budinanda (*Bajura*) follow the trade route via Martadi market to Amargadhi and then to Dhangadhi. In the case of oranges, 80% of the collection takes place at the regional market, at *Surkhet* in Karnali, and Kailali in Sudurpashchim

Market map

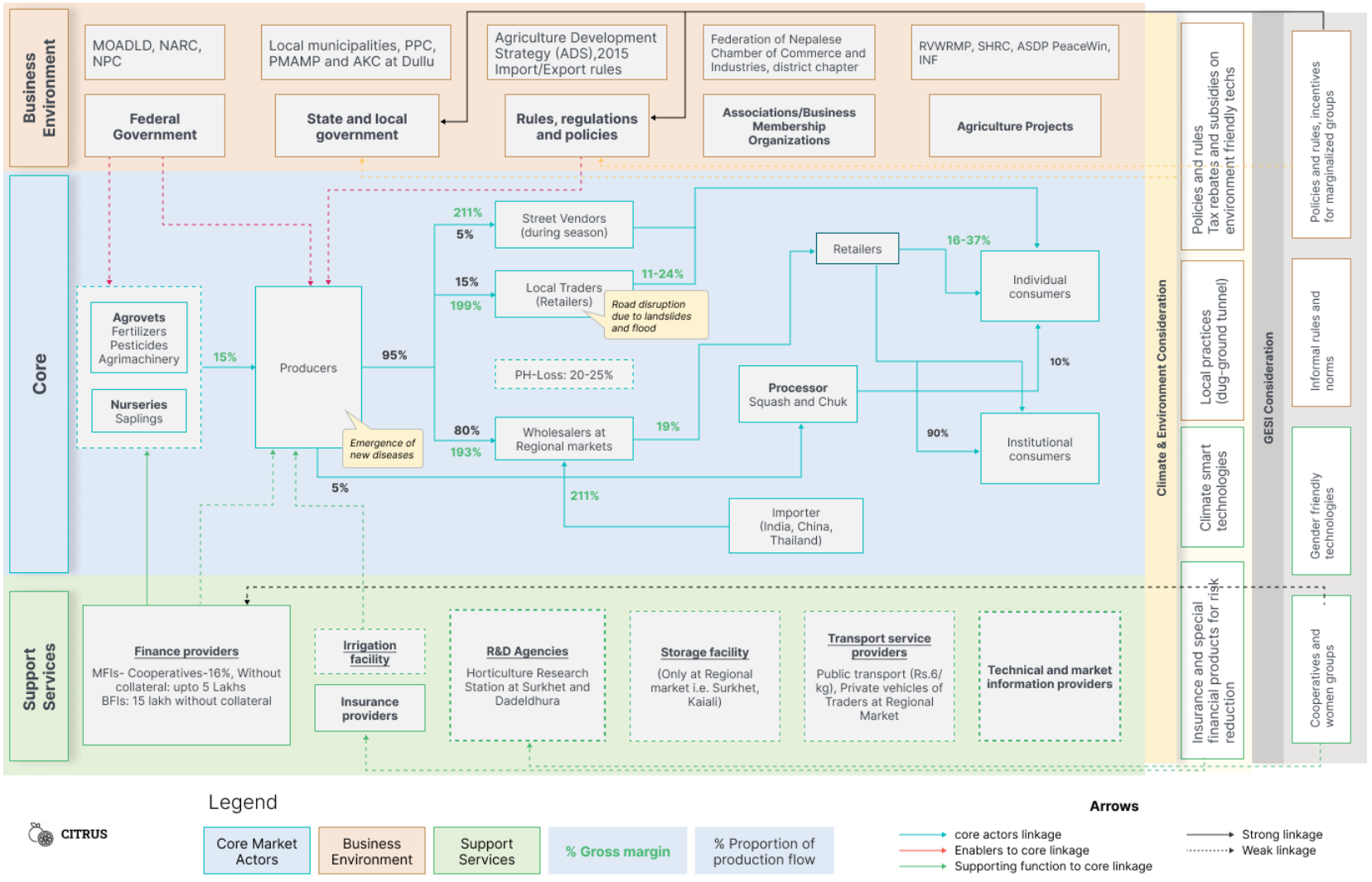

Figure 17 Market map of citrus value chain

Input supply *(Saplings, fertilizers, pesticides, agri-tools and machinery)*

Local entities like AKC, and the Citrus zone, *Dailekh* are the primary suppliers of seeds and saplings, but fertilisers, pesticides, and other minerals come from the agro-vets. The inputs for citrus farming sold by agrovets is limited to pest control measures, and the average gross margin on such inputs is around 15%. In some cases, government programs, and NGOs (Peacewin, INF) also distribute the saplings to promote citrus farming. There are a few private nurseries, but they mostly make saplings for their own use.

Production *(Lemon and oranges)*

Citrus is one of the high-income generating crops.

A case of Arghakhanchi has shown that producers and related actors in the citrus value chain have generated more than Rs770 million in economic activity in one year. Citrus also has high market value and is a low-cost high-return investment for producers. Although the initial investment is high in orchard development, it gives higher returns after the tree starts bearing fruit, and the cost of production also starts decreasing every year. Several research studies conducted in the assessment areas have concluded that citrus farming is a profitable enterprise in the assessment areas, but the share of profit is higher for large farms compared to small farms. (Regmi and Pandey, 10)

A producer can gain between 193 – 211% of gross margin in citrus production, and additional resources required before selling the produce is very low. It can be a suitable option for uplifting the socio-economic status of the people in *Dailekh*, *Doti*, and *Dadeldhura* districts.

Similar to the national and provincial situation, the production area, and production of major citrus fruits under assessment area i.e., mandarin orange, sweet orange, and lime, show an increasing trend. However, , their productivity is decreasing over the past three years. NGOs and government programs have worked rigorously in the citrus promotion in the last decade. These programs distributed required inputs to the farmers and provided advisory support which significantly brought a boost in citrus production, not only in the assessment area, but also throughout the country. These efforts have encouraged the farmers to expand the production area. However, they are yet

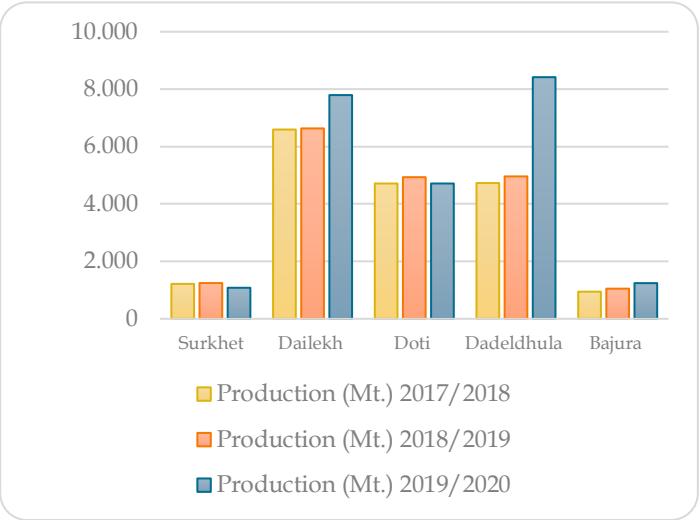

Figure 18 Trend of citrus production volume in project cluster

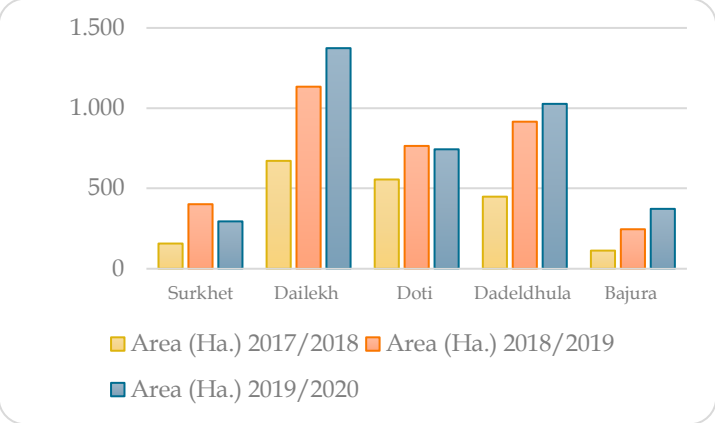

Figure 19 Trend of Citrus production area in project cluster

to realize fruiting and harvest as it takes at least three to four years. The emerging problems in citrus farming are diseases and pests' management, the main causes of the low productivity. A study conducted in *Chure*, *Kailali* found 19 out of 21 citrus trees positive for the greening effect. It means more than 90% of the citrus trees in *Chure* are already infected with the disease. Trees with this disease will give low yield and completely die out after five years. The ineffective practice of orchard management is also one of the vital reasons behind the decline in productivity in Nepal. Poor adoption of management practices like exhaustive intercrop, rain-fed irrigation, an inappropriate dose of manure and fertilizer, the incidence of insect pests and diseases as well as lack of control method are the major causes affecting orchard management that is resulting in production decline in the past 3-4 years. (Adhikari and Dhital, 2006)

Farmers in the assessment area are increasing their production area to enhance production as they have become more aware of the market demand and realized the economic benefit of citrus farming. More

people are leasing land and getting loans from MFIs for citrus cultivation. However, it is still difficult for the resource-poor farmers to be involved in citrus production as they cannot invest huge amounts to develop orchard and wait for three to four years to get their first harvest.

Trading

Comparatively, citrus farming is considered a more beneficial option for producers and traders as the return is higher than other crops. Moreover, the trading channel of citrus fruits has few layers of intermediaries compared to potatoes and vegetables providing more margin to the actors in the chain. Out of the total oranges produced in Kailali, *Dailekh*, and *Dadeldhura*, 20% are sold in the local market by local retailers, such as roadstead vendors and street vendors to the local consumer, and people travelling through that road corridor. The rest of the oranges (80%) directly goes to the regional markets in *Kailali* and *Surkhet* via large traders. Then the oranges reach to consumers via retailers. Oranges of Kailali, *Dailekh*, and *Dadeldhura* have a very high brand value, due to which the traders can sell them at a higher price receiving a better profit margin. An orange trader or retailer receives an average margin of 11-37%. But the key constraint associated with citrus trading is improper post-harvest handling practices like packaging and handling during transportation that results in a loss of up to 10-15% (in the case of *Dailekh*). This loss often has to be borne by the farmers, as the traders reduce the lost amount while paying back to the farmers. If this loss can be reduced, both farmers and traders can benefit from the transaction.

As the demand for citrus fruits is more in the regional market, local collectors collect most of the oranges and supply them to wholesale markets in *Surkhet* or *Dhangadi*. Local collectors also collect oranges from Martadi, *Bajura* which is a meeting point or one of the largest markets that connect several districts in the higher hills and mountain region of *Sudurpashchim* Province. In the case of other citrus fruits like lemon, producers in *Bajura* complain about the lack of market access and reliable transportation services to transport the local produce to the trading hubs.

Processing

Processing of citrus fruits is almost non-existent. A few micro-scale processing companies produce Chuk[32], pickles, squash (juice), etc., but the marketing of these products is difficult as they do not meet the quality standard set by DFTQC. These companies face difficulties in preserving, maintaining quality, labelling, packaging and storing the processed products and fail to cater to larger market. On the other hand, since the supply of fresh fruits is unable meet the existing market demand, processing has not been a priority.

Supporting Services

Storage:

The storage facility is only available at Birendranagar, Attariya, and Dhangadhi at the wholesale market centers. Traders have more accessibility to the storage facilities rather than the producers as the storage facilities are far from producers' reach. Not having access to a storage facility also reduces the bargaining power of citrus producers. If proper storage facilities were available, producers could store their products during peak season that lasts for 2-3 months and have greater bargaining power with the traders.

Transportation:

Transportation service for agricultural commodities is an issue for fruits and vegetable producers in *Dailekh*. Existing service providers are passenger carriers, and minitrucks and such vehicles are not exclusive to transporting agricultural produce. Unavailability of regular transportation services and poor handling while transporting and loading and unloading also lead to post-harvest loss. The other common practice, which is comparatively better is, that large traders send vehicles from the regional market centers like *Surkhet*, and Dhangadi to collect fruits and vegetables from, *Dailekh*, *Kailali*, *Bajura*, *Doti*, and *Dadeldhura*. Apart from these two, there are no other options of transportation. In addition to the unreliability of transportation services, the cost of transporting the products is also very high. Service charge depends on the free will of vehicle owners or drivers, as there is no standard rate determined for transport of produce.

Financial Services:

Producers do not have proper access to finance from commercial banks due to hassles of documentation. The traders, however, have comparatively better access to finance. The financial service providers are usually national, sub-national banks, and microfinance institutions. Co-operatives are the major source of credit to the producers. Producers need a small loan that they

32 Chuk is a concentrated citrus juice used as an additive in cooking.

can get without collateral from co-operatives. A similar loan from commercial banks requires longer process and many documents. However, most of the input suppliers and large-scale traders get financial services from commercial banks.

Business Environment

Federal and Provincial Government:

- Department of Agriculture under the Ministry of Agriculture and Livestock Development is the chief body for all the rules and regulations related to citrus.
- Citrus promotion has been prioritised by Agriculture Development Strategy (2015-2025) and provincial planning commission.

State and Municipal Government:

- Municipalities and Rural Municipalities mainly support producers and production activities.
- PMAMP, AKC support the citrus production zones by providing inputs and extension services.
- Fruit area expansion program is being implemented by the municipalities from F.Y. 2015/16 which has set the long-term goal to increase the area of citrus production from 39,035 ha (F.Y. 2014/15) to 94,554 ha, increased production from 2,22,894 Mt. (F.Y. 2014/15) to 5,93,877 Mt. and increased productivity from 8.82 Mt/ha (F.Y. 2015/16) to 10.22 by the end of F.Y. 2036/37.

Non-Governmental organizations:

- Citrus (Orange) is one of the 12 selected VCs of ASDP area[33]. ASDP is helping in production management, market linkages and also business facilitation.
- Peace win, INF in *Sudurpashchim* also support the producers by easing their access to inputs, extension services, and finance.

Associations/Business Membership Organizations:

- DCCIs work in the facilitation and implementation at the local level for projects working in agriculture

GESI Consideration

- **Input:** Most of the private nurseries in the assessment areas were owned and managed by men but they employ women as labourers in plantation, weeding and mulching. According to the field interview, weeding requires less physical effort, and women are perceived to work more neatly hence this kind of work is designated for women. Such works involves less physical labour which makes it more attractive to women.
- **Production:** An assessment conducted in Dullu, *Dailekh* has found that Brahmin and Chettri (higher caste groups) are predominantly involved in Citrus farming and more than 70% of citrus producers are male. Whereas, similar to the case in nursery management of citrus, women involvement was found mostly in mulching, weeding, and pesticide application. Women also work as wage labourers for these activities. [34] Transitioning from other crops to citrus or males returning to citrus farming from other occupations (returnee migrants) in search of better occupation has created a new identity for men as citrus farmers specially in *Dailekh*. As a result, other production crops like vegetables, potatoes, and livestock rearing are being handed over to women. Yet, the male member takes charge of the market-oriented (more lucrative) crops like Citrus farming. [35]
- **Output:** Women are also employed as daily wage laborers at the wholesale markets for grading, sorting and packaging of the fruit in sacks and plastic crates before selling to the retailers. Males from low-income groups are also often employed as daily wage laborers for loading and unloading jobs at the market centers.

Climate and environment consideration

33 ASDP area – hills and mountains of Karnali Province including Dailekh and Surkhet of GRAPE clusters.

34 An assessment of mandarin (Citrus reticulata Blanco.) orchard management practices in Dailekh, Nepal, Ansu Adhikari1* , Pankaj Raj Dhital2 , Sambat Ranabhat1 and Shilpa Koirala, 2021

35 Examining Agency in Agriculture: The Feminization Debate in Nepal,Journal of International Women's Studies ,2018

It is predicted that the temperature in the hills of *Sudurpashchim* will keep on rising in the coming 20 years, and this may bring detrimental effect in the production of citrus if adaptive measures are not initiated soon. Due to increasing temperatures, pests' infestation has been a common challenge in most of the value chains, including citrus. High amount of off-seasonal rainfall and hailstorms are mainly causing loss to the production. The most vulnerable group to the climate risk in citrus value chain, are the producers at *Chure*, *Doti*/*Dadeldhura* and *Dailekh*, and the impact is harsher for small-scale producers who do not have the capacity to invest in climate adaptive measures such as nets to protect from hailstorm and pests. Limited understanding of the climate change effects and the absence of adaptive measures, causes more problems in citrus production. Inconsistency in production as a result of changing weather patterns also affects the traders as they are not able to get regular supply of the products. Without a guaranteed prediction of amount of harvest from the producers, traders do not have enough incentive to collect farmers produce hence a consistent and sustainable supply chain cannot be formed.

Citrus fruits are resource-efficient crops since they require less fertilisers than other crops. Low chemical fertiliser use is also better to keep soil nutrition and health intact and thus contributes to save the climate. Citrus farming also allows intercropping of vegetables and potatoes in the citrus orchards, and many producers in *Doti*, Dadeldhura, assessment area were found to be taking advantage of this opportunity.

Furthermore, because it is a tree-based product, citrus trees help in the preservation of soil fertility and the prevention of soil erosion. Hilly areas are prone to drought and landslides, where citrus trees can help in preventing such disasters in the form of agroforestry.

CAPACITIES, CONSTRAINTS, INCENTIVES, AND OPPORTUNITIES ANALYSIS

Capacities	• Citrus farming requires a high initial investment for orchard development. Landless producers will require even higher investment to take land on lease., They do not have easy access to loans from commercial banks without collateral, and a collateral-free loan from cooperatives is very expensive and hard to repay. Although most producers in the assessment areas are cultivating on their landholding, expansion of the orchard will require them to take land on lease. 70% of the producers in the assessment areas are planning to expand their orchard in the coming years.
Constraints	• **Decreasing Productivity of citrus trees and orchards:** Citrus farming has become prone to disease. The productivity of oranges is declining every year due to poor orchard management, disease, and pest infestation. This is partly also because of **climate change** (sometimes long drought, heavy rainfall, and changing weather patterns) and mostly because of producers with **limited technical knowledge about production practices.** • **Disorganised marketing channel:** Coordination between producers and marketers is lacking. There is no consistency in trading channels as traders/collectors, and trading places keep changing every year. This is mainly because of the increased number of part-time seasonal traders. • **High-Post harvest loss:** Farmers are not aware of proper harvesting practices, harvesting time, and plucking techniques which largely determine the shelf life and fruit quality. Not following appropriate practices contributes to the quality and post-harvest loss. In addition, oranges and mandarins are just stacked on top of hay inside tractors, trucks, etc. instead of stacking them in plastic crates. Transporting it without appropriate packaging causes a 20-25% loss by the time the fruit reaches the market.
Incentives	• Due to better taste and quality, citrus from *Chure*, Dullu, and Amargadhi **receive premium prices**. Consumers are willing to pay a higher price if they get an assurance of the product's origin. Taking advantage of this opportunity, some

	traders in the *Kailali- Dadeldhura* road corridor sell the imported oranges as locally produced. • **Income from Citrus farming is higher** than from vegetables and cereal crops due to the higher farm gate price of citrus. • **The market demand for Citrus** is very high which is also reflected in increasing citrus import figures. This concludes that the increased production of citrus fruits is insufficient to meet the demand of the market.
Opportunities	• **The Government's various plans and policies have prioritised mandarin** as a high-value crop in the hill farming system. It aims to increase the production and productivity of mandarin by supporting the producers with inputs and providing extension services. • **Expansion of market and road corridors connecting the municipalities**. This has made market linkage easier along with easy sourcing of inputs, and easy access to transportation. Producers are getting better exposure due to better access to inputs, extension, advisory services, market-related information, and an established supply network to reach the regional market.

POTENTIAL INTERVENTIONS:

(Please refer to annex for details on the interventions derived and which cluster each intervention is applicable to)

1. Encourage private input suppliers to provide extension services to the producers.
2. Facilitate FIs to introduce new Financing schemes and repayment packages
3. Incentivize and facilitate the technology providers to demonstrate and promote among the prospective buyers (producers).
4. Support the local entities to design training package that covers all these necessary aspects from production to harvesting.
5. Facilitate traders and market centres to provide producers with PH knowledge of grading, sorting, packaging, etc.
6. Encourage and facilitate traders and market centres to provide packaging materials (plastic crates) on rent to package and transport the fruit.
7. Facilitate the large-scale traders at the regional market to establish a well-structured supply chain network.
8. PSPM-Production Sales Planning Meeting. Production sales planning meeting is designed to stimulate innovation along production and market chains by enhancing stakeholder collaboration and trust. PSPM strives to foster the smallholder producer's production and market access by generating fruitful collaboration among different actors (producers, traders, retailers, agro-vets, and other related stakeholders).
9. Partner with palikas and AKCs to disseminate these technologies and train the extension service providers who can use and provide services to digitally illiterate producers or who need support to use such technologies.
10. Demonstrate the benefits of these technologies through local resource persons of AKC, local municipalities, co-operatives.
11. Introduce low-cost technologies after assessing the production situation, need, cost-benefit, and strategic location for cold storage before building it.
12. Incentivize and share risk of new potential service providers to try their business model in the targeted assessment areas.
13. Facilitate the local entities (Local municipality, market centres) to intervene and set standard rates and have a regular monitoring mechanism.
14. Output-based subsidies should be prioritised. Output-based subsidies can be provided to only those producers who are able to maintain certain quality standards or adopt certain improved production practices.
15. Use of Multi Stakeholder platforms to encourage coordination and build synergy between related actors in the value chain.

Figure 20 Potential interventions in citrus value chain

APPLE VALUE CHAIN

Photo 6 Apples in Humla (by Ashta Prajapati)

SECTOR OVERVIEW

Apples are a deciduous fruit that thrives in the mid and high mountainous regions of Nepal. High-quality apple production is best suited to sub-humid and dry temperate mountain environments with elevations ranging from 1800 to2800 meters above sea level. Some low chilling apple cultivars are planted at altitudes as low as 1200 meters above sea level. The total production area for apples in Nepal is 12.9 thousand hectares, where 45000 MT of apples were produced in 2019/20. The top 5 apple-producing districts of Nepal and their contribution to national production in shown in Figure 21.

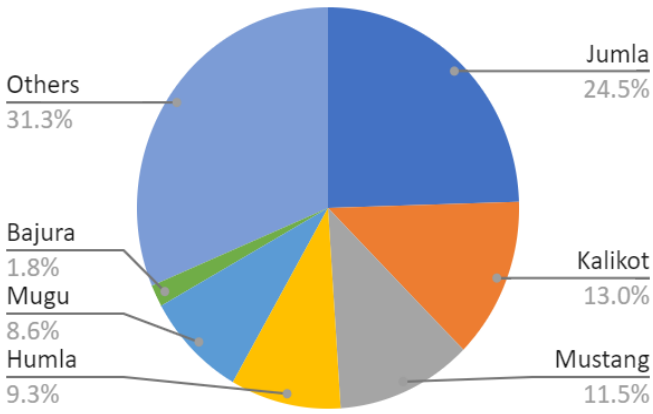

Figure 21 Top apple producing districts and their contribution in National Production

Jumla is the largest apple producer in the country, followed by *Kalikot* and *Mustang*. *Humla* stands at 4th most apple producing district above *Bajura* which contributes only 1.8 % to national production.

Besides domestic production, Nepal imported 65 million metric tons of apples in 2019/20, which is close to 1500 times the national production. However, if we see the import value of apples in the last three years it is declining as shown in the figure 6.

Domestic production of apples increased gradually until 2015/16 and then saw a decline till2018/19. The production, however, has picked up again, although the reason behind it is increase in land rather than the productivity.

Production of apples in *Humla* alone increased by 187% after the land size for cultivation increased by 156% from 2018/19 to 2019/20. Apple production also increased in *Bajura* by over 56% over the same period.

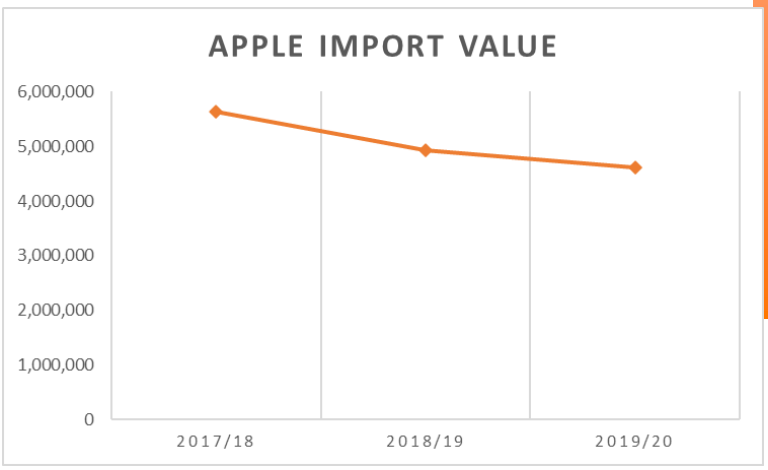

Figure 22 Import value of Apples in Rs.

GEOGRAPHIC MAP

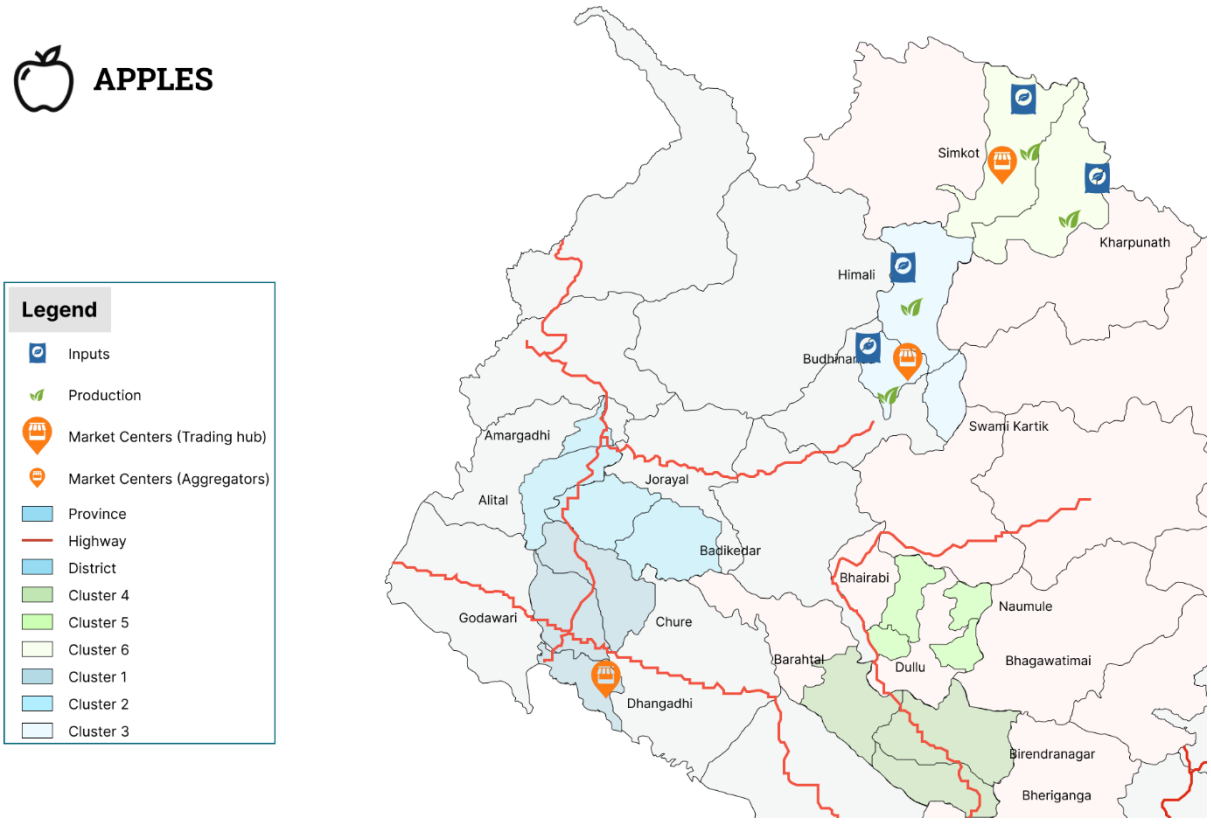

Figure 23 Apple production and market centers in project clusters

Apple are mainly produced at Simikot, in *Humla* and at Budinanda, Swamikartik and Himali in *Bajura*. In the case of *Bajura*, the apples are collected and sold in the Kolti market. However, after the construction of motorways in 2019, apples from *Bajura* have also reached market centers in Dhangadhi and Kathmandu. Similarly, the major market for apples from *Humla* is Simikot, where the major buyers are the tourists visiting the district Occasionally the apples from *Humla* are also transported to Nepalgunj via air. The input suppliers, nurseries and agrovets, are available within the municipalities where apples are produced.

MARKET MAP

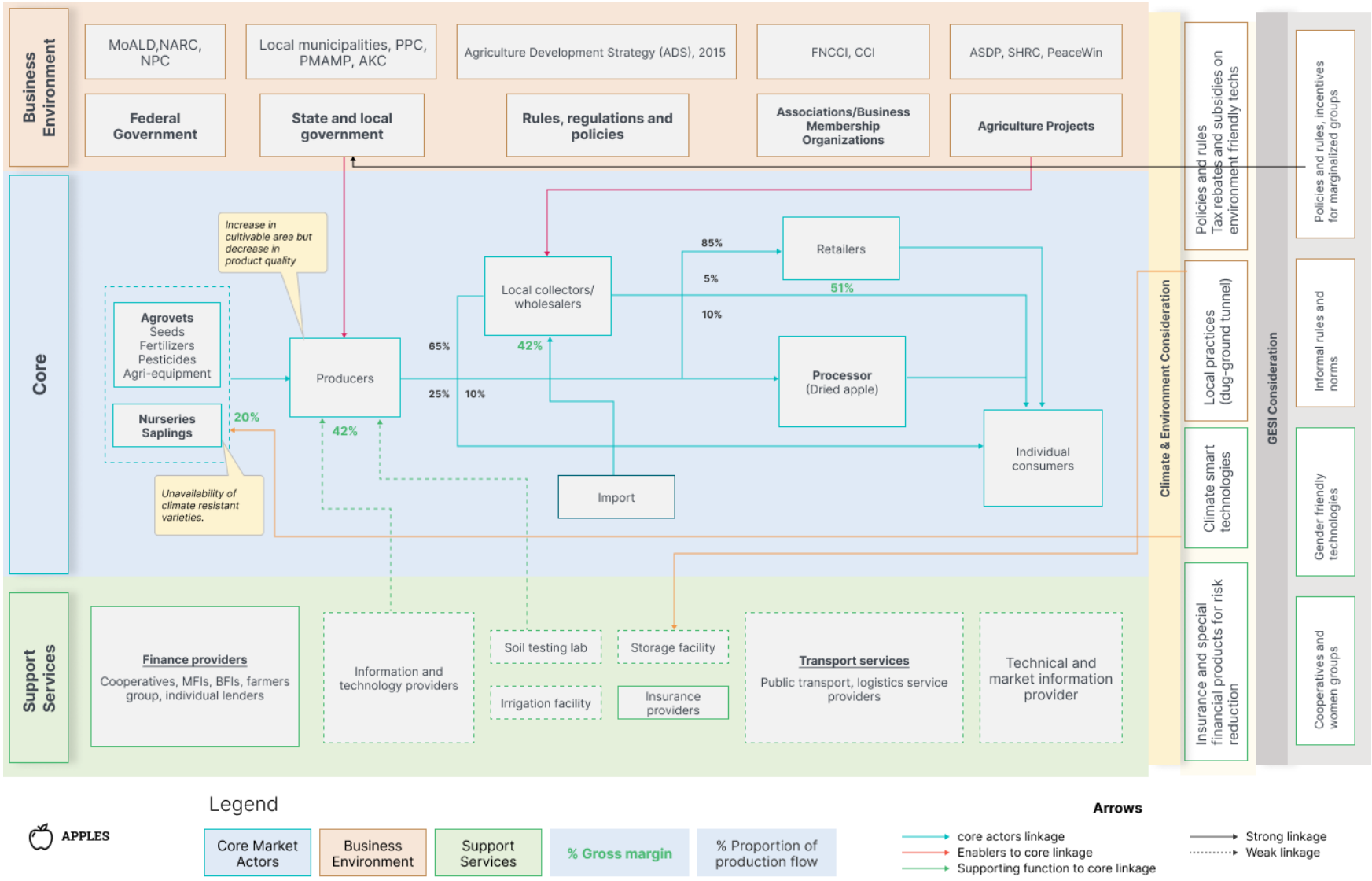

Figure 24 Market map of apple value chain

Input supply *(Apple saplings, seeds, fertilisers, pesticides, agri-machinery)*

Apple saplings, water, pest control measures, harvesting equipment, and fertilisers are the major inputs required for apple production. While they get saplings from the government office, and other development programmes, producers get other inputs from the agrovets. Government and other development programmes source the saplings from private nurseries in districts like *Jumla* and in very rare cases also import improved varieties for trial and testing. There are no private nurseries supplying apple saplings in both the clusters and producers are not satisfied with the types of saplings distributed by local authorities. In some cases, producers themselves are taking initiative to bring and test new varieties. One of the lead producers in *Humla* bought saplings from Himachal Pradesh for trial. The results are yet to be observed, but it is encouraging till date with good progress so far.

Production *(Apple fruit)*

Apple production is on rise in both the clusters—*Bajura* and *Humla*. *Humla* has a target to qualify itself as an apple zone, which requires a minimum of 500 trees. Commercialization of apple farming is taking place in both districts. The producers are aware of the demand of apples in the market, but they are constrained with dependency on rain for irrigation, inefficient technology for harvesting, and limited technical knowledge on improving production. Producers are also referring to a decrease in production. The quality (sweetness, shape) is also degrading. Producers blame climate change for this change.

Producers in *Humla* have started to increase their production with the expectation of road connectivity. They have allotted more land to grow apple which is also seen in the Figure 25

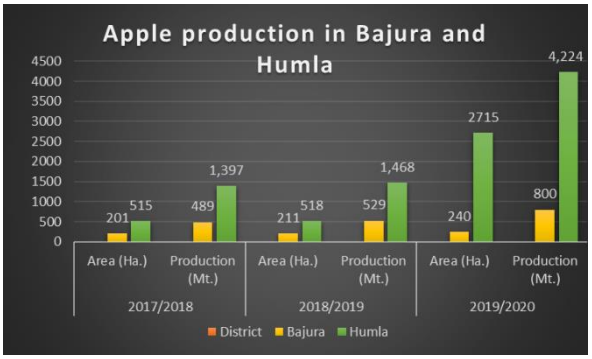

Figure 25 Production data of Apples in *Humla* and *Bajura*

Producers claim apple farming as one of the profitable ventures. The gross margin on apple per hectare of land was Rs. 109,615 in an assessment conducted in the *Jumla* district. Apple is one of the high-income generating crops and even a very conservative calculation shows average net income opportunity ranging from Rs 24,000 to Rs 35,000 on 0.021 ha of land with fruiting apple.[36] Considering similar productivity in Jumla and *Humla*, apple farming can be considered profitable. However, the production area of apples is still quite low and is only spread over 240 ha in *Bajura*, and 2715 ha in *Humla*

Trade

Different levels of traders are involved in the apple value chain. Collectors buy apples from producers, which are sold to local traders and retailers. Apples in *Humla* are sold within the district and are mostly bought by tourists visiting *Humla* and beyond. There is no proper road access to *Humla*, so transportation to larger markets is a problem in the sector. China used to be the main trade partner for *Humla* apples, but China recently established a quarantine center, which has reduced the trade. However, there are increasing numbers of tourists to Mansarovar and the Limi Valley, who are the potential customers of the produce. Apples in *Bajura* are also mostly sold at the Kolti market in *Bajura* by traders. The under-construction road allows apples from *Bajura* to reach the market at *Dhangadhi*.

As apples are grown at the most remote part of the country without proper road access, the cost of transportation and loss become high. Thus, the gross margin for each level of actor is similar to that of producers.

[36] A Value Chain Analysis of Apple from Jumla, SNV, 2011

Processing

Apple processing is limited to drying and making brandy (*marpha*). Sun drying and to some extent, solar dryers (a rare case in *Humla*) are used for drying apples. Apple brandy is locally made without any brands, in loose bottles. Both processes are done at small household level units without setting up a proper enterprise. Processing of apple is not very commercial and it is a seasonal activity when the local market cannot consume the production and there are no other alternatives to send it to the larger market or store it. Hence, the processed items are mostly made in limited quantity and mostly sold locally to tourists, with only some quantities being exported to Nepalgunj.

Supporting Services

Storage

Apples are seasonal products that are usually harvested from mid-September to December. The harvested apples need to be sold right after harvest or can be stored in a temperature-controlled chamber for future use or sales. Proper storage facilities are not available in both the clusters. There are small-scale traditional storage systems which can prolong the life of apples by 2-3 months in Simikot, but they are of small capacity. Hence, to minimise losses, producers sell apples at a lower price during the peak harvest season.

Transportation

Transportation is one of the major factors that determines the market accessibility. Producers and traders use mules to carry apples from remote *Humla* to district headquarter and in rare cases on motor vehicles which is still a very expensive option. *Humla* does not have any motorable roads connecting it with larger markets and therefore the only access to other districts is on foot or by air from Nepalgunj. *Bajura* now has access to a seasonal motorable road, so apples are transported to *Dhangadhi* market centers in jeeps/buses. Access to roads and transportation is a big challenge in both clusters to link the produce with the markets.

Extension services

According to an assessment conducted in *Bajura* in 2018, 40% of producers had received extension services such as training on modern apple farming and subsidies on saplings, tools, and equipment. Most of the producers received training from the agriculture offices at the districts, the Prime Minister's Agriculture Modernization Project (PMAMP), and I/NGOs.

Business Environment

The agriculture knowledge centers were developed under the provincial agricultural directorate to promote agriculture development in the provinces and clusters. The AKCs in both clusters provide extension services and hold programs related to apple production for producers. Similarly, other NGOs and INGOs working in the clusters are also providing apple processing training and distributing saplings as part of their project activities. The fruit development directorate carries out several activities for the development of fruits, including apples. Similarly, DCCI has also been supporting the apples producing farmers in post-harvest management and marketing of apples.

In 2019, AKC in *Bajura* started collecting apples from producers and supplying the apples to provincial and national centers. The same year, *Bajura* sold 1,000 tons of apples to Kathmandu and 600 tons to Dhangadhi.[37]

GESI Considerations

Production: Apples are grown by small to large-scale farmers. However, apple production income is directly related to land ownership, implying that apple production is not perceived as sufficiently pro-poor as the disadvantaged group, and low-income families have lower landholdings. (SNV,2011). Similar scenario still prevails in the assessment areas and also reflects that apple production is dominated largely by Brahmin/Chhetri (81%) followed by Dalits (19%) which means the participation of marginalized groups is found less. Wage workers in the Nepalese context generally belong to marginalized groups. Apple farming requires a large number of labourers, which provides huge opportunities for poor wage labourers to work on farm/orchard management, harvesting, and post-harvest opportunities.

37 Krishna Oli, Bajura apples find their way into the Capital. My Republica. September 2019.

Output: As far as output market is concerned, women from disadvantaged groups are mostly found involved in local transportation (carrying apples in bamboo baskets). They are also employed in apple processing (sun drying), and trading of apples at the local market while other large-scale trading, storing activities are mostly male-dominated. Apples are among the most grown fruits in *Humla* and have potential to generate high incomes. Hence, with increased production of apples and proper market linkages, and other processing opportunities explored, economic growth of the marginalized population of the municipalities and clusters can be anticipated.

Climate and Environment Considerations

Water resource depletion increased northern wind, high-speed wind, less snowfall, and prolonged droughts were identified as major climatic hazards in the *Bajura* and *Humla*. These changes have reduced fruit productivity, size, and quality. Furthermore, unpredictable rainfalls and hailstorms can cause significant damage to apple farms by destroying all the fruits. However, climate change does not only have negative effects as increasing temperatures in the mountains are making more areas or lands suitable for apple farming that were previously unsuitable due to low temperatures.[38]

The field assessment has also revealed some negative impacts of climate change. Due to change in climatic patten the farmers have observed the incidence of insects, pests and diseases in apple which has impacted the production. Also, the climatic change has impact on the quality of apple due to which farmer are not getting good market price. The farmers also reported that high temperature and moisture stress has increased sunburn and cracking in apples. Alternative and/or additional irrigation water sources; the use of low chilling, drought tolerant, and early maturing varieties; the adoption of efficient irrigation methods; and conservation agriculture practises were identified as important adaptation measures but were rarely implemented in the assessment areas. Although farmers are aware of the impact of climate change on production and quality of fruits, they are unaware about the mitigation strategies to cope up with the negative effects of climate change.

According to research from Cornell University, apples are environment friendly as apple trees can absorb between 10-20 tonnes of carbon dioxide per acre every year and release 15 tonnes of oxygen. Similarly, in hilly and mountainous regions of Nepal, apple trees help in soil conservation and reduce the risk of landslides. Producers interviewed during the assessment were found to be aware of the climate change issues. They are facing loss in quantity and quality of fruits due to change in climatic conditions. Some studies have been initiated for new varieties of apples for higher altitudes to cope up with the impacts of climate change **and** these are mostly done by the locals as mentioned by the FNCCI representative in *Humla*.

[38] WFP Critical Corporate Initiative: Climate Response Analysis for Adaptation Nepal; 2021

CAPACITIES, CONSTRAINTS, INCENTIVES AND OPPORTUNITIES ANALYSIS

Capacities	• Producers and other value-chain actors are aware of the market demand for apples, so efforts on increasing production by planting trees have started. • Traditional storage facilities to extend shelf life of apples have been practised in some places of Simikot.
Constraints	• Abundant production in a short span of season, but lack of storage facility compels producers to sell apples at lower price. • Productivity of apples in the assessed clusters is close to 8 MT/ha which is almost half of the productivity in China which is15 MT/ha. However, the productivity in Mustang Nepal seems to be promising at 12 MT/ha. • Transportation cost from *Bajura* to other districts is very high, and the road is seasonal. In case of *Humla*, the road is not operational yet and transportation to other districts carried out via air. • The saplings available are not of good quality. • Loss of apples due to improper fencing, and intrusion of animals. • Impact of climate change has been observed in apple production. The quantity and quality of apples are declining due to changing weather patterns and increasing temperature. • The processed products are not of consistent quality.
Opportunities	• There are opportunities for technology transfer from Mustang to the project clusters for increasing apple productivity. Manang and Mustang are known as places that produce highest volume and best quality apples in the country. The producers are following modern orchard management practices, and planting varieties that gives more yield and are of better quality. There are new successful apple storage technologies that has motivated the farmers to boost apple production. Several studies have also mentioned about the trials of apple varieties resistant to climate change in Manang and Mustang.[39] • Abundant land area to expand production. Increase in temperature is also making more land suitable for apple production in *Humla* and *Bajura*. • National and international demand for processed products like dried apples and brandy (marpha).
Incentives	• The ongoing road construction joining the clusters to market centers, and the high demand of local apples from the market. • Promotion of the clusters for apple production, and many government programmes supporting apple value chain. • High tourist inflow in *Humla* to visit Mansarovar, and Lipi Valley has created a good market for apples and its products in *Humla*. • Road from *Bajura* has connected the district market with other regions of the country.

POTENTIAL INTERVENTIONS:

(Please refer to annex for details on the interventions derived and which cluster each intervention is applicable to)

Figure 26 Potential interventions in apple value chain

39 Aash Gurung. Apple farmers in Manang grow new varieties at higher altitudes. The Kathmandu Post. April 2021

1. Research on productive and climate suitable varieties of apples.
2. Understand causes for low productivity and intervene as per the findings suggest.
3. Train the producers, and local traders to build low-cost technology suitable to local needs.
4. Incentivize and facilitate the technology providers to improvise the existing storage units.
5. Explore for small-scale, low-cost portable technology that is suitable for remote areas.
6. Encourage local entities (AKC, local municipality) to test and import new varieties and to train the producers on modern farming practices.

WALNUT VALUE CHAIN

Photo 7 Walnut Tree (by Ashta Prajapati)

SECTOR OVERVIEW

Walnut is one of the important fruit crops of the Himalayan region of Nepal. Almost all the mountain region of Nepal has a suitable climate for walnut production which can happen at elevations of 1000 to 4000 meters. Naturally grown hard-shelled walnut seeds have been traditionally used as indigenous medicines for treating skin diseases and as a subsistence food item rather than as a cultivated crop. Softer shelled walnuts are said to have been introduced to Nepal from Kashmir, and the production is gradually growing. Due to its amazing fruit properties and economic and socio-cultural factors, walnut planting is gaining popularity in Nepal. As walnut is non-perishable, it can be preserved for a extended period of time even if immediate selling is not possible owing to obstacles such as transportation. Nuts have a high monetary value, are simple to handle, and stimulate market demand. Apart from that, walnut trees are significant in agroforestry [40] . Nepal produced 10,000 MT of walnut in 2019/20, which is an increase of 12% compared to the previous year. The 10-year walnut production trend is given the Figure 27.

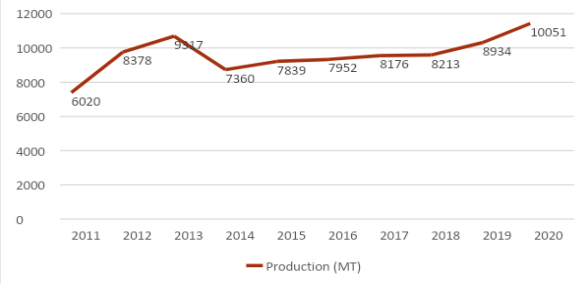

Figure 27 Walnut production trend (2011 - 20)

40 Maria Anderson, "Walnut Cultivation and Care," AgroCorrn, August 17, 2021, https://agrocorrn.com/cultivation-and-care-of-walnut/.

GEOGRAPHICAL DYNAMICS

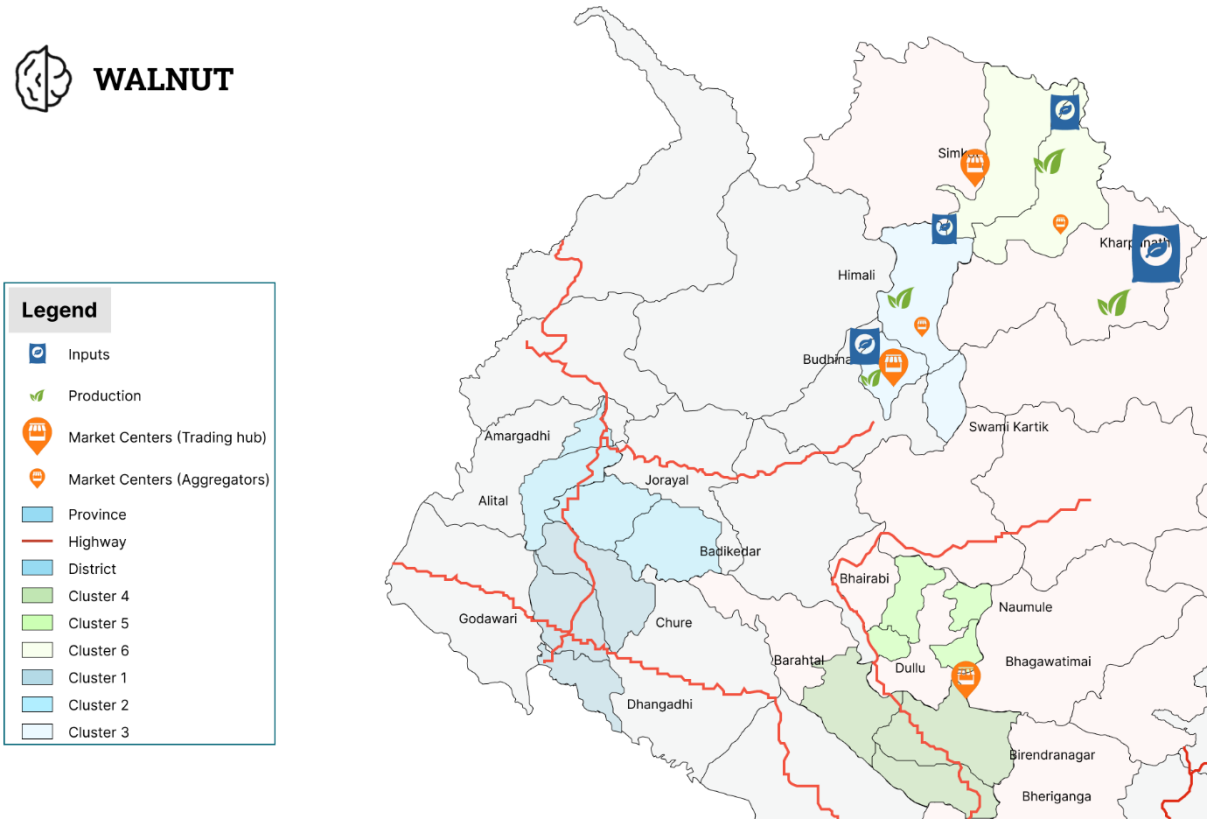

Figure 28 Walnut production and market centers in project clusters

Among the selected clusters for the assessment, walnut was selected for *Bajura* and *Humla* clusters. Out of the total national production, *Humla* cluster contributes only 1.9%, while *Bajura* contributes only 0.6%. However, in terms of productivity, *Humla* has the highest rate of yield at 10.1 MT/ha, which is significantly high compared to National average of 5 MT/ha. [41] Walnuts are grown in Simikot municipality and Kharpunath rural municipality of *Humla* district. The walnuts collected from these areas are sold at the Simikot market and *Surkhet* market. In *Bajura*, walnuts are grown in Himali and Budhinanda rural municipalities. The walnuts produced in *Bajura* are consumed locally and sold to the Kolti market. Producers at *Bajura* and even *Humla* are just starting to plant the commercial variety or the soft-shelled walnuts in larger areas. Its production will take another 2-3 years. Inputs for plantation comes from the DFO at Simikot in *Humla* and Budinanda in *Bajura*.

41 Statistical Information on Nepalese Agriculture, MoALD

Market Map

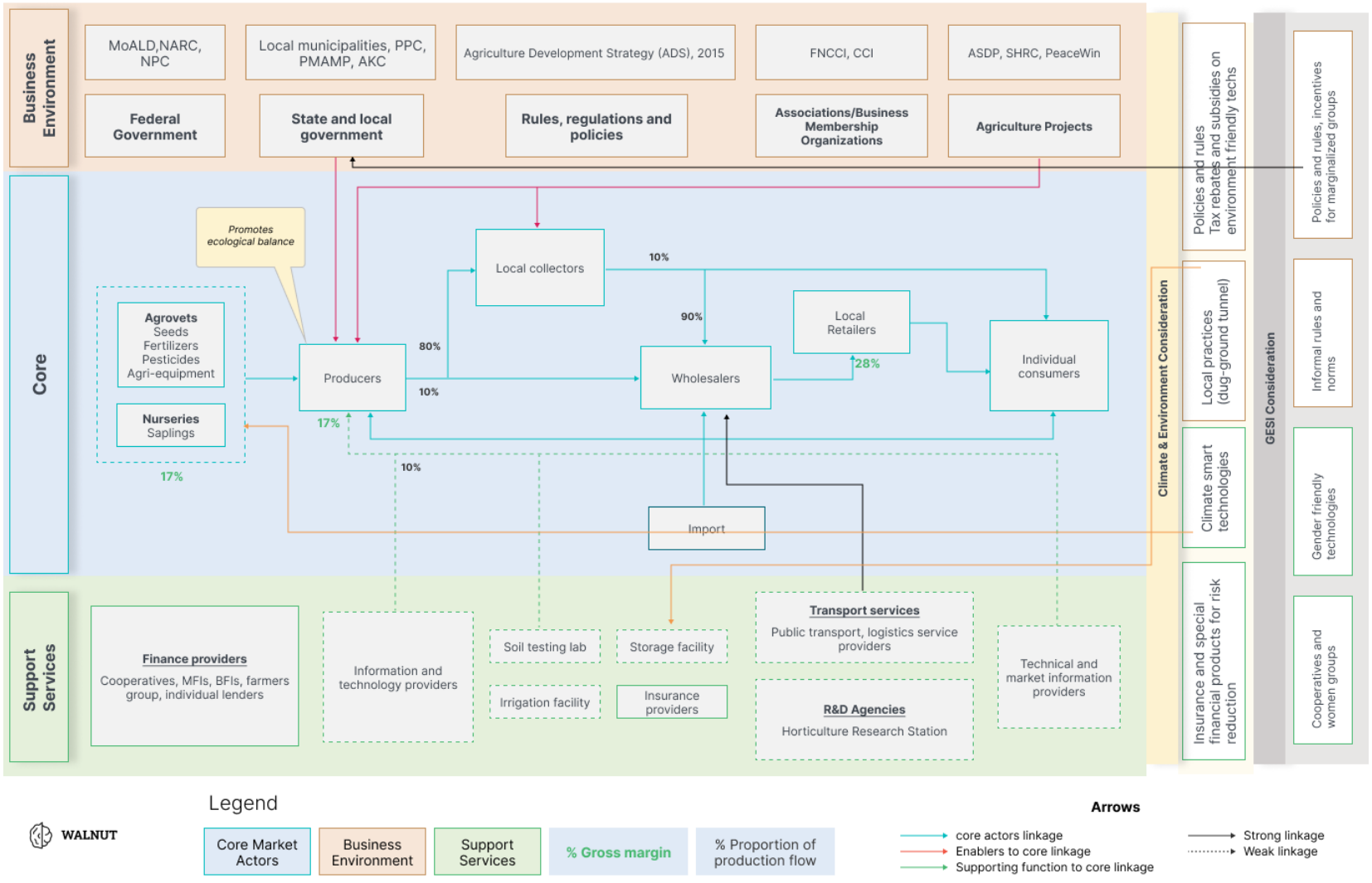

Figure 29 Market map of walnut value chain

Input supply *(Walnut saplings, seeds, fertilisers, pesticides, agri-machinery)*

Walnuts are indigenous to the Himalayan regions of Nepal. Hard-shelled walnut trees grow naturally, while farmers have started cultivating soft-shelled walnuts. In general, the department of agriculture provide inputs to produce walnut. Importers in Kathmandu import high yielding new varieties at the request of the DoA, and the DoA distributes these saplings to producers as per their annual action plan. The distribution of saplings is based on a government-level price subsidy of 50%. Farmers must therefore deposit 50% of the price of the sapling before receiving it from the local authority. In some cases, local farmers also serve as custodians by supplying fresh thin-shelled walnut seeds to the nurseries started by DFO, and other development organizations, from where the saplings are produced. Agro-vets also supply other required inputs like tarpaulin, packaging bags, pesticides and fertilizers if and when required.

Production *(Walnut fruit)*

Walnut trees start fruiting only after 5 to 6 years of plantation, and it requires at least 8 to 10 years to produce enough production for commercial scale. As per an estimate, a five-year-old plant gives an average yield of about 1.5 Kg of dry fruit per year. Production increases further in successive years, and an average yield of a plant is about 36 kg in the eleventh year. This means although it requires a high initial investment to set up an orchard, the cost decreases and profitability increases over the period. [42]

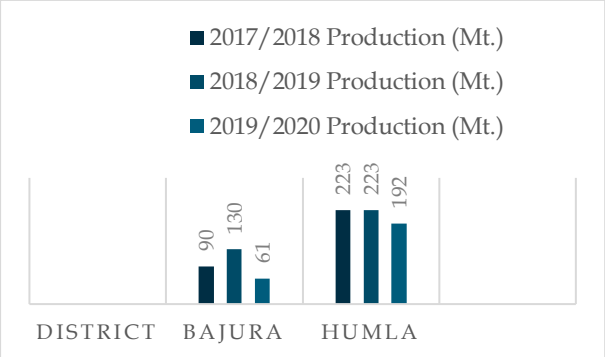

Figure 30 Walnut Production trend in Project clusters

At present, the farmers have just started to plant the saplings of the thin-shelled walnuts. Although the assessment team observed an increase in the area for walnut production, to record the actual production volume and see its economic benefits to the producers, it will still take 4-5 years. Following the market momentum, a farmer in *Bajura* have recently planted 1000 saplings of walnut trees for which he received 50% subsidy in saplings from the local municipality. Therefore, although the national statistics show a decline in walnut production in both the districts, any concrete conclusion cannot be drawn using this data.

Apart from soft shelled walnuts, according to the locals, hard-shelled walnuts are available in abundant quantity in *Humla* but people do not bother collecting them as they do not have the technology to break the hard shell and consume the fruit. It is a lot of hassle due to which 100s of tons of hard-shelled walnuts are left uncollected.

Processing

The first step of processing walnuts is dehulling and cleaning after the fruit is harvested, and this process is done by the farmers themselves. Traditionally, walnuts were processed to obtain walnut oil which was used in cooking. The hard-shelled walnuts were used for oil production, at a very small scale.

Though there were claims about walnut oil being processed, the team could not find evidence at the field. The quantity of walnut available, and potential extractable quantity needs to be further researched.

Women are crucial in the walnut harvest and extraction of walnut oil using traditional methods and equipment. Removing green skin from hard-shelled walnuts harvested before maturity for oil extraction is a time-consuming operation. Removing the peel from the gathered walnut fruits, then boiling the shell to soften it and make it easier to break, is a difficult task for those involved. Scooping the kernel out is a time-consuming technique that is followed by pressing standard extraction equipment. The walnut oil t, with a retail price ranging from NRs 1000 to 1200 per litre, might be a significant revenue generator. The walnut oil produced is confined to household consumption

42 ASDP, 2021. A strategic Investment Plan for Walnut in Karnali Province.

locally. Commercial production has been affected due to difficulty in processing as there are no effective technologies available at the clusters to break shells and extract oil.

Trade

Hard-shelled walnuts are in the highest demand during the festival of Tihar (October/November) but the demand is not as much as the thin-shelled walnuts. Thin shelled walnuts have a good demand year-round therefore, huge volume is imported from China as the local production cannot fulfil the market demand. The volume of import has been rising quite dramatically, which is also reflected in the figure 8.

Walnuts from *Bajura* are collected by producers and sold to local traders who sell them to retailers in the local market and at the Kolti market. From *Humla*, walnuts are sold to tourists visiting or transiting at *Humla*, and also sent by air to traders in *Surkhet* and Nepalgunj.

Since it is a seasonal fruit, the road-head traders collect and trade walnut along with other agriculture products. They usually contact the orchard owner or just collect in small volumes from producers who have 1-2 trees and sell to wholesalers in particular and local traders or retailers. Wholesalers tend to buy as much as they can from the local walnut collectors, co-operatives, middle-men, collection centers, but the volume is limited due to small production volume. Wholesalers assemble walnut from different places and transport it to regional market and sell it to the retailers who finally sell it to the consumer. Sometimes, the whole collection process is tedious as the wholesalers have to collect in small quantities rather than in bulk.

Walnut farming has emerged to be a very stable business due to the health benefits of walnuts. Walnuts fetch a very good price in the market, and being a forest product, many households can benefit from its production and trade. The rural population in the Himalayan regions of Nepal can benefit from sales of walnuts. There is very little cost involved in the value addition of walnuts, and each value chain actor can make profit of Rs. 65 to Rs 95 from a kilo of the fruit. The market price for a kilogram of walnut is NRs. 1040.[43]

Supporting Services

Storage

Walnuts after harvest are dehulled and cleaned before storage or sales. If not dried properly, or if the storage conditions are not proper, the walnuts get infected with fungal infections and molds. Proper storage technologies are therefore required for walnuts. At present, there are no specific storage facilities for walnuts in the municipalities. Producers store walnuts in sacks or spread over on the floor of their house.

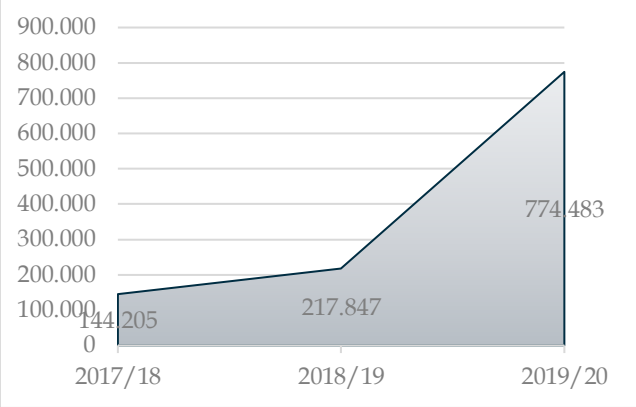

Figure 31:Import value of Walnut in Rs.

Transportation

Transportation is one of the major factors that determines the market accessibility. In remote *Humla*, the only means of Transportation to the district headquarters (larger market) are mules and in rare case motor vehicle which is very expensive option. *Humla* does not have any motorable roads connecting it with larger markets and therefore the only access to other districts is on foot or by air from Nepalgunj. *Bajura* now has access to a seasonal motorable road, so walnuts are transported to Dhangadhi market centers in jeeps/buses. Access to roads and transportation is a big challenge in both clusters to link with the markets. The standard mode of transport from the area to the wholesale market is the pick-up vehicle or truck. The cost of transportation from collection areas to wholesale is from Rs 1 and Rs 3 for a kilo, depending on the distance.[44]

Business Environment

[43] ASDP, 2021. A strategic Investment Plan for Walnut in Karnali Province.

[44] Strategic Investment Plan, Walnut, ASDP, 2021

Federal and Provincial Government:

- The Ministry of Agriculture & Livestock Development (MoALD), Ministry of Industry, Commerce and Supply (MoICS), and Horticulture Research Station (HRS) facilitate research, demonstration, infrastructure support, production, and business through policy formulation and bilateral trade agreements.
- Plant Quarantine and Pesticide Management Center (PQPMC), Harihar Bhawan, Lalitpur, issue the plant health certificate certifying the imported walnut sapling from the third country free from any disease and pest.

Municipal Government:

- District Forest Office and PMAMP, provide grafted sapling to the producers, they also provide subsidized saplings to the producers.

Non-Governmental Organizations:

- HELVETAS NEPAL provided the agro-technology and saplings of walnuts to the cultivators.
- Walnut Project (Mitho Okhar Pariyojana) of, based in *Surkhet*, Karnali province, is also working on developing walnut shell cracking machines and mechanization of oil extraction.
- Walnuts are one of the 12 selected VCs of ASDP area. ASDP is helping in production management, market linkages, and also business facilitation.

GESI Considerations:

Production: Women play a larger role in the Walnut value chain than men. Both gender roles are equally important as mentioned by the informants, as one compliment the other. Women play an important role in the entire process, from fieldwork to walnut production. For example, women are less involved in land preparation and digging the pit for the Walnut plantation, but both men and women work equally hard during the Walnut plantation and harvesting. But, after harvesting women handle 90% of the work in the postharvest operation, which includes de-husking, drying, and storing. In some cases, the seasonal migration of men leads to women's increased involvement in walnut production and related business. As a result, the pressure to produce more from a limited land area exacerbates women's struggles.[45] This presents an opportunity for women as walnuts can be a potential enterprise for generating income for women. However, care should be taken to reduce drudgery for women in households.

Output: Women also play an important role in product transportation (carrying it in bamboo baskets called doko) to the local market. However, men dominate the marketing scene as they do most of the trading activities such as price fixing and selling to larger traders. Women are price fixers in the local market in places like Jumla, where there is a high production of walnuts, but this was not observed or confirmed in the assessment areas.

Climate and Environment Considerations

Walnut trees are large trees, promoting ecological balance. Vegetables like beans can be grown in between the trees in an agroforestry model. They do not require much fertiliser and pesticides and grow best under natural conditions without human intervention. Walnut trees can produce fruits even in very dry conditions and they require very little to no irrigation which meets the condition for resource efficiency. Much effect on the value chain was not observed during the field assessment.

CAPACITIES, CONSTRAINTS, INCENTIVES, AND OPPORTUNITIES ANALYSIS.

Capacities	• Producers are aware of primary processing technologies of walnuts. • Walnuts grow naturally in the clusters. • Saplings for soft-shelled walnuts are available in the nurseries. • The value chain actors are aware of the market demand and market.

[45] Strategic Investment Plan in Walnut, ASDP, 2021

Constraints	• Production of soft-shelled walnuts is still too low to be commercially traded in the market. • There is limited research on varieties and propagation of walnuts. • Walnut processing for oil extraction is limited to the household level. • It takes a very long time for walnut trees to grow and produce fruit. • Improper storage and drying technologies result in a lower shelf life of Nepali walnuts.
Opportunities	• There is abundant land to grow walnut trees in the municipalities. • Walnut oil can be promoted as a high-value medicinal oil if effective processing technologies can be implemented. • Road under construction joining clusters with major markets.
Incentives	• There is high demand for walnuts in the national market. • Walnut trade gives high returns to producers and other value chain actors. • It requires low maintenance, and a yearly harvest can be obtained once the tree starts fruiting.

POTENTIAL INTERVENTIONS:

(Please refer to annex for details on the interventions derived and which cluster each intervention is applicable to)

1. Encourage and facilitate the local entities (AKC and NARC) to research types of saplings and application of proper propagation methods.
2. Introduce and pilot methods for initial processing of hard-shelled walnut.
3. Introduce suitable machinery for the local context Identify or build machinery for walnut processing. ***(NOTE: The feasibility of this intervention needs to be further assessed, we need to identify the amount of hard-shelled walnuts going to waste, what quantity of oil can be extracted from it, and its commercial viability)***

Figure 32 Potential interventions in walnut value chain

GINGER/TURMERIC VALUE CHAIN

Photo 8: Unwashed ginger sold in the market (by Ashta Prajapati)

SECTOR OVERVIEW

Ginger is an important commodity in Nepal's economy, with pro-poor growth potential in the mid-hills of Nepal. Nepal is the world's fifth-largest ginger producer with a production of approximately 245 thousand metric tons per year. At the same time, Nepal is the world's fourth-largest exporter, with values of approximately USD 6 million in the fiscal year 2015/16. Ginger is one of the 12 priority export products of the Nepal Trade Integration Strategy (NTIS) defined by the Government of Nepal. Until 2020, this national strategy aimed to increase the export price for Nepalese ginger via value addition in the country from 217 US$/MT to 815 USS$/MT. In Nepal, ginger is a crucial crop in terms of employment and area of cultivation.

According to Nepal Foreign Trade Statistics, Nepal exported 12.88 million kg of ginger in the Fiscal Year 2018/19, earning a total export value of NPR 775 million. Official data and secondary literature review reveal that more than 70% of the ginger export happens in raw form. Due to its export potential, it plays a significant role in the national income. FGD with the farmers and KII with other market actors reported that ginger has a significant contribution to the household income of small as well as large producers. Some even reported up to 30% of family income from ginger farming.

Similarly, Turmeric is one of the 25 spice crops largely used for the culinary and seasoning of foods. In Nepal, turmeric is used as a daily household spice and for medicinal use from ancient times. With increased awareness of the benefits among the users and its use in several processed products, the demand for turmeric is increasing in the domestic

market. It is also one of the major cash crops for tropical hilly regions of Nepal as its production requires less water, low technology, and less capital investment, and it can be grown with comparatively less fertiliser use and low pest/disease infestation.

The majority of turmeric produced is consumed in the domestic market, and only a small share of the production is exported. India is the largest turmeric producer, consumer, and exporter in the world. It accounts for 80% of the world's turmeric production. Hence, the excess production from Nepal also goes to India. The yearly production volume of ginger and turmeric over the last three years is depicted as follows:

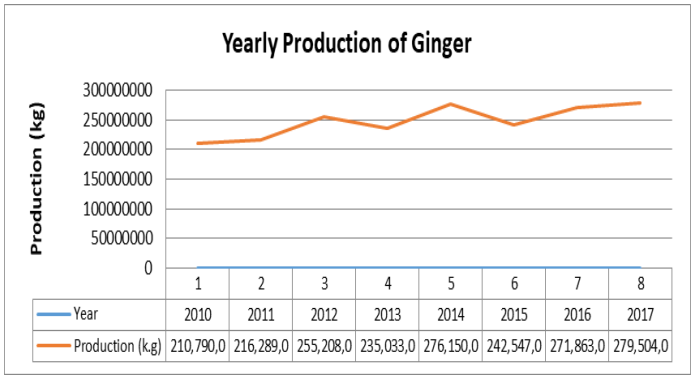

Figure 33 Ginger production trend (2010-2017)

Table 5 Ginger and Turmeric production trend (2018-2020)

Ginger						
	2017/2018		**2018/2019**		**2019/2020**	
	Area (Ha.)	**Production (Mt.)**	**Area (Ha.)**	**Production (Mt.)**	**Area (Ha.)**	**Production (Mt.)**
National			22,132	297,512	23,000	**284,000**
Karnali	3,039	39,149	3,111	45,274	2,413	31,310
Sudurpashchim	1,618	27,033			1,714	23,503
Turmeric						
National	7,300	71,500	10,160	98,904	9,795	99,907
Karnali	881	8,484	939	10,002	1,076	10,543
Sudurpashchim	1,398	16,964	1,391	16,899	1,198	10,325

Ginger/Turmeric is also the priority crop of Karnali and *Sudurpashchim* provinces. According to the recent data published by MoALD, Karnali contributes 11% to national ginger production and the figure is 10.55% for turmeric. Likewise, *Sudurpashchim* contributes 8.2% to ginger and 10.33% to turmeric in terms of national production. The production and trade of ginger were lucrative due to its export potential, as a result, there was a rise in the production of ginger all over Nepal including in all the assessment areas during the last decade. However, the last five years show a different picture, with the production area and production volume of ginger decreasing significantly. The export value also reduced significantly from NPR 775 million in 2017/18 to NPR 435 million in 2019/20. This trend in ginger production is partly due to diseases and pest infestation, and the declining demand from the Indian market.

On the contrary, the production area and production of turmeric have somewhat remained the same in the last five years.

GEOGRAPHIC MAP

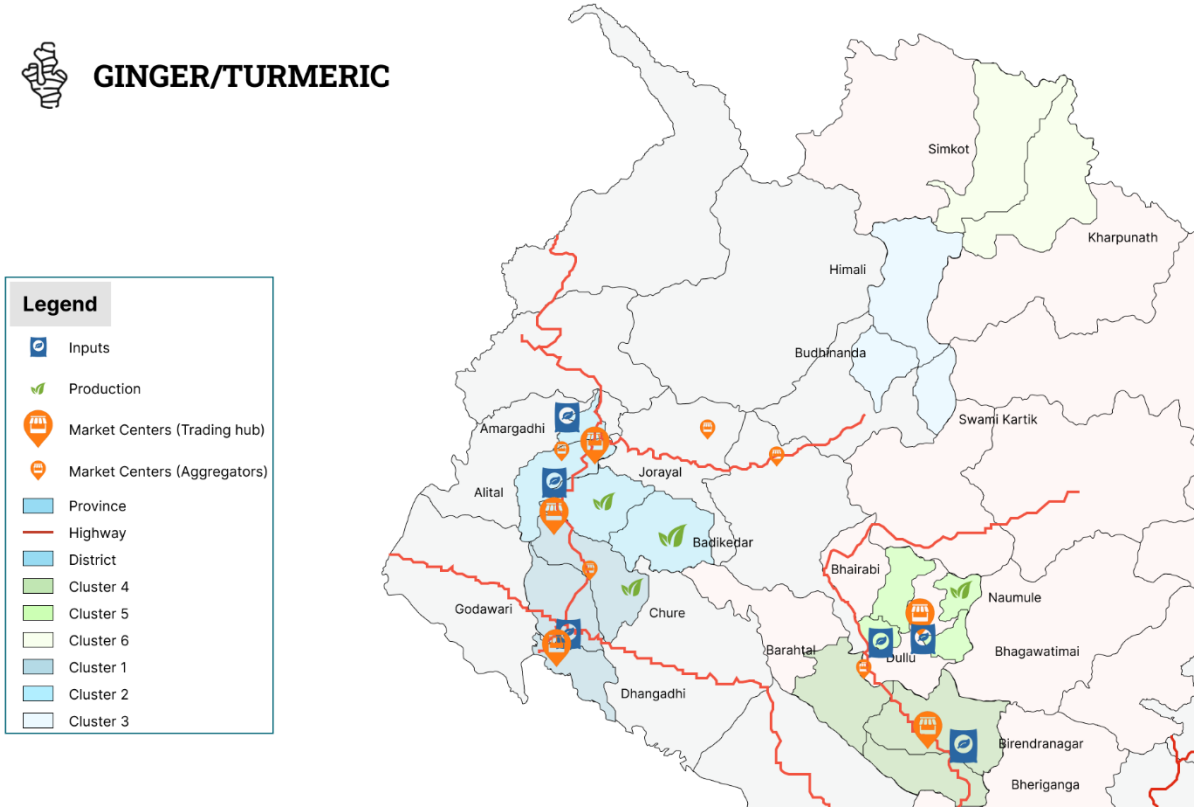

Figure 34 Ginger and Turmeric production and market centers in project cluster

Most of the farmers in *Surkhet-Jumla* and *Surkhet-Dailekh* road corridors are the primary producers. With an increase in the commercialization of ginger/turmeric, few producers, mainly from production pockets near Birendranagar such as Kunathariare are interested to go for commercial scale. In *Surkhet*, commercial producers are concentrated in production pockets nearby Birendranagar, Chhinchu, and Botechaur market centers. Whereas in *Dailekh* the production pockets are very scattered, and only a few producers are producing it in *Dullu*.

In Karnali province, production of Ginger/Turmeric has reduced drastically and the producers are switching to other crops because of decline in production caused by disease in case of ginger and loss to pests (insects and ants) in case of Turmeric. Local collectors are found at all the road corridors of *Surkhet* while the major trading center is in *Birendranagar*. A ginger and turmeric processing center (Organic Mountain Flavor) is located at *Chinchu-Birendranagr*. The processing center prioritizes organically certified raw ginger that either comes from the eastern part of the country or from *Jorayal- Doti*. However, a small quantity of ginger and turmeric is also collected from cooperatives in *Surkhet* for further processing. *"Organic Mountain Flavor (OMF) was established in 2013 with an objective to cultivate organic ginger and turmeric. It is the first organic ginger sourcing and processing company in Nepal."*

In the case of *Sudurpashchim* province, ginger is produced commercially in *Chure-Kailali*, Badikedar-*Dadeldhura*, and Jorayal-*Doti*. *Chure*, Badikedar, and Jorayal are also the ginger production pockets declared by PMAMP. The market for ginger produced in these regions varies according to the producer groups. If produced by the organically certified group, it goes to the processing center (Organic Mountain Flavour) at *Chure*-Kailai; otherwise, it is aggregated by local traders and sold in the wholesale market at *Kailali*. The processing center at *Chure*- Kailali is the branch of the processing center at *Surkhet*.

MARKET MAP

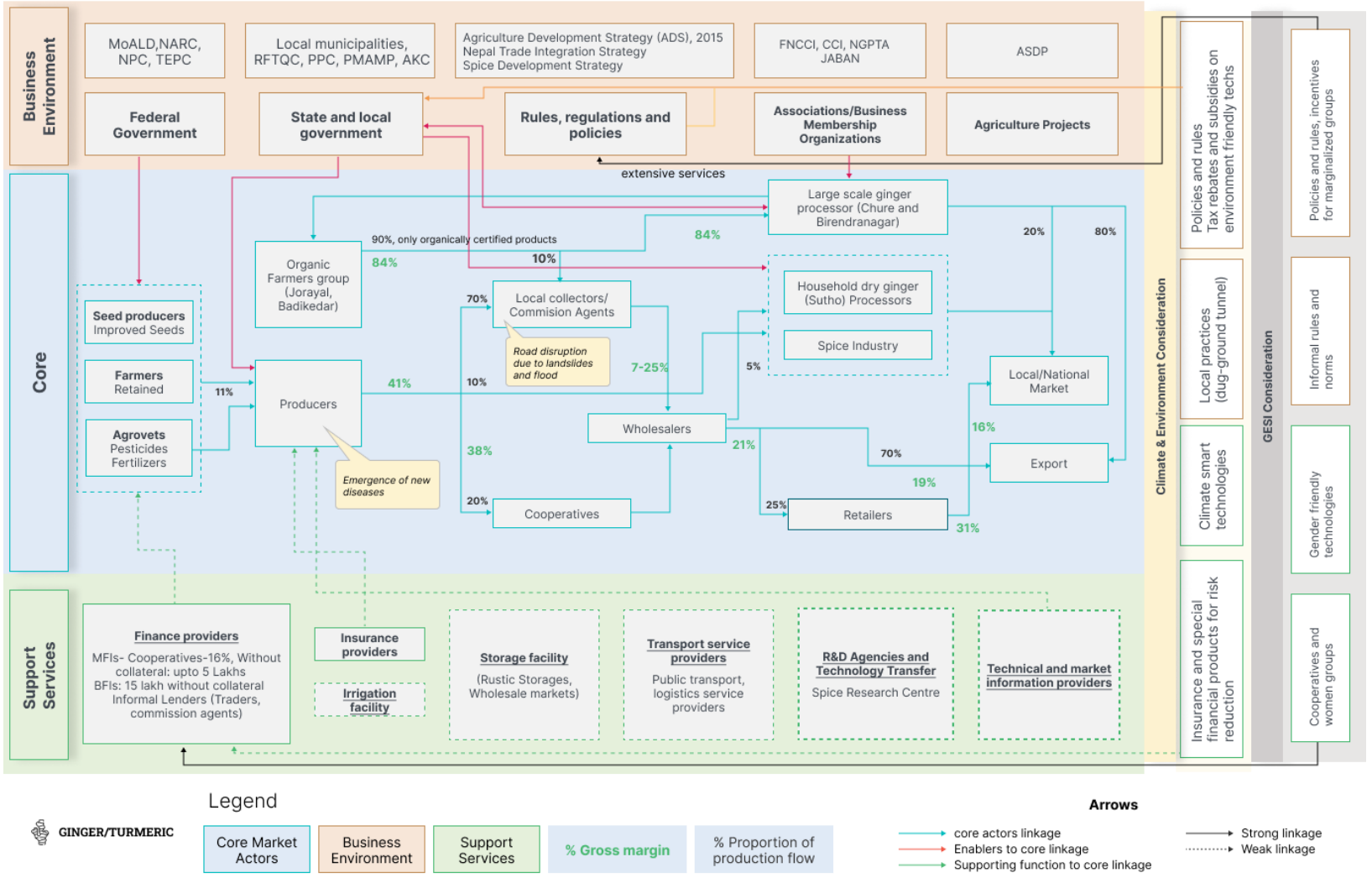

Figure 35 Market map of ginger/turmeric value chain

Input supply *(seed tubers, pesticides, fertilisers, agri-tools and machinery)*

The main inputs for ginger/turmeric production are seeds, fertilizers, insecticides, and labor, which are normally managed by the producers themselves. Producers mainly rely on the retained seeds, and only a few purchase seed from suppliers. Agro-vets provide fertilizers and pesticides, which is rarely used in ginger and these chemical fertilizers and pesticides are brought from dealers in nearby market centers. In most cases, producers plant rhizomes from previous harvests. As a result, productivity is declining and disease susceptibility is rising. A loss in productivity is also caused by other factors such as a lack of irrigation, poor soil health, and traditional agricultural practices.

NARC has released certain improved varieties and supports numerous community-based seed multiplication programs. However, the seed produced in this manner is insufficient to replace the old planting methods. Producers also don't use the right seed treatment and storage technologies, which leads to deterioration of seed, disease outbreaks, and lower production quantity and quality. As a result, indigenous ginger/turmeric seeds are extinct in *Surkhet*, and types imported from districts with climate and soil incompatibilities were more susceptible to diseases, which became the primary reason for the reduction in production.

Production *(Ginger and turmeric tubers)*

Large-scale commercial producers primarily dominate the ginger supply in the market, but non-commercial producers dominate the number of producers in the assessment areas. Usually, these producers cultivate turmeric on marginal land that is unsuitable for other crops or produce in the small patch of land that is sufficient for their domestic consumption throughout the year. On average, the area for ginger/turmeric cultivation varies from 0.5 Ropani to 11 Ropani per producer. Production of ginger/turmeric has reduced in *Surkhet* and *Dailekh* in the past years, especially in the assessment areas. However, commercial producers cultivating ginger/turmeric on a large scale were present in the assessment areas of *Doti* and *Dadeldhura*.

Producers are still using traditional cultivation procedures, despite the fact that quality planting materials and improved cultivation practices can considerably boost the productivity. Planting in non-irrigated marginal soils where nothing else grows, using low-quality planting materials, failing to maintain appropriate seed weight, and conducting insufficient intercultural activities are some of the unconventional cultivation practices. During the harvesting of ginger, producers still employ traditional harvesting instruments such as a local spade, sickle, and hoe, as well as traditional harvesting methods. After harvest, ginger is usually trimmed and stored without being washed. They only select uniform bluish light when cut, clean, pest-free rhizomes from locally available homemade zero-energy storage, and they never grade after sorting. Mother rhizome, which disintegrates after the plant has established roots and fetches a greater price, is rarely taken during the off-season months. All of these issues have made it difficult for producers to produce higher-quality ginger and generate more revenue from it. The current gross margin of ginger producers is between 34 to 84% which was as high as 200% during 2019[46].

Rhizome rot is a fungus that can be found in practically every commercial ginger-growing region. Its control requires proactive rather than reactive methods. However, the issue of rhizome rot is being exacerbated by a lack of technical know-how, seed and soil treatment techniques, incorrect land rotation, and seed selection. As a result, many ginger producers are increasingly switching to other crops since producers are not receiving sufficient technical assistance from both the public and private sectors to manage rhizome rot disease.

The rhizome rot situation is very widespread in *Surkhet* and *Dailekh* which used to be commercial production hubs of ginger. Many producers have left ginger production and switched to vegetables, potatoes, and fruits due to ginger's decreasing

46 Devendra Prasad Chalise, Bachelor Graduate, Agriculture and Forestry University, Nepal. Research Article Received: September 16, 2019; Published: October 31, 2019

productivity, unmanageable disease, and on top, decreasing market value.

A reason behind reduction in cultivation of Ginger/Turmeric

In the last few years, every household in *Surkhet* were cultivating turmeric in average of 1-2 Ropanies of land. In 2076, PMAMP introduced a hybrid variety of Turmeric in the district which did not give the expected yield and the appearance of a new disease became chronic, decreasing production and product quality. It led to a decline in market demand. Hence, farmers, these days are reducing the cultivation area for turmeric and increasing the cultivation area for vegetables. According to the farmers, vegetables are better than turmeric because of their shorter production cycle, and better market demand.

Trading

The collectors play a major role in transporting and handing of the ginger/turmeric product compared to other actors in the value chain. Generally, ginger producers' hand over their produce to the cooperatives (minimum amount of total ginger production) or the local traders and commission agents. Local collectors gain a gross margin between 7 to 25% and their major activities are transportation and bulk packaging.

The local traders transport the collected ginger from producers to wholesalers and processors and make payment arrangements for producers. The local traders also store ginger in the storage facility without packing or in jute bags. Collectors sort the ginger before packaging it in jute bags, but they do not grade, clean, and wash ginger before selling it to wholesalers. Local traders are usually small traders operating in villages near the ginger production areas. These traders sell groceries and other household items to the ginger growers in credit. After the harvest, they collect the product and pay the producers deducting the credits., This increases the dependency of the producers on the traders, and as a result, the producers fail to get competitive prices. Commission agents are agents of wholesalers operating from larger market areas (market hubs/regional markets). Such Commission agents take a certain percentage of the total sales amount as a commission fee for their services. The commission agents make a partial payment to the sellers during the delivery of products, and the remaining payment is made after the complete sales and deducting the commission fee. The wholesalers provide advances to these agents who collect the ginger from producers. The average gross margin for wholesalers is 21%.

Processing

Household Dry Ginger (Sutho) Processing

Dry ginger (*sutho*) is locally made from fresh ginger at the household level. *Sutho*, the major processed product, is largely processed by producers using traditional methods and is sold to local collectors. More than 80% of the ginger produced is sold fresh, while just about 20% is sold dried (*sutho*). When the market price for fresh ginger is low, *sutho* is made as it is easier to store dried ginger compared to the fresh one. Value addition (particularly processing) is not a commercial activity in the assessment areas, despite the fact that there is a considerable opportunity to improve the per-unit price and create jobs at the local level.

Washing/Drying

After it is collected, fresh ginger undergoes just minor value addition processes, such as cleaning and sorting. The cleaning process begins at the producer's level, with preliminary cleaning of the rhizome by removing soil and roots. The ginger is usually washed at riverbeds and transported without adequate drying, resulting in a significant loss. Within the assessment area, there are no adequate washing and drying facilities. Other parts of the country, such as Birtamod, Jhapa district, have constructed washing facilities that employ a large number of women as labourers. The Indian government has banned the export of unwashed ginger beginning in 2019/20, so ginger needs to be washed in Nepal before being sent to India. Due to the lack of a washing and drying facility, local collectors are forced to sell unwashed ginger to wholesalers who then wash it themselves.

High-Value Addition

Organic processing at *Surkhet* and *Chure*, both source ginger from *Doti*-Joryal and also have their own group of certified producers who produce organic ginger required for the company. It doesn't source products from local producers who are uncertified., It also source the produce from the Eastern part of the country when there is a short supply in the local market.

In the case of Turmeric, small-scale local processing units using traditional means to produce turmeric powder are present in the assessment areas, mostly known as mills. A significant amount of fresh and dried turmeric goes to large-scale spice industries, these industries convert it into powdered form and supply it to the local markets.

End markets

The majority of fresh and dried ginger mainly goes to India, while a small amount of ginger also goes to third countries. The second-largest market for the Nepali fresh ginger is Bangladesh, but the trade route is via India. A small volume of dried and processed ginger also finds its end markets in Europe and the Middle East. Nepal exported 808,861 MT of ginger in 2019/20 (MoALD, 2020).

India, the major market for Nepalese ginger, is vast and dynamic, with most of the trading in the northern part. Ginger from Karnali and *Sudurpashchim* mainly goes to India from the border in Nepalgunj, *Dhangadhi*, and *Mahendranagar*.

Compared to a decade ago, the export of ginger has reduced because the ginger production in India (the main buyer of Nepali ginger) has started to increase. Indian ginger is of better quality (clean and larger bulbs with graded quality, which is assumed to be due to cultivation in fresh soil) and is available at a lower price. According to some key informants, the number of Indian traders who came to Nepal to buy Nepalese ginger has reduced significantly in the last 3 to 5 years. Nepalese traders these days are finding it difficult to export fresh ginger due to reduced demand and market price. The export potential of value-added products like dried and powdered ginger, however, is still intact.

Supporting Services

Financing services: Banking and Financial Institutions provide financial services. Producers' access to loans is primarily through micro finance institutions, but services from microfinance become costly because of the long gestation period of ginger—nearly 9 to10 months.

Storage: Wholesalers/ exporters primarily do the storing and packaging of ginger. Specialized logistics is not available and even the private or public sectors fail to provide so. Lack of storage makes the export of raw ginger to third countries impossible.

Business Environment:

Federal and Provincial Government:

- Ginger Research Center, Nepal Agriculture Research Council (NARC) develops and releases improved variety seeds, supports community seed multiplication programs, and develops technologies for production and post-harvest. It also conducts research in plant protection technologies, mainly the rhizome rot.
- Department of Agriculture (DoA), Agriculture Knowledge Center (AKC) provides technical services to the producers. Plant Quarantine and Pesticide Management Center (PQPMC), Department of Food Technology and Quality Control (DFTQC) provide lab and certification services to facilitate export., Trade and Export Promotion Center.
- The Federal Government has recognized ginger as a highly prioritised export commodity in the National Trade Integration Strategy (NTIS).

Municipal Government:

- Improved seed multiplication and replacement of retained seed is where the Municipal governments have a greater role. The provincial government has to play a role in the development of logistics (Auctioning, warehousing, commercial storage, cold chain) to facilitate regular supply to the international buyers.
- Prime Minister Agri Modernization Project (PMAMP) has established Ginger zones in *Surkhet* and *Dailekh*
- Municipal and provincial governments can play a role in breaking the dominance of the exporters over producers by facilitating financial services and trade both inside and outside the country.

Non-Governmental Organizations:

- Ginger is one of the 12 selected VCs of the ASDP area. ASDP provides advisory services as well as creates linkage with the market.

Associations/Business Membership Organizations:

- Federation of Nepalese Chambers of Commerce and Industry (FNCCI), Nepal Ginger Producers and Traders Association (NGPTA), and Jadibuti Association of Nepal (JABAN) facilitate trade and export.
- Nepal Ginger Producers and Traders Association (NGPTA): Established in 2062 B.S., NGPTA is working mostly in the facilitation activities for the trade of ginger. It involves 36 producer groups and 27 traders (mostly from the eastern region) and plans to extend branches in 22 districts of Nepal.

GESI Consideration

Production: Involvement of marginal and low-income households is found high in ginger/turmeric production areas. Also, ginger cultivation has become an attraction for poor farmers as it has comparatively high value and greater scope for trading. In case of gender participation, women's involvement is found particularly at the farm level, and their involvement in market activity (especially in cash transactions) is limited. Similar to other value chains, most of them are engaged in plantation, weeding, harvesting, and post-harvesting handling.

Output: Ginger/Turmeric not only create on farm employment but also provides ample off-farm employment opportunities. Traders (local to exporter) also use the poor and disadvantaged groups as labourers for cleaning, grading, packaging, loading/unloading activities, giving them income-earning opportunities. Since labour required for the cultivation practices of ginger is relatively higher than other selected agricultural commodities, it creates better on-farm and off-farm opportunities for marginalized people. In the assessment areas, women were also employed by traders/exporters for washing, cleaning, and grading near borders. There is no distinct difference between the participation of gender in labour for ginger production, but the males have greater influence than females in marketing decision, and loan borrowing. Filing loan applications at financial institutions are mostly done by male and rarely by women farmers or traders. It further supports the fact that women have very limited access to financial services. But programs of government and non-government organizations are specifically putting emphasis on providing benefits and privileges to women, this factor has also provided a push in changing the traditional norms.

Climate and Environment Consideration

When it comes to Ginger/Turmeric, climate change makes production and supply more vulnerable. Changing temperatures and soil conditions are prolonging diseases and reducing the adaptability of new varieties in new soil and environment.

Ginger production is considered relatively environmentally sustainable mainly because it has a low water and carbon footprint, meaning it requires less water and is more carbon neutral compared to other crops. Ginger thrives best in organic soil and as long as chemical fertilisers are not used it doesn't do significant damage to air, water, land, soil, and forest resources. It is also considered environment friendly crop has it does less harm to soil.[47]

Since, the cultivation of ginger/turmeric mostly involves the use of organic manure and mulching, it helps to retain soil fertility. Usually, ginger/turmeric is grown in wetlands where other horticulture crops and grains do not grow properly, reducing the need to use = additional cultivable land.

CAPACITIES, CONSTRAINTS, INCENTIVES, AND OPPORTUNITIES ANALYSIS

Capacities	• Producers in the assessment areas are the traditional ginger/turmeric farmers who have been using traditional practices to their optimum benefit, and it still is a major cash crop in these areas, except *Surkhet* where producers are shifting to other crops. Since ginger/turmeric is grown in marginal lands (non-irrigated), marginal, poor, and disadvantaged groups with unirrigated lands can also benefit from it. • Many commercial producers in the past also reinvested their earnings to expand their production area.

[47] https://sustainability.wisc.edu/ginger-root-and-evaluating-food-carbon-footprints/

Constraints	• **Local traders' dominance in the collection:** Ginger is collected by local sellers and commission agents. Local traders are typically small businesses that operate in villages near ginger-growing areas. The ginger producers receive credits to buy groceries and other household supplies from these traders. They collect the ginger after it is harvested and pay the producers after deducting the credits. Because of this, the producers have no other options for selling their ginger to other traders. As a result, the producers are unable to obtain a fair market price. There are also agents of wholesalers who operate in wider market areas known as commission agents. The wholesalers give these agents advances to collect the ginger from producers, however, these commission agents tend to bargain with the producers to buy ginger at a lower price. • **There is dominance of Indian traders in the Nepalese market** as there is no alternative market other than India for fresh ginger; Since India is the largest buyer and consumer of Nepali ginger/turmeric its influence is very much on the market demand and price. Alternative market to sell Nepalese ginger can reduce the monopoly of Indian buyers over Nepali products. • **Decreasing production and export volume and value:** In the case of ginger, both export volume and value are decreasing as there is less demand from India. India itself has started increasing ginger production and Indian ginger is of better quality and available at a low price. Due to this, the export of ginger has been decreasing subsequently over the past few years. • **Insufficient Processing technologies for large-scale processing;** There are only two large-scale ginger processing units in both the provinces. And in the case of turmeric, the processing units are small and use traditional technologies to produce dried and powdered turmeric. This technology is old, tedious, and time-consuming.
Incentives	• **High scope to increase area and productivity:** The productivity of both ginger and turmeric is lower than the national average although the mid-hill districts of Nepal are suitable to cultivate ginger/turmeric. Therefore, there is a huge scope to increase the area of cultivation. Therefore, there is still a scope to increase productivity by introducing high-yielding varieties and improved cultivation practices. • **Ginger/turmeric is considered a high-value crop** due to its high market and export value. • **Value addition through cleaning, grading & sorting:** To make the products competitive in regional markets, simple activities like cleaning, grading, and sorting can be done. These activities would be helpful to increase the shelf life of products and generate premium prices in the market. Although the demand for fresh ginger is decreasing, the demand for value-added products is still high in other countries apart from India.
Opportunities	• The Federal Government has recognized ginger as a highly prioritised export commodity in the National Trade Integration Strategy (NTIS). Prime Minister Agri Modernization Project (PMAMP) has established ginger production zones in some of the assessment areas. • There is good demand for quality seeds and effective plant protection measures from ginger/turmeric producers. Hence, there is clear scope to develop a seed supply chain that can benefit this sector. • Greater product diversification opportunity for ginger/turmeric (dry, powder, extracts, curry powder, colouring agent, medicinal, cosmetics, etc.) • Establishment of Organic Mountain Flavour (OMF) Industry for ginger processing at *Surkhet* and *Chure-Kailali*. This company currently trains the producers within its production pockets who produce organic ginger; hence there is an opportunity for other producers who are struggling with the market.

Potential interventions:

(Please refer to annex for details on the interventions derived and which cluster each intervention is applicable to)

1. Partner with traders or local entities to explore and promote technologies (low-cost warehouses, brick storage, rustic storages etc.) suitable for the local context.
2. Increase in the involvement of other actors (Private seed producers) in seed production other than just NARC.
3. Incentivize the private input suppliers to provide extension service to the producers
4. Work with TEPC to explore international markets demanding processed ginger products.
5. Encourage associations and TEPC to explore for alternative market to sell the ginger and other processed products to break the monopoly of India.
6. Incentivize the private input suppliers to provide extension service to the producers.
7. Lobby with the local and federal governments to identify mechanisms to standardize the market rate.
8. Incentivize and facilitate financial institutions to create new repayment models.
9. Introduce alternatives like Kishan Credit Card that makes repayment easier (a proven method used by iDE)
10. Partner with traders or local entities to explore and promote technologies (low-cost warehouses, brick storage, rustic storages etc.) suitable for the local context.
11. Encourage NARC to partner with private research institutions to do research on better varieties.
12. Output-based subsidy should be prioritized. output-based subsidies can be provided to only those producers who are able to maintain certain quality standards or adopt certain improved production practices, for example, raised beds, seed treatment, etc.

Figure 36 Potential interventions for ginger/turmeric value chain

TIMUR VALUE CHAIN

Photo 9 Timur sold on the streets of Kathmandu market (by Aju Nyachhyon)

SECTOR OVERVIEW:

Timur falls in the category of Medicinal and Aromatic Plants (MAPs). Approximately 70% of the total value of the MAPs collected in Nepal is attributed to the fruits of this species. Timur is naturally grown, as well as a transplanted shrub in the barren lands and forests (community, leaseholds, and private). It is a prioritised commodity for export due to its trade potential in raw and processed form in Indian and European markets. Timur has its own importance due to its high relevance to the poor and landless people who can earn extra income through forest collection. It serves as a medium for rural livelihood improvement.

In Nepal, Timur is found in more than 30 districts and is most prominent in the Karnali with the province producing and trading highest volume of the spice in Nepal. The export figure for the last 10 years shows that more than 600 MT of Timur was exported in 2012 and 2020. The figure kept on fluctuating in between due to adulteration with foreign material, stocking a large volume, and quarantine issues of Nepal origin products in India.

Around 90 % of Timur produced in Nepal is exported to India while a few percent is exported to other countries. Only a nominal portion is consumed in the domestic market. China is the top importer and consumer of Timur also known as Szechuan pepper (Zanthoxylum piperitum) which accounts for 96% of global trade, followed by the Nepali pepper (Zanthoxylum armatum), which accounts for only 1%. Most of the Timur traded from Nepali comes from Karnali Province.

The total average annual production of Timur is around 601 MT in Karnali alone. Out of this 18.08% of Timur is produced in the hilly and and mountainous areas. Salyan is the largest producer followed by *Surkhet*, *Dailekh*, and Jajarkot in Karnali Province. Production of Timur is not as commercial in the *Sudurpashchim* province. Despite having potential for Timur production, it is limited to collection from forest, and commercial plantation on private land is still very rare.

GEOGRAPHIC MAP

TIMUR

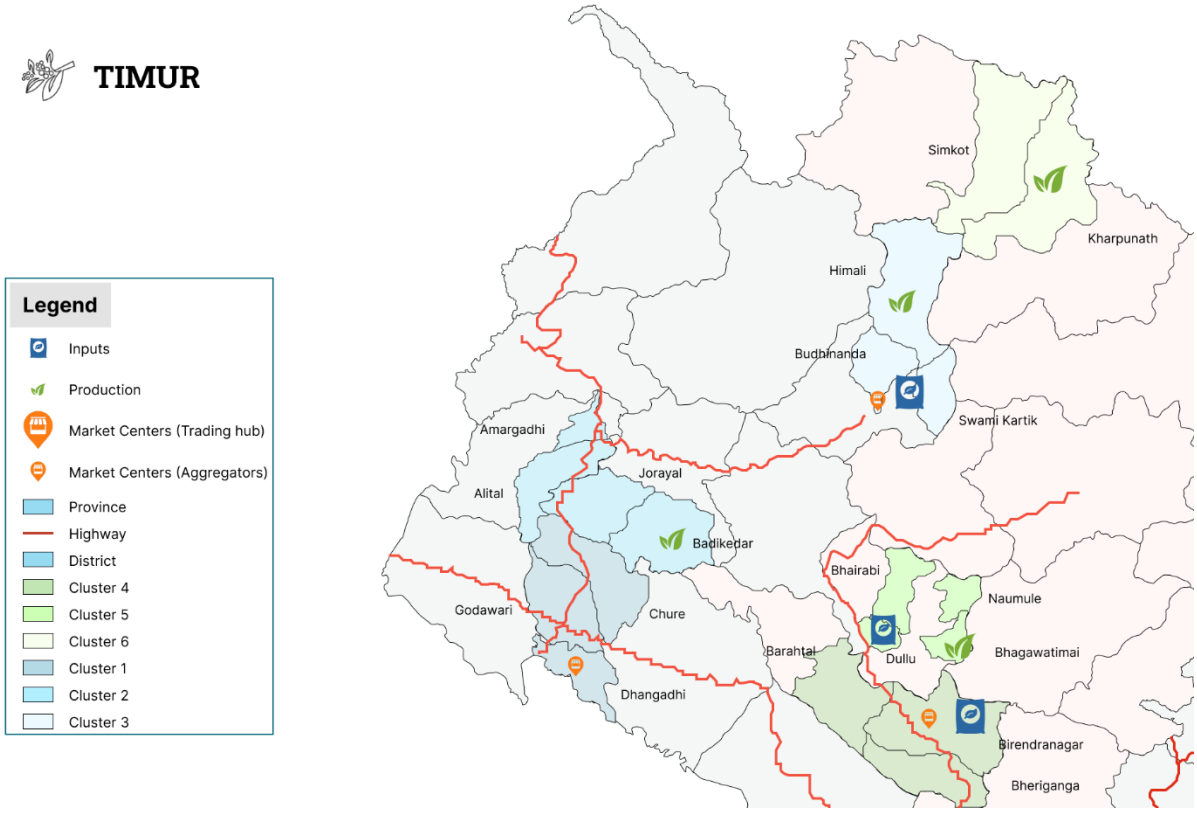

Figure 37 Timur production and market centers in project clusters

Although the production zone and timur pocket areas don't lie in the targeted areas of *Surkhet*, it produces and trades more than 150MT of Timur annually and the district ranks second in terms of production and trade in Karnali Province. Similarly, Dailkeh ranks fourth in Timur production. The production zone of *Dailekh* is Bhagwatimai Rural Municipality. According to an estimate, almost 390 households in *Dailekh* produce 17MT of Timur in a year.

The market centers of Timur produced in *Dailekh* are Dullu, Naumule, and Narayan. While Dullu and Naumule serve as collection centers, Narayan (district headquarters), is the main trading hub of Timur produced in *Dailekh*. Collected Timur is sold to the large aggregators in *Surkhet* or Nepalgunj.

In the case of *Sudurpashchim* Province, the production of Timur is less and is limited to small producers collecting during the season for side income. A producer only sells a maximum of 10kgs per season. The collected Timur is mostly used for household consumption while a small quantity is sold in the market.

MARKET MAP

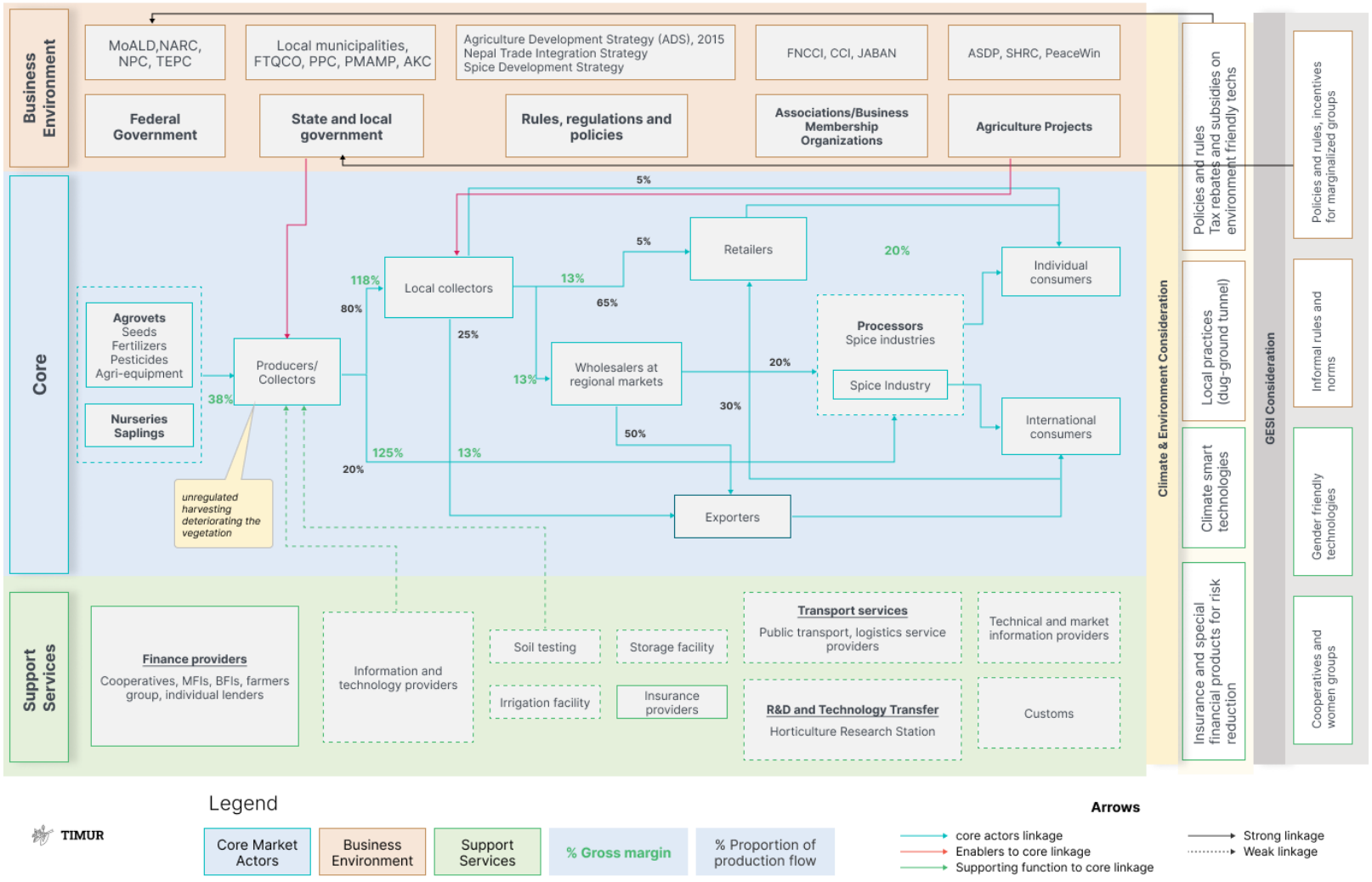

Figure 38 Market map of timur value chain

Inputs *(saplings, seeds, fertilisers, pesticides and agri-tools)*

The most important inputs required for Timur cultivation are seeds or saplings. But production of Timur seeds is quite a tedious process that involves much time and effort. One kilogram of dry Timur fruits yields about 33 percent (minimum 27 % to maximum 37 % recovery) of seeds, and the germination rate is only 15-10%. Sapling production is also a lengthy process with three to four months for germination and couple of more months to grow into sapling.

Seeds are sold mostly by traders of Timur at a rate equivalent that of dry Timur fruits. Producers prefer buying saplings rather than seeds while nurseries, co-operatives, and local entities buy seeds to develop them into saplings. Although saplings cost more than the seed does, only a limited number of nurseries produce it. The low germination rate, technical difficulties while managing Timur nursery, and unavailability of reliable seed sources are the major reasons despite the higher price fetched by sapling. A nursery is located at the premises of Division Forest Office, *Dailekh*, produces more than 2500 saplings per year. The produced saplings are then distributed to the interested parties for cultivation within the *Dailekh* district. Similar is the case in *Surkhet*, although the district also has other private nurseries producing saplings. Other inputs like pesticides and fertilisers are required in a very low amount and are used only in the private lands. On an average, input suppliers gain a gross margin of 38% selling inputs related to Timur production to producers.

Production *(Timur seeds)*

The economically marginalized families and the household that holds the less productive marginal land are primary producers. In the assessment area, state, community, and private forests are the prime source of Timur. According to the Forest Act of 1993, Forest Department issues a license to collect timur from state forestlands, and a royalty payment is necessary prior to the collection. License is often issued to the traders rather than individual collectors due to the cumbersome process of obtaining the license. Individual people hence have open access and can collect timur without any license. In the assessment areas of Sudurpashchim i.e., *Dadeldhura* and *Bajura*, producers collect Timur from state-owned and community forests. Commercial plantation of Timur in private land or forest is not common and is only done in *Surkhet* and *Dailekh* by a few producers.

Producers are aware of the high demand for Timur in the market, it is the main reason for producers to intensify the management of Timur along with the financial one. A Timur producer has a gross margin of 118 to 138%. The local market price of timur has increased considerably in the last five years as shown in the table below:

Table 6 Price trend of Timur

Timur Farm gate price (NPR./Kg)[48]						
2070/71	2071/72	2072/73	2073/74	2074/75	2075/76	2076/77
80	160	280	400	750	850	550

Due to the continuous increase in the market price of Timur, the production and collection of the spice have become more luring to the producers. According to the findings from the field, the plantation on private land is also increasing.

There are some constraints associated with Timur cultivation and collection, like the quality planting material, high cost involved, and lack of proper knowledge of cultivation practices. Timur is cultivated in small patches and poor orchard management results in low yield. Producers also lack knowledge about harvesting techniques and have limited access to harvesting tools. They are still following the traditional means of chopping down the branches or hand plucking the fruits. Chopping off the branches compromises the quality of the fruits, and hand plucking limits the producers to collect only a minimal amount.

After harvesting the fruits, initial farm level processing like drying and packaging are crucial to ensure quality. Delayed drying compromises quality and storing it without drying breeds fungus. Quantity (15-20%) and quality of the harvested fruit are lost to bad handling techniques. Qualitative losses, such as loss in aroma, essential oil content, and contamination with pesticides/fungicides induces buyers reluctant to

[48] Timur Commodity Value Chain Annual Report, HVAP, 8 July 2018 (24 Aashad 2075).

accept the products. And the farmers are not able to sell the desired quantity at an appropriate price.

Trading

Farmers and collectors usually sell their Timur products to the village-level traders, who represent the larger traders of the district. In the absence of village-level traders, the product goes to the road head trader's collection points and occasionally to traders situated on the main highway. They buy the product from individual hand collectors. Around 15 to 25 local and road head traders are based in the road corridors of *Surkhet-Dailekh*, *Surkhet*-Jajarkot and *Surkhet*-Jumla, with the capacity to buy 1 to 10 MT.

The village level/road head traders consolidate it at strategic market centers for transportation to the regional market. Some amount of Timur produced in *Surkhet* directly goes to Dabur Nepal and the rest to the traders in Nepalgunj who mainly export it to India. Timur produced in Dailkeh, *Dadeldhura*, and *Bajura* is collected by road head traders and is supplied to large aggregators in Nepalgunj and Kailali.

There are no standards for price determination and it is still unclear how the market price is set by the traders. Producers and traders still succumb to the price fluctuation caused by the Indian traders who usually govern the market price as they are the largest buyer. One thing in particular in setting the price is the quality of the product. Quality standards, quantity, buyer's preferences, and purchasing capacity vary significantly among local, regional traders, and end-users. For instance, Dabur Nepal, a multinational company, can purchase more than 300 MT annually. MANE FILS, an aroma blenders French company for flavours and perfumery has not purchased more than 5 MT per annum. Similarly, regional traders based in Nepalgunj city, a trading hub of forest-based natural resources including Timur, can trade more than 500MT annually. [49]

Inadequate quality control is a major challenge for the traders as adulteration by producers in dry Timur decreases the quality of the product. For the trading purpose, collected Timur must possess attributes like the ratio of 50:50 percent seed and seed coat/pericarp, absence of foreign materials, minimum of 2 % essential oil content, reddish brown colour, pungent aroma and should be completely dry (moisture level not more than 10 percent).

Other constraints associated with Timur trading are the use of unsuitable packing materials (bags of chicken feed, chemical fertiliser, etc.) that reduce the quality hence the market value. Producers' reluctance to do proper packaging, storing, and labelling has caused difficulties to trace the origin as demanded by foreign buyers.

Processing

Timur is used in the production of essential oil and as a raw ingredient to produce various ayurvedic products. Large-scale processors of Timur are scarce in the assessment area and even in both the provinces. Timur oil processors and other processors like Dabur Nepal, Patanjali, Singhadurbar Vaidyekhana, HPPCL, and Mooswaan Herby Industry are located either in Nepalgunj or Kathmandu. The essential oil processors in the local areas are small-scale and located in rural areas near to the source, often around district headquarters. They are of micro-scale, use traditional methods and produce a limited volume. Scaling of such a processing unit is often difficult due to limited materials for processing, and technical and financial constraints.

End Market

The Indian companies are the primary buyers of Timur produced from Nepal and a very nominal amount is consumed by the individual consumer. In Nepal and India, a large volume of the Timur product is used as spices in raw and powder form. Ayurved-based companies like Dabur Nepal Pvt Ltd, Dabur India Pvt Ltd, and Patanjali Ayurved use Timur (raw and oil) to produce end products like Toothpaste and powder. Similarly, Nepalese companies like Singhadurbar Vaidyekhana, HPPCL, and Mooswaan Herby Industry use Timur as the main ingredient in their herbal product, like liquid balm. The Timur exported to European countries, namely France, Italy, Belgium, Germany, and the UK, mainly uses spices and its oil for perfumery purposes. (SNV,2011)

Supporting Services

Post-Harvest Handling: Immediately after harvest, drying is critical to ensure preservation. The mode of the drying process determines the quality of the product. Although the best practice is to dry it in a solar tunnel dryer, the most

[49] Strategic Investment Plan of Timur by ASDP, 2021

common practice used by producers is laying it out in the sun for drying. Proper drying and primary processing have direct relations with post-harvest loss and ease to separate leaves, thorns and tiny twigs from properly dried material. But Timur producers do it manually due to a lack of tools and technologies.

Storage: Proper storage of dried Timur determines the product quality. General practice among producers is to stack it in their house and this practice causes a huge amount of loss due to fungus infestation. Scientific airtight storage facilities are not available, and use of hermetic bags is considered a costly option by the producers. Distributors of such technology are also not available in the assessment areas and producers have to bring it from the regional markets like *Kailali* and *Surkhet*.

Business Environment

Federal and Provincial Government:

- The Ministry of Forest and Environment (MoFE) is responsible for providing royalty exemption. The Provincial government has also prioritized Timur in *Karnali* Province.
- The Ministry of Industry, Commerce and Supplies (MoICS), Customs Department, Trade and Export Promotion Centers are the main facilitator of Timur export to other countries and they are also responsible to provide certificate of origin and production verification for export.
- Organizations working in Research and Development like NARC work in varietal development. But there is a lack of research on high yielding plants with less or no thorn.

Municipal Government:

- District Forest Office (DFO) and District Plant Resource Office are the main responsible agencies. They are the regulating body from production to sale through monitoring, licensing, product verifying, and levying royalty, fees and tax.
- Municipalities and Rural Municipalities mainly support production activities, but their influence is quite limited in Timur production.

Non-Governmental Organizations:

- Timur is one of the 12 selected VCs of ASDP. ASDP is helping in production management, market linkages and also business facilitation.
- ANSAB also played an important role in providing market information and technology and business training to the processors.

Associations:

- Jadibuti Association of Nepal (JABAN), DCCIs work in the facilitation and implementation at the local level for the project working in agriculture or forest resource management

GESI Consideration

Inputs: Similar to the case of Citrus, nurseries are managed by male., Plantation and preparation of saplings even in state-owned forest are carried out by men. Carrying of farmyard manure and its application is done by women.

Production: Timur has been an important source of income for landless people, rural women, and unemployed youths in the assessment areas. The economically marginalized families and the household who holds less productive marginal land are primary producers. More than 5,000 households which belong to the disadvantaged group (poor, ethnic, Dalit etc.) are directly engaged in Timur collection and production in Karnali Province. [50]The plant's ability to grow in dryland with less irrigation, with no risk of disease and pest infestation, its usage as a terrace raiser for crop land and the long experience of the rural women and poor in its collection also makes it a suitable plant species for livelihood improvement of the poor.

Output: Women and disadvantaged groups were also found participating in output markets. Women and disadvantaged groups were found selling small quantities of Timur, but large-scale aggregation, processing, trade, and export are largely dominated by males and those from advantaged groups who have greater access to resources and information. Women involvement is limited to employees and laborer, but the bright side is that the target group (women and disadvantaged) has employment opportunities. Women's and disadvantaged groups participation in large-scale activities is less, and some of the reasons for this include a lack of knowledge, skills, and information, as well as a lack of mobility and access to resources. Even if a woman wants to take out a loan to start a business, she will face gender biases in the loan application process,

[50] Strategic Investment Plan in Timur, ASDP, 2021

dealing with traders, or even starting and operating a business.

Previous ASDP research in Karnali province discovered that women dominate Timur fruit collection. They are responsible for drying, primary processing, and post-harvest storage, as well as transporting it to the nearest market. However, Timur's wholesale business is dominated by men. According to the research, Timur's wholesale business requires less market time and extensive travel (around 5 to 6 hours on foot with the backload of 40-50 kilogramme on a one-way trip). Many women are unable to do so because of the household responsibilities. Furthermore, their involvement in business is limited by the mode of transportation available, which further reiterates the assessment's findings about women's participation in Timur marketing is limited to the small-scale retail trade in local markets.[51]

Climate and Environment consideration

Timur is primarily found in the wild, as well as in state and communal forests. Lately, overharvesting of Timur has begun as people become more aware of the market price and demand for Timur. During the stakeholder consultation in *Bajura*, overharvesting of Timur causing the depletion forest resources was brought up as a grave issue. Timur collectors harvest before the plants release seeds, slowing reproduction of Timur tree, particularly in state and communal forests. If this trend continues, and there are no mechanisms in place to prevent and preserve existing varieties causing sharp decline in Timur production in the near future.

From an environmental perspective, Timur also has comparative advantages over other agriculture crops due to the following reasons. First of all, it was kept in the wild (a natural shrub) and then domesticated in appropriate geo-climatic settings or locations, in areas like *Dailekh*, *Humla*, *Doti*/*Dadeldhura* and *Bajura*. Secondly, Timur is generally collected in natural conditions (in the forest, with no human intervention during production), and hence can be classified as organic. Third, the plant can be grown without impacting agricultural productivity in the forest and adjoining agricultural regions.

CAPACITIES, CONSTRAINTS, INCENTIVES, AND OPPORTUNITIES ANALYSIS

Capacities	• Similar to Ginger/Turmeric, producers have a long experience in collecting Timur and have been using traditional practices for benefit. They usually collect Timur as a part of their side income, but they are not into reinvesting the earnings to establish a private orchard. But the good part is producers can utilize the open resources and earn their livelihoods. • Requires high initial investment for orchard establishment to cultivate Timur in private lands. Current producers are mostly marginal who may not have the capacity to invest in a private orchard. • Requires high initial investment for orchard establishment to cultivate Timur in private lands. Current producers are mostly marginal who may not have the capacity to invest in a private orchard.
Constraints	• **Quality of Timur produced in the assessment areas is inferior** due to a lack of quality plantation materials, poor orchard management, and poor harvesting techniques used by the producers. Producers use traditional harvesting techniques like, plucking by hand, and lopping off the fruiting branches while also harvesting the premature fruits that compromises the quality of Timur. Producers also do not know about proper cultivation practices that result in cultivation in small patches; poor orchard management hence bringing low yield. • **Lack of research** on high yielding plants with less or no thorn. To encourage commercial plantation of Timur research on high yielding plants needs to be done. The main problem in Timur collection is difficulty in harvesting due to the nature of

[51] Strategic Investment Plan in Timur, ASDP, 2021

	the Timur trees with big thorns. High yielding varieties with less thorns would make production easier for the farmers. • **Inadequate quality control:** Adulteration is very high in the case of Timur, improper cleaning and drying before the trading and the lure of mixing other materials in dry Timur decreases the quality and the market value of the product. • **Lot of hassles in Timur collection for Traders:** Timur is collected by farmers of different scales., Traders collect a small volume from many in the rural parts, and this process is not time and cost-effective. The collection system of Timur is not well established in the production areas.
Incentives	• **The farm gate and market price of Timur has increased steeply** in the past five years. Timur of high hills and mountain regions of Karnali and *Sudurpashchim* province have better quality and taste and this value proposition can fetch a better price. • Processed products like essential oil is considered a high-value commodity and it has very high demand and value in national as well as international markets. • **Timur fruits as well as processed products have a high demand in international markets.** Timur is also used as raw material to extract the essential oil and is an ingredient of Ayurvedic medicine. The number of processing companies for product diversification (production of Timur essential oil); value addition (paste, powder, pickle, etc.). is increasing after realising the market value of raw as well as processed Timur and other diversified products (paste, powder, pickle, etc.).
Opportunities	• **Timur is a high-priority crop for cultivation and export.** with High demand in both the domestic and international markets. Due to its market potential and its suitability for rural producers, more producers are showing their interest in growing more Timur plants. Timur production and trade are still in a nascent stage and unexplored. The scope to increase the yield through the adoption of improved production practices and technologies is high. With proper research on varietal development and improved production and harvesting practices can result in increased yield.

POTENTIAL INTERVENTIONS:

(Please refer to annex for details on the interventions derived and which cluster each intervention is applicable to)

1. Facilitate DFO to co-ordinate with private nurseries for saplings production.
2. Local entities to identify and segregate cultivation areas (zones, pockets, groups) to promote the production of Timur.
3. Encourage private input suppliers to provide extension services to the producers.
4. Support the equipment suppliers to assess the market and demand of such tools and promote it among the prospective buyers to create demand.
5. Encourage local entities (DFO, local municipalities input providers) to provide such knowledge to the producers/collectors of Timur.
6. Incentivize and facilitate the technology providers to promote and introduce low-cost technologies at strategic locations.
7. Encourage NARC to build partnerships with private research institutions or academic institutions to carry out research and new varietal development.

Figure 39 Potential interventions in timur value chain

INDIGENOUS CROPS VALUE CHAIN

Photo 10 Indigenous grain field (by Ashta Prajapati)

SECTOR OVERVIEW:

This assessment defined indigenous crops as Buckwheat, Millet, Barley, and Beans because they are indigenous staples in the mountain region and share similar agro-ecological requirements and agronomic practices. These crops are the primary source of food and nutrition for people living in mountainous areas, and people have been cultivating them for ages. Except for beans, indigenous crop production has remained relatively stable over the last ten years. It is still regarded as a neglected crop consumed primarily by the poor and produced in small quantities. However, demand has recently increased due to increased health consciousness among urban consumers. Bean production has increased significantly in the last five years due to the increased market momentum of *Karnali* beans. The increase in production volume is also represented in the table below:

Table 7 Timur Production Trend

Year	Area	Production Mt.
2014/15	30,426	32,913
2015/16	30,644	32,817
2016/17	30,644	32,817
2017/18	26,302	28,397
2018/19	33,826	37,011

Indigenous crops are important crops of both *Karnali* and *Sudurpashchim* Provinces, particularly in the higher mountains. Both provinces contribute equally to the national production of Buckwheat, Millet and Barley, but

Karnali produces more beans and hence contributes more to the national production. Because high mountain beans of *Karnali* have good brand value, *Sudurpashchim* beans are also sold as *Karnali* beans in regional markets like Nepalgunj, *Kailali*, Pokhara, and Kathmandu. Regional markets have the highest demand for *Karnali* beans and consumers are also willing to pay premium prices due to the taste and quality of the beans.

GEOGRAPHIC DYNAMICS

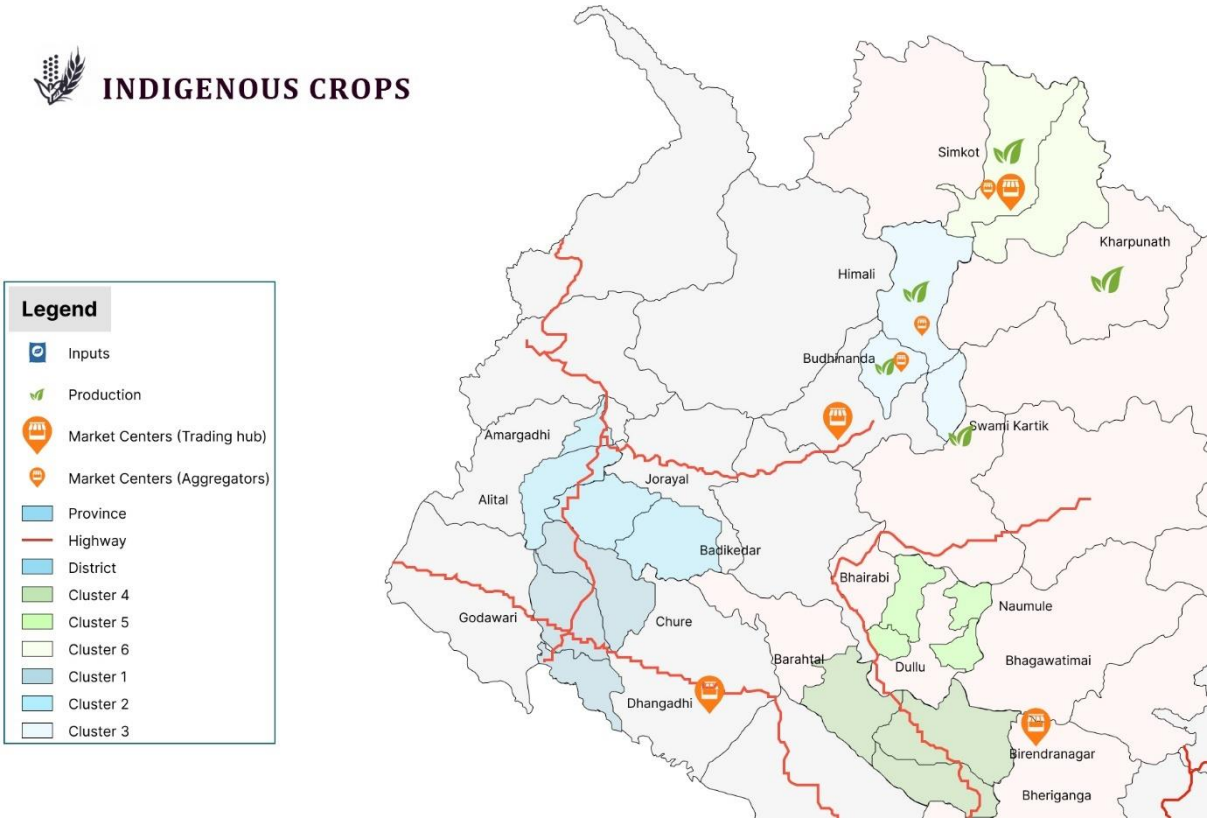

Figure 40 Indigenous crops production and market centers in project clusters

Humla and *Bajura* produce indigenous crops and it is produced in all municipalities/assessment areas in both districts. The majority of the production is consumed by the producers themselves, with the rest sold in local markets such as Simikot and Martadi. Buckwheat, millet, and barley produced in *Humla* and *Bajura* are only found in small quantities in regional markets such as *Surkhet* and Karnali. However, a significant amount of Karnali beans reach the regional market. The majority of production inputs are obtained from the local market. Budinanda in *Bajura* and a local seed bank in Kharpunath, *Humla* are the main suppliers of inputs for the producers in the assessment areas.

MARKET SYSTEMS MAP

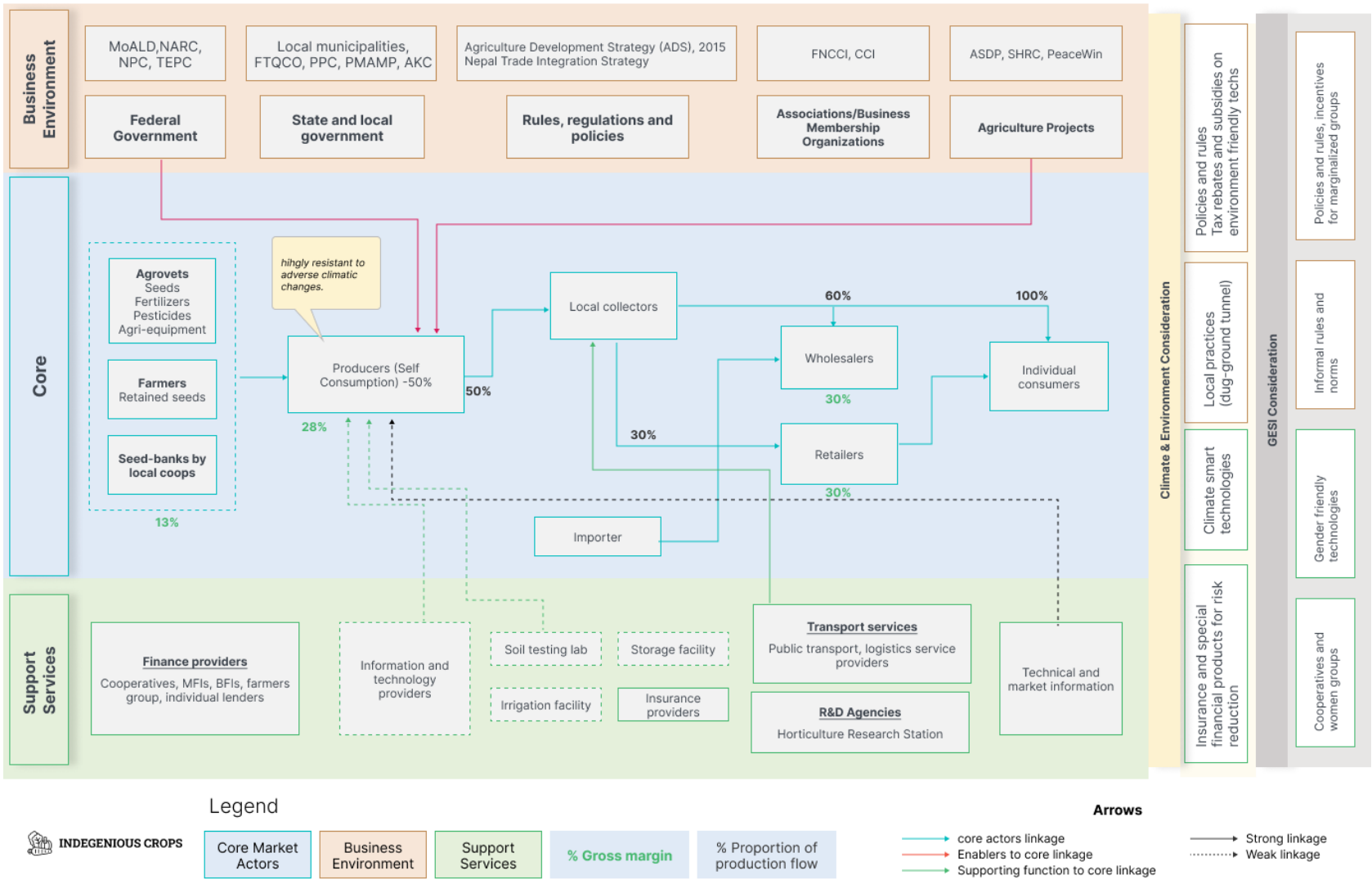

Figure 41 Market map of indigenous crops value chain

Inputs

Seeds are the most important input for IC; farmers use some bio-fertilizers, but the use of chemical fertilisers is rare. Input supply actors include co-operatives and agro-vets, from which farmers obtain seeds and fertilisers, but a large number of farmers use retained seeds in the case of IC. Improved seed varieties are still unavailable on the market. The majority of private input suppliers are concentrated in district headquarters; however, a co-operative operating seed bank at *Humla* is preserving IC varieties but sells loose unpackaged seeds with no guarantee of productivity. Because demand for IC inputs (mainly seeds) is very low, the incentive for private input sellers to sell IC seeds is also very low. The only large-scale actor supplying inputs of IC is Krishi Samagri Company based in *Surkhet*, it also has its dealers' network however, none are present in the assessment areas.

Production

Indigenous crop producers are dispersed all over the assessment areas, and production pockets and zones have yet to be identified. The IC farming community has been cultivating crops for generations, and the techniques have been passed down from generation to generation. Because farmers produce with limited resources, the production unit and volume are small. Despite the good economic value and high export potential, demand is not met due to low production volume. So far, production has been stagnant and is mostly limited to household consumption. Commercial orientation in producing Buckwheat, Millet, and Barley has not been seen; however, as farmers have learned about the market potential of beans, they have started to increase production. Farmers, however, do not achieve satisfactory productivity due to a lack of varietal improvement. Commercial varieties that yield harvests in three months or less are yet to be introduced in *Humla*, whereas these are already popular in Jumla.

Indigenous crops require a lot of effort but provide less return, whereas vegetables and fruits provide 3-4 times more return for the same amount of effort and resources invested. Because of the comparative advantage of fruits and vegetables, most farmers in *Humla* and *Bajura* have switched from Indigenous crops to vegetables. Vegetable markets are also more secure than IC markets. However, the resource efficiency, and short crop cycle, often from August to November when no other crops grow, presents a good opportunity for farmers to benefit from ICs in the short term.

Trading

Indigenous crops are produced by individual farmers and they are collected by local and road-head collectors. However, the crops collected by some cooperatives are supplied to national traders and further reached out to exporters. The bargaining power of collectors determines the price of the commodity. There seems to be a communication gap among producers and traders as their activities are not coordinated. The remaining surplus after the local consumption are sold out to collectors for trading. Also, the collectors have to visit different households and they tend to collect the commodity in small units. The end customers, especially in the urban areas like Kathmandu and Pokhara are willing to pay a premium price due to the high value of indigenous crops from the project clusters.

Moreover, Karnali beans have a good demand in the market because of good taste and high-land products and yet lacks a systematic distribution channel.

Processing

The crops are processed in traditional techniques. It involves winnowing, cleaning, dehulling and grinding and the gradings for crops are not practiced in the project clusters. Further, traders are involved in the packaging at collection centers. Millets are passed through the milling process to produce flour. However, the traditional methods are practised using dhiki or huller machines in rural areas for processing of Indigenous crops and high-level value addition is almost non-existent.

Support Services

Storage Service Provider

Traders use their own private storage, which is limited in volume. The warehouse facilities in the project clusters are not designed for large-scale storage. The Food Management and Trading Company Limited (FMTC) has built a 400mt commercial storage facility in Simikot, *Humla* but it is not accessible for all producers. Almost every household stores their crops in privately owned rooms, as there are no commercial storage facilities.

Business Environment

Federal and Provincial Government

- Krishi Samagri Company Limited (KSCL) is responsible to supply subsidized chemical fertilizer and organic fertilizer and seeds
- There is a research center in Karnali province under NARC that conduct research on indigenous crops at Dasharathpur, *Surkhet*.

State and Municipal Government

- Local governments at both *Humla* and *Bajura* have recognized and identified Indigenous crops as important products. However, dedicated plans and budget is yet not allocated to promote these crops.

Non-governmental Organizations:

- Indigenous crops are one of the 12 selected VCs of ASDP area in Karnali Province. ASDP is helping in production management, market linkages, and also business facilitation.

GESI Considerations

Production: Indigenous crops have the highest percentage of poor farmers and women involved in production. Women dominate crop management, which includes land preparation, weeding, fertiliser application, harvesting, and postharvest activities. Similarly, men are involved in the supply of fertiliser and inputs, as well as crop marketing activities. Minority groups, in addition to women, are involved in the production of ICs. Women appear to be less involved in the Karnali bean, but they appear to be more involved in the barley, buckwheat, and millets. Due to the high rate of male migration in the area, women now also make small scale trading and agricultural expenditure decisions. The marginalized people also collaborate with other communities for production on issues such as seed sharing, cultivation practises, and so on).

Output: Women and disadvantaged groups dominate small-scale trading in the local market. However, large-scale trading and transportation to a larger market is done by traders with better access to resources. Females were also underrepresented in long-distance trading due to their limited mobility due to other household responsibilities.

Climate and Environment Considerations

Indigenous crops are less affected by climate change because they can withstand extreme weather conditions such as high rainfall and drought. Because it produces well in drought-prone areas, it is regarded as one of the most suitable crops for higher hills and mountain regions such as *Humla* and *Bajura*. Indigenous crops can also create a reliable system for effective use of natural resources because crop residues can be used as animal fodder and animal manure can be used as crop fertilizer. Indigenous crop promotion can also improve natural resources preservation because the value chain preserves and protects the decade old local variety of the crops. Therefore, as an environmentally sustainable crop, it also aids in rural livelihood improvements and social-wellbeing by promotional activities.

CAPACITIES, CONSTRAINTS, INCENTIVES, AND OPPORTUNITIES ANALYSIS

Capacities	• Indigenous crops have been produced by farmers traditionally, and the practices and technologies used in production, seed retention, harvest, and post-harvest are all traditional. Though the demand for these crops are gradually increasing, the production is declining due to the shift of farmers towards more cash generating value chains such as vegetables.
Constraints	• **Low production volume:** The production of indigenous crops is limited to smaller production units, and almost all the production is dependent on rain-fed irrigation. Improved varieties of these crops are very limited, and good quality seeds and other inputs are also not readily available. This has resulted in declining productivity of the crops. Additionally, with declining productivity, farmers are shifting towards more cash generating crops, thereby reducing the production of indigenous crops. • **Unassured product quality:** Though the demand for indigenous crops is increasing, the quality of these products cannot be ensured due to poor post-harvest practices. These products, even though sold at supermarkets in urban

	areas, have to be properly cleaned and sorted before consumption, making them inconvenient for consumers. Poor storage conditions after harvest reduce the shelf-life of these products, resulting in early mold growth and insect infestations. • **Unorganized supply chain:** Due to the low trade volume of these products, there are limited dedicated traders of such crops. Prices are not formalized at value chain levels, and the supply chain is not organized. Due to low volume and seasonal production, indigenous crops are mostly sold only at specialty stores, and a sole market only for such crops is not possible due to low volume and seasonal production.
Incentives	• **The market demand for indigenous crops is increasing** due to the changing perception of consumers towards local products. Consumers prefer indigenous crops for their flavor, health benefits, and organic properties. Therefore, these products are sold at premium prices in the domestic and international markets.
Opportunities	• **Increasing domestic tourism has increased the demand for indigenous food** in the municipalities of *Humla* and *Bajura*. The domestic and international tourists traveling for trek and work in these areas seek traditional experiences and demand for traditional food prepared from the indigenous crops. The demand is considered to further grow as the trends of domestic tourism is on rise. • **Expansion of block, zone, and super zone programs by PMAMP** has proven very successful in boosting production volume and improving economies of scale. • **Improved road networks within municipalities and connecting districts**. With **increased access to road infrastructure and transportation facilities**, farmers can sell as much as they can produce. Road connectivity has given farmers more opportunities to reach the regional markets. This assurance is very motivating for producers to increase their production size.

DAIRY VALUE CHAIN

Photo 11 Dairy Farm in Dadeldhura (by Narendra Dhami)

SECTOR OVERVIEW:

The per capita milk availability in Nepal is approximately 79 litres per annum, which is substantially below the recommended limit of 91 litres per annum by World Health Organization (WHO)[52]. In 2019/20, Nepal produced 2.3 million MT of milk, contributing to around 0.247 percent of world's milk production[53]. Cows and buffalos are the major dairy animals for milk production in Nepal, and buffalo contributes to 60% of the total milk production. Table 1 represents the national milk production trend over 3 years, and annual milk production in project clusters. The *Sudurpashchim* Province accounts for 10% of the total National milk production and positions itself as second least milk producing province only above Karnali Province, which contributes only 4.5% to the national milk production. The two potential clusters for the dairy value chain; *Surkhet* and *Dadeldhura* contribute to 21% and 7% of their provincial production respectively.

52 Republica. "Nepal Short of 13 Liter per Capita per Year to Be Self-Reliant in Milk." My Republica. My Republica. Accessed May 13, 2022. https://myrepublica.nagariknetwork.com/news/nepal-short-of-13-liter-per-capita-per-year-to-be-self-reliant-in-milk/.

53 "A assessment on Growth and Performance of Dairy Sector in Nepal," accessed May 13, 2022, https://www.ijeab.infogainpublication.com/upload_document/issue_files/36IJEAB-108202012-Aassessment.pdf.

Table 8 Milk production trend in selected clusters[54]

	Production (Mt.) 2017/18	Production (Mt.) 2018/19	Production (Mt.) 2019/20
Surkhet	23,665	25,032	16,631
Dadeldhura	16,153	16,579	12,946
Karnali	113,374	115,345	105,301
Sudurpaschhim	235,074	245,281	235,341
National	2,092,403	2,168,434	2,301,000

The milk production system in Nepal is dominated by traditional production systems within small non-commercial holdings. However, the government has been pushing to commercialise dairy production in recent years through various subsidies, development programs, tax exemptions, and other means for farmers and milk processors. The trend of milk production over the last five years shows a gradual growth as the sector is moving towards commercialization. However, Nepal Dairy Development Board (NDDB) reports that the production and productivity of dairy animals are comparatively low because of poor genetic pool, poor feeding, and inadequate health care management.

Demand for milk and milk products are ever increasing. Nepal imported milk worth Rs 2.4 billion while it exported only 2.04 million litres of milk in 2019/20. As per the national data, the total population of Nepal is 29 million[55] and yearly milk production is 2.3 million MT[56], making per day milk availability per person of 216g, which is far less than the WHO recommended daily milk consumption of 761g per day per person. Similarly, the per capita milk availability is 254g/day in *Dadeldhura* and 109g/day in *Surkhet*. Also, the supply of milk from the project clusters is limited to local consumption and some of the regional markets close and accessible to the clusters. It has been found that there is a potential demand in higher hills of the provinces. Supply of milk to these areas is limited both due to low production, and difficulty in transportation of milk especially because of its perishable nature. All the interviewed actors from the project clusters mentioned that there is a production deficit, and the current production is not enough to meet the demand for milk.

54 Statistical Information on Nepalese Agriculture. Ministry of Agriculture and Livestock Development. 2017 – 2020.

55 CBS Nepal, "Annex of Preliminary Report of Census 2021," Census Nepal 2021, accessed May 14, 2022, https://censusnepal.cbs.gov.np/Home/Details?tpid=5&dcid=a82d0762-6f49-4752-a02d-19fdaddc55ed&tfsid=17.

56 Statistical Information in Nepalese Agriculture. 2019/20.

GEOGRAPHIC DYNAMICS

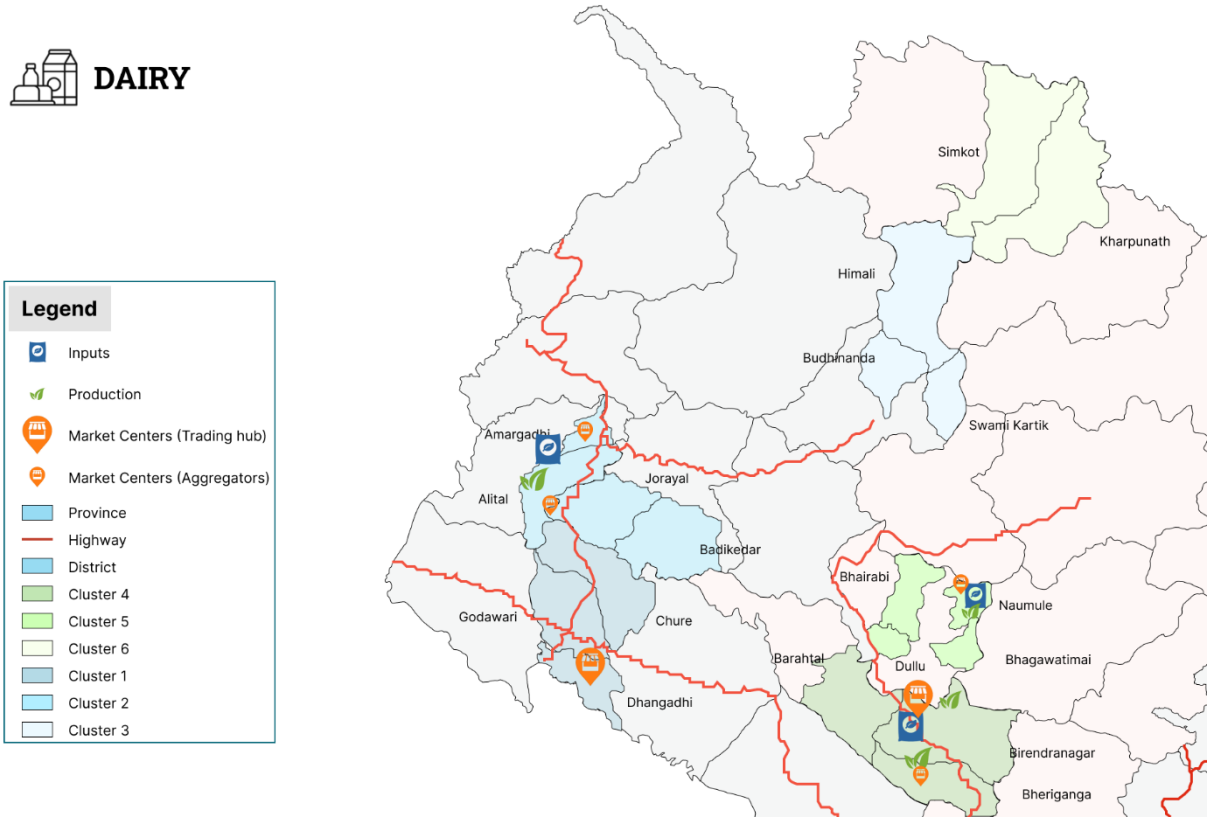

Figure 42 Dairy production and market centers in project clusters

A rapid assessment was conducted in *Surkhet*, and *Dadeldhura* clusters to understand the sector's market dynamics in the selected municipality and beyond. The indicative map for dairy production areas in project clusters is presented in Figure 42.

The selected clusters do not fall under dairy zones or super zones, but sufficient production for the province was found in some of the selected municipalities. Highest milk producing municipalities were Birendranagar, and Barahtal from *Surkhet*, and Alital from Dadheldhura. Milk produced by producers is collected locally within the municipality at collection centers, then supplied to trading centers in Dhangadi, and Birendranagar. Milk from Alital municipality is sold to Amargadhi and *Kailali*, while milk from *Surkhet* and *Dailekh* clusters are sold to dairy in Birendranagar.

MARKET MAP

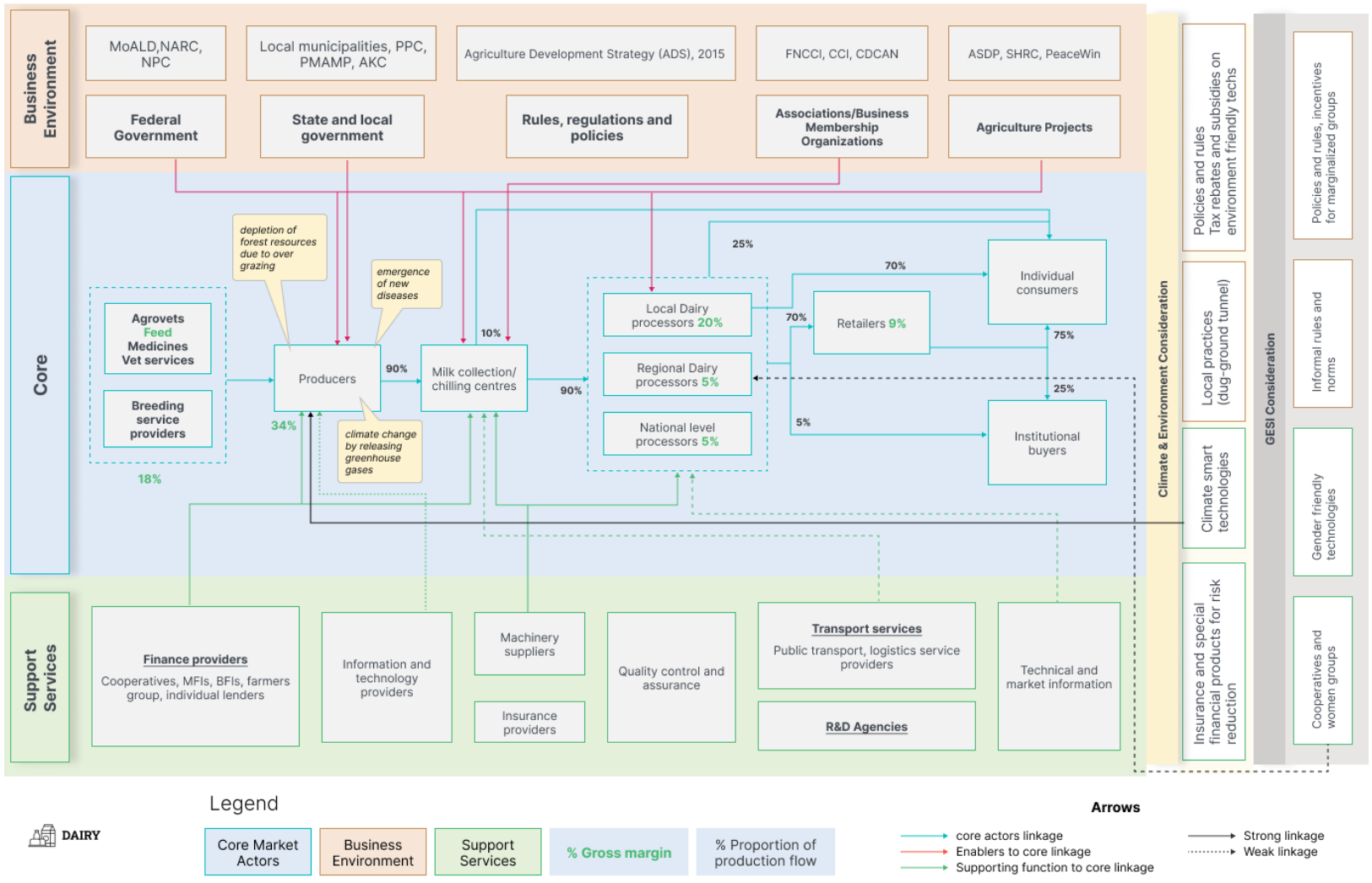

Figure 43 Market map of dairy value chain

Inputs *(Commercial feed, fodder and forage seeds, feed supplements, vet services, breed)*

Feed for cattle (commercial feed, forage, grains), feed supplements, veterinary drugs, water, and breeding services are the most important inputs for the dairy value chain in the *Surkhet* and *Dadeldhura* clusters. The agrovets sell commercial feed, feed supplements, veterinary medicines, and some forage seed varieties to producers as inputs and gross margin in sell of inputs is 18%. In addition to private sector actors, government and development agencies play an important role in dairy input provision. The local municipality, ward office, and the Veterinary Health and Livestock Service Expert Center (VHLSEC) are responsible for distributing medicines and feed supplements to dairy cows, as well as mobilising breeding services through artificial insemination to increase animal genetic qualities. The services of natural breeding are provided by bulls within the community upon paying certain fee to the owners of the bulls. Producers mostly feed grass and green forage to dairy animals which are available in the local forests. In dry seasons, animals are fed straw from rice and wheat. Straw and grass are supplemented by cooked grain meals (*Kudo*), and sometimes with commercial feed. Calcium is the most used feed supplement for dairy animals.

Production *(Milk)*

Producers raise cows and buffalos to produce milk and producing milk is quite beneficial for the farmers as they can earn a minimum gross margin of 34%[57]. Milk production is dominated by small-scale dairy producers owning two to four cows, with only a few larger-scale producers rearing 5 to10 animals, in the project clusters. Major milk production locations include Alital in *Dadeldhura*, and Bheriganga and Barahtaal in *Surkhet*. Though commercial dairy farming dates back to a long time in *Surkhet*, it is very new to the *Dadeldhura* cluster. The increasing trend of commercial dairy farming in *Dadeldhura* cluster is observed after the establishment of milk collection centers a few years back[58]. The quantity of milk produced is affected by the season, as well as other farm inputs and management. April to November is regarded as lean season for milk production while December to March is referred to as flush season (daily milk production difference during these seasons is ~ 35%[59]) for milk production.

Trade

Commercial producers sell 90% of their milk to collection centers, and individual small- scale dairies within the locality. A very small amount is directly sold in retail, mostly to the neighbours within a limited radius. When selling to the collection centers, the price of milk is determined in terms of fat and solid-not-fat (SNF) quantity, and the price per unit is set by the dairy association. Collection centers then sell it to the dairy (milk processing companies) from where milk and milk products are sold to the consumers in retail. Unlike other value chains, the gross margin for collectors was also found to be significant in the case of dairy. This is due to the high investment and operation cost required for maintaining temperature and quality testing.

Collection centers in Alital are privately run, while there are collection centers run by cooperatives in Birendranagar and Barahtaal. These collection centers have chilling vats of 1000 liters to 5000 liters capacity for storage, and they sell milk to individual consumers, hotels/tea shops, and to other regional and national level dairies. Milk collection centers in Alital collect between 100 and 700 liters of milk per day and supply milk to Khaptad dairy in Attariya and DDC in *Kailali*. Khaptad dairy and DDC in *Kailali* supplies surplus of the collected milk to Skimmed milk powder (SMP) plant in Pokhara. Collection centers in *Surkhet* supply milk to Rara Dairy in *Surkhet*, which supplies processed milk products to national markets. Rara dairy in *Surkhet* also collects milk from other districts of Karnali province, including *Dailekh*.

Processing

Local dairy processors collect between 100 and 250 liters of milk per day and sell it directly to consumers or process the milk into products such as paneer, khoya, chhurpi, yogurt, and ghee. Most of these processed products are consumed locally. In the case of *Dadeldhura*, the products from Alital are sold in Amargadhi, which is the market center of the district. Rara dairy in *Surkhet*, and other large-scale dairies in *Kailali*, Pokhara, Chitwan produce different kinds of processed dairy products. The small-scale dairy processors are flourishing because of the high profit margin. Many new dairy products are demanded by

57 Calculated using the data from the field interviews.

58 Collection centres were established with support from the M-RED project, MercyCorps in Alital.

59 International Journal of Applied Agricultural Research ISSN 0973-2683 Volume 5 Number 4 (2010) pp. 419–427. Research India Publications http://www.ripublication.com/ijaar.htm

the market, indicating the growth and feasibility of the sector. The cost analysis of raw milk was only conducted during this assessment.

Supporting Services

Veterinary health and advisory services: Health of the animals is very important to produce good quality milk and to maintain optimum productivity of animals. Producers mostly rely on the VHLSEC, district veterinary office, the veterinary section of the municipality for such services. These units provide timely vaccination, diagnose disease, and recommend curative measures to ensure animal health. Some of the agrovets and individual paravets also provide such veterinary services on call. Some of the producers in *Surkhet* also mentioned the use of mobile applications like SmartKrishi App for advisory services. Due to increased mobile phone and internet penetration even in rural areas, digital information through mobile phones seems to be an effective means of mass information sharing.

Transportation: Raw milk transportation varies across different value chain actors. Producers carry raw milk in small plastic, steel or aluminum cans to collection centers, who then transport milk in larger cans in larger vehicles. In such practices, the cold chain of milk is not maintained posing higher risk of milk spoilage. Some of the collection centers in *Kailali* and *Surkhet* also transport milk in dedicated milk transport tanker with a chilling vat. Dairy processors from urban centers like Pokhara, Chitwan, and Kathmandu send their own milk trucks to collect milk from GRAPE clusters.

Financial services: Financial services are required at each level of the value chain. Commercial banks, microfinances, and cooperatives are the key source of finances for the actors in the dairy value chain. The agriculture development bank is providing agri-loans at the rate of 4% interest rate to producers. It is also providing collateral free loans worth up to NPR. 1.5 million. Similarly, commercial banks like Nabil is also providing collateral free loans at 4% for a maximum loan amount of 10 lakhs. The bank is lending up to Rs 1.5 million with collateral. But it was observed that producers found loan processing from commercial banks tedious and preferred getting loans from microfinance and cooperatives despite higher rate of interest. Though there is relatively less documentation required, interest rate charged by microfinance and cooperatives is as high at 15%.

Marketing: Milk cooperatives play an important role in the dairy value chain. In addition to providing financial services, cooperatives provide inputs to producers at subsidised rates, act as a collection center, and ensure optimum price for the producers. It was evident in Alital municipality of *Dadeldhura* that, with establishment of collection centers in the municipality, more producers were encouraged to commercial dairy farming.

Insurance: Government's subsidy in agriculture insurance increased from 75% of the premium amount to 80% this year. Each private non-life insurance company is assigned a different district for insurance provision. Insurance of dairy animals is promoted especially for improved breed animals, as a preventive measure to reduce risk of loss of life. Livestock insurance is commonly practised in municipalities of *Surkhet* cluster, while it is less common in *Doti*/*Dadeldhura* cluster.

Training: Different types of training on good husbandry practices in milk production, dairy farm management, and basic dairy processing technologies are being provided by the government, development agencies, and private firms.

Business Environment

Federal Government:

- Department of Livestock under the Ministry of Agricultural and Livestock Development issues policies and regulations for the livestock sector, including the dairy sector. The department mobilises its budget for the development of the sector.
- The Animal Breeding and Animal Nutrition departments of NARC conduct research on technologies related to breeding, feed and related inputs.
- The National livestock breeding office is responsible for providing animal breed related services and technologies. It produces frozen semen for artificial insemination and distributes it to relevant bodies for producers' access.
- The Department of Food Technology and Quality Control is the sole government unit that regulates the quality of food, including milk and milk products. The Department sets guidelines and provides licenses for establishing dairy processing enterprises.

Provincial and municipal governments

- Municipalities and rural municipalities mainly support producers and production activities. They mobilise the municipality budget for dairy development activities. Producers can register their farms at the wards under municipalities.
- Livestock division of municipality offices, and Veterinary Health and Livestock Expert centers provide technical services, training, and other veterinary services.

Non-Governmental organizations

- M-RED project: MercyCorps, Saajhedaari, and Seeds Nepal are supporting dairy producers and businesses with training, by establishing collection centers, and providing inputs.

Associations/Business Membership organizations:

There are several types of associations in the dairy sector. Some of them are the Central Dairy Cooperatives Association Nepal (CDCAN), Dairy Industries Association (DIA), Nepal Dairy Development Board (NDDB) and Nepal Dairy Association (NDA). These agencies support dairy farming and dairy processing industries through networking, training and technical backstopping, research and development, subsidies, and policy lobbying. Some of these agencies are also regulators; for example, CDCAN is an association of dairy cooperatives and it CDCAN regulates milk pricing and the roles and responsibilities of dairy cooperatives.

Policy rules and regulations

The following are the relevant government legislation, rules, and regulations governing the dairy sector. These acts and policies govern the dairy sector and regulate the quality of milk and dairy products sold, as well as the trade of milk and its products. Some of the other policies for banks and insurance companies regulate the financial products offered by MFIs and insurance companies for dairy production, trade and processing.

- Dairy Development Policy (2064 BS)
- Milk and Milk Products Purity and Quality Control Directives 2075 B.S.
- Code of Practice for Dairy Industry
- Nepal Food Act 1967 AD
- National Food Safety Policy 2076 BS
- Industrial Enterprises Act, 2016
- Trade Policy 2015
- Income Tax and VAT Act
- Insurance Act
- Directives to Banking and Financial Institutions
- Directives to Non-life Insurance Companies

GESI Considerations

Federal Government:

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- Income Tax and VAT Act
- Insurance Act
- Directives to Banking and Financial Institutions
- Directives to Non-life Insurance Companies

GESI Considerations

Milk is a complete food and one of the most basic components of the human diet. As a result, milk is regarded as a valuable agricultural commodity, and the sector provides liveable pay and living conditions.[60]. Access to nutritious food is facilitated by the availability of milk and its products for consumption. Dairy farming is tolerated by all social groups, and there are no social standards against drinking milk. The dairy sector provides decent employment opportunities throughout the value chain, and women have key functions in the industry. According to the sector assessment done by CASA in 2020, women are the principal caretakers of dairy animals. Women are involved in the major activities like collecting fodder and forage for feeding animals and the overall management of the farm (shed cleaning, feeding, healthcare and reproductive care, and milking). Though most of the activities are done by women, men usually have access to the income from milk sales as they are mostly responsible for taking milk to the collection centers.

Climate and Environment Considerations

The warming of the earth's climate system has a variety of consequences for animal-based production systems. It has an impact on feed supplies; affects thermoregulation systems, resulting in thermal stress; increases the emergence of new diseases due to epidemiological changes, and has a variety of other indirect effects. The most noticeable effect of global warming on dairy cattle is the intensity and increasing frequency of thermal stress. It causes a variety of physiological, metabolic, and milk production problems.

On the other hand, dairy animals and their manure contribute to climate change by releasing greenhouse gases, particularly methane. Poor manure and fertiliser management can have a negative impact on local water resources. In addition, unsustainable dairy farming and feed production can result in the loss of ecologically significant places such as grasslands and forests due to erosion. Use of cattle manure for compost and biogas, proper management of feed, and regulations for better grazing management can contribute to fewer negative impacts on the environment.

60 “Dairy Contribution to Social Sustainability - Eda.euromilk.org.” Eda Factsheet, January 2018. http://eda.euromilk.org/fileadmin/user_upload/Public_Documents/EDA_Position_papers_-_Fact_Sheets/Sustainability/2017_01_30_EDA__Positive_dairy_factsheet_Social_facts_FINAL_D-FEP-17-122.pdf.

CAPACITIES, CONSTRAINTS, INCENTIVES AND OPPORTUNITIES ANALYSIS

Capacities	• Small-scale dairy processors that require low investment are scattered throughout the district, producing milk products catering to local demand. They usually use their self-acquired knowledge or training given by local authorities and co-operatives to run the dairy. • Private and cooperative-owned milk collection centers are operational in most municipalities.
Constraints	• **Limited product diversification:** There are limited types of products processed from milk in the clusters. Processors do not have adequate skills and market information to cater to the demand for milk products. • **Producers are not aware of appropriate forage varieties** for increasing productivity and reducing the cost of production. • **Low-profit margin and high competition** for input suppliers: Agrovets in clusters face competition from government and development agencies. Producers wait for government subsidies or free medicines rather than purchase them from agrovets. Even when the projects purchase medicines from these agrovets, they need to sell at a very low margin.
Incentives	• There is **increasing market demand for milk and milk products**. Consumers are seeking diversified milk products, evident from the increased variety of imported dairy products in the market. • There are various government incentives for commercial dairy farming.
Opportunities	• Expansion of markets and road corridors connecting the municipalities • Better access to inputs, extension, advisory services, market-related information, and a resilient supply network to reach even the local market. • Operational milk powder plants in Chitwan and Pokhara. This has reduced the risk of milk loss due to lower demand during the flush season.

POTENTIAL INTERVENTIONS:

(Please refer to annex for details on the interventions derived and which cluster each intervention is applicable to)

1. Identify and make suitable freezing technologies available to the municipality to ensure uninterrupted AI services.
2. Identify gaps in nutrition for dairy animals in the municipality and promote improved fodder and forage to mitigate the gaps.
3. Create a system of referral to private practitioners by Government institutions for better service provisions.
4. Introduce processing of dairy products suitable in the municipality's climatic conditions, through interested dairy processors. Create opportunities for establishment of dairy processing plants.

Figure 44 Potential interventions in dairy value chain

HONEY VALUE CHAIN

Photo 12 Traditional Bee-hive for honey collection in Humla (by Ashta Prajapati)

SECTOR OVERVIEW: HONEY

Due to the dispersion of a diverse bee flora and ideal climatic conditions for honeybee varieties, beekeeping has immense potential in Nepal. Although apiculture provides a modest percentage of agricultural GDP (less than 1%), beekeeping has been identified as a high-value income-generating agriculture activity in the Agricultural Perspective Plan (APP) and the tenth plan. The topographical climate and floral diversity, which is suitable for bee keeping and honey production, make beekeeping a profitable enterprise in Nepal. Nepal is home to five of the world's seven honeybee species, *Apis laboriosa S.*, A*pis dorsata F., Apis florae F., and Apis cerana F.*, as well as one foreign honeybee, *Apis mellifera L*. To keep the bees, both conventional wood hives and contemporary beehives are used. The *A. cerena* is kept in traditional wooden log hives by rural producers in the Himalayan regions of *Humla*, whilst the *A. cerena* and *A. mellifera* are housed in contemporary beehives by modern producers in the hills and Terai[61].

Nepal trade integration strategy (NTIS) 2016 has ranked at fifth position among the exportable commodities of Nepal. However, the export is minimal, although a significant increase in honey production has been witnessed since 2014. As of 2019/20, Nepal produced around 4000 MT of honey from 248 thousand hives. Out of which only around 10 MT was exported. During the same

61 Devkota, Kedar. "Beekeeping: Sustainable Livelihoods and Agriculture Production in Nepal" In Modern Beekeeping: Bases for Sustainable Production, edited by Ramón Ranz. London: IntechOpen, 2020. 10.5772/intechopen.90707

year, Nepal imported 696 MT of honey. [62]

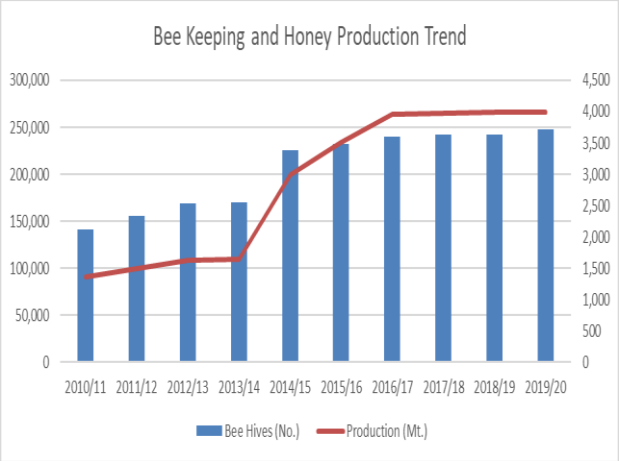


Figure 45: Beekeping and honey production trends in Nepal[63]

Honey and wax are the most well-known primary beekeeping products in Nepal. Pollen, propolis, royal jelly, venom, queens, bees, and their larvae are among other bee products in Nepal. The majority of these goods are edible as they are produced by bees. Only a small amount of honey produced in Nepal is exported, with the majority of it used for food and ayurvedic medicine in Nepal. According to a report in 2009, Nepal has the potential to produce over 10,000 MT of honey per year.[64] However, the actual growth in production is quite slow with annual growth rate of 2.8 % from 2016 to 2020. Nepali honey is not yet available in sufficient quantity and quality for the export market. In 2019/20, Nepal exported only 10,100kg of natural honey. The main importers of Nepali honey are Bangladesh, China, the UAE, Malaysia, and Japan. Before 2016, honey used to be exported to the EU, but due to regulatory restrictions, Nepali honey export is limited to only a few countries. Export apart, Nepali honey is enough to fulfil only 45% of the total domestic demand. Nepal imported around 700 MT of honey in 2019/20.

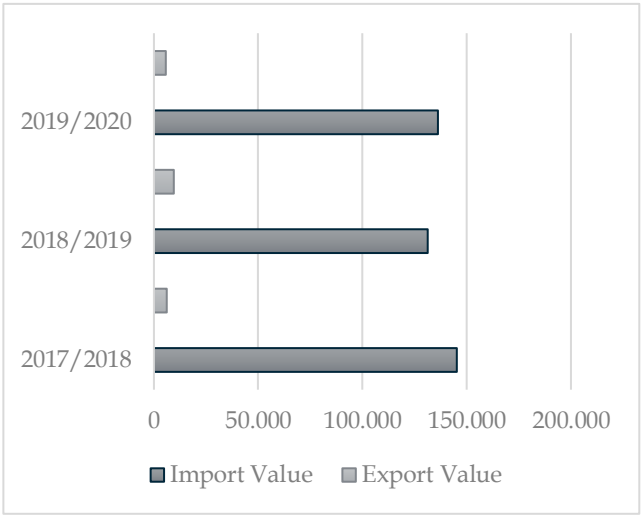


Figure 46: Import and Export of value of Honey in Rs. (TEPC)

62 Statistical Information on Nepalese Agriculture, Ministry of Agriculture and Livestock Development. 2019/20.

63 Statistical Information on Nepalese Agriculture 2017-2020. Ministry of Agriculture and Livestock Development.

64 Pokhrel S (2009) Comparative Benefits of Beekeeping Enterprise in Chitwan, Nepal. Journal of Agriculture and Environment 10: 46-59. DOI: 10.3126/aej.v10i0.2129.

GEOGRAPHIC DYNAMICS

HONEY

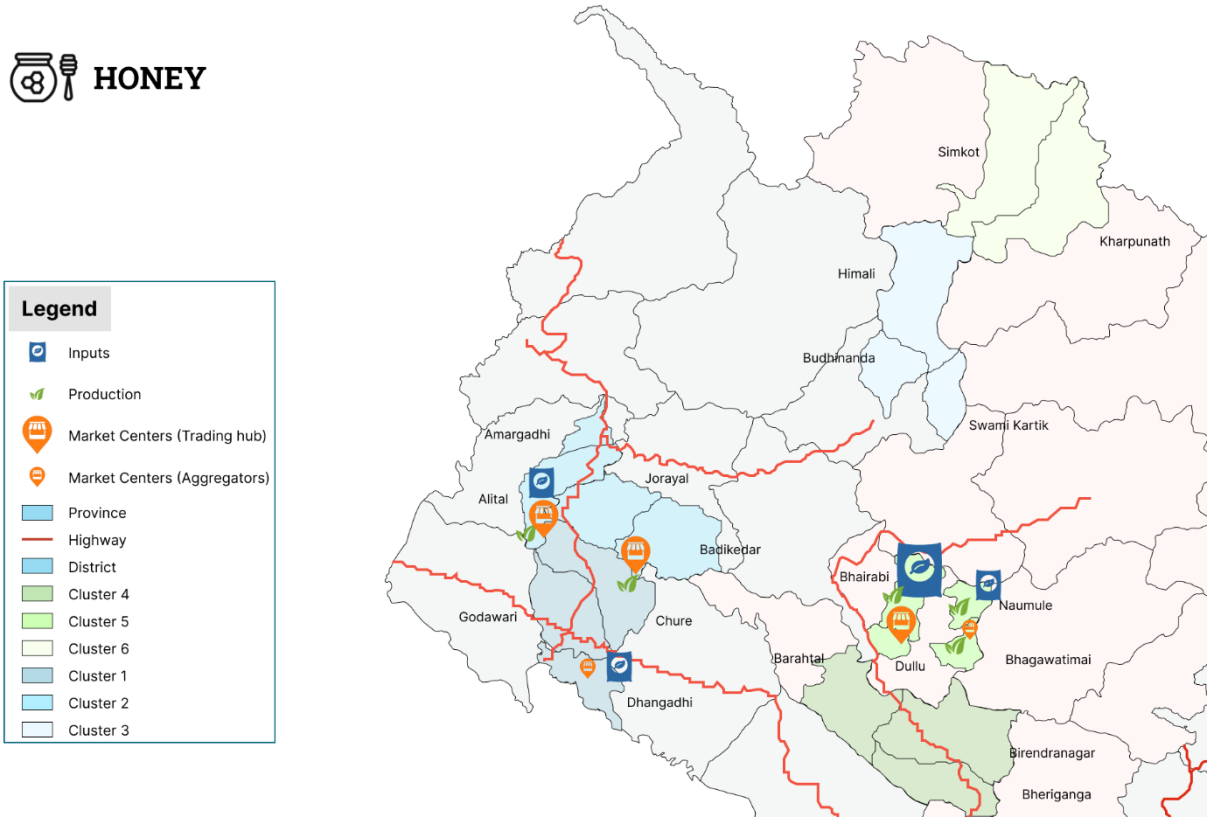


Figure 47 Honey production and market centres in project clusters

None of the districts in Karnali or Sudurpashchim provinces fall under zones or superzones for honey production. However, there is a potential to produce honey due to the availability of forests and flora required. Currently, honey is produced in all three municipalities of *Dailekh* and production is consumed is the same area. The inputs for honey production are purchased from agrovets within the municipality.

Similarly, in *Dadeldhura* honey is produced in Alital municipality and produce is either sold within the municipality or to nearby Amargadhi municipality. *Chure* has very few production units while Dhanngadhi is its main market.

Humla also has potential to produce honey albeit in small scale and methods are traditional. Instead of going for modern hives, producers use wooden logs to make beehives. Honey produced in the rural municipalities of *Humla* is often sold at district headquarters.

MARKET MAP

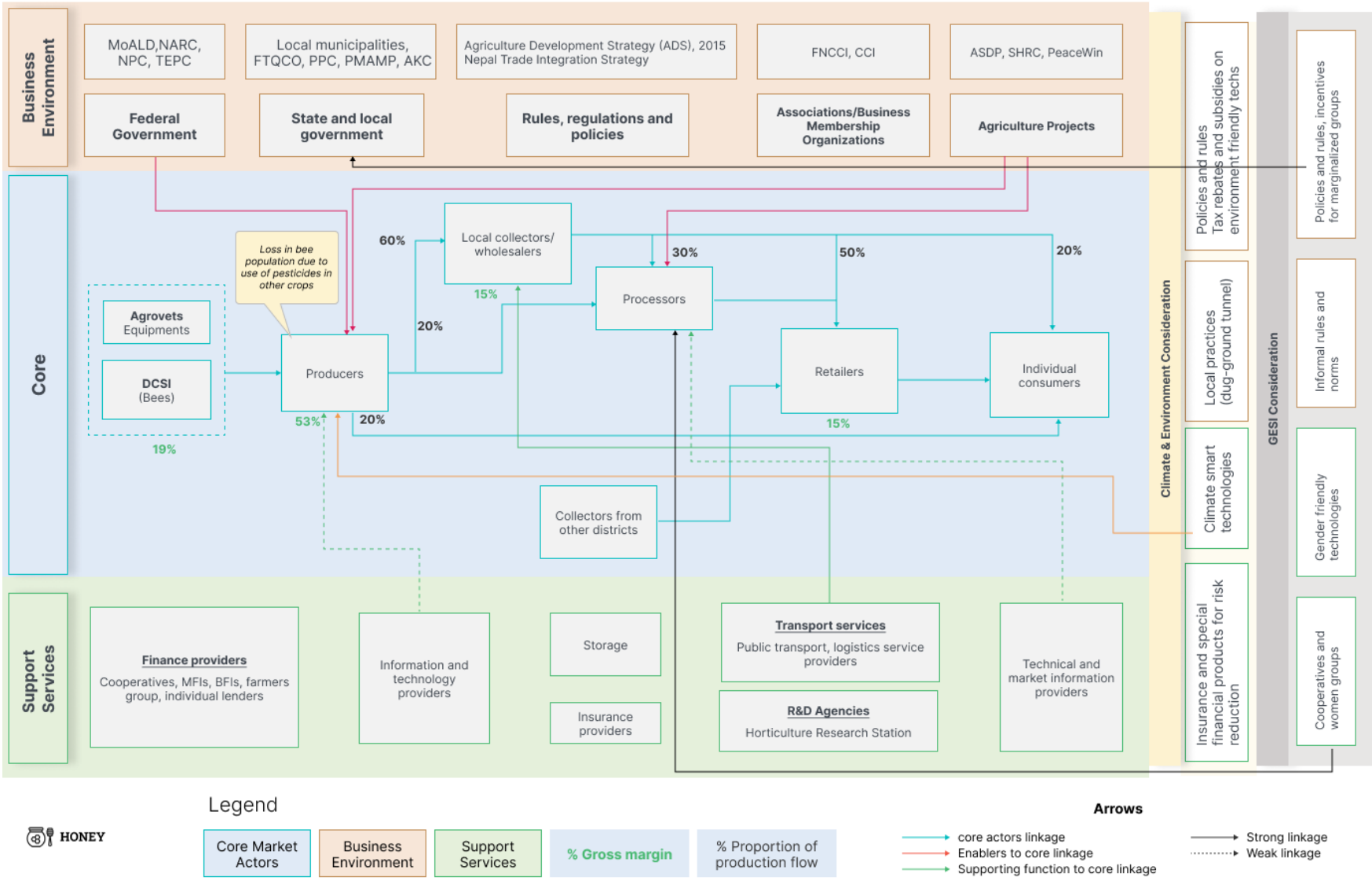


Figure 48 Market map of honey value chain

Beekeepers, hive producers, bee breeders, equipment providers, honey processors, and traders are all involved in the production and trade of honey and honeybee products.

Inputs *(Bees, beehive)*

Beekeeping requires minimum inputs for production. The only inputs required are beehives, bees, and harvesting equipment. Beehives, along with bees, are supplied by input suppliers. In some cases, department of cottage and small industries also supports farmers with equipment. In the assessment area, beehive boxes are built and sold by furniture companies in Alitaal. Beekeeping and Honey Processing Product Development Center also provides bees and other inputs in Alital. Similarly, in *Dailekh* and Kailai, equipment is available at the agrovets whereas producers rely on other beekeepers to purchase new bees.

In the case of *Humla*, the producers only purchase gloves and net at inputs from the market nearby. They build beehives using wooden logs manually at their home. Therefore, the cost of inputs for honey production in *Humla* is almost negligible.

Production *(Honey)*

Honey production involves rearing bees in hives, managing the hives, harvesting honey, and heating and sieving before packaging. Honey is produced during flowering seasons. Producers rearing bees allow the bees to graze in nearby forests and fields. Honey produced from Chiuri fruit is considered the best in terms of flavour and quality. A beekeeper in Barahtaal municipality is allowed have a maximum of 25 hives considering the resources available in the forests. On an average, a honey producer produces 400 kg of honey per year with 25 hives and enjoys gross margin of 53%. Beekeeping is one of the most profitable agricultural activities, with low investment and high return.

Large-scale commercial honey production was not found in the project clusters, though areas like *Chure* in *Kailali* have the potential for it due to good access to forests and flowers. Alital in *Dadeldhura* is also known for honey production and the producers in Alital are receiving a lot of support form the l municipality as well as other development organizations like MEDEP. These organizations provided a lot of trainings on beekeeping to the locals which has helped to boost beekeeping and honey production in the area. *Humla* also has the potential to produce honey due to the abundance of natural resources and flowering plants in the forest. Honey is produced in a few rural areas of *Humla*, including Simikot, Dojhang, and Kharpunath, but scaling up the production is difficult. The production unit is typically managed by a family, and due to a lack of infrastructure to protect the hives from rain, they cannot maintain more than 15 hives per season. Few families in *Humla* have been producing honey for more than three decades, and the tradition is being passed down to the next generation. Some from the younger generation have not only continued beekeeping, but also directly and indirectly passed on their knowledge to others, which has increased honey production in *Humla*.

But, the main driver of increased honey production, even in rural municipalities, is high market demand and price. Due to the limited production and supply of honey, producers are the price setters in *Humla*. As a result of this opportunity, more households have started beekeeping, which, if done collectively, could be helpful to scale up the production.

Trade

The honey trade commonly takes place between the producer and the direct consumer. In Alital municipality, there were no collectors or middlemen connecting producers and consumers. However, in the case of *Dailekh*, there were collectors who would collect honey in large containers before repackaging it into smaller pack to sell it to end users or retailers.

Demand for honey in *Humla* often exceeds supply and customers do not hesitate to pay premium prices as it is believed to have medicinal properties. National and international tourists, as well as the government officials stationed in the district buy most of the produce. Local consumption of honey is not as high; hence it is only sold at specialty shops (Koseli Ghar), cooperative shops targeting the tourists. The surplus is brought to Nepalgunj by individual traders. Apart from the producers, traders too make good profit from the honey. While producers' average gross profit is Rs 483 per kg of honey, traders would earn Rs 150 form a kilo. A While producer in *Humla* and *Dadeldhura* sell directly to end users securing full margin, producers in *Dailekh* rely on traders and share the margin with them.

Processing

Honey doesn't require much processing. It happens only at the farm level, where the raw honey is heated to remove the wax and filtered through a sieve before it is packed. It is often sold in bulk, and the retailers repackage it in different sizes.

Supporting Services

Financial Services

Financial services are required at each level of the value chain and commercial banks, microfinance, and cooperatives are the key sources of finance. The agriculture development bank is providing agri-loans at a rate of 4% interest to producers and providing collateral-free loans of up to NPR. 10 lakhs. Similarly, commercial banks like NMB and Nabil are also providing loans at a 4% interest rate to women entrepreneurs and producers. The interest rates on loans by the microfinance and cooperatives are as high as 16% but produces would find it easier to secure loan from such financial institutions. Cooperatives would provide collateral-free loans up to NPR. 30 lakhs.

Business Environment

Federal, Provincial and Local Government:

- Department of Food Technology and Quality Control (DFTQC) provide lab and certification services to the processing companies.
- Trade and Export Promotion Center facilitate the export of processed honey.
- The local government, agriculture units of municipalities, provincial directorate of agriculture, district agriculture office and the development projects are the enablers of the honey value chain.

Non-Governmental Organizations:

- The Agriculture Service Development Project (ASDP) provides subsidies for beehives and bees.
- Other non-governmental organizations and development projects have mostly concentrated their support in Alital-*Dadeldhura*.
- MEDEP provided entrepreneurship and skill training, supported with market linkage and gave inputs on new technology for honey processing and extracting, through cooperatives operated by producers themselves at Alital.

Associations/Business Membership Organizations:

- Federation of Nepalese Chambers of Commerce and Industry (FNCCI) supports the trade and marketing of the honey.

GESI Considerations

Honey is believed to be a pure food used in medicine, cosmetics, and even as offerings to the Gods. Compared to other agricultural products, beekeeping is considered glamorous and attracts young people[65]. According to the beekeeper's association, 40,000 people are directly or indirectly involved in honey production while 200 people are engaged in packaging and marketing. Though most of the modern beekeeping is dominated by empowered farmers, traditional beekeeping in rural Nepal contributes to the economic well-being of the rural and marginalized landless farmers[66].

Climate and Environment Considerations

Bees play a vital role in preserving ecological balance and biodiversity in nature. They support the environment by helping plants and trees grow. However, bees are very sensitive to climatic and environmental conditions. Producers are unable to cope (as they are unable to preserve the bee species) with the climatic changes and thus have failed to expand their enterprise. The farmers also reported that heavy rain, prolonged drought and harsher winters have affected flowering seasons and destroyed blossoms decimating the country's honey supply. Unusual weather pattern has also taken a toll on beekeeping with the increasing incidents of colony collapse, leading into many swarms either dying or leaving their hives to escape the heavy rains, freezing temperatures and dry spells. On the other hand, at Alital-*Dadeldhura* beekeeping was adversely affected by the insecticides used for vegetable farming. Several studies have shown that insecticides like

65 P.L. Bhandari and R.R. Kattel (2020). Value Chain Analysis of Honey Sub-sector in Nepal. Int. J. Appl. Sci. Biotechnol. Vol 8(1): 83-95

66 Devkota, Kedar. "Beekeeping: Sustainable Livelihoods and Agriculture Production in Nepal" In Modern Beekeeping: Bases for Sustainable Production, edited by Ramón Ranz. London: IntechOpen, 2020. 10.5772/intechopen.90707

Neonicotinoids disrupt learning and memory in bees. At higher levels, the chemicals impair reproduction by reducing the viability of sperm, leading to fewer offspring. Evidence of reduced honey productivity was observed in the *Dailekh* cluster due to pesticide use in vegetable farming, as per the interaction with a government official in the cluster. Hence, beekeeping is recommended in areas with the least pesticide use or in the area where there is availability of natural flora for grazing[67].

CAPACITIES, CONSTRAINTS, OPPORTUNITIES, AND INCENTIVES

Capacities	• There are enough forests and resources for grazing, which is a motivating factor for honey producers. However, some producers are struggling due to a lack of infrastructure and their lack of financial ability to build the required infrastructures like beehives and shades to place the hives. • Some honey producers are skilled as they are in the occupation started by their ancestors while others had exposure and training related to beekeeping and honey production. Apart from that, adequate skills and technologies are also available for building beehive boxes, and inputs are easily accessible in the market.
Constraints	• **Inadequate bee research programs**, data on bee floral identification, pesticide use, low product quality control, low quality management of bees, colony migration and disappearance are major constraints for beekeeping in Nepal. These constraints, among others, hamper the productivity of honey. Lots of opportunities in beekeeping can be tapped by designing effective honeybee pests and predator control measures, the introduction of full package improved beekeeping technologies with adequate practical skill. • **Trade barriers for honey export:** The EU has restricted the import of Nepali honey, stating that the nature of honey production in Nepal does not meet the standards. The EU has not approved the residue monitoring system of Nepal[68]. • Due to **limited knowledge on adapting to climate change**, beekeepers are unable to expand. It was also reported that banks are reluctant to provide loans to beekeepers. • **There is no clear differentiation in high value and normal honey**: Honey cultivated in the high mountains have medicinal properties and can fetch higher prices. Similarly pure honey from the hills can also fetch higher prices compared to the commercially available, mass-produced honey. Product traceability, and product differentiation is limited in honey, which discourages producers to scale.
Incentives	• There is **unmet demand for honey** in the national and international markets. Domestic production cannot fulfil the national demand and there is heavy import. • **High demand of honey** from high altitudes in national and international markets **for medicinal purposes**.

67 Devkota, Kedar. "Beekeeping: Sustainable Livelihoods and Agriculture Production in Nepal" In Modern Beekeeping: Bases for Sustainable Production, edited by Ramón Ranz. London: IntechOpen, 2020. 10.5772/intechopen.90707

68 Thomas Heaton. 2019. Nepal's honey and beekeeping industry is about more than profit. Kathmandu Post.

https://kathmandupost.com/national/2019/03/30/nepals-honey-and-beekeeping-industry-is-about-more-than-profit

Opportunities	• Honey is one of the priority sectors for export. Honey was ranked as 5th exportable commodity of Nepal by the Government of Nepal. • Honey from Nepal is considered of medicinal value and thus fetches a higher price in the international market.

POTENTIAL INTERVENTIONS:

(Please refer to annex for details on the interventions derived and which cluster each intervention is applicable to)

1. Introduce practical beekeeping technologies effective to adapt to the climate changes.
2. Introduce practical beekeeping technologies for effective pest and predator control.
3. Segregate honey production with other agriculture practices and identify ways to create a win-win for both sectors.
4. Improve the honey testing technology after a detailed cost-benefit analysis
5. Improve the honey processing by helping the processors differentiate the honey and market it according to the quality and type.

Figure 49 Potential interventions for honey value chain

GOAT VALUE CHAIN

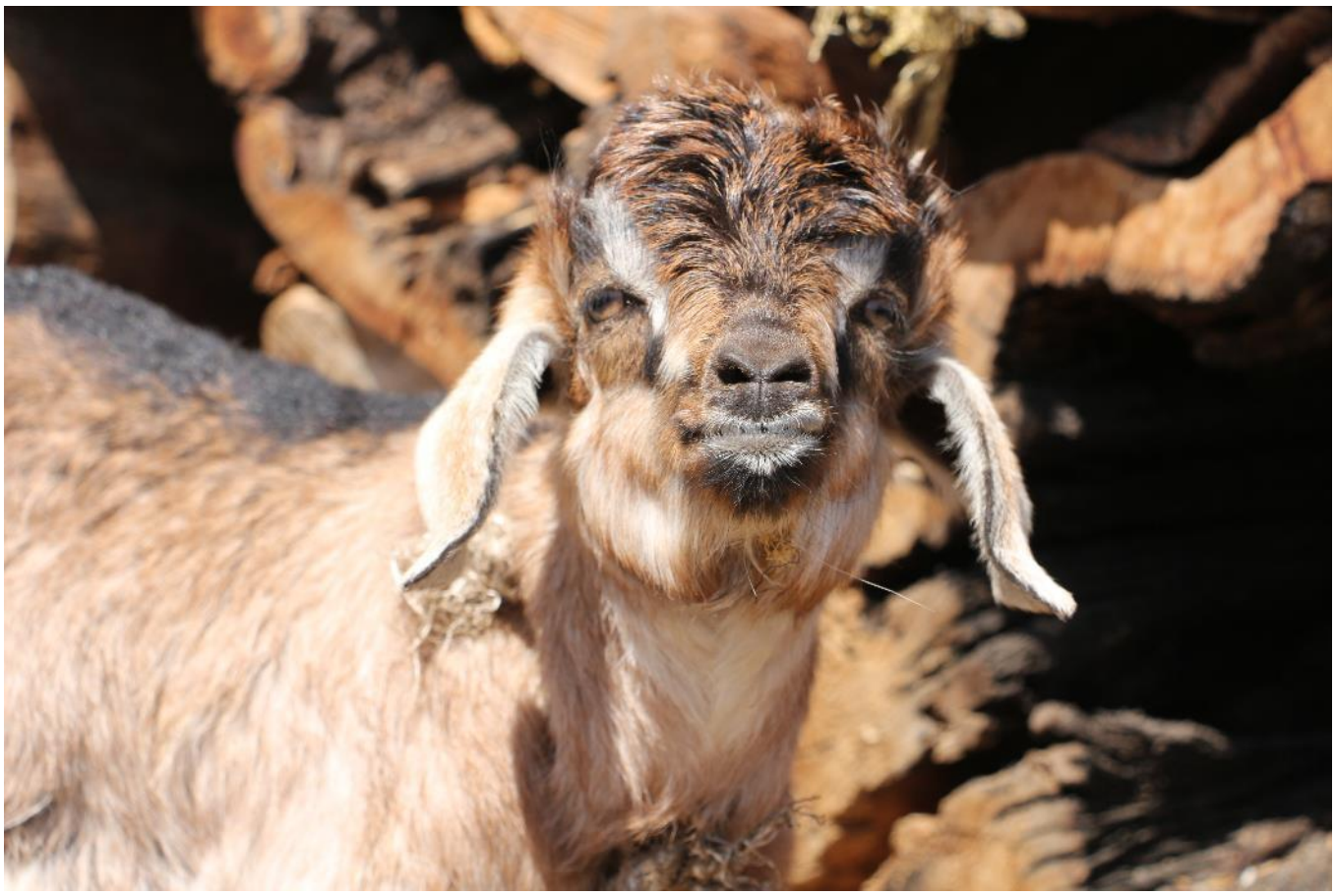


Photo 13 A young goat (by Ashta Prajapati)

SECTOR OVERVIEW:

Goats are among Nepal's most common ruminants. For most of the Nepali farmers, raising a few goats as part of their farming system is an integrated method. It is also seen as a convenient source of money at times of need, making it appealing for poverty reduction and improving family food security and livelihood in developing countries like Nepal. Goat meat is commonly consumed throughout the country and is the most expensive per unit weight. It is the second most popular meat in the country, behind buffalo meat, and accounts for nearly a fifth of all meat produced in the country. The total goat population in the year 2019/20 was 12.8 million, a surge by 4.3% compared to the previous year. Table 6 represents the goat population trend over three years in project clusters, provinces, and the country. The *Sudurpashchim* Province accounts for 7.6% of the national goat population, while Karnali Province has 11.2% of the total goats in the country.

Table 9 Goat production trend at selected clusters[69]

Cluster	Total Number of goats		
	2017/18	**2018/19**	**2019/20**
Surkhet	208,409	216,745	352,153
Dailekh	200,000	208,000	232,482
Doti	102,865	109,037	112,308
Dadeldhura	129,364	135,186	139,242
Karnali	1,359,890	1,400,696	1,435,690
Sudurpashchim	913,256	955,364	983,739
National	11,647,319	12,283,752	12,811,953

Goat farming for subsistence is dominant in Nepal, with each household rearing 1 to 5 goats. With the introduction of improved breeds of goats and various incentives from the government and development agencies, commercial goat farming is gaining popularity. A significant increase in the goat population by 62% was observed in the *Surkhet* cluster, and an increase of 11% was observed in the *Dailekh* cluster during the year 2019/20.

Goat meat is the most expensive meat in Nepal in terms of price per unit weight. Despite increasing production of goats, the price of goat meat is increasing every year. The price hike was observed to be at a peak during 2019/20, after the government of Nepal imposed restriction on goat imports without proper veterinary certificates. Nepal imported goats worth Rs 3.3 billion in 2017/18, which decreased to Rs 0.12 billion in 2019/20[70] after the restrictions. The consumer price per kg of goat meat in Kathmandu center increased from Rs 1000 per kg to Rs 1200 per kg after the decrease in imports (a price hike by 20%).[71] Besides live goat, Nepal also imported 3700 kg of goat meat (fresh, chilled or frozen) in 2019/20. Goat is another sector among the selected value chains where the supply gap is very high.

[69] Statistical Information on Nepalese Agriculture 2017-2020. Ministry of Agriculture and Livestock Development.

70 Statistical Information on Nepalese Agriculture 2017-2020. Ministry of Agriculture and Livestock Development.Statistical Information on Nepalese Agriculture 2017-2020. Ministry of Agriculture and Livestock Development.

71 Live goat price for butchers increased from Rs. 560 per kg to Rs. 670 per kg. Krishana Prasain, "Fall in Imports, Bird Flu Scare Drive up Price of Goat Meat," The Kathmandu Post (The Kathmandu Post, May 4, 2019), https://kathmandupost.com/money/2019/05/04/fall-in-imports-bird-flu-scare-drive-up-price-of-goat-meat.

GEOGRAPHIC DYNAMICS

GOAT

Figure 50 Goat production and market centers in project clusters

Among the clusters assessed, *Dailekh* and *Surkhet* are the most popular clusters for goat production. The zones and superzones for goats are yet to be defined, but a larger share of the agriculture budget is allocated to all three clusters. For a district to be identified as a zone, it must district must have an improved goat population of 15,000[72]. Chhinchu in *Surkhet* is the main trading hub for goats from Karnali Province, where goats brought from *Dailekh*, *Surkhet*, and other districts are collected for their supply to the regional markets like Pokhara and Kathmandu. Badikedar is another municipality in *Doti* with an increasing number of goat producers. Goats from *Doti*/*Dadeldhura* cluster are sold at local markets and Dhangadi. Bheriganga Municipality of *Surkhet* is a popular destination for boer crossbred goats and improved varieties of forage seeds.

72 PMAMP, Project Management Unit, Khumaltar Lalitpur, 2077

MARKET MAP

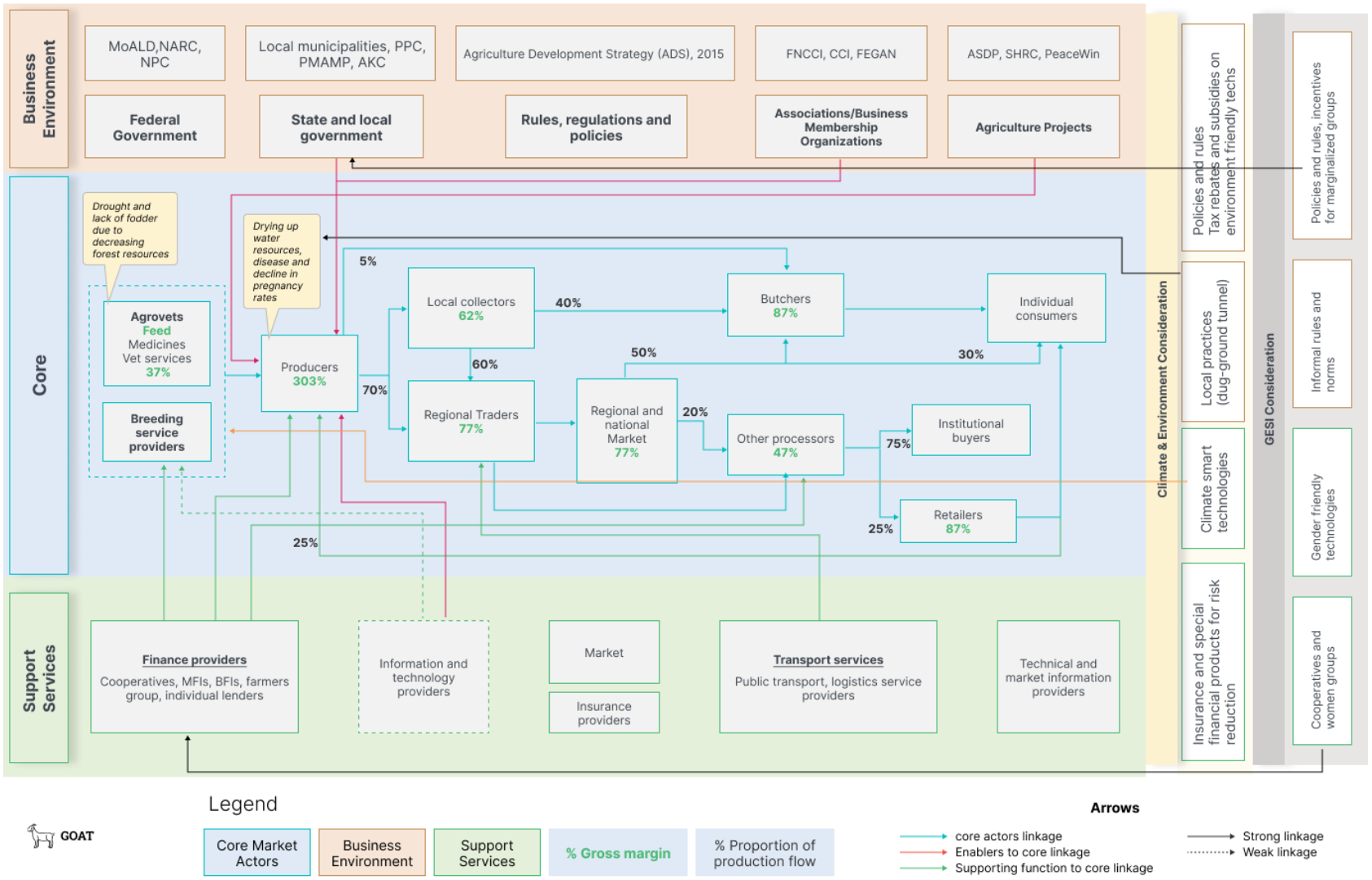


Figure 51 Market map of goat value chain

Input supply *(Breeding service, AI service, supplementary feed, fodder and forage seeds, veterinary medicines)*

Breeding service, feed (forage and fodder, ration feed, supplements), water, and veterinary medicines, are the primary inputs for goat production. Producers also rear bucks to provide breeding services to goats. But with increased awareness of inbreeding, commercial producers purchase breeding services from different service providers. Improved breed goats, especially Boer, are gaining popularity because of their high growth rate. Many breeding farms have been established that sell cross-bred boer goats and also provide breeding services with a buy-back option for the kids produced[73]. Pure-bred boer goats are purchased by the local breeders from national level breeders who are breeding goats from the boer goats imported from Australia and South Africa. Semen of improved breed goat is supplied by the National Livestock Breeding Office (NLBO) in Pokhara and Nepalgunj and is distributed by the VHLSEC in Birendranagar municipality of *Surkhet*. However, this practice is not common in other municipalities and clusters.

Goats are either stall fed with fodder and forage collected from nearby forests, or are left to graze in the forests. Feeding rationed meals to goats was not a very common in the project clusters. Producers rely on the VHLSEC and the veterinary section of the ward office for medicine (esp. anthelmintics and vaccines), which they get either for free or at a subsidised rate. If not available through this channel, producers opt for agrovets, which, according to producers, are quite expensive.

Production *(Live goat)*

The Ministry of Livestock and Agriculture Development (MoALD) has categorised goat farming into three scales: (i) small scale goat farming with 1–5 goats for household consumption or communal consumption; (ii) semi-commercial producers with 5–10 goats to sell in the market; and (iii) commercial scale goat farms with more than 30 goats for breeding and selling purposes[74]. The MoALD has a provision for registering goat farms with more than 25 goats as commercial goat farms. These registered goat farms are eligible for various subsidies and grants offered by the government. Goat production potential is very high in Bheriganga and Barahtaal of *Surkhet*, Naumule in *Dailekh*, and Badikedar in *Doti*. Bheriganga has become more of a hub for cross-bred boer goats, which are supplied to districts as far as Jhapa. Some young producers have started boer breeding farms in Naumule, while other producers are rearing goats for meat purposes.

Goats are considered living bank by small producers as they can make an instant sale whenever they require funds. The consumption of goat meat is ever increasing, and so is the price hence the gross margin in goat is quite good with producer getting the highest margin (303%). There have been several efforts by traders, development agencies, and the government to standardize the price of goats through weight measurement to ensure a fair deal for all the actors in the value chain.

Trade

Goat trading is very informal in nature and price is set after negotiation between the seller and the buyer. Visual estimation is used to determine the price of goats in most cases, though weight-based pricing is being promoted in regional centers, especially Birendranagar. According to the stakeholders interviewed, most of the goats produced are consumed within the district and locality, and others are sold to local butchers, or are sold through collectors and traders. Collectors move around the villages to collect goats and supply them to traders and butchers. Goats from all municipalities of *Dailekh* are exported to markets in Jumla, Kalikot, and markets in Pokhara and Kathmandu. Chinchu is a trading hub for goats from Karnali Province. Goats collected from *Dailekh* and Surket clusters are aggregated in the trade hub at Chinchu , which is then supplied to other regional markets. Pokhara goat market is among the largest buyers of goats from Chinchu trade hub (80% of the goats are sold to Pokhara Khasi Bazaar, while 20% are sold to Kathmandu market)[75]. Goats from *Dadeldhura* and *Doti* Cluster are sold in Dhangadi, Kathmandu, and Pokhara, besides being locally consumed. Ninety % of the goats from Badichaur go to the Kathmandu market. Besides the national production, goat worth Rs. 122 million was imported, mostly from India. Importers sell these goats to local traders, who then sell them to other traders, butchers, or consumers all over the country.

73 Case observed in Bheriganga Municipality of Surkhet.

74 HVAP, 2011. A report on Value chain analysis of goat.

75 HVAP, 2011. A report on Value chain analysis of goat.

Goat trading is considered quite profitable by the traders as the gross margin is more than 50% for all the value chain actors, which is also illustrated in market map of goat value chain in Figure 51.

PROCESSING

Goat meat processing is not very common due to its high price and consumers' preference for fresh meat. Some slaughterhouses prepare large prime cuts to sell them to institutional buyers such as hotels and restaurants. An increasing trend for frozen goat meat has been observed in the city after COVID situation. Domestically packed frozen goat meat pieces at a relatively cheaper price are sold at supermarkets in the main cities of the country.

SUPPORTING FUNCTIONS

Transportation: Live goats are transported in bulk in mini-trucks and pick-up trucks. The transport service providers charge between Rs. 4 to Rs. 6 per kg of goat In most cases, there are no specific designs or customizations for transport. However, trucks that transport goats from *Surkhet* to Pokhara have compartments and double-deckers to hold a higher number of goats. One such truck can carry up to 300 goats.

Financial Services: Financial services are required at each level of the value chain. Commercial banks, microfinance, and cooperatives are the key sources of finance for the actors in the goat value chain. The agriculture development bank is providing agri-loans at a rate of 4% interest to producers and providing collateral-free loans of up to Rs 1 million. Similarly, commercial banks such as NMB and Nabil are providing loans at 4% interest rate to women entrepreneurs and producers. The interest rates on loan by microfinance and cooperatives are high and go up to 16%., However, it was observed that producers found it easy to get loans from cooperatives due to fewer documentation requirements and easy access. Cooperatives provide collateral-free loans up to NPR. 30 lakhs.

Market linkages: Cooperatives like Sanakisan Tatha Mahila Sahakari in Barahtal municipality provide market linkage services to goat producers. The cooperative charges Rs 5 per kg of live goat sold.

Insurance: The government's incentive in agriculture insurance increased from 75% of the premium amount to 80% of the premium this year. Each private non-life insurance company is assigned different districts for insurance provision. Goat producers get insurance mainly for improved breeds of goats, and it is common for breeders' farms.

Training: Different types of training on good husbandry practices in goats, different scales of goat rearing, and overall goat farm management are being provided by the government, development agencies, and private farms. There are even dedicated service providers like Smart Krishi that conduct regular training on goat farm management for new and experienced producers. The information regarding the training schedules is available on their app and Facebook pages. Due to increased mobile phone and internet penetration even in rural areas, digital information through mobile phones seems to be an effective means of mass information sharing.

Business Environment

The key enablers in goat value chain are the extension services, subsidies and incentives from government, trade associations, and development projects enabling production and easing market linkages.

Municipalities have allocated budgets for commercial goat farming. Badikedar spent over 20 lakhs on the commercialization of goat farming, the agricultural sector receiving highest allocation. within the municipality. Development agencies support producers and private companies to get market access. Many development agencies have distributed goats as a part of improving the livelihoods of producers. Associations like the Goat Entrepreneur Association and traders' associations are responsible for policy lobbying and encouraging goat producers. The association has a chapter in the Karnali province and is having a new *Sudurpashchim* chapter soon for goat sector development in the province.

The Nepal Livestock Breeding office, located in Nepalgunj, and the National Training center in Nepalgunj, provide the latest technologies and training to producers on goat farming.

POLICY RULES AND REGULATIONS

The sector is regulated by various policies and rules that regulate transportation, trade, and processing of goats and goat meat. Some of the relevant policies are:

- Livestock Transportation Standard 2064
- Animal Slaughterhouse and Meat Inspection Act, 2055 B.S (1999)
- Slaughterhouse and Meat Inspection Regulation, 2057 (2001)

Despite the standards and rules documented, implementation of the rules is found to be inadequate.

Besides these national level regulations, the sector is regulated by local trading policies formulated by the traders' associations and traders, for price setting, customs and quarantine policies for the import of breeding goats, and other rules affecting support functions such as insurance and financing.

GESI Considerations

Inputs: Women are involved in gathering fodder and forage for the goats, as well as feeding them. Some women have been found selling medicines at agro-vets, but most of them have not received any formal training or certification to do so. They do it on the basis of general knowledge and experience, and they sell whatever the customer asks for. Lack of technical knowledge and proper accreditation are major reasons that limits the women's ability to scale up their businesses.

Production: The assessment area's case is similar to the national context where women play a significant role in farm animal management and care, accounting for roughly 70% of the work in livestock rearing. Their role and decision are especially important in day-to-day activities like animal grazing, collecting water, fodder, and forest leaves, watering and feeding livestock, applying compost, and processing livestock products (drying and storing meat) at home. Despite their high level of engagement in the value chain, the assessment in the targeted areas shows that women had little authority to make contribution in decision related to livestock sales and use of proceed.

Output: Traditionally, goats were gifted to women from their parents' homes during weddings, and considered private assets owned women. In small-scale farming households, women are involved in the overall activities of goat rearing, from farm management to sales and income decisions. Thus, many development projects and government interventions promoted goat farming for the economic empowerment of women and marginalized communities. However, with establishment of larger commercial farms, more male members were engaged when it came to making major market related decisions. Women are also marginalized from access to credit and newer technologies, which limited them to traditional goat rearing instead of investing in modern improved shed, more value-added and higher income generation activities.

Climate and Environment Considerations:

The impact of environmental changes on animals reared for meat is relatively lower than that of breeding or milking purpose. [76] However, producers have claimed that drought, drying water sources, a decline in crop productivity, poor animal health, lack of feed, and poor breeding conditions have caused major impacts on goat rearing. [77] Increasing instances of diseases in goats due to changing climate and environment has been a key impact of climate change in goat production. This has increased mortality rates of goats along with, shunted growth, low weight gain, and declined pregnancy rates. Additionally, the drying of water resources has made it difficult for the farmers to arrange water to feed the goats.

It is also a challenge for goat farmers to arrange feed during the winters, and during the months of April and May when the grazing fields are dry, and the supply of fodder and forage is limited. Declining pregnancy rates is also one of the impacts of waning supply of fodder and forages. Besides, haphazard and uncontrolled grazing in the forests has hindered the growth of trees and plants in the forest, thereby causing significant environmental risks. To overcome these issues, communities were found to have undertaken several measures including adding new breed, destocking, purchasing fodder and forages, and planting grasses for securing feed availability. However, in *Dailekh* it was observed that the problems of animal health, breeding conditions, soil fertility, forest degradation, increasing women workload, and water shortages were largely unaddressed.

Many forest groups throughout the country have banned forest grazing, although the practice is not common in the project clusters. A better option would be to enable goats to graze in the forest region where the producers plan to burn the forest to clear it. As a result, carbon emissions from fire can be offset, resulting in a healthier environment. Rangeland grazing is less labor-intensive and more favorable to the environment, but

76 Dairy Sector Assessment, CASA 2020

77 Capacity-Building And Strengthening Of Livestock Production System While Adapting To Climate Change In Nepal (2013), Feed the Future Innovation Lab for Collaborative Research on Adapting Livestock Systems to Climate Change Colorado State University.

rangelands are limited to certain areas of the mountainous regions like *Humla*.

CAPACITIES, CONSTRAINTS, INCENTIVES, AND OPPORTUNITIES ANALYSIS

Capacities	• Private market actors in the municipalities have been investing in inputs such as veterinary medicines, improved breeds. • Artificial insemination in goats through boer semen is progressing in other parts of the country. • Producers and collector linkages for live goat marketing. • Availability of financing options. • Access to digital technologies; mobile phones and internet.
Constraints	• **High cost of breeding bucks and services:** Highly productive breeds of goats, especially boer, have been recently introduced (not more than 5 years). Since, the pure-bred bucks are imported from Australia and Africa, and due to high demand, the cost of breeding bucks and breeding services is very high. The National Livestock Breeding Office (NLBO) has started producing boer goat semen for artificial insemination, but it has not reached the target clusters. Insufficient technologies to hold and carry semen, and limited production of semen at NLBO are the reasons behind limited access. • **High incidence of disease in goats leading to loss:** Despite many efforts from the government and development agencies to improve goat health, disease incidences are still prevalent. Commercial goat farms holding more than 5 goats are more susceptible to diseases due to poor shed management, and open field grazing (risk of parasites and body pests). Access to veterinary health services has improved with a dedicated veterinary unit in each municipality, but the resources at these service providers are not enough to meet the service demand from the producers. Unavailability of means of remote diagnosis even for simplest diseases means that service providers need to travel to each farm, or producers need to travel to service providers for consultation, leading to higher cost and time for service provision. • **Limited commercial orientation towards goat fattening:** Goat breeding has taken a step up into commercialization after the introduction of Boer goats. High investments in farm infrastructure, farm management, and stall-feeding practices have been observed at breeder farms. Breeders have set practices for breeding, feeding, vaccination, sales, and record keeping. However, there is no special practice of fattening goats that are used for meat purposes. There is limited research and knowledge transfer in terms of feed management, feed conversion ratio, and practices to gain optimum profit from goat fattening.
Incentives	• The demand for goat meat is increasing, and there are no incidences of disease outbreaks in goats affecting human health. So, the demand is considered to remain high. • Goat farming requires less investment compared to other livestock such as dairy. • Market access and an assured market for all kinds of goats.

Opportunities	• Promotion of goat farming has always been a priority for the government in the agriculture sector. • Expansion of market and road corridors connecting the municipalities, and therefore better market access. • Better access to inputs, extension, advisory services, market-related information. • High demand in the market. Newer opportunities of selling unproductive female goats to meat processors producing frozen meat cuts.

POTENTIAL INTERVENTIONS:

(Please refer to annex for details on the interventions derived and which cluster each intervention is applicable to)

1. Pilot a financing model between breeders and producers or involve financial institutions in providing finance options for breed improvement.
2. Improve and make technologies available to transfer semen for AI in goats within the cluster.
3. Optimize low cost shed design for commercial goat farming.
4. Promote an early diagnosis service through public and private actors.
5. Identify a key issue in water supply and promote climate-smart technologies for water usage.
6. Research on goat fattening techniques.

Figure 52 Potential interventions for goat value chain

SUMMARY OF FINDINGS AND RECOMMENDATIONS

As shown in the tables below, two things were primarily considered when recommending interventions: **value chain functions (strategic interventions)** that consist of recommendations in each VC functions, namely input, production, output, support services, business environment, GESI, and environment and climate; **and cluster specific recommendations**. Because it was difficult to combine cluster-specific recommendations with strategic intervention, a separate section for cluster-specific findings and recommendations is included.

Table 10 Value chain function-wise interventions

	Interventions
Input	**Intervention Area 1: Strengthen the capacity of input producers and improve the current supply of inputs to increase producers' access to the necessary quantity and quality of inputs.**
	I.1. Strengthen the capacity of seed producers to increase the production and improve the quality and supply of seeds
	I.2. Facilitate to establish/strengthen f private sector led extension services to minimize the supply chain gap between local retailers of agri-inputs (agrovets) that are mainly located in the market towns and end-user in remote villages.
	I.3. Encourage and facilitate the local entities (AKC and NARC) to research types of saplings and application of proper propagation methods.
	I.4.Create a collaborative channel for the District Forest Office and private nurseries for sapling production.
	I.5. Facilitate research, feasibility assessment and uptake of small scale biofertiliser plants to mitigate fertiliser shortages at local level.
	I.6. Identify and facilitate access to required seed preservation technologies; ● For preserving crop seeds without letting their germination quality decline. ● For preserving frozen semen for AI in livestock, and
Production	**Intervention Area 2: Improve producers' capacity (technical skills and business orientation) to increase production, productivity and quality (Demand-responsive production)**
	P.1. Encourage improved farming and demand stimulation for improved production practices by introducing GAP (Good Agriculture Practice) and GHP (Good husbandry practices)
	P.2. Introducing a forum called PSPM (Production Sales Planning Meetings) to stimulate innovation along production and market chains
	P.3. Identify and segregate cultivation areas (zones, pockets, groups) for production in scale and to segregate production of non-complementing value chains like pesticide used crops and honey.
	P.4. Research and trials of technologies and practices to increase productivity of the value chains; e.g. goat fattening, increasing fruiting, increased milk production.
	P.5. Identify gaps in the composition of feed fed to livestock reared for different purposes, and develop and promote a relevant nutrition composition with different feed options.
	Intervention Area 3: Introduce Climate Smart technologies to minimise the effect of climate change or help the actors adapt to the changing environment.
	P.6. Identify key issues in water supply, and promote climate-smart technologies for water usage for irrigation and also for feeding the livestock.

	P.7. Facilitate in introducing practices and technologies to adapt to the effects of climate changes, pest, and diseases.
Output	**Intervention Area 4: Improve the existing trade linkage to bring the market down to the producer's level hence improving producer's access to the output market.**
	O.1. Facilitate market actors to uptake roles of a collection center, and together provide embedded services to farmers to obtain products as per the market demand.
	O.2. Upgrade and operationalize existing collection centers using the concept of Resilient Market Ecosystems (https://youtu.be/yZN8ZYVNEX0)-Also described in the box below
	O.3. Create strong linkage/connections between such as large traders at regional markets and small/local traders and producers.
	O.4. Support and facilitate traders and market centers to provide packaging materials (plastic crates) on rent to package and transport the fruit.
	O.5. Support associations and TEPC to explore alternative markets to sell the ginger and other processed products to break the market monopoly of Indian Traders.
	Intervention Area 5: Improve the existing value-addition practices at different levels of value chains.
	O.6. Improve the existing grading, sorting and packaging activities that is done right after the harvest.
	Intervention Area 6: Build the capacity of the existing processing companies and provide technical skills as well as business related knowledge to the companies who want to start a processing business.
	O.7. Facilitate in product differentiation, and branding of different types of honey.
	O.8. Introduce processing of dairy products suitable in the municipality's climatic conditions, through interested dairy processors. Create opportunities for establishment of dairy processing plants.
Supporting Services	**Intervention Area 7: Promote ICT or scale the uptake of digital technologies among the value chain actors.**
	S.1. Promote digital technologies for mass information sharing, digital platforms to promote GAP, market information.
	Intervention Area 8: Design financial and insurance products that are more suitable to farmers and service providers.
	S.2. Develop tailored loan products targeting farmers and agri-businesses. Along with that, capacitate farmers and value chain actors to apply for the financial products.
	S.3. Reform agriculture insurance policies to make it beneficial to both farmers and insurance providers.
	Intervention Area 9: Introduce new agri-logistics service and service providers in the assessment areas.
	S.4. Extend market for agri-logistics service providers in the assessment areas.
	S.5. At places where dedicated agri-logistics are not feasible, promote a dedicated space for agri-products in public vehicles at a subsidised rate.
	Intervention Area 10: Promotion of low-cost (efficient) storage technology/practices suitable for local context.
	S.6. Explore low-cost storage technologies, and opportunities to improvise existing storages built at a household level.
	S.7. Conduct a feasibility of cold storage facilities with endorsement from regulating bodies, so that the document is referred to before building any cold storages.
	Intervention Area 11: Improve availability of agri-machineries and technologies that are affordable, effective and efficient to target clusters and value chain

	S.8. Identify and promote mechanised tools and technologies (through suppliers and fabricators) for different activities of the production function, suitable for the topography of the municipalities.
Business Environment	**Intervention area 12: Facilitate in creating an inclusive and relevant business environment that is accessible to all actors involved in the value chain.**
	E.1. Use of Multi Stakeholder platforms to encourage coordination and build synergy between multiple actors involved in the value chain.
	E.2. Facilitate NGOs and government projects to include all private input suppliers in their subsidy model, encouraging them to sustain their business without market distortion.
	E.3. Output-based subsidies should be prioritised. Output-based subsidies can be provided to only those producers who are able to maintain certain quality standards or adopt certain improved production practices.
	E.4. Support NARC to build partnership with private research institutions or academic institutions to carry out research and new varietal development
	E.5. Support local entities (AKC, local municipality) to test and import new varieties and to train the producers on modern farming practices.
	E.6. Facilitate the proper implementation of seed import rules and regulations through SQCC (Seed Quality Control center).
	E.7. Facilitate Seeds and fertilisers association to lobby with the federal government to bring changes in these rules.

Table 11: Priority ranks of Value chains in each municipality

			Priority Ranks* of Value Chains			
	District	**Municipalities**	**1**	**2**	**3**	**4**
Cluster 1	***Surkhet***	*Birendranagar UM*				
		Bheriganga UM				
		Barahtal RM				
Cluster 2	**Dailkeh**	*Bhagawatimai RM*				
		Naumule RM				
		Bhairabi RM				
		Dullu UM				
Cluster 3	***Humla***	*Kharpunath RM*				
		Simikot RM				
Cluster 4	***Kailali***	*Dhangadi UM*				

		Godawari UM				
		Chure RM				
Cluster 5A	***Doti***	*Badikedhar RM*				
		Jorayal RM				
Cluster 5B	***Dadeldhura***	*Amargadhi UM*				
		Alital RM				
Cluster 6	***Bajura***	*Swamikartik RM*				
		Himal RM				
		Budhinanda UM				

STRATEGIC INTERVENTIONS

Following strategic interventions are proposed based on a rigorous analysis of each selected value chain in municipalities, taking into account important value chain functions as well as cross cutting elements viz.: climate and environment and GESI. These interventions are derived from the Intervention Logic Framework Analysis, ILAF (Refer to Annex 1), that was done for each function of all the Value Chains. Based on the analysis, the most important ones and common interventions under different functions are listed and elaborated in this section. **A tentative estimation of timeline for each interventions indicated below are based on field interactions with relevant stakeholders, iDE and different project's experiences. However, realistic timeframe needs to be decided after further consultations between GRAPE implementation team and relevant stakeholders/partners.**

Input functions

In almost all value chains, the major constraints on input functions were:

- Limited access to inputs, mainly quality seeds for vegetables, potatoes, ginger and turmeric; limited access to high productive breeds in dairy and goat, and inadequate quality of planting saplings for apple and timur.
- Limited supply of chemical fertilisers for all kinds of crops, and suitable technologies for pest and disease control.
- Limited knowledge of nutritious feed compositions for animals reared for different purposes (milk, breeding, or meat)

can be achieved during project period *can be partially achieved during project period* *- cannot be achieved during project period*

Interventions	**Relevant Value chain**									
										

Intervention Area 1: Strengthen the capacity of input producers and improve the current supply of inputs to increase producers' access to the necessary quantity and quality of inputs.	
Implementation Modalities	
I.1. Strengthen the capacity of seed producers to increase the production and improve the quality and supply of seeds	
I.2. Facilitate to establish/strengthen private sector led extension services to minimize the supply chain gap between local retailers of agri-inputs (agrovets) that are mainly located in the market towns and end-users smallholders in remote villages.	
I.3. Encourage and facilitate the local entities (AKC and NARC) to research types of saplings and application of proper propagation methods.	
I.4.Create a collaborative channel for the District Forest Office and private nurseries for sapling production.	
I.5. Facilitate research, feasibility assessment and uptake of small scale biofertilizer plants to mitigate fertiliser shortages at local level.	
I.6. Identify and facilitate access to required seed preservation technologies; • For preserving crop seeds without letting their germination quality decline. • For preserving frozen semen for AI in livestock, and	

Intervention Area 1: Strengthen the capacity of input producers and improve the current supply of inputs to increase producers' access to the necessary quantity and quality of inputs.

Inputs are vital component of production, and the main issue for producers is a lack of quality and required quantity of inputs, which severely impedes production and the overall value chain. The intervention area thus aims to improve producers' access to inputs by increasing the capacity of existing input producers and suppliers, resulting in positive changes in the input production and distribution.

Private input suppliers cannot produce and supply the required quality seeds as they do not have enough resources to monitor the seed producing farmers, they are compelled to source

whatever the producers produce, package and supply in the market. Producers who use illegally imported seeds also do not get the desired yield, and there are no mechanisms in place to monitor and balance the use of illegally imported and/or seeds sold in the market. Domestic seed production is insufficient to meet market demand, and imported seeds are most often of poor quality, which has hampered productivity and quality. This requires the development of a better channel for supplying quality seeds and fertiliser, as well as an increase in local seed production so that good quality inputs are readily available to farmers.

Furthermore, this intervention area will encourage continued research on existing varieties as well as the development of new climate-resistant and high yielding varieties, as many producers are still using decade-old seeds. These decade-old retained seeds have a low yield and are unable to adapt to changing environmental conditions and producers may need to change the seeds and saplings to better adapt to the climate change. Because research and varietal development take a lot of time and resources, NARC, the only government agency responsible for research and development cannot keep up with the changing market environment due to its limited resources. Collaboration with private research organizations (national input suppliers such as Muktinath Krishi Company, SEAN Seeds, and universities) hence would be able to enable ongoing research and testing of varieties in response to changing climate and market needs.

Several activities under intervention area 1 (I.1, I.2, I.3, I.4, I.5, and I.6), as listed in the table above, will help to improve coordination between input suppliers and producers. Improved relationships between farmers and input suppliers will also increase coordination and information flow among both, timely supply of inputs will be guaranteed, and producers will be provided with options or varieties of inputs based on their needs.

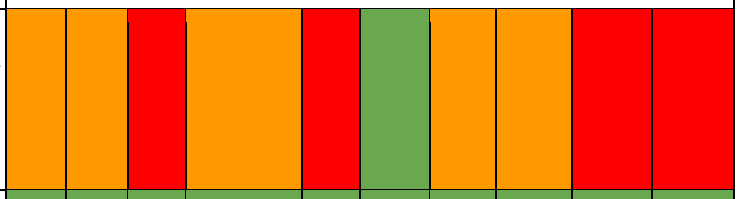
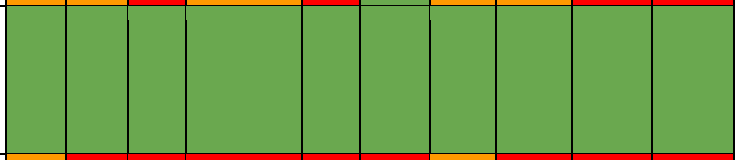
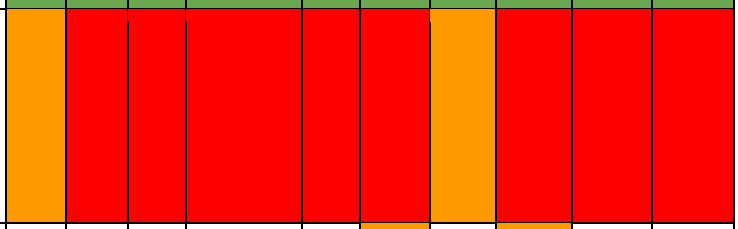
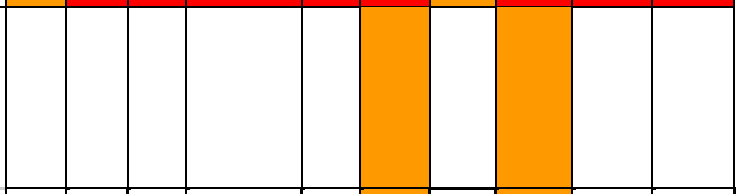
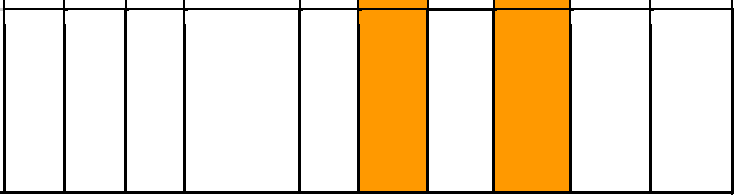
Potential Partners: NARC, DFOs, AKC, and Private input producer, supplier, or distributor.

Production functions

Farmers are involved in production and all the factors including political, environmental, social, technological, economic, factors affect production. Among the selected value chains in the selected municipalities, the major constraints in the production function identified were:

1. Dependency on rainfall for irrigation, and limited irrigation facilities in most municipalities affect the production of crops, and health of livestock.
2. The lack of good agricultural practices (GAP) and good husbandry practices (GHP) in the livestock industry is causing the sectors to underperform.
3. The supply and demand of produce such as vegetables are not in sync forcing farmers to sell at lower prices when supply is high, and consumers having to pay very high when the supply is low.
4. Limited access to proper extension services in terms of disease control and advisory services, due to geographic inaccessibility or limited capacity of the service providers.
5. Scattered productions of all kinds of crops causing difficulty in aggregation and collection and reducing economies of scale for the actors in the value chain.
6. There is no formal desegregation of areas for farming different products requiring different environments. For example, pesticide use on vegetables and other crops affects honey production by the bees. Not separating the two affects both value chains.
7. Limited research on technologies for increasing productivity of livestock products.
8. Farmers unaware and unskilled on technologies required for adapting to climate change and environmental impacts.
9. Increased out migration of productive workforce leads to unavailability of labourers, and when available the wage is high. The remittance earned is not

used for productive purposes, particularly for production.

Interventions	Relevant Value chain
Intervention Area 2: Improve producers' capacity (technical skills and business orientation) to increase production, productivity and quality (Demand-responsive production)	
Implementation Modalities	
P.1. Encourage improved farming and demand stimulation for improved production practices by introducing GAP (Good Agriculture Practice) and GHP (Good husbandry practices)	
P.2. Introducing a forum called PSPM (Production Sales Planning Meetings) to stimulate innovation along production and market chains	
P.3. Identify and segregate cultivation areas (zones, pockets, groups) for production in scale and to segregate production of non-complementing value chains like pesticide used crops and honey.	
P.4. Research and trials of technologies and practices to increase productivity of the value chains; e.g., goat fattening, increasing fruiting, increased milk production.	
P.5. Identify gaps in the composition of feed fed to livestock reared for different purposes, and develop and promote a relevant nutrition composition with different feed options.	
Intervention Area 3: Introduce Climate Smart technologies to minimise the effect of climate change or help the actors adapt to the changing environment.	
Implementation Modalities	
P.6. Identify key issues in water supply and promote climate-smart technologies for water	

usage for irrigation and also for feeding the livestock.										
P.7. Facilitate in introducing practices and technologies to adapt to the effects of climate changes, pest, and diseases.										

Intervention Area 2: Improve producers' capacity (technical skills and business orientation) to increase production, productivity and quality (Demand-responsive production)

The intervention area focuses on addressing some market-related constraints at the farmer's level, such as fragmented production, low production volume, and high post-harvest loss, as well as an inability to compete with imported products. As a result, farmers do not receive the desired revenue from their production. The goal of this intervention area is to provide farmers with information on production practices for demand-based production, reduce post-harvest loss, and increase the competitiveness of products. Identified stakeholders will provide technical knowledge to farmers through technology, on areas such as, what to grow, when to grow, how much to grow, how to reduce post-harvest loss, how to gain economies of scale by increasing production, and what the market price of the product is. Producers are expected to adjust their cultivation practices based on this information and be able to increase their revenue.

In addition, the intervention area has the potential to provide information on proper input usage, disease and pest management, and other aspects of Good Agriculture Practice. It is critical to provide information about proper cultivation practices because it directly affects the performance of the inputs used. The primary role of providing such information is of input suppliers, traders or forward market actors who are in direct contact with the producers. Farmers will be able to adopt demand-based production practices and produce and sell more once they have this information, which will benefit both the producer and the market player.

Depending on the market and the needs of the producers or other value chain actors, additional activities such as building traders' capacity to provide information to farmers, strengthening linkages between farmers and traders for demand-based vegetable production, promoting information on harvest and post-harvest management practices, and enhancing market competition by facilitating product differentiation will also be required.

The potential partners for this intervention are: Traders/cooperatives/processing companies (which are involved in trading), NGOs, Local Municipalities, AKC, Input Suppliers, CBOs, BMOs.

Intervention Area 3: Introduce Climate Smart technologies to minimise the effect of climate change or help the actors adapt to the changing environment.

Climate change has impacted several value chains under assessment or posed numerous threats to agricultural production and distribution. Climate change and changing weather patterns are also attracting new chronic diseases and pests that are difficult for farmers to manage, requiring the development of technologies and adaptive practices to withstand such changes. There is an immediate need in the assessment areas for the adoption or scale-up of successful CSA practices to overcome farmer problems related to climate change. However, efforts to address these challenges and adaptive practices were not common assessment areas.

Climate Smart Agricultural Technologies such as mulching, drip irrigation, semi-protected house cultivation, climate adaptive seeds and saplings, and so on are required to mitigate the negative effects of climate change. These technologies are not only for battling environmental change but also for increasing production. For example,

cultivating off-season vegetables using plastic tunnels or a greenhouse, producing vegetables that require less water during winter when irrigation is not available etc. During the field survey, the assessment team discovered some non-technological local techniques or practices, such as building a greenhouse below ground level to keep the temperature stable while it snows outside; such techniques can be improved and replicated wherever feasible and applicable. In addition, as a climate-smart measure, new technologies must be introduced, existing practices must be improved, and best practices must be replicated in new areas. Private technology providers can pilot and demonstrate their products to gain trust and promote them to prospective buyers. Local governments or AKCs that promote agriculture, on the other hand, might act as a catalyst for CSA adoption by cooperating with technology providers to demonstrate the technology through lead farmers. Once producers see proven results, they will be more inclined to copy or adapt the practices or technology, resulting in increased demand for CSA approaches or technologies and private sector attention for it.

Potential Partners: Technology providers, Local municipalities, AKC.

Output function

Collection, trade, processing, and export of value chain products are the activities in the output functions. The output function of the value chain analysis revealed the following key constraints at the municipalities.

1. Due to scattered farming practices, farmers are unable to sell to traders seeking products in bulk. Limited aggregation facilities is a reason for farmers' not having access to larger markets.
2. In some instances, like *Bajura*, collection centers that were established by development projects are left non-operational due to weak management, high operation cost, and inappropriate location.
3. Informal and irregular supply linkages between local traders and regional traders limits the access to products to major markets.
4. Poor communication between major traders and farmers causes gaps in quantity/quality demanded and supplied.
5. High loss during transport and handling, due to improper harvesting practice, inappropriate packaging and handling materials, and poor post-harvest handling.
6. Price of high value exportable products such as timur and ginger is regulated by the Indian market that has a monopoly over the export value chain. Alternative markets have not been identified internationally.
7. Limited knowledge and skills in processing milk into products of high demand such as cheese and chhurpi, which are also suitable to be produced in selected clusters like Alital, *Dadeldhura*.
8. There is no specific product differentiation of honey produced in the clusters. Local high value honey has to compete with imported honey, reducing profit for the producers and traders.

Interventions	**Relevant Value chain**									
										
Intervention Area 4: Improve the existing trade linkage to bring the market down to the producer's level hence improving producer's access to the output market.										

Implementation Modalities	
O.1. Facilitate market actors to uptake roles of a collection center, and together provide embedded services to farmers to obtain products as per the market demand.	
O.2. Upgrade and operationalize existing collection centers using the concept of **Resilient Market Ecosystems** (*https://youtu.be/yZN8ZYVNEX0)-Also described in the box below*	
O.3. Create strong linkage/connections between such as large traders at regional markets and small/local traders and producers.	
O.4. Encourage and facilitate traders and market centers to provide packaging materials (plastic crates) on rent to package and transport the fruit.	
O.5. Encourage associations and TEPC to explore alternative markets to sell the ginger and other processed products to break the market monopoly of Indian Traders.	
Intervention Area 5: Improve the existing value-addition practices at different levels of value chains.	
O.6. Improve the existing grading, sorting and packaging activities that is done right after the harvest.	
Intervention Area 6: Build the capacity of the existing processing companies and provide technical skills as well as business related knowledge to the companies who want to start a processing business.	
Implementation Modalities	
O.7. Facilitate in product differentiation, and branding of different types of honey.	
O.8. Introduce processing of dairy products suitable in the municipality's climatic conditions, through interested dairy processors. Create	

opportunities for establishment of dairy processing plants.										

Intervention Area 4: Improve the existing trade linkage to bring the market down to the producer's level hence improving producer's access to the output market.

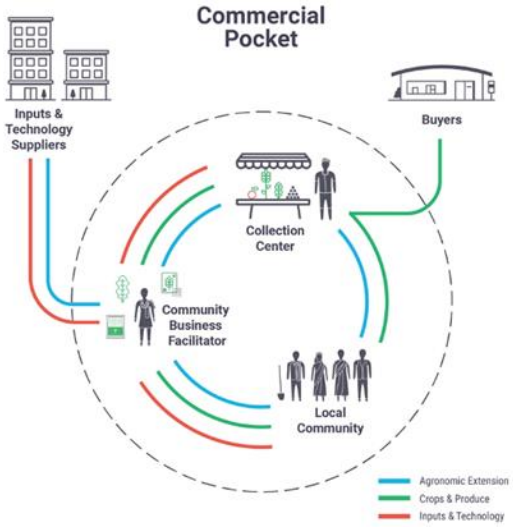
Creating market linkage and access to markets is essential for the development of the agriculture sector and its commercialization. The most important factor driving production is a market guarantee, so is the goal of this intervention, so that producers are encouraged to scale-up their production. Collection centers, which are the rural farmers' first point of contact with the market, are not able to reach all farmers and some collection centers are not able to function effectively. As a result, farmers in rural municipalities continue to face numerous market access issues. In this case, a single establishment, such as Resilient Market Hubs, can provide a one-stop solution to farmers who lack access to markets, inputs, and market information. It is anticipated that it will drive commercial orientation among producers while also providing them with the necessary knowledge and information. However, prior to establishing such hubs, a proper assessment must be done to ensure that it meets the needs of the producers and is easily accessible to the targeted parties. As per the experience of iDE, commercial centers were found most functional at the district level, however, depending on the production scale and farmers demand it can also be made regional. Local municipalities can support the establishment of such a facility; but, the relevant committee of producers, dealers, input suppliers and local governing body should be responsible for its effective functioning and must be driven by commercial incentives.

Examples of some successful resilient market ecosystems can be observed in the project areas of Anukulan project implemented by iDE.

Understanding Resilient Market Ecosystems:

The Resilient Market Ecosystem (formerly known as the "Commercial Pocket Approach") is a holistic model for creating sustainable market systems that enable poor and marginalized subsistence smallholders to become commercial farmers and establish enterprise. At the local level, this ecosystem is made up of individual "hubs" of economic activity, tying together established businesses, smallholders, entrepreneurs, financial institutions, civil society, and government to unlock sustainable development for impoverished communities. The individual components of this approach are designed to address specific market failures and structural barriers that trap subsistence smallholders in the cycles of vulnerability and poverty. This approach to agricultural development focuses on improving the efficiency and resilience of smallholders operating in weak markets, and ultimately the efficiency and resilience of the markets themselves. Traditional smallholder agriculture is often inefficient and uncoordinated, with many farms relying on rainwater for irrigation and producing primarily staple crops. Rain-fed agriculture leaves many smallholders exposed to the effects of climate change, while staples are often subject to intense competition from cheap imports.

Resilient Market Hubs seek to address the specific market gaps that prevent smallholders and agropastoralists from engaging in more efficient, productive, and resilient agriculture. The approach addresses climate risk through local stakeholders pooling knowledge on climate impacts and working with the private sector, government, and development programs to identify available climate-smart agriculture technologies and solutions that are promoted through the Market Hub actors.



https://docs.google.com/document/d/1qgwyecb14zaFp5h2hZ_XuY4ISpH6U2WI

In addition to the above, a strong network of traders is another avenue to provide farmers with market access and information. Large traders provide access to the forward market for small traders, and small traders provide access to the market for producers. While they are unable to provide actual technical knowledge, traders are the best sources of information about supply-demand balances – the quantity and variety of vegetables likely to be required by the market at specific times. Farmers and traders can generate win-win returns by adjusting the production time of specific crops based on market forecasts, easing periods of low production and reducing waste/loss. But traders at the regional market sometimes prefer to import rather than buy locally produced items due to the hassle of collection and the availability of better-quality fruits and vegetables at a lower price from India. To avoid this, large scale traders should strengthen their ties with small local traders scattered throughout the terai, hills and mountain areas, making collection easier. The overall goal is to establish a large network of small traders across a large geographical area so that large-scale traders can collect a consistent volume and quality of fruits and vegetables throughout the year. Hence, it is important to target large scale traders and their networks to promote locally produced items in the larger market.

Potential Partners: Local Municipalities, Large Traders/Aggregators, Related Associations.

Intervention Area 5: Improve the existing value-addition practices at different levels of value chains.

Value addition focuses on enhancing consumer experience and readiness to pay premium price for a product that is similar yet differentiated in

terms of production origin, quality, packaging, perceived taste, and so on. Value addition is essential for value chain development since it can result in higher returns for actors involved, as well as the penetration of new products in new markets that will ultimately drive the production. In the assessment areas, producers complain about not getting an appropriate price for vegetables, potatoes, walnut, timur, indigenous crops, which could be due to lack of value addition activities right after the harvest. Due to lack of grading, sorting and packaging there is no product differentiation, hence producers do not receive price differentiation based on quality. Simple value addition in agricultural products like grading, sorting, packaging goes a long way in increasing the value of primary products rather than more complicated techniques to change product form from one to another.

Among the assessed value chains, products with low production volume but high market value can be made more competitive with value-addition activities such as product traceability through QR systems, branding and marketing of the product based on their place of origin. For example, if consumers can trace products like citrus, timur, and walnuts, they will be willing to pay more for citrus grown in *Dadeldhura*, timur grown in *Bajura*, walnuts grown in *Humla*, and so on

In one instance a trader in Budar, *Doti* was selling imported Indian oranges by calling them *Dadeldhura* oranges. According to the trader it is easier to attract customers' attention and charge premium prices if they call them *Dadeldhura* oranges.

This kind of customer preference can be capitalized using branding strategies and product traceability through technologies like QR codes. In another case, although Timur has a lot of export potential, sometimes the traders are reluctant to pay the price as they cannot trace the origin of timur and do not trust the collectors. It will be much easier to sell and export timur if their origin can be traced.

Similarly, grading, sorting, and packaging timur and walnuts can improve quality and, as a result, market price. These activities not only add value and increase market prices, but they also increase market potential in both domestic and international markets. Increased market potential eventually encourages producers to produce more.

Potential Partners: Traders, Processors.

Intervention Area 6: Build the capacity of the existing processing companies and provide technical skills as well as business related knowledge to the companies who want to start a processing business.

Existing processing companies are of small scale and use traditional or rudimentary methods that fail to maintain product quality and consistency. In general, the appearance, standardised packaging, labelling, and quality of processed products are inferior to imported products. There is no consistency in product quality in terms of ingredients, and taste which makes the aggregation and collective marketing of small scattered production units to a regional marketplaces difficult. Quality control services such as standardised packaging, labelling, lab testing, and certification by government and government accredited private laboratories may help in this situation. Aside from technical knowledge, processing companies lack proper business skills such as how and where to promote and market their products, as well as how to diversify their business or products in response to changing market demands. These soft skills are also required and can be obtained from private business development service (BDS) providers. However, these service providers are mostly concentrated in Kathmandu and are hardly present in some of the regional markets. To improve the current situation, private BDS service providers should be encouraged to expand their business in the target areas and provide business services to help scale the processors. Similarly, authorities such as DFTQC can offer technical assistance to businesses by providing technical training about quality control and maintenance, packaging, certification, etc.

Potential Partners: Business Development Service Providers, DFTQC (Department of Food Technology and Quality Control), Department of Small and Cottage Industries

Supporting Services

The key Supporting Services for the value chains are transportation, storage, information and technology, finance, quality control and assurance, mechanization, and insurance. The key constraints identified at the support function levels are:

1. Disruption in road access, no dedicated transport system for agriculture commodities, has caused high transportation costs for the value chain actors.
2. Limited number of platforms to share information on a mass scale, and limited awareness among the actors about the existing platforms.
3. Despite increasing availability of financial products offered by many BFIs, not everyone is able to access the products due to reasons such as limited awareness, difficulty in procedure, and lower priority of BFIs in the selected municipalities.
4. Inadequate storage facilities for seasonal high value products such as fruits and nuts, and seeds. The cost of building storage facilities is high, and low-cost technologies used in some areas of the country have not been validated. Even the existing storage facilities are not operational due to various reasons such as poor management, high operating cost, and inappropriate location.
5. The quality testing and quality assurance facilities for high value exportable products such as honey, ginger and timur is inadequate. This has limited the export of the products to countries like the US and EU.
6. Though there have been efforts from the government in promoting agriculture insurance through 80% subsidy in the premium, farmers' adoption is quite low. Farmers complain about difficulty in receiving the claim, while insurance companies find agriculture insurance a nonprofitable business[78].

The recommended interventions are;

Interventions	**Relevant Value chain**									
										
Intervention Area 7: Promote ICT or scale the uptake of digital technologies among the value chain actors.										
Implementation Modalities										
S.1. Promote digital technologies for mass information sharing, digital platforms to promote GAP, market information.										
Intervention Area 8: Design financial and insurance products that are more suitable to farmers and service providers.										

[78] As per the KII with insurance companies in *Kailali*.

Implementation Modalities	
S.2. Develop tailored loan products targeting farmers and agri-businesses. Along with that, capacitate farmers and value chain actors to apply for the financial products.	
S.3. Reform agriculture insurance policies to make it beneficial to both farmers and insurance providers.	
Intervention Area 9: Introduce new agri-logistics service and service providers in the assessment areas.	
Implementation Modalities	
S.4. Extend market for agri-logistics service providers in the assessment areas.	
S.5. At places where dedicated agri-logistics are not feasible, promote a dedicated space for agri-products in public vehicles at a subsidised rate.	
Intervention Area 10: Promotion of low-cost (efficient) storage technology/practices suitable for local context.	
Implementation Modalities	
S.6. Explore low-cost storage technologies, and opportunities to improvise existing storages built at a household level.	
S.7. Conduct a feasibility of cold storage facilities with endorsement from regulating bodies, so that the document is referred to before building any cold storages.	
Intervention Area 11: Improve availability of agri-machineries and technologies that are affordable, effective and efficient to target clusters and value chain	
Implementation Modalities	

S.8. Identify and promote mechanised tools and technologies (through suppliers and fabricators) for different activities of the production function, suitable for the topography of the municipalities.	

Intervention Area 7: Promote ICT or scale the uptake of digital technologies

Several digital technologies in agriculture are used for information dissemination (market information, cultivation practices, disease and pest management), product tracing (blockchain), and financial services (digital payment). However, these technologies are not widely adopted in rural areas and only a few producers in *Bajura* are using digital technology for getting information on production practices, disease and pest management. Digital technologies can also be used as a climate resilient means. There are mobile-based applications like Smart Krishi, and Crop-inn that can provide information related to possible climatic hazards and potential adaptive measures against such climatic hazards to the producers.

Other technologies for record keeping, digital payment and blockchains usage were seen among some traders, but only in urban areas. These technologies are still new among the producer group; however, increased use of these technologies has the potential to help actors at various levels to operate and scale their businesses. Even if the number of service providers is limited and concentrated around Kathmandu or the regional market, these service providers can be incentivized to go to the rural market and expand their services. Trades and aggregators can benefit from blockchain technology as product traceability improves customer experience and trust; and it will be easier to brand and receive premium prices for products like Citrus from *Dadeldhura*, Walnut from *Humla*, Timur from the high mountainous region, and so on.

Digital service providers like Geo-Krishi and Smart Krishi have mobile based applications for weather forecasting, information on cultivation and harvesting practices for different types of crops, information on disease management and even business plan development tools embedded in their applications. This can help producers and even traders in several farming and trading activities.

Although at present digital literacy might be low among the producers in the assessment areas, local government can take initiatives to ensure the uptake of ICT to provide producers with optimal benefits. Local governments and other enablers can collaborate with digital service providers to incorporate these technologies into their information generation and dissemination systems. Local resource persons and lead farmers can be the users of these technologies and provide information to other smallholder farmers increasing their digital literacy over the time.

Potential Partners: ICT service providers (Smart Krishi, Geo-Krishi,Shreenagar Agro Farm), Local Municipality

Intervention Area 8: Design financial and insurance products that are more suitable to farmers and service providers.

Producers and agri-businesses require financing and funds to expand their operations. There are no specialized loan products, and commercial banks do not target the agriculture sector due to the small loan size, repayment risk, and high operating costs. Furthermore, the procedure for obtaining loans from commercial banks is perceived to be complicated, and the application process is lengthy. As a result, producers and even agri-businesses who require small loans hesitate knock banks' door. On the other hand, banks also consider the agriculture sector lending as a risky one due to the high credit default rate.[79]

[79] Conversation with the BFIs representatives.

There are some innovative products in the market to help financial institutions reduce this risk, such as the Kishan Credit Card (description in the box), a new digital loan product developed by R&D solutions that is currently being offered by Mega Bank. Other similar products can be introduced in the assessment areas.

There are some initiations in Karnali Province where local municipalities and even the Provincial government provide a guarantee against the loan taken by producers. Many producers are unaware of such provisions which necessitates a strong information flow. Various stakeholder meetings and programmes can be organised to bridge the information and knowledge gap between BFIs, producers, agribusiness, and other relevant stakeholders, thereby facilitating access to finance.

About Kishan Credit Card:

R&D Innovations developed Kishan Credit Card to facilitate subsidised loans to farmers. The subsidised loan is disbursed by the bank against simple documentation with no charges or processing fees. It is not even necessary to register the farm (an individual's permanent account number [PAN] is sufficient). The loan amount is credited to the card and the farmer can only use the card to buy agri-inputs through any input vendors/suppliers within the Kishan card network. Mega Bank has launched and is piloting the product targeting farmers in Lumbini Province, Karnali Province and *Sudurpashchim* Province. iDE is also facilitating Mega Bank to promote this digital solution in its project

The discussions at these meetings and programmes will help financial institutions develop appropriate loan products or scale-up existing products/services among value chain actors. Measures to reduce the risk of repayment, on the other hand, will make banks and financial institutions more inclined to lend to producers and agri-businesses. A win-win situation must be guaranteed, both for the banks and customers in terms of reduced risk and additional business portfolio.

Potential Partners: BFIs, Local Municipality, Provincial Government.

Intervention Area 9: Introduce new agri-logistics service and service providers in the assessment areas.

Due to a lack of dedicated logistics service providers, farmers and traders in the hills, upper hills, and mountain region encounter numerous challenges. Local passenger carriers, tractors, trucks, and, in rare situations, vehicles of large-scale traders in regional markets are the existing providers of transportation services (these traders often cover the terai and hilly districts but not the higher hills and mountain regions). The assessment team identified the need of a specific service provider in the area to facilitate the delivery of agricultural products. Some companies, such as Upaya-city cargo and Pick-

up and Drop, haven't yet expanded their services to transport agricultural products in the assessment areas; instead, they are primarily limited to regional markets and city areas. Piloting of new service models with these service providers in the assessment areas can provide better and safe transportation to the agricultural produce. This transportation service will be more reliable, regular rates will be set, and producers and traders will be able to transport their products with less loss. Incentives for service providers, on the other hand, will include expanding their company portfolio and expanding their market base.

Apart from introducing dedicated service providers, existing public transportation can be made more efficient. To do so, the local municipality must collaborate with the relevant vehicle association and traders' associations to create a dedicated space in public vehicles for agricultural products and establish a standard subsidised rate of transportation for agriculture products. Market management committees in regional market hubs such as Attariya Market or Birendranagar Wholesale Market can help regulate this activity. This will force public transportation to transport the product at a standard rate without putting pressure on the producers.

Potential Partners: Private Agri-Logistics Service Providers, Wholesale Market Management Committee, Trader's Associations, Vehicle Associations.

Intervention Area 10: Promotion of low-cost (efficient) storage technology/practices suitable for local context.

Both perishable and non-perishable products require storage facilities. Because of a lack of storage, producers cannot store their products during the flush season to sell them during the lean season, when market demand is high, and supply is low. Existing local storage facilities are incapable of storing products for an extended period while maintaining the quality. Since large-scale storage units are only present in regional markets, they are not accessible to all producers, event not to the traders in the hill and mountainous regions. Due to the lack of such facilities, producers and traders prefer to sell it immediately after the harvest, and post-harvest loss is also high.

Existing warehouses or storage units need upgrading whereas there is demand for the new one that meets the local needs and affordability. As a result, a larger number of traders and farmers will be motivated to store their products during the flush season or when it is difficult to transport due to road blockage during the monsoon. The availability of storage facilities will also encourage producers to increase production and traders to collect more locally produced items. Therefore, technology providers should be brought into the assessment areas where potentials for upgrading existing storage or piloting new small-scale storage facilities are present. The project needs to encourage the cooperatives or farmers groups with commercial incentives to launch these initiatives. However, before establishing such units, an assessment of the area's production situation, storage requirements, and capacity of the group/cooperative that will run the facility must be conducted.

Potential partners: Stockist/warehouses, technology providers

A Success Story of Zero Energy Cellar Store at Jumla: "A few degrees make a big difference for Apple Producers in Jumla, Nepal."

The Zero Energy Cellar Storage is built on the idea of a traditional cellar with zero energy cool chambers and direct evaporative cooling. It's a structure that's designed to maintain fruits at a consistent, cool temperature and humidity, preventing them from perishing. It prevents fruits from freezing in the winter and keeps them cool in the summer to avoid and reduce spoilage. In the Jumla district, the High Value Agriculture Project (HVAP) established three apple cellar stores. In light of the then energy crisis, the project designed and constructed a cost-effective, environmentally friendly, effective, and efficient zero-energy cellar (a structure designed to keep primarily apples, vegetables, and some fruits at a constant temperature and humidity to prevent them from rotting) for the community to preserve their farm products for future use. These stores were found to be the most cost-effective in terms of operations and energy consumption, and they could keep the fruits fresh for up to 6 months. Farmers who used to sell their apples at Rs15-20 per kg could sell their produce at (NRs.100-120) during the off season. Farmers have benefited greatly from these facilities, which can be promoted and scaled in different other places for easier handling of fresh produce.

Source: HVAP, http://hvap.asdp.gov.np

Intervention Area 11: Improve availability of agri-machineries and technologies that are affordable, effective and efficient to target clusters and value chain

Though there have been many efforts from the government and non-government agencies in promoting technologies such as tillers, sowers, and harvesters, the effectiveness and feasibility in target areas have not been seen. Especially, many agri-machineries are heavy and not user-friendly to women producers. Customised agri-machineries as per the requirement of the value chain, geography, topography, and users are required to be useful. Small and customised machinery is required for potato seed sowing and harvesting to minimize the cost of production. A similar kind is required for timur harvesting, dehusking of indigenous crops and processing of hard-shelled walnuts. While this machinery may not be readily available in the market, they can be fabricated at the local level by mechanics. The mechanics, on the other hand, do not have an idea about the demands for such customised machinery and only follow demand-based production. Hence, establishing links between producers and machinery service producers needs to be done.

To ignite the use of machinery and incentivise the producers, the local municipalities can collaborate with the machinery suppliers or fabricators to demonstrate the benefits of using machinery for various activities across the value chain.

Potential partners: Agri-machinery suppliers, fabricators, local municipalities.

Business Environment

Rules and regulations, special development programs, advocacy, and subsidies create an environment for the value chain to function effectively. However, there were several challenges identified in the Business Environment at the municipalities for the value chains.

1. There aren't effective platforms where actors of the value chain can network for idea and information sharing.
2. Input-based subsidies creating dependency among farmers and causing lower efficiency due to lack of ownership of the subsidised products.
3. Limited coordination among government agencies and private companies to scale up seed production, for technology transfer.
4. Ineffective implementation of seed and fertiliser import rules.

The proposed interventions under Business Environment are as follows:

Interventions	Relevant Value chain									
Intervention area 12: Facilitate in creating an inclusive and relevant business environment that is accessible to all actors involved in the value chain.										
Implementation Modalities										
E.1. Use of Multi Stakeholder platforms to encourage coordination and build synergy between multiple actors involved in the value chain.										
E.2. Facilitate NGOs and government projects to include all private input suppliers in their subsidy model, encouraging them to sustain their business without market distortion.										
E.3. Output-based subsidies should be prioritised. Output-based subsidies can be provided to only those producers who are able to maintain certain quality standards or adopt certain improved production practices.										
E.4. Encourage NARC to build partnership with private research institutions or academic institutions to carry out research and new varietal development										
E.5. Encourage local entities (AKC, local municipality) to test and import new varieties and to train the producers on modern farming practices.										
E.6. Facilitate the proper implementation of seed import rules and regulations through SQCC (Seed Quality Control center).										
E.7. Facilitate Seeds and fertilisers association to lobby with the federal government to bring changes in these rules.										**In**

Intervention Area 12: Facilitate in creating an inclusive and relevant business environment that is accessible to all actors involved in the value chain.

The business environment has a considerable impact on the operation and growth of value chain firms. Regulations, lobbying, research, and extension services are all examples of value chain influencers. However, there have been instances where support in the form of subsidies to specific value chain actors has distorted the market for others. Subsidised input to farmers by government and non-government organizations is one of the most common examples. Though the goal of these schemes is to assist farmers, it increases farmers' reliance on these subsidies, forcing them to wait for subsidised supplies rather than purchasing them as needed from input suppliers. As a result, local input suppliers have a smaller market and stock fewer inputs, making supplies unavailable even when needed.

A model whereby the subsidy programmes involve the private sector or focus on output-based subsidies is likely to create a better business environment to the actors, reduce dependency of the farmers, and encourage better production.

Similarly, for continuous improvement of the business environment, regular interaction of the value chain actors with the influencers is required. This will provide insights to the influencers on how to enable the business environment. Wherever feasible, a public private collaboration is suggested: for example, in scaling up vegetable and potato seed production, varietal research and disseminating technologies. Increasing capacity of the enablers in better implementation of policies and regulations and facilitating advocacy and lobbying for modification of regulations are some of the recommended implementation modalities under this intervention area.

Potential partners: Municipality government, Associations, Cooperatives

Analysis and Recommendations on Environment and climate change impact

Climate change analysis was based on analyses from the aspects of value chain effects on the environment and effects of the environment on the value chain functions. While analysing the effect of environment on value chains, mainly two components were considered as a basis of analysis viz: i) the effect on soil and human health due to use of chemical fertilizers and pesticides in production; and ii) VC following more resource efficient production (water, fertilisers, pesticides and land use). Effect of climate change was assessed across all the value chains at their key function levels. However, even though climate risks occur throughout the value chain, the highest risks facing small-scale producers were prioritized in the production stage of the chain.[80] Furthermore, the effect of climate change was observed to be similar in same ecological belts (terai, hills, and mountain regions). The Terai belts are more vulnerable to hot-waves caused by rising temperatures, as well as water-logging flash floods caused by erratic and prolonged rainfall. The hilly areas, on the other hand, occasionally experience prolonged rainfall, and the temperature is gradually rising, causing a shift in the production cycle and the introduction of new pests and diseases in the hills and mid-hills. In terms of the mountain region, the Nepal government's 2021 risk and vulnerability assessment[81] ranked *Bajura* as the second most vulnerable district, with *Humla* in the northwest being the most vulnerable. Vulnerability was defined as *"sensitivity to harm as well as a lack of ability to cope and adapt. It is influenced by a number of conditions, the sensitivity of which varies, such as demographic, socioeconomic, ecological, physical, and geological characteristics, as well as the status and condition of resources and infrastructures."* According to the 2021 District Disaster Preparedness and Response (DDPR) report, *Bajura* also suffers from drought for eight months of the year, with unpredictable monsoon rainfall patterns.

80 Participatory gender-sensitive approaches for addressing key climate change-related research issues: Evidence from Bangladesh, Ghana and Uganda. Working Paper 19. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), Copenhagen, Denmark.

81 Vulnerability and Risk Assessment and Identifying Adaptation Options Summary for Policy Makers

According to this assessment results, climate change has a mixed effect on different value chains. Climate change has the potential to increase yields and land area for some crops while decreasing yields and land area for others.[82] As mentioned in the analysis above, it has positive effects on production of potato and apples, whereas for rest of the value chains it has negative effects on production.

The assessment's findings state that at the producer's level, climate change is perceived as change in rainfall pattern, rainfall duration, monsoon onset, and changes from summer to winter. Some producers are aware of the climate change and its impact on their current farming practises. However, more than 50% of the producers are still unaware of climate change and how to deal with it. The field findings are also coherent with other studies conducted in similar areas.[83]

Some of the other major impacts as observed and mentioned by the actors in the field, on the selected value chains were:

- Prevalence of new diseases in crops and livestock due to the proliferation of pathogens due to high temperatures, rainfall, and humidity.
- Changes in production and harvesting timeline.
- High incidence of floods and landslides, causing loss of crops and a diminishing quality of soil nutrients.
- Reduced rainfall or erratic rainfall has affected cropping patterns and the productivity of crops. Similarly, glacial melts have caused floods in mountainous clusters affecting the production
- Frost and other changes in climatic conditions have impacted the physiological characteristics of fruits and other agriculture crops.
- Livestock feed is impacted due to changes in vegetation, and therefore growth rate and milk production rate have been impacted.
- Some of the environmental impacts found in beekeeping include migration of bees due to excess heat or cold; and a reduced rate of reproduction and honey production due to excessive use of pesticides.
- Disruption of roads due to floods and landslides caused by excessive rainfall hinder transportation of goods including agricultural products and inputs. Erratic and untimely rain has been one of the major natural calamities in the selected regions affecting production and trade.
- Inadequate availability of flexible finance, especially during and post disaster phase, has limited producers' and traders' ability to (re)invest in their businesses, preventing them from bouncing back economically.

Some farmers from *Surkhet*, *Doti*/*Dadeldhura*, *Kailali* and even *Bajura* are adopting climate smart agricultural technologies including mulching, drip irrigation, cultivation of vegetables under semi-protected houses, climate resistant seeds and breeds, etc. to mitigate the negative impacts of climate change and increase production. However, it is not very common and adopted by only a few commercial farmers. Farmers in the urban municipalities like Amargadhi, Birendranagar, Dhangadhi (mostly district headquarters) of the selected clusters have access to these technologies (though not adopted effectively), while such access is still limited in the rural municipalities. Adoption of area-specific successful climate smart agriculture technologies and their scaling up are of immediate need in the project clusters. Proper implementation of the practices and better extension services may overcome the value

82 WRI. 2017. Climate Data Explorer. Washington, DC: World Resources Institute. Available at: http://cait.wri.org

83 Impacts of Climate Change on Livestock and Livestock Produces: A Case Study of Banke District, Nepal; Anish Shrestha;Samata Baral, 2018

chain actors' challenges related to climate change. In addition to these, flexible financing options and insurance provisions considering the impacts of climate change should be introduced to manage risks.

It was not possible to assess climate change situation specifically at municipalities level as the change and effect were almost identical in other municipalities that lie in similar ecological belts. However, the adaptive measures and responses of the VC actors in different assessment areas were captured and highlighted above in each Value Chain analysis. As a result, in the case of climate change, general recommendations were prioritised; however, in case of specific recommendations applicable to specific value chains, they have been highlighted in the recommended interventions as below:

Recommended Interventions:

CC.1: Promote climate resilient varieties in various locations and agro-climatic conditions through community seed banks, some learnings can also be made from the proven methods used by LIBIRD. (Apple, Ginger, Citrus, Vegetables in all regions)

CC.2: Encourage and train small-scale producers and MSMEs on tools and practices that will assist them in incorporating climate change considerations into their investment and production plans. Some specific tools and practices are: integrated Pests Management and Water Efficient Irrigation Methods for Vegetables, Potato in Hills. Stall feeding for over grazing management for Dairy and Goat in Hills and mountains, Nutrient smart and carbon smart improved Cattle Shed management as implemented by LIBIRD. (All VCs in all regions)

CC.3: Increase the availability and accessibility of climate resilient technologies and provide advice on how to implement climate adaptation measures by supporting the market development of climate adaptive technologies. Such intervention may require development of financing and market promotion tools for relevant technologies producers, suppliers and service providers (All VCs in all regions)

CC.4: Invest in multi-use water systems and small-scale irrigation to reduce the risks of short-term water scarcity. (Vegetables, Citrus, Potato, Goat, Dairy in Hills and Mountains)

CC.5: To make the extension service more effective, information dissemination through information and communication technology (ICT) providers and farmer-to-farmer dissemination can be introduced and scaled up. Such technologies are expected to help the producers predict the weather, plan in advance and act accordingly. (All VCs in all regions)

CC.6: Index based agriculture and livestock insurance. This measure has been adopted by LIBIRD and is proven effective in terai, hills and mountains. (All VCs)

CC.7: Identify opportunities for economic diversification. If production is more affected by climate change, diversified economic activities (off-farm jobs) will be needed for people involved in the value chain. This will help to recover the loss and generate an alternative income source.

CC.8: Sustainable harvesting of forest resources which needs to be regulated by local municipalities in coordination with District Forest Offices, forest user groups and traders.

Gender equality and social inclusion issues in selected value chains

The components of Gender equality and social inclusion (GESI) in Nepal varies geographically and involves exclusions in terms of caste system, gender, ethnicity, and disability. In addition to that, there are informal exclusions due to feudalism and patriarchy which influence the social mobility, health, and wellbeing of the people. At the household differently-caste households differently abled. The agriculture sector being a driver of rural development, it has potential to provide economic benefits to the most vulnerable populations. These groups tackle barriers like access to services and markets, and social and gender-based restrictions in agricultural development. A rising trend in Nepal since the past decade is increasing women's participation in agriculture, leading to the "feminization of agriculture" due to increased out-migration of male members of family to urban centers or internationally. According to the World Bank, remittance from foreign labour is equivalent to 30% of Nepal's GDP, one of the highest

proportions in the world. There are five main areas where the impact of feminization of agriculture has been significant in Nepal, these are: 1) division of labour; 2) agricultural productivity; 3) household nutrition; 4) women's empowerment; 5) standard of living. While there is evidence that men's out-migration has resulted in a shift in attitudes toward gender norms and improved women's decision-making authority, there is also evidence that it has resulted in increased women's time poverty[84].

Active participation of women in the core market functions is generally visible at all levels, including input selling, production, trading, wholesaling and retailing. Most input shops and trading activities in the far-off locations are carried out by women, and their participation is reasonably good at trading, including sale of vegetables, goats, and honey at local markets. However, face-to-face (business deal making) meetings with bigger buyers from bigger markets are carried out by male members. Producers in general lack access to appropriate technologies, and women producers in particular, lack access to and application of user-friendly machines and tools. Participation/ownership of women is equal, if not high, in case of financial (purchase of inputs and spending of income) and business operation decisions.

Measures to make agriculture inclusive

1. Apply effective participation and involvement quotas to increase the representation of excluded groups.
2. Orient producers toward a more demand-responsive approach and Good Agricultural Practices, which results in increased income for all participants, especially women and other marginalized groups considering the time poverty. Work with mixed groups of power holders and excluded groups in the same forum.
3. Enhance selling and commercial deal-making skills (e.g. services like machine/equipment rental, repair and maintenance, inputs sales agent, farm technicians, etc.) to provide additional revenue for landless/marginal producers on input sales and output trading.
4. Consider off-farm activities to include differently able groups in the agriculture value chain. Off-farm activities such as bookkeeping and retailing provide employment prospects; for example, a single ginger processing factory can employ around 50 people for ten months. Small scale processing enterprises (pickles processing, dried vegetables processing) are mostly led by females and provide employment opportunities to more females from marginalized and low-income households.
5. Women have access to remittance finances sent by male members who have migrated for work. Better investment options and their knowledge can help women to better manage finances.

SUMMARY OF CLUSTER-BASED FINDINGS AND RECOMMENDATIONS

This section discusses the key findings in each cluster as well as the prioritised value chains and recommended intervention for the clusters. Value chains are prioritised and ranked for each cluster and targeted municipality based on field interactions with various stakeholders, production status, market demand, and local government priority. Similarly, interventions are only recommended for value chains that have more constraints and require immediate attention. *Surkhet*, for example, has a good production status and market for dairy, goats and vegetables, but potatoes and ginger/turmeric comparatively have more problems that require immediate attention. As a result, the intervention suggestions in this section are limited to potato and ginger/turmeric. This structure is used in all the clusters in this section. However, the ILAF,

84 A typical definition of time poverty, therefore, is where: "some individuals do not have enough time for rest and leisure after taking into account the time spent working, whether in the labor market, for domestic work, or for other activities such as fetching water and wood" (Blackden and Wodon 2006

includes a detailed list of interventions for all VCs in relevant cluster (Refer to Annex 1)

Cluster 1- *Surkhet*

Surkhet connects all districts in Karnali Province; it is the province's only trading and production hub, and it contributes significantly to the province's economy. Birendranagar, the district headquarters, is the trading hub in *Surkhet*, and it has the lowest proportion of people engaged in agriculture when compared to Bheriganga and Barahtal.

Table 12 Priority Value Chains in municipalities of Cluster 1

	District	Municipalities	Priority Ranks of Value Chains			
			1	2	3	4
Cluster 1	*Surkhet*	Birendranagar UM				
		Bheriganga UM				
		Barahtal RM				

Table 13 Constraints and recommended interventions in cluster 1

Value Chains	Constraints	Suggested Interventions	Potential Entry point for Intervention
Potato	Unavailability of required quality and quantity of seeds due to lack of seed production and supply. Absence of storage facilities for table and tuber potato.	Creation of seed producing pockets, groups or blocks Explore and promote technologies (low-cost warehouses, brick storage, rustic storage, etc) suitable for the local context	Local municipality, AKC Local municipalities, Traders, Co-operatives
Ginger/Turmeric	Decreasing production and productivity of Ginger/Turmeric	Provide the technical know-how on post-harvest, cultivation, seed and soil treatment practices, proper crop rotation, proper seed selection, use of agri-equipment etc	Private input suppliers, AKC

From a production standpoint, vegetables, potatoes, and goat are the most promising. Despite their production potential, each of these value chains has its own set of problems described in the VC analysis followed by the best ways to overcome those constraints. *Surkhet* was also known as a Ginger/Turmeric Production and Trading Hub, but according to locals in the

assessment areas, production and trade are declining due to the various constraints mentioned in the Ginger/Turmeric VC analysis above. The most pressing issue in Ginger/Turmeric is low productivity and declining trade volume with India, which is negatively affecting all Value Chain actors. Unless the productivity and production are improved, the ginger produced in *Surkhet* will not be competitive to gain competence in the market.

Surkhet is a production, input supply, and trade hub, with most value chain functions guided by commercial incentives rather than government and non-governmental organization subsidies. Local entities are also well-functioning in comparison to other districts in the hills and mountain region. As a result of the presence of sufficient private sector actors, established supply chain networks, and linkage opportunities with other strategic markets such as Nepalgunj, this cluster is more suitable for market-based or private sector-led approaches.

Cluster 2- *Dailekh*

Despite improved road networks, growing demand, and a market for various agricultural products of *Dailekh*, it lags behind other hilly districts in agriculture and related economic activities. According to the assessment team's observations, people are not very interested in farming because they have a relatively easy source of income, i.e., remittance, which is also the reason behind their preference for fast food over vegetables or more nutritious food. Among the assessment areas in *Dailekh*, *Bhagwatimai* has the highest proportion of agricultural workers, while *Dullu* has the lowest. This information was also confirmed by SEWAK, a local NGO based in *Dullu*. *Dailekh* also has difficult road conditions and limited connectivity with other districts; in fact, road connectivity within *Dailekh* is lacking. For example, it is easier and less expensive for *Bhairabi* RM producers to transport their product directly to *Surkhet* rather than to *Narayan* UM, the district headquarters. As a result, product aggregation and trading via Narayan become unstructured and disorganised.

Table 14 Priority Value Chains in municipalities of Cluster 2

	District	Municipalities	Prioritised Value Chains			
			1	2	3	4
Cluster 2	Dailkeh	Bhagawatimai RM				
		Naumule RM				
		Bhairabi RM				
		Dullu M				

Table 15 Constraints and recommended interventions in cluster 2

Value Chains	Constraints	Suggested Interventions	Potential Entry point for Intervention
Vegetable	Unavailability of quality inputs (mainly seeds and fertilisers)	I.1. Strengthen the capacity of seed producers to increase the production and improve the quality and supply of seeds, by linking NARC and private entities to scale up seed production with assured quality. I.2. Facilitation for the establishment/strengthening of private sector led extension services to minimise the supply chain gap between local retailers of agri-inputs (agrovets) which are mainly located in the market towns and end-users' smallholders in remote villages.	NARC, Private input suppliers Private input suppliers
	Low production and productivity due to seasonal cultivation practices and lack of irrigation	P.2. Introducing a forum called PSPM. Production sales planning meetings will help to stimulate innovation along production and market chains by enhancing stakeholder collaboration and trust. PSPM strives to foster the smallholder producers' production and market access by generating fruitful collaboration among different actors (producers, traders, retailers, agro-vets, transportation service providers, and other related stakeholders). P.5. Identify key issues in water supply and promote climate-smart technologies for water usage for irrigation and also for feeding the livestock.	Local municipalities, Local NGOs, CBOs, Co-operatives Irrigation technology providers

Potato	Unavailability of required quality and quantity of seeds due to lack of seed production and supply. Absence of storage facilities for table and tuber potato.	Creation of seed producing pockets, groups or blocks Explore and promote technologies (low-cost warehouses, brick storage, rustic storage, etc) suitable for the local context	Local municipality, AKC Local municipalities, Traders, Co-operatives
Citrus	High Post-Harvest loss due to inappropriate practices.	Support the to design training package that covers all these necessary aspects from production to harvesting. Provide packaging materials (plastic crates) on rent to package and transport the fruit.	Local entities (Municipalities, AKC) Traders, Market centers

Citrus, Goat, Potato, and Vegetables are the most promising Value Chains in *Dailekh*. Citrus and goat are mostly exported to other regional markets, whereas potatoes and vegetables are mostly consumed locally.

In the case of potatoes and vegetables, the main issue is a lack of inputs. While required quantity of potato seed is not available during the season, vegetable seeds, when available, are of poor quality. These factors have a significant impact on production volume and, as a result, trade. In the case of citrus, the market channel with *Surkhet* traders is well established, but farmers are losing a lot due to poor post-harvest handling. Citrus tree productivity is also declining due to a lack of knowledge about good orchard management, disease, and pest management. Inadequate irrigation has also been one of the main constraints for producers to expand production in most assessment areas. They rely on rain-fed irrigation and import 99 percent of fruits and vegetables from *Surkhet* during the off-season.

Dailekh is a partially developed economy with few private sectors engaged in agriculture; there are still many on-farm problems, and farming requires a push to increase production for exportable products such as vegetables and potatoes. As a result, to engage more farmers in production and increase productivity, production, and trade of agricultural products in Cluster 2-*Dailekh*, a collaborative approach between local entities, private sector and other stakeholders is required

Cluster 3- *Humla*

Due to its unique geography, topography, lack of road connectivity with other districts, and proximity to China, *Humla* has a different dynamic than the other assessment areas. *Humla*'s economy is primarily based on the collection and trade of MAPs. Despite living in one of Nepal's most remote areas, residents of Simikot, the district headquarters, appeared to be doing well in terms of earnings. *Humla*'s youth migration is also lower than in other parts of the country. According to locals, youths have a better income from MAPs collection and trade, which is the main reason for their preference to stay.

Because of its geography and climatic conditions, production is low; therefore, grains, vegetables,

and meat products are flown in from Nepalgunj to meet market demands. People nowadays rarely consume indigenous staples such as Marshi, Chino, and others because they can afford vegetables and rice. Prior to Covid-19, when the Chinese border was open for trade, the majority of products, including food and infrastructure, came from China. Illegal trade of MAPs through the Chinese border was also quite common, but when the border closed after Covid, it had a significant impact because locals could no longer bring in and sell products through the Chinese border. They now bring the necessary products from Nepalgunj, which are significantly expensive.

Table 16 Priority Value Chains in municipalities of Cluster 3

	District	Municipalities	Priority Ranks of Value Chains			
			1	2	3	4
Cluster 3	*Humla*	Kharpunath RM				
		Simikot				

Table 17 Constraints and recommended interventions in cluster 3

Value Chains	Constraints	Suggested Interventions	Potential Entry point for Intervention
Vegetable	Producers have limited access to the market due to lack of collection points, aggregators at rural municipalities like Kharpunath.	Encourage lead producers, or local co-operative to uptake the collectors' role. They can provide a full-service package starting from input supply to collection/aggregation. The idea of Commercial Pocket or Resilient Market Ecosystem can also be piloted [85] . This link here provides an example of how a Commercial Pocket functions.	Lead producers, Co-operatives Local Municipality
MAPs	Overharvesting of MAPs, which increases the risk of varietal elopement	Putting an immediate halt to MAPs harvesting followed by sustainable harvesting in the future.	DFO, Local Municipality

85 (https://youtu.be/yZN8ZYVNEX0)-

Apple	Low production and productivity compared to other apple producing regions due to low adaptation to climate changes. Producers receive a very low farm gate price as the local market price is very low. There is no market assurance for increased production due to lack of road connectivity.	Introduce climate smart or adaptive technology/practices. Promote climate resilient varieties in various locations and agro-climatic conditions through community seed banks. Improve existing storage units and test other low-cost technologies appropriate for the region so that farmers can keep their produce for a longer period of time in order to sell it during the lean season.	Technology Providers, Local municipalities, AKC. Private technology providers, NGOs, Local municipalities.

Potatoes, vegetables, apples, indigenous crops, MAPs (Jatamsi, Khiraula, Gucchi Chyau, Atish, Ban lasun), and honey are examples of potential VCs. All of these products have a high export potential, and their production is aimed at markets other than *Humla*. In contrast, vegetable and potato production is geared more towards the local market. Even though *Humla*'s main market, Simikot, is small, with only 2500 HHs, local production cannot meet market demand. Vegetable production has begun to increase in a few municipalities, including Kharpunath and Langdu, where farmers are replacing indigenous cereals with vegetables, realising the potential for income. This push was also provided by the local NGO, SHIP Nepal, which is supported by LI-BIRD. To encourage vegetable production, they provide free inputs to farmers in their working area. Despite the fact that farmers have switched to vegetable farming, access to the market remains difficult. Women farmers from rural municipalities such as Kharpunath carry their produce to Simikot, owing to the lack of a local collector/aggregator.

Apple production is increasing, but producers are struggling due to a lack of quality saplings. Inadequate storage, a lack of market access due to poor road connectivity, and a lack of processing facilities all limit producers' ability to scale their production. If the local market cannot consume the products during the 3–4-month season, they generally go to waste due to a lack of options for preserving or transporting them to a larger market.

Another important product in *Humla* is MAPs, which provide a living for many people. However, if people continue to harvest MAPs at their current rate and before the ideal harvesting time, the varieties will elope in a few years because they cannot regrow. According to the DFO, collectors do not allow plants to release seeds, start unnecessary fires in the forest, and engage in other practices that reduce MAP productivity. At the same time, it is not even grown on private land in order to preserve the MAPs varieties. Therefore, harvesting should be halted for the time being in order to allow the MAPs to regrow. After the halt, sustainable harvesting will be critical to preserving the MAPs. To accomplish this, regulatory and control mechanisms must be implemented. The regulatory entity, DFO, currently lacks sufficient human resources to implement strict control mechanisms, and even if it did, it would be ineffective due to the difficult geography and travel time required to reach all parts of *Humla*. As a result, DFOs must work with local municipalities to enforce strict monitoring of MAP harvesting. Meanwhile, local governments must consider alternative sources of income for youths who will lose their source of income if MAP

harvesting is prevented; One of the options could be vegetable production.

Among Indigenous crops, beans are the most commercially important Indigenous crop, but production is still lower than that of Jumla. A new commercial variety that is successfully cultivated in Jumla has yet to be introduced among producers.

Because *Humla* is a rural economy, the majority of the people still do not have comparable facilities to other assessment areas. Many producers still require encouragement to increase output; inputs are scarce, farmers continue to use traditional methods, and market access remains difficult due to poor road conditions. As a result, the actors require more assistance from local entities, including non-governmental organizations, in order to introduce and promote new practices in farming, trading, storage, and processing. However, it is also necessary to ensure that the actors are motivated by commercial incentives, so that producers and other market participants do not always rely heavily on subsidies.

CLUSTER 4-*KAILALI*

Because of its proximity to India, *Kailali* is the regional market and trading hub of *Sudurpashchim* province, as well as the trade and import/export hub of all the selected value chains. Vegetables, potatoes, and citrus are the most promising VCs from a production standpoint. Kailai's production is consumed locally and exported to the *Sudurpashchim* hills. A small amount is also exported to India, but only during the off-season when production is low. The exact volume of export from *Kailali* is still unknown, but it may be useful in analysing the export potential of vegetables to India.

Aside from traditional farming, new practices such as riverbed farming are being introduced in *Kailali*. It is becoming more popular as a result of the increased production potential in riverbeds. Many Indian nationals are also growing vegetables in the Kailali riverbeds. They appear to achieve better results than Nepali producers, owing to better agricultural practices, better engagement, and farm monitoring. This type of good practice should be replicated in other areas of Kailali or assessed areas where productivity is low. Similarly, while open borders with India facilitate trade, they have also increased the malpractice of bringing in illegal and low-quality input (seed and fertiliser), which distorts the productivity and production of Nepali farmlands. As a result, strict control mechanisms for this activity are necessary.

List of Most Potential Value Chains-*Kailali*

Table 18 Priority Value Chains in municipalities of Cluster 4

	District	Municipalities	Priority Ranks of Value Chains		
			1	2	3
Cluster 4	*Kailali*	Dhangadhi UM			
		Godawari M			
		Chure RM			

Table 19 Constraints and recommended interventions in cluster 4

Value Chains	Constraints	Suggested Interventions	Potential Entry point for Intervention
Citrus	Low productivity due to increased pests' infestation and chronic diseases.	Encourage improved farming and demand stimulation for improved production practices by introducing GAP (Good Agriculture Practice).	AKC, Lead producers.
Vegetables	In terms of price and quality, vegetables are unable to compete with imported products. Low productivity of vegetables.	Encourage improved farming and demand stimulation for improved production practices by introducing GAP (Good Agriculture Practice) to reduce the cost of production and improve quality of vegetables.	Lead Producers.

Citrus farming in *Chure* has high potential, and it also commands higher prices due to superior taste and quality. Citrus farming in *Chure*, on the other hand, is highly susceptible to chronic disease, and the majority of orchards are dying. To ensure increased citrus productivity at *Chure-Kailali*, local entities such as AKC and NARC must prioritise preventive measures for disease control and pest management.

Kailali is a larger market than *Surkhet*, but it is also a hub for production, input supply, and trade, with most value chain functions guided by commercial incentives rather than government and non-governmental organization subsidies. As a result, while implementing the suggested interventions in the ILFA, market-based or private sector-led approaches should be prioritised due to the presence of sufficient private sector actors, established supply chain networks, and linkage opportunities throughout the country, including across international borders.

Cluster 5- *Doti*/*Dadeldhura*

Amargadhi- *Dadeldhura* is another important trading center in *Sudurpashchim* Province's hilly districts. Products from hilly areas such as Baitadi, Accham, Darchula, Bajhang, and *Bajura* are gathered in Amargadhi before being transported to the regional market of *Kailali*. Because it is located on the main highway, it serves as a strategic transit market and trading hub for Sudurpashchim Province. It is also ahead in terms of production when compared to other assessment areas.

List of Most Potential Value Chains- *Doti*/*Dadeldhura*

Table 20 Priority Value Chains in municipalities of Cluster 5

	District	Municipalities	Priority Ranks of Value Chains		
			1	2	3

Cluster 5A	*Doti*	Badikedhar RM			
		Jorayal RM			
Cluster 5B	*Dadeldhura*	Amargadhi			
		Alital			

Table 21 Constraints and recommended interventions in cluster 5

Value Chains	Constraints	Suggested Interventions	Potential Entry point for Intervention
Potatoes	Increase in cost of production.	Encourage improved farming and demand stimulation for improved production practices by introducing GAP (Good Agriculture Practice) to reduce the cost of production.	Lead producers, AKC
Dairy	While there is an increase in demand for processed milk products, there is a limited local market and low value addition.	Introduction of processing of dairy products suitable in the municipality's climatic conditions. Create opportunities for establishment of dairy processing plants.	Dairy Processors
Honey	Honey production has remained nearly constant over the years due to producers' and processors' lack of technical and business expertise to scale.	Introduce modern bee-keeping practices among producers. Encourage product diversification and help the existing processors to scale.	AKC, DFTQC, Small and Cottage industries.
Vegetables	Due to a lack of irrigation and climate-smart technologies and practices, vegetable production is limited to seasonal production.	P.5. Identify key issues in water supply and promote climate-smart technologies for water usage for irrigation and also for feeding the livestock.	Technology Provider, Local Municipalities

Citrus and Potato are the most promising VCs for *Dadeldhura*. Citrus and potatoes are both consumed locally and exported to *Kailali*. The local market consumes more than 70% of seasonal vegetables, but production is insufficient to meet demand during the off-season, so more than 95% of fresh vegetables are brought from *Kailali* during the winter. As a result, climate-smart technologies to promote off-season vegetables to replace vegetable imports are required. *Dadeldhura* has well-connected roads and infrastructures such as Potato seed

storage that help to regulate the supply of quality potato seeds in the *Dadeldhura* district. This demonstrated success should serve as a model for replicating similar practices in other assessment areas where potato seed is scarce.

Honey is another potential value chain in the context of *Dadeldhura* with Alital declared as a Honey production zone by PMAMP and kept in priority by the local municipality. Although there are open forests and natural resources, and a suitable climate for honey production, beekeeping is not commercial and has not been able to scale. The key reasons for beekeeping not commercialising in Alital despite favourable conditions and reported high returns from the business could not be found in detail during the assessment. Comparison of cases in Alital, and the superzone for honey production - Chitwan is recommended to get an in-depth understanding of the major issues to scale.

Another popular agriculture product in Alital is milk. With the establishment of collection centers with the support from various development projects, milk production in Alital has significantly increased. Only a small volume of milk collected is sold in the local market, while the rest is supplied to regional dairy in *Kailali*. Considering the geographic and climatic conditions of the municipality, there is scope for processing milk into high value and highly demanded products such as cheese and chhurpi. Milk processing into a range of products is popular in the Eastern Nepal, and the demand for these products are still unmet. Technology transfer and facilitation in establishing dairy processing plants can further improve the dairy sector in the municipality.

Badikedar in *Doti* has been identified as the most potential area for goat farming. The local government of the municipality is making much effort with investments in the goat sector. There have been funds allocated for goat distribution, and shed improvement, but it was evident that farmers reared both female goats for kidding, and castrated goats for sale. A model where breeder farms and fattener farms are separated is anticipated to bring higher income, better division of roles, and goal-specific farm practices.

Dadeldhura is also a hub for input supply, the majority of the districts in the hills get input supply directly from *Dadeldhura*, whereas, seeds and other inputs at *Dadeldhura* come from *Kailali*. The presence of private sector actors in input, production, and trading are present in ample amount in the district headquarters but the number starts to dwindle as soon as you enter the rural municipalities. Some of the stakeholders during the consultation meeting also mentioned the lack of support provided by the local entities, but they were satisfied with the support from AKC or PMAMP program.

Dadeldhura is a developed economy with few private sectors engaged in agriculture; however, agriculture remains the mainstay of many farming households; farming in rural municipalities still requires a push to increase production for exportable products such as honey, citrus, and potatoes. As a result, a more private-sector-driven approach is required, but local entity collaboration is required to solve the problems elaborated in the VC analysis in order to engage more farmers in production and facilitate agricultural product trade in Cluster 5-*Dadeldhura*.

Cluster 6- *Bajura*

Bajura is rapidly growing as a result of an improved road network and market accessibility. Agriculture is the primary source of income for most people in the assessment areas, but many continue to engage themselves in subsistence agriculture. Increased market access has encouraged people to enter commercial agriculture. During the assessment, farmers increased the size of their land for commercial vegetable farming. A farmer also planted 1000 walnut saplings recently after realising the increased market demand and value of soft-shelled walnut. Supportive organizations such as PeaceWin and INF are facilitating changes by providing inputs and establishing market links through the establishment of fruit and vegetable collection centers.

List of Most Potential Value Chains-*Bajura*

Table 22 Priority Value Chains in municipalities of Cluster 6

	District	Municipalities	Priority Ranks of Value Chains			
			1	2	3	4
Cluster 6	*Bajura*	Swamikartik RM				
		Himal RM				
		Budhinanda UM				

Table 23 Contraints and recommended interventions in Cluster 6

Value Chains	Constraints	Suggested Interventions	Potential Entry point for Intervention
Potatoes	Post-harvest loss due to difficult market access and transportation services	Explore and promote technologies (low-cost warehouses, brick storage, rustic storages etc) suitable for the local context. S.3. Extend market for agri-logistics service providers at the project locations. At places where dedicated agri-logistics are not feasible, promote a dedicated space for agri-products in public vehicles at a subsidised rate	Local municipalities, Traders, Co-operatives, Transportation and Storage service providers.
Vegetables	Production is limited, and it is unable to meet local market demand. Access to market is difficult due to Failed collection centers at several locations.	Encourage improved farming and demand stimulation for improved production practices by introducing GAP (Good Agriculture Practice)	Local municipalities, Lead producers, Input Suppliers
Indigenous crops	Indigenous crops are not commercially produced. Collection and trading are difficult due to fragmented production units and small production scale.	P.2. Introducing a forum called PSPM. Production sales planning meetings	Local municipalities, NGOs, CBOs

Vegetables, potatoes, indigenous crops, apples, and walnuts are the most promising value chains in *Bajura*. Among these, potatoes and vegetables are primarily for local consumption, whereas apples, walnuts, and indigenous crops have strong market potential in regional markets such as *Kailali*. The issue with *Bajura* is the difficult road and transportation services that are not functional of for 3 to 4 months during the monsoon season. When transportation costs are extremely high, producers cannot afford it. Another major challenge is the availability of inputs., As inputs are usually subsidised, farmers expect free seeds and subsidised fertilisers and are unwilling to pay a higher price for quality inputs.

Because *Bajura* is a rural economy, most people do not have comparable facilities to other assessment areas. Many producers still require encouragement to increase output; inputs are scarce, farmers continue to use traditional methods, and market access remains difficult due to poor road conditions and high transportation costs. Farmers require assistance from local governments and non-governmental organizations to change current production practices, implement better technology and infrastructure, and establish resilient market links. With the emergence of a few private sectors, it is also necessary to incorporate them so that the actors are motivated by commercial incentives.

ANNEX 1: INTERVENTIONS LOGIC ANALYSIS FRAMEWORK (ILAF)

ANNEX:1.1 ILAF - VEGETABLES

Functions	Cluster	Key Problems	Underlying causes	Service (SS or BE)	Weakness in the Service (SS or BE)	Interventions (Int.)
Input	***Kailali*, *Dailekh*, *Dadeldhura***	Input suppliers cannot provide the required quantity and quality of seeds and chemical fertilizers on time	Input suppliers cannot assure the quality of imported seeds Unregulated import of unregistered and low-quality seeds.	Mechanisms to check the quality and registration of imported seeds	Weak implementation of the regulations regarding usage of illegal variety seeds and fertilizers.	Facilitate the proper implementation of seed import rules and regulations through SQCC (Seed Quality Control Center)
			Seed manufacturers are not able to manufacture and supply consistent quality seeds.	Quality assurance and monitoring	Seed producers cannot cater to all the seed-producing farmers due to limited resources	Strengthen the monitoring mechanisms of the seed providers.
			Restrictions on import of seeds and fertilizers. A limited import quota on seeds imports and restrictions for the private sector to import chemical fertilizers.	Enabling import rules	Lack of timely review and revision of policies and laws - the prevailing rule on import restrictions has not been revised for a very long time.	Facilitate associations of Seeds and Fertilizers and other stakeholders like cooperatives, producers' group to lobby with the federal government to bring relevant changes in existing regulations.
	***Humla* (Simikot, Kharpunath)**	Absence of private input suppliers in the local market	Input supply is dependent on NGOs and local municipalities, AKC, cooperatives instead of private input suppliers.	Knowledge of the need and benefits of using quality inputs	Subsidizing agencies does not inculcate the habit of buying inputs at producers' level and does not encourage private input sellers	Output-based subsidy or partial subsidy to the producers to reduce the dependency on inputs by mobilizing private input sellers

			Private input suppliers do not have enough incentives to start a business due to the small market and demand size for quality inputs.	Increase the demand for agri-inputs from private sector channel	Producers expect free inputs, and if not, demand for cheap inputs.	Subsidizing agencies like NGOs, and local entities (AKC, local municipality) need to encourage and facilitate private input sellers to establish the business and market.
Production	**All clusters**	Low productivity and production volume	Limited knowledge of good agricultural practices.	Extension Services from multiple actors lead producers, input suppliers, and local entities like AKC.	Producers do not seek information to improve their production and harvesting practices, and many do not have access to extension services.	Encourage improved farming and demand stimulation for improved production practices by introducing GAP(Good Agriculture Practice)[86] through lead producers.
			Low commercial orientation among producers. Fragmentated and scattered production areas and low production volume.	Market information	Lack of role clarity on who should provide the information to the producers.	Introduce a forum called PSPM-Production Sales Planning Meeting.[87]
			producers only follow seasonal production practices	Technologies to promote off-season farming	Technology providers are concentered only on the regional markets.	Promote the off-season farming (CSA) technology by partnering with the private suppliers along with helping them build a strong supply

86 Good Agricultural Practices (GAP), as defined by FAO, are a "Collection of principles to apply for on-farm production and post-production processes, resulting in safe and healthy food and non-food agricultural products, while taking into account economic, social and environmental sustainability"

87 Production sales planning meeting is designed to stimulate innovation along production and market chains by enhancing stakeholder collaboration and trust. PSPM strives to foster the smallholder producers production and market access by generating fruitful collaboration among different actors (producers, traders, retailers, agro-vets, transportation service providers and other related stakeholders).

						chain network in both rural and urban municipalities.
	All clusters	Unavailability of irrigation/irrigation technology for off-seasonal vegetable farming	producers do not have the financial ability to invest in technologies	Improved financial services	Commercial banks do not have a specialized loan product targeting producer MFIs have high-interest rates.	Partner with Financial institutions to introduce loan products
			Dependency on rainwater for irrigation hence there is less awareness hence the demand for irrigation technologies.	Irrigation technologies and facilities.	Irrigation technology providers demonstrate and promote the technologies.	Incentivize the irrigation technology providers to demonstrate and promote the technologies among the prospective buyers(producers).
Output	***Humla* (Kharpunath)**	Producers have limited access to market	Absence of local collection center due to low aggregation volume	Collection/Aggregation services	Lack of Incentive for a trader/collector due to low collection volume	Encourage lead producers, or local co-operative to uptake the collectors' role. They can provide a full-service package starting from input supply to collection/aggregation.
			Failed collection Centers at several locations.		Collection is not driven by commercial incentives. Collection centers are not established at strategic locations. Poor management of the collection centers	Encourage a participatory approach between private sectors and farmer's groups or co-operatives to manage the collection centers. Facilitate the non-profit organizations, local municipalities, CBOs, cooperatives to assess the market

						needs, and location accessibility before establishing a collection centers.
	All clusters	Post-Harvest loss of vegetables	Lack of grading, sorting, and inappropriate handling while transporting it to market centers	Post-Harvest Management and preliminary processing facilities	Extension service providers do not provide knowledge and information beyond on-farm cultivation practices.	Encourage and Incentivize Traders/Collectors to provide PH handling, cost-efficient production knowledge to the producers. GAP.
		Difficulty to compete with Indian Vegetables in terms of price and quality	Due to bad post-harvest practices local produce has a lower shelf life			
			The market price is higher due to the high cost of production.	Cost efficient production to reach economies of scale		
Supporting Functions	All clusters	Low adoption of digital technology (Agriculture related apps) by the actors	Producers are unaware of such digital technology and means.	Promotion of digital means and technology Knowledge on the usage of ICT.	ICT companies do not prioritize the study areas to promote and optimize their technologies	Partner with *Palikas* and AKCs to disseminate these technologies and train the extension service providers who can assist and orient digitally illiterate producers or the one who needs support using such technology. Demonstrate the benefits of these technologies through local resource persons of AKC, local municipalities, co-operatives, CBOs and NGOs. Incentivize the ICT service providers to

						extend their services in the targeted areas.
		Limited access to Finance for producers and agri-entrepreneurs	Financial service providers do not have appropriate loan products targeting producers and Agri enterprises.	Customized loan products targeting the actors involved in the Agri value chain.	BFIs do not consider producers and Agri-enterprises as potential customers. They only provide loans to meet the regulatory requirement set by NRB.	Loan Products Explore alternative financing options through traders, input suppliers.
Enabling Environment		Lack of needs assessment before providing subsidies and services to the market actors.	NGOs and other subsidy providing agencies are not guided by a longer-term vision, immediate solution is prioritized rather than sustainable solution		Lack of coordination between various stakeholders before designing and implementing programs and activities	Use of Multistakeholder platforms to encourage co-ordination and build synergy
		Government's extension service providers give partial knowledge to the producers	AKC, local entities have limited resource and they mostly focus on providing knowledge on production practices, and post-harvest management, market linkage doesn't come as a priority.		Lack of coordination with relevant stakeholders in the market system	

ANNEX 1.2: ILAF - POTATOES

Functions	Relevance to specific Cluster or Palikas	Key Problems	Underlying causes	Service (SS or BE)	Weakness in the Service (SS or BE)	Interventions
Inputs	*Surkhet* and Dailkeh	Unavailability of proper quality and quantity of seeds	Producers cannot store potatoes for a longer time to use it as seeds.	Storage Facilities	Absence of seed storage	Partner with traders or local entities to explore and promote technologies (low-cost warehouses, brick storage, rustic storage, etc.) suitable for the local context.
			Potato seed is mainly produced by potato producers who are not exclusive seed producers.	Quality seed production and marketing	Lack of exclusive seed-producing groups, areas or actors	Partner with Local municipalities and zone offices to create a seed-producing zone, blocks, and groups.
Production	All clusters	Low production and productivity of Potatoes	Land size of the producers is limited and they cannot rent land due to financial restrictions.	Access to Finance	Financial service providers do not have suitable loan packages for producers and Agri-enterprises.	Loan Products
			Commercial production is low, producers mainly produce for household consumption on fragmented land.	Commercial Orientation	Lack of commercial orientation among producers	Introduce a forum called PSPM
			Low Yielding seeds	Availability of good quality seeds	Lack of production and supply of quality seeds.	Increase and improve the production and supply of quality seeds.
			Inappropriate production practices	Knowledge on good production practices	Extension Service Providers have limited reach, usually only within the pocket areas	Incentivize and encourage traders, input providers, cooperatives to provide embedded services to the producers.

Output	*Bajura*	High Post-Harvest loss	Unavailability of Storage facilities to store potatoes for a longer time	Storage services	Absence of seed storages	Partner with traders or local entities to explore and promote technologies (low-cost warehouses, brick storage, rustic storages etc.) suitable for the local context.
			Lack of market access due to difficulty in transportation	Transportation services	Lack of reliable transportation service providers. Expensive transportation.	*(Same interventions as mentioned in improving Transportation services under supporting functions)*
		Price competitiveness with Imported potatoes	Increased cost of production due to expensive inputs and farm labor	Mechanization on cultivation and harvesting practices	Unavailability of service providers	Partner with private input suppliers to introduce low cost-technology, tools and equipment to replace labor. Demonstrate such technologies by coordination with AKC and zone office.
Supporting Functions		High Transportation cost	Unavailability of dedicated service providers	Transportation Services	Dedicated service providers (like Upaya city cargo, pickup and drop ltd.) have not expanded their operations in the assessment areas.	Partner with service providers like Upaya city cargo, pickup and drop ltd. to facilitate the piloting of new service models in the targeted areas.
			Transportation service is given by local passenger carriers, tractors etc., they charge random rates based on their free will	Determination of standard rates for agriculture products.	Standard rate to transport agriculture products is not determined. Unclear roles of the market actors, no one knows who needs to determine and regulate the standard rate	Facilitate local entities to intervene and determine standard transportation rates.

	Bajura	Dedicated Storage for potato is not available	Local production cannot meet the capacity requirement of large-scale storage facilities; hence it is not profitable to operate	Low-cost storage facilities	Demand, need, and potential use is not properly assessed by the entities building the cold storage.	Assessment of production situation, need, cost-benefit, and market assessment of cold storage before building it. Incentivize and facilitate the technology providers to promote and introduce low-cost technologies at strategic locations.
Enabling Environment	All clusters	Government extension service is limited	AKC, local entities have limited resource and they mostly focus on proving knowledge on production practices, post-harvest management, market linkage doesn't come as a priority.	Extension Services	Lack of coordination with relevant stakeholders in the market system	Use of Multistakeholder platforms to encourage co-ordination and build synergy between multiple actors involved in the value chain.

ANNEX: 1.3 ILAF - CITRUS

Functions	Relevance to specific Cluster or Palikas	Key Problems	Underlying causes	Service (SS or BE)	Weakness in the Service (SS or BE)	Interventions
Production	*Chure-Kailali*	Decreasing Productivity of citrus trees and orchards	Producers do not have proper technical knowledge on right application of pesticides and fertilizers	Better extension services	Extension service providers are mostly zone office and they do not have enough manpower and resources to train and reach all the producers.	Encourage private input suppliers to provide extension services to the producers.
			Producers do not follow proper orchard management practices			
	Dullu-*Dailekh* and Amargadhi *Dadeldhura*	Unavailability of irrigation/irrigation technology	Producers do not have the financial ability to invest in technologies	Improved access to finance	Financial service providers do not target producers, MFIs have high interest rate.	Facilitate FIs to introduce new Financing schemes and repayment packages
			Dependence of producers on rain-fed irrigation, do not want to invest in irrigation technology unless it is subsidized	Promotion and demonstration of low-cost technologies and its positive effect on production practices	Irrigation technology providers do not do enough demonstration and promotion of the technologies.	Incentivize and facilitate the technology providers to demonstrate and promote among the prospective buyers (producers).
Output	Dullu-*Dailekh* and Amargadhi *Dadeldhura*	High Post Harvest Loss	Improper post-harvest practices followed by the producers.	Knowledge of harvesting techniques	Extension service providers do not provide such knowledge as producers never inquire about such techniques.	Support the local entities to design training package that covers all these necessary aspects from production to harvesting.

			Improper grading, sorting, and packaging of the harvested fruit	Unavailability of plastic crates for proper packaging	Traders do not provide packaging materials. Lack of service providers who can rent out such materials.	Facilitate traders and market centers to provide producers with PH knowledge of grading, sorting, packaging, etc. Encourage and facilitate traders and market centers to provide packaging materials (plastic crates) on rent to package and transport the fruit.
	Dullu-*Dailekh* and Amargadhi *Dadeldhura*	Disorganized marketing channel.	There is no consistency in trading channels, traders, or collectors due to the presence of seasonal and part-time traders who trade in small volumes	Improvement in supply chain	Poorly functioning supply chain network.	Facilitate the large-scale traders at the regional market to establish a well-structured supply chain network.
			Producers cultivate in small patches of land and a limited number of trees. Some of them also use it as a source of side income.	Regularity in production in marketing volume.	Lack of commercial orientation to the producers	PSPM-Production Sales Planning Meeting.Production sales planning meeting is designed to stimulate innovation along production and market chains by enhancing stakeholder collaboration and trust. PSPM strives to foster the smallholder producer's production and market access by generating fruitful collaboration among different actors (producers, traders, retailers, agro-vets, and other related stakeholders).
Supporting Services	*Chure-Kailali*, Dullu-Dailkeh and Amargadhi-*Dadeldhura*	Limited use of digital technology (apps) by the actors	Unaware about such digital technology and means	Promotion of digital means and technology that can support both production and trade.	ICT companies do not prioritize the study areas to promote and optimize their technologies	Partner with palikas and AKCs to disseminate these technologies and train the extension service providers who can use and provide services to digitally illiterate producers or who need support to use such technologies.

			Producers do not know how to use such means	Information about the presence of ICT companies and technology providers.		Demonstrate the benefits of these technologies through local resource persons of AKC, local municipalities, co-operatives.
	Chure-Kailali, Dullu-Dailkeh and Amargadhi-*Dadeldhura*	Unavailability of storage in the local areas or around production pockets	Local production does not meet the capacity requirement of large cold storages	Low-cost technology.	Demand, need and potential use is not properly assessed by the entities that are building cold storages.	Introduce low-cost technologies after assessing the production situation, need, cost-benefit, and strategic location for cold storage before building it.
	Chure-Kailali, Dullu-Dailkeh and Amargadhi-*Dadeldhura*	Expensive Transportation	Unavailability of exclusive service providers	Transportation Services	Exclusive service providers (like Upaya city cargo, pickup and drop) have not expanded their operations in the	Incentivize and risk share such kind of new potential service providers to try their business model in the targeted study areas.
			Transportation service is given by local passenger carriers, tractors etc., they charge random rates based on their free will	Determination of standard rates for agriculture products.	Standard rate to transport agriculture products is not determined. Unclear roles of the market actors, no one knows who needs to determine and regulate the standard rate.	Facilitate the local entities (Local municipality, market centers) to intervene and set standard rates and have a regular monitoring mechanism.

Enabling Environment	*Chure-Kailali*, Dullu-Dailkeh and Amargadhi-*Dadeldhura*	Unscientific way of providing subsidies and services to the market actors.	NGOs and other subsidy-providing agencies are not guided by a longer-term vision, immediate solution is prioritized rather than sustainable solution		Lack of knowledge on market-based approaches.	Output-based subsidies should be prioritized. output-based subsidies can be provided to only those producers who are able to maintain certain quality standards or adopt certain improved production practices.
	Chure-Kailali, Dullu-Dailkeh and Amargadhi-*Dadeldhura*	Government extension service is limited	AKC, local entities have limited resources and they mostly focus on proving knowledge on production practices, post-harvest management, market linkage doesn't come as a priority.		Lack of coordination with relevant stakeholders in the market system	Use of Multi Stakeholder platforms to encourage coordination and build synergy between related actors in the value chain.

ANNEX 1.4: ILAF - APPLES

Functions	Relevance to specific Cluster or Palikas	Key Problems	Underlying causes	Service (SS or BE)	Weakness in the Service (SS or BE)	Interventions
Input	All clusters	The growth rate of apple saplings is low, and gives low productivity	The quality of saplings available at the nurseries are not assured	Quality assurance	No measures of quality assurance of saplings, and parent plant is not available.	Research on productive and climate suitable varieties of apples.
Production	All clusters	Reduced quantity and quality of apple production	Change in climatic conditions	Climate Smart Technology	Technologies, and plants adaptive to climate change have not been studied in the cluster area	
		Low productivity compared to other apple-producing districts of the country	Could be climatic conditions, inputs, or topography	Research and Development	Research on reasons for low productivity have not been conducted	Understand causes for low productivity and intervene as per the findings suggest.
Output	All clusters	Producers receive a very low farm gate price as the local market price is very low.	Apples are produced in abundance during the season and sold at a very low price to minimize loss. Limited storage facilities to save apples for the off-season when apples receive a higher price.	Storage	Very few storage facilities at the clusters have low capacity and can store apples for not more than 2-3 months.	Train the producers, and local traders to build low-cost technology suitable to local needs. Incentivize and facilitate the technology providers to improvise the existing storage units.

		Quality of processed products is not consistent	Use of traditional sun drying technologies, without any kind of initial processing for making the products better quality	Machinery and technology	Machinery and technology suppliers have not reached the clusters for their product demo and promotion.	Explore for small-scale, low-cost portable technology that is suitable for remote areas.
Supporting Functions		High transportation cost	The apple-producing clusters are far from the market centers, and the road access is either not present, or is only operated in the dry season.	Transportation		
Enabling Environment		Lack of good practice and technology transfer like introducing high yielding varieties, and good agriculture practice.	Lack of demand for high-yielding varieties and practices from producers.	Technology and good practices transfer.	Local entities do not prioritize these things.	Encourage local entities (AKC, local municipality) to test and import new varieties and to train the producers on modern farming practices.

ANNEX 1.5 ILAF - WALNUT

Functions	Relevance to specific Cluster or Palikas	Key Problems	Underlying causes	Service (SS or BE)	Weakness in the Service (SS or BE)	Interventions
Input	All clusters	The quality of walnut saplings is not assured	Limited research on varieties and propagation of walnuts	Research and development	Dedicated unit for walnut is not available. Limited experts in walnut plant breeding.	Encourage and facilitate the local entities (AKC and NARC) to research types of saplings and application of proper propagation methods.
Production	All clusters	Low production of soft-shelled walnuts	Soft-shelled walnuts have recently been planted. It takes over 8 years for the tree to commercially produce walnuts.			
Output	All clusters	High incidence of molds and damage	Improper drying during initial processing, and lack of storage facilities.	Technology, Extension services	No awareness programs or training on initial processing technologies for walnut. Inadequate storage units.	Introduce and pilot methods for initial processing of walnut.

		Hard-shelled walnuts that are produced in large volumes go to waste	Hard-shelled walnuts can be processed to extract oil, which is of very high value, but the processing method is very difficult. Consumer awareness of the benefits and availability of walnut oil is also poor.	Technology, Machinery, Marketing, and branding	Unavailability of machinery to extract walnut oil. Marketing of walnut oil has not been initiated.	Introduce suitable machinery for the local context Identify or build machinery for walnut processing. ***(NOTE: The feasibility of this intervention needs to be further assessed, we need to identify the number of hard-shelled walnuts going to waste, what quantity of oil can be extracted from it, and its commercial viability)***

ANNEX 1.6: ILAF - GINGER/TURMERIC

Functions	Relevance to specific Cluster or Palikas	Key Problems	Underlying causes	Service (SS or BE)	Weakness in the Service (SS or BE)	Interventions
Input	*Surkhet*	Insufficient supply of improved seeds	Seeds cannot be stored for a longer period of time	Seed Storage	Improper seed storage	Partner with traders or local entities to explore and promote technologies (low-cost warehouses, brick storage, rustic storages etc.) suitable for the local context.
			Seeds is produced in a small scale, the volume of seed produced is not enough to meet the market demand	Seed Production and Supply	Limited number of seed multiplication programs at various locations initiated by NARC	Increase in the involvement of other actors (Private seed producers) in seed production other than just NARC.
Production	*Surkhet*	Decreasing production and productivity of Ginger/Turmeric	Producers are still following conventional cultivation practices	Technical know-how on post-harvest, cultivation, seed and soil treatment practices, proper crop rotation, proper seed selection, etc.	Extension service provided by local entities is not enough. Extension service providers are not available.	Incentivize the private input suppliers to provide extension service to the producers
			Rhizome rot disease due to improper seed selection and lack of soil treatment practices			
			Producers still use traditional harvesting tools like local spade, sickle, local hoe, and harvesting methods during the harvesting of ginger.			
Output						

		Limited number of Ginger Processors for Value addition	Domestic market for Processed Ginger is limited	Market promotion of processed Ginger		Work with TEPC to explore international markets demanding processed ginger products.
		Decreasing demand and market Value (Loss in the overall market share of Nepalese Ginger)	Production of Ginger in India (Main trade partner of Ginger) is growing	Exploration of potential markets.	Lack of exploration for alternative markets.	Encourage associations and TEPC to explore for alternative market to sell the ginger and other processed products to break the monopoly of India.
			Quality of Nepalese Ginger has started to deteriorate	Improvement in the production practices	Extension service provided by local entities is not enough. Extension service providers are not available.	Incentivize the private input suppliers to provide extension service to the producers.
		Market price fluctuation is very high.	Trading price of Nepalese ginger is determined by Indian traders and market.	Stabilization of Market Price	Absence of proper policies to standardize the price	Lobby with the local and federal governments to identify mechanisms to standardize the market rate.
Supporting Services		Financial Services (loan products) are expensive for producers	Crop cycle of Ginger is longer compared to other crops	Different repayment schemes	Financial institutions do not realize the needs of their target customers, especially farmers.	Incentivize and facilitate financial institutions to create new repayment models. Introduce alternatives like Kishan Credit Card that makes repayment easier (a proven method used by iDE)
		Lack of storage facilities for seed as well as ginger storage	Large investment is needed to establish large scale storage facilities that makes the cost recovery difficult	Dedicated small to medium scale storage facilities at the local level	Unaware about the low-cost technologies and small storages	Partner with traders or local entities to explore and promote technologies (low-cost warehouses, brick storage, rustic storages etc.) suitable for the local context.

Enabling Environment		Seed variety improvement is not done sufficiently by NARC	Limited resources with NARC	Test and improve the existing variety	Limited resources with NARC	Encourage NARC to partner with private research institutions to do research on better varieties.
		Unscientific way of providing subsidies and services to the market actors.	Subsidy providing agencies do not assess the actors and private companies to understand the short-term and long-term needs of the actors.		NGOs and other subsidy-providing agencies are not guided by a longer-term vision, the immediate solution is prioritized rather than a sustainable solution	Output-based subsidy should be prioritized. output-based subsidies can be provided to only those producers who are able to maintain certain quality standards or adopt certain improved production practices, for example, raised beds, seed treatment, etc.

ANNEX 1.7: ILAF - TIMUR

Functions	Relevance to specific Cluster or Palikas	Key Problems	Underlying causes	Service (SS or BE)	Weakness in the Service (SS or BE)	Interventions
Input		Required quality and amount of planting materials (saplings) is not available	Timur seeds do not give very low yield (Less than 20%)	Enough planting materials.	DFO can only produce limited number of Saplings	Facilitate DFO to co-ordinate with private nurseries for saplings production.

			Private nurseries rarely produce saplings due to high cost involved, production of saplings is mostly dependent on District Forest Office (DFO)			
Production		Low yield of Timur	Cultivation in a small patch of land and mostly dependent on forest supply.	Increase the size of production	Lack of commercial orientation among producers	Local entities to identify and segregate cultivation areas (zones, pockets, groups) to promote the production of Timur.
			Poor orchard management	Technical knowledge in orchard management	Extension service providers in case of Timur are not present.	Encourage private input suppliers to provide extension services to the producers.
			Limited collection due to difficulty in collection and a tedious process	Tools and equipment for easy harvesting	Tools and equipment providers are not aware about such demand	Support the equipment suppliers to assess the market and demand of such tools and promote it among the prospective buyers to create demand.
		Poor Post-Harvest Handling	Producers lack knowledge about proper and sustainable harvesting techniques. Producers have limited access to harvesting tools	Knowledge on Post-Harvest handling Tools and equipment for easy harvesting	Lack of role clarity on who should be providing the knowledge to the producers	Encourage local entities (DFO,local municipalities input providers) to provide such knowledge to the producers/collectors of Timur.

Supporting Services		Lack of suitable Storage and packaging materials providers in the study areas	Low demand for packaging materials like pics bag, hermetic storages	Proper Storage and Packaging	Dependence on Subsidy for packaging and storing materials. Lack of small-scale storage facilities.	Incentivize and facilitate the technology providers to promote and introduce low-cost technologies at strategic locations.
Enabling Environment		NARC does not supply high yielding and modified varieties	Lack of research on high yielding plants, and less or no Thorne	Plant Research to develop new varieties	Limited resources with NARC	Encourage NARC to build partnerships with private research institutions or academic institutions to carry out research and new varietal development.

ANNEX 1.9: ILAF - DAIRY

Functions	**Relevance to specific Cluster or Palikas**	**Key Problems**	**Underlying causes**	**Service (SS or BE)**	**Weakness in the Service (SS or BE)**	**Interventions**
Input	*Doti*/*Dadeldhura* and *Dailekh*	Limited supply of improved breeding services	Inadequate cooling technologies to freeze semen for AI	Technology	Inadequate cooling technologies to freeze semen for AI	Identify and make suitable freezing technologies available to the municipality to ensure uninterrupted AI services.
	Doti/*Dadeldhura*, *Dailekh*, and *Surkhet*	Limited use of improved feed products	producers unaware of types of improved feed products, and their economic benefits.	Knowledge, research and market	Agrovets unable to promote improved feed products.	Identify gaps in nutrition for dairy animals in the municipality and promote improved fodder and forage to mitigate the gaps.

Production	*Doti*/*Dadeldhura*, *Dailekh*, and *Surkhet*	High incidence of disease causing low milk production or loss of milk	Poor management of the shed leading to increased infection. producers not using preventive and curative measures properly.	Veterinary services, Knowledge	Inadequate human resources at the government veterinary units. producers do not trust private practitioners.	Create a system of referral to private practitioners by Government institutions for better service provisions.
Output	*Doti*/*Dadeldhura* and *Dailekh*	Limited local market, and low value addition	Presence of only small scale dairy processors producing limited varieties of products.	Knowledge, equipment, finance	Medium to larger scale dairy processors not operational. Limited knowledge on processing technologies.	Introduce processing of dairy products suitable in the municipality's climatic conditions, through interested dairy processors. Create opportunities for establishment of dairy processing plants.

ANNEX 1.10: INTERVENTION LOGIC FRAMEWORK HONEY

Functions	Relevance to specific Cluster or Palikas	Key Problems	Underlying causes	Service (SS or BE)	Weakness in the Service (SS or BE)	Interventions
Production	All clusters	Honey production has remained close to constant over the years	Limited knowledge among producers to adapt to climate change	Extension services	Inadequate bee research program, ineffective bee management protocols to match all conditions	Introduce practical beekeeping technologies effective to adapt to climate changes
	All clusters	Migration of the bees, and loss of bees	Poor pest and predator control	Extension services	Inadequate knowledge among extension service providers	Introduce practical beekeeping technologies for effective pest and predator control
			Effect of pesticides used for other agriculture practices (e.g., vegetable farming)	Rules and regulations for honeybee grazing	No specific rule to control the use of pesticides harmful for bees.	Segregate honey production with other agriculture practices and identify ways to create a win-win for both sectors.
Output	All clusters	Trade barriers for export to US and EU	Honey testing measures not as per EU and US regulatory standards	Quality assurance	Inadequate equipment and resources at the testing facility	Improve the honey testing technology after a detailed cost-benefit analysis
		Lack of processing, labeling and branding of honey.	Lack of local intermediate firms to collect and process honey.	Processing Facilities		

			Consumers prefer loosely packed honey as it is considered unadulterated and hence pure.	Consumer Awareness	Inadequate knowledge among buyers regarding processed and unprocessed honey.	

ANNEX 1.11: ILAF - GOAT

Functions	Relevance to specific Cluster or Palikas	Key Problems	Underlying causes	Service (SS or BE)	Weakness in the Service (SS or BE)	Interventions
Input	*Doti/Dadeldhura*	Inadequate supply of high productive breeds of goat	High productive breeds are imported and therefore unaffordable to most producers.	Finance, technology	Credit facilities and finance options specific to breed improvement are not available	Pilot a financing model between breeders and producers or involve financial institutions in providing finance options for breed improvement.
	Doti/Dadeldhura		AI services are not available for goats in the clusters.	Finance, technology	The production of semen from boer goats is not adequate. Moreover, the technologies to transport frozen semen to clusters is inadequate in the selected clusters.	Improve and make technologies available to tranfer semen for AI in goats within the cluster.
Production	*Doti/Dadeldhura*	Poor husbandry practices	High cost for constructing improved shed.	Finance, knowledge	Relevant bodies have not been able to suggest low-cost improved shed suitable for the type of goat farming systems.	Optimize low cost shed design for commercial goat farming.

	Doti/*Dadeldhura*		Disease transfer in animals during grazing	knowledge	Though stall feeding is being promoted, feeding cut grass is more labor-intensive compared to goat grazing in areas where grazing land is abundant	
	Doti/*Dadeldhura*		Producers are unable to identify early signs and symptoms of disease	veterinary services	No awareness programmes and services on early diagnosis	Promote an early diagnosis service through public and private actors
	Doti/*Dadeldhura*		Insufficient access to water	Water supply		Identify a key issue in water supply, and promote climate-smart technologies for water usage
	Doti/*Dadeldhura*, *Dailekh*, *Surkhet*	Long fattening cycle of goats.	Limited knowledge on fattening of goats for quick returns	technology, R&D	No specific products for fattening goats.	Research on goat fattening techniques.

ANNEX 2: LONG LIST OF VALUE CHAINS

S.N.	Value Chain	Districts	Source Provided by GiZ	Other Sources
Vegetable products				
1	Vegetables (Cauliflower, cabbage, tomato, pea, bean)	Terai and hills	IFAD	USAID, KISAN II, *Sudurpashchim* Planning Commission,ASDP
2	Vegetable Seeds	*Surkhet*, *Dailekh*, *Doti*		ASDP
3	Potato	***Dadeldhura***, ***Dailekh***,*Surkhet*,*Kailali*,*Doti*,*Bajura*		PMAMP, Agricultural Knowledge Center, ASDP
Fruits				
4	Apple	*Humla*,*Dailekh*	SNV	*Sudurpashchim* Planning Commission,ASDP,Province Product Profile byTEPC
5	Walnut	*Humla*	Research paper (M. Raizada)	Karnali Province Planning Commission,2020,ASDP
6	Citrus Fruits	*Kailali*,*Dadeldhura*,*Doti*,*Dailekh*	FAO	Karnali Province Planning Commission,2020, ASDP
7	Banana	*Kailali*	UNDP	*Sudurpashchim* Planning Commission,
8	Sugarcane	*Kailali*		Province Product Profile byTEPC
9	Olive	***Bajura***		PMAMP
Cereals				
10	Soyabean	***Dadeldhura***,*Surkhet*		PMAMP
11	Maize	*Humla*, *Dadeldhura*, *Surkhet*,*Dailekh*	Research Paper (by Dil Bahadur Gurung)	Province Product Profile by TEPC, FNCCI
12	Maize Seeds	*Kailali*,*Dailekh*, *Surkhet*		Karnali Province Planning Commission,2020 *Sudurpashchim* Planning Commission,
13	Beans	*Humla*		
14	Paddy	*Dadeldhura*,*Bajura*, *Humla*,*Surkhet*,*Kailali*		*Sudurpashchim* Planning Commission, Province Product Profile byTEPC

15	Buckwheat	Bajhura		*Sudurpashchim* Planning Commission, Province Product Profile by TEPC
16	Millet	*Humla*,Bajhura,***Kailali***	LIBIRD	Province Product Profile byTEPC
17	Barley	*Surkhet*,	R.B. Amgai	Province Product Profile by TEPC
18	Jorayal Rice	*Doti*		
19	Indigenous crops(Chino,Kaguno, Marsi)	*Dadeldhura*,*Humla*,*Bajura*		
Spices				
20	Ginger/Turmeric	***Doti*, *Surkhet***	USAID,IFAD (HVAP)	PMAMP, Agricultural Knowledge Center, ASDP, Province Product Profile by TEPC
21	Chilli	*Surkhet*,*Kailali*		Province Product Profile by TEPC
22	Onion	*Kailali*		*Sudurpashchim* Planning Commission,
23	Garlic	*Kailali*,Kanchanpur		Strategic Guidance of Value Chain Development in Karnali and *Sudurpashchim* Province by DCA(Dan Church Aid)
24	Mustard	*Kailali*,*Surkhet*		PMAMP
NTFP and MAPs				
25	Timur	*Surkhet*, ***Dailekh***,	UNDP; IFAD (HVAP)	Karnali Province Planning Commission,2020, ASDP
26	Allo	*Dailekh*		Karnali Province Planning Commission,2020
Livestock and Livestock Products				
27	Honey	*Kailali*, *Surkhet*	GIZ/INCLUDE, Padam Lal Bhandari, Rishi Ram Kattel (Journal article)	ASDP, HVAP
28	Milk	*Surkhet*, *Dadeldhura*	National Dairy Development Board (NDDB)	*Sudurpashchim* Planning Commission, Karnali Province Planning Commission, ASDP
29	Goat	***Dailekh***, *Surkhet*,*Kailali*,*Dadeldhura*	IFAD, HEIFER	Strengthening Resilience Livelihood of Poor and Marginalized Farmers (SACAR) , ASDP, Karnali Province Planning Commission

ANNEX 3: RANKING MATRIX

	Category of selection criteria	Selection criteria	Description	Weighting	Pos/Neg	Vegetables	Vegetables Seeds	Potato	Apple	Walnut	Citrus Fruits	Maize	Maize	Indegenous Crops)	Paddy	Timur	Ginger/Turmeric	Milk	Honey	Goat	VC
Economic Sustainability	**Growth potential**	1. Strength of demand and supply side growth / improvement potential	-Unmet/Increasing market demand -Volume and value of (local and export) market demand in the last 3 years -Volume of unmet market demand -Volume of production and consumption Share (%) of the value chain in GDP and export value -Potential to increase production/productivity, quality or increased market price through interventions	5.00	Positive	4	3	4	4	4	4	4	3	3.5	3	4	4	4	4	4	
		2. Value addition opportunities	-Value addition is a factor for overall market growth. -Opportunities to add value to farm produce e.g processing, packaging.	4.00	Positive	4	3	4	3	3	3	4	2	3	3	3	4	4	4	2.5	
		3. Investment Potential (Existing and Future Potential)	-Robust business case for investors -Prospects for attracting more actors in the value chain or support services. Because business case/incentives for market entry is an essential factor for market growth and sustainability.	3.00	Positive	4	2	4	4	3	3	4	2	3	3	4	3	3	3	4	

	Feasibility of MSD approach	4. Presence of enough private and public sector actors and service providers/ Presence of 'lead firms' and appropriate incentives	-Presence of market actors/companies willing to partner and change their way they are doing business to benefit the poor. -Potential for new market actors/companies to enter the market, access to finance for market actors/companies and willingness of existing market actors to invest in this value chain	4.00	Positive	4	4	3	3	3	3	4	4	3	2	3	3	3	3	3		
		5. Comparative advantage of the VC	-Production costs/volume -Comparative advantage - product differentiation, quality, image, proximity markets, labour, technology availability, capacity for upgrading and innovation, etc.; -Enabling infrastructures, Roads connectivity, internet, etc.	3.00	Positive	3	3	4	4	4	4	2	3	3	3	4	3	3	4	4		
		6. Alignment with government plans and policies	-Promotion of value chain is within the government priority. -Government organization's willingness to change or collaborate. Alignment with government priority implies there is a higher possibility for enabling regulatory environment	2.00	Positive	4	4	4	4	4	4	2	4	4	2	4	4	4	4	4		

Social Sustainability	**Relevance**	7. Potential to create jobs across the value chain and impact incomes	-Potential to increase production/productivity or increase market price through interventions -Potential to create off-farm jobs and MSMEs (it includes women entrepreneurs) -Potential for new provision of off-farm services such as post-harvest handling practices, processing, trading, etc.	5.00	Positive	4	3	4	3	3	3	3	3	4	3	3	4	4	4	3	
		8. Relevance for poor and marginalized, women, minorities, and people with disabilities (relevance also signifies inclusion)	-Potential benefits for women along the chain -Potential for women/TG to find job across the value chain	3.00	Positive	4	3	4	3	4	4	3	3	4	3	4	3	3.5	3.5	4	
		9. Risk of increasing women's workload	-Chances of increasing current workload of women without potential economic benefits. -Exploitation of women labour	2.00	Negative	2	1	3	2	1	1	4	3	1	4	3	1	2	2	1.5	
Environmetal Sustainability	**Environmental Impact**	10. Has less negative or positive impact on the environment	-Reduces the chances of human health hazards due to the use of pesticides and other chemicals. -Crops do not reduce the productivity of soil/fertility of the soil	2.00	Positive	2	2	3	3	4	3.5	2	3	4	2	4	2	3	4	4	

			-VC has resource-efficient production (use of less water, chemical fertilizers etc.)	2.00	Positive	2	1	2	4	4	3	2	2	4	2	3.5	4	3	2	3		
				35.0		117	94	116	110	114	111	98	90	113.5	81	112	113	112.5	115.5	112		
	Ranking					1	13	2	11	4	10	12	14	55	15	8	6	7	3	8		

Note: Indigenous Crops Include- Buckwheat, Millet, Barley, Karnali Beans

ANNEX 4: ASSESSMENT TEAM

S.N.	iDE Nepal Core Team	Designation
1.	Corey O Hara	Country Director, iDE Nepal
2.	Ashta Prajapati	Market Development and New Business Lead, iDE Nepal
3.	Alina Adhikari	Market Development Officer, iDE Nepal
4.	Rakesh Kothari	ICT, Monitoring and Evaluations Head, iDE Nepal
5.	Shradha Bhatta	Communications Officer, iDE Nepal
6.	Neeraj Nepali	Consultant, Assessment team lead
7.	Aju Nyachhyon	Consultant, Market System Expert
8.	Mallika Thapa	Intern, iDE Nepal

S.N.	Field Team	Designation
1.	Roshan Prasad Shrestha	Research Coordinator, Sudurpashchim Province
2.	Kahadak Bahadur BK	Research Assistant
3.	Chitra Raj Joshi	Research Assistant
4.	Bahadur Bohara	Research Assistant
5.	Padam Raj Mahatara	Research Assistant
6.	Narendra Bahadur Dhami	Research Assistant
7.	Lokendra Bahadur Singh Shah	Research Assistant
8.	CP Sharma	Research Coordinator, Karnali Province
9.	Indrajeet Sunar	Research Assistant
10.	Dipendra Chaudhari	Research Assistant
11.	Ganesh Kc	Research Assistant
12.	Resham Bogati	Research Assistant

S.N.	iDE Global Team	Designation
1.	Lauren Riley	Gender Equality and Social Inclusion Manager; iDE Global
2.	Simon Crittle	Writer, iDE Global
3.	John Choptinay	Senior Director of Climate, Resilience, and Agriculture, iDE
4.	KC Koch	VP Global Communications & Marketing; iDE Global

ANNEX 5: INTERVIEWEE DETAILS

Province Karnali
District *Surkhet*
Municipality Birendranagar

Collector						
	Value chain	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1.	vegetables/ Potato	March 25	Bishnu Neupane	Ayush and Anjila sabji mandi	Rahalpur	9848008581
2.	Milk	May 10	Jaya Kisan Sapkota	Rara diary	Audhogik chhetra	9867752649

Processor						
	Value chain	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1.	Vegetable	March 23	Sita Kumari Oli	Saino Sauce and Chowmin Uddyog	Itraam	9848243990
2.	Honey	April 3	Prem Kumar Acharya	Acharya Mauri Firm	Pipira, Pritana Road	9848038662

Input						
	Value chain	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1.	Vegetables, milk, potato, honey, goat	March 26	Yogesh BC	Shital Agrovet Trading Center	Hatiyaline	9848105408
2.	Vegetables, milk, potato, honey	March 27	Sushma Shah	Karnali Agriiculture Suppliers	Mangalgadhi liine	9858052025
3.	Goat	March 28	Yam Sharma	Sambriddhi Agro Solution	Mangalgadhi Chowk	9858050331

Government						
	Value chain	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**

1.	Milk, goat	March 25	Jitendra Shrestha	Province Vetereinary Laboratory	Itram	9841605005
2.	Milk, goat	March 27	Yagya Psd Pandeya	Pashupanchi Bikash Sakha, Birendranagar Municipality	Itram	98480458883
3.	Vegetable, potato	March 27	Binod Kharel	Agriculture director office	Rangasala	9843238745
4.	Vegetable, potato	March 27	Padam Nepali	Municipality Agriculture Branch	Itram	
5.	Vegetable, potato	March 27	Garesh Kumar Thapa	PMAMP	Itram	

Financial						
	Value chain	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1.	Vegetables, potato, goat, milk and honey	March 25	Suna Salami	Latikoili Samajik Uddhyami Mahila Sahakari Santhsa	Bamekhola	9863123448
2.	Vegetables, potato, goat, milk and honey	March 28	Kalpana Baduwal	Manikapur Krishi Shahakari Sanstha Ltd	Manikapur, Ghusra	9861839307
3.	Vegetables, potato, goat, milk and honey	April 4	Prem Kumar Acharya	Kankrebihar Mauripalan Shakari Sanstha Ltd	Pipira, Pritana Road	9848038662
4.	Vegetables, potato, goat, milk and honey	April 4	Bidhya Sapkota	Agriculture Development Bank *Surkhet* Branch	Birendra Chowk	9858020059
5.	Vegetables, potato, goat, milk and honey	April 4	Chandra Bahadur Shekhar	NIC Bank *Surkhet*	Birendra Chowk	9851034603

Producers					
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Address**	**Phone number**
1	Honey	April 4	Prem Kumar Acharya	Pipara, Pirtana Road	9848038662
2		April 4	Pimkali Dhakal	Pipara, Pirtana Road	9868073782
3		April 5	Bhima Bhandari	Pipara, Pirtana Road	9848229405
4		April 5	Kaushila Gaha	Pipara, Pirtana Road	9742824852
5		April 5	Ram Prasad Pokhrel	Pipara, Pirtana Road	9863505915
6	Vegetables	March 28	Ganesh Bahadur Thapa	Manikaour Ghusra	9848005253
7		March 28	Gita Gautam	Manikaour Ghusra	9864224208
8		March 28	Kaushila Khatri	Manikaour Ghusra	9861839307
9		March 28	Man Kumari Chaudhary	Manikaour Ghusra	9861839307
10		March 28	Narayan Prasad Bhattarai	Manikaour Ghusra	9848051511

11		April 3	U kumari pun magar B C	Naya Ghusra, Dada	9865266700
12		April 3	Dharma Thapa	Naya Ghusra, Dada	9867363562
13		April 3	Radha Puri	Naya Ghusra, Dada	9848268440
14		April 3	Nannakali Nepali	Naya Ghusra, Dada	9819587233
15	Potato	March 29	Ganesh Bahadur Thapa	Manikaour Ghusra	9848005253
16		March 30	Gita Gautam	Manikaour Ghusra	9864224208
17		March 31	Kaushila Khatri	Manikaour Ghusra	9861839307
18		April 1	Man Kumari Chaudhary	Manikaour Ghusra	9861839307
19		April 2	Narayan Prasad Bhattarai	Manikaour Ghusra	9848051511
20	Goat	April 4	Chandra Bahdaur Chaudhary	Tilpur	9848041042
21		April 4	Sita Tharu	Tilpur	9812457439
22		April 4	Rama Thapa	Tilpur	9848041042
23		April 4	Goma Khadka	Tilpur	9848076910
24		April 4	Kaushila Sunar	Tilpur	9848041042
25		April 5	U kumari pun magar B C	Naya Ghusra, Dada	9865266700
26		April 5	Dharma Thapa	Naya Ghusra, Dada	9867363562
27		April 5	Radha Puri	Naya Ghusra, Dada	9848268440
28		April 5	Nannakali Nepali	Naya Ghusra, Dada	9819587233
29		April 5	Rabina Sunar	Naya Ghusra, Dada	9812559539

Province Karnali
District *Surkhet*
Municipality Bheriganga

	Producer					
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1.	Vegetable	March 24	Amber Bahadur Raut			9858085088
2.	Vegetable	March 24	Anita Poudel			9858078910
3.	Turmeric	April 13	Gan Bahadur Budha			9864366554
4.	Turmeric	April 13	Yam Bhadur Khatri			9848206636
5.	Turmeric	April 13	Visna Thapa			9816533415
6.	Turmeric	April 13	Ashmita Gharti			
7.	Turmeric	April 13	Amber Bahadur Khatri			9800511169

Financial

S.N.	Value chain	Date of Interview	Name of the interviewee	Name of the business/organization/company	Address	Phone number
1.	Vegetables, potato,goat,milk,ginger	March 23	Tilak Rawat	Civil Bank	Chinchu	9851115308
2.	Vegetables, potato,goat,milk,ginger	March 23	Balak Rana	Sana Kisan Sahakari Santha	Chinchu	9848088683

Storage						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1.	Potato	March 23		Sana Kishan Cold Store		

Province Karnali
District *Surkhet*
Municipality Barahatal

Collector						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization /company**	**Address**	**Phone number**
1.	Potato/ Vegetable		Chandra Bahadur Sijapati	Karnali and Barahatal Sabji Mandi	Baddichur	98448075525
2.	Goat		Bal Bahadur Gautam	Baddichur Animal goat collection center	Baddichur	9848114615

Input						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization /company**	**Address**	**Phone number**
1.	Vegetables, milk, potato, goat		Gayatri Kadel	Kisan Agrovet	Baddichur	9848160370
2.	Vegetables, milk, potato, goat		Rabi Lal Koirala	Kunathari Agrovet	Baddichur	9848161175

Financial						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization /company**	**Address**	**Phone number**
1.	Vegetables, goat, milk		Binaya Pothani	Nabil Bank	Baddichur	9841915982
2.	Vegetables, goat, milk		Dal Bahadur Sijapati	Sano Kisan tatha Mahila Samuha	Baddichur	9846916144

Producer					
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Address**	**Phone number**
1.	Goat	April 2	Nita Pun	School tole	9748484959
2.	Goat	April 2	Kalpana Saru	School tole	9869617921
3.	Goat	April 2	Durupadha Pun	School tole	
4.	Goat	April 2	Dipa Sijali	School tole	

Province Karnali
District *Dailekh*
Municipality Dullu

Collector						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization /company**	**Address**	**Phone number**
1.	Vegetables	March 25	Umesh Khadka	Umesh Tarkari Pasal	Kritikhamba	9869517710
2.		March 27	Sagar khadka	Sagar Tarkaari Pasal	Kritikhamba	9866696590
3.		March 27	Sunil Thapa	Sunil Tarkari Pasal	Dullu Bazar	9844881096
4.		March 26	Susila Khadka	khadka Tarkari Pasal	Dullu Bazar	9868070900

Input						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization /company**	**Address**	**Phone number**
1.	vegetables, potato	March 25	Dipak Bogati	Dipu Agrovet	Toraya	9868145618
2.		March 26	Sita puri khadka	Aakriti Aashis Agrovet Center	Dullu Bazar	9848192782
3.		March 26	sagar khadka	Sagar Agrovet	Dullu Bazar	9866965900
4.	**Government**					
5.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization /company**	**Address**	**Phone number**
6.	Vegetables and goat	March 28	Rajan Bista	Dullu Rural Municipality (Agriculture Department)	Chadani Chowk	9868074977
7.	Orange/Goat/ Potatoes	March 28	Tanka Regmi	Agriculture Office Dullu (Suntala Zone)	Chadani Chowk	9868145618

Financial						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization /company**	**Address**	**Phone number**

1.	vegetables/potatoes/fruits/goats	March 26	Santosh sedari	Aarambha chautari lagubita	kriti khamba	9848656168
2.		March 27	Raj kumar Bista	Agricultural development Bank	Chadani chowk	9868074987
3.		March 27	Om bahadur shahi	Rasriya Banijey Bank	Chadani chowk	9858050219
4.		March 31	Hari Gautam	Nirdhan Uthan lagubitta Bitiye sanstha LTD.	Kritikhamba	9844881096

Producer					
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Address**	**Phone number**
1.	Vegetables, potatoes	March 28	Krishna Bdr Khatri	Riju	9824541503
2.			Tika Rimal	Riju	9806454331
3.			Rudra Bdr Jaisi	Riju	9868004188
4.			Moti Pd Jaisi	Riju	9867787360
5.			Sita Thapa	Riju	9867915815
6.	Orange	March 28	Pare Kaserra	Bogati Dada	9822483919
7.			Lal Bdr Bogati	Bogati Dada	9868656415
8.			Lal Bdr Khatri	Bogati Dada	9848118671
9.			Chabilal Bogati	Bogati Dada	9848049812
10.			Jaya Prakash Khatri	Bogati Dada	
11.	Ginger, Turmeric	March 26	Surendra Bhandari	Vukaha and Nepa	9848116768
12.			Man Bdr Khatri	Vukaha and Nepa	9822432041
13.			Thir Bdr Karki	Vukaha and Nepa	9822854220
14.			Jagat Pant	Vukaha and Nepa	9848064122
15.	Goat	March 28	Bhakta Bdr Panta	Palata	9818297153
16.			Gagan Bdr. Khatri	Palata	9825516641
17.			Tul Bdr Thapa	Palata	9819554887
18.			Khadka Bdr Sunar	Palata	9878091093

Province Karnali
District *Dailekh*
Municipality Bhairabi RM

Collector						
	Value chain	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization /company**	**Address**	**Phone number**
1.	Vegetables/potato	April 4	Nim bahadur Thapa Magar	Tada tarkari pasal	khambagadey	9866897204
2.	Vegetables/potato	March 25	Sher Bahadur Basnet	Basnet Sabji Mandi	khambagadey	9.74657E+11
3.	Vegetable/potato	April 4	Bhakti Sarki	Bhakti Sabji Mandi	Dadimadi	9819585862

Input						
1.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization /company**	**Address**	**Phone number**
2.	Vegetables/potato	April 1	Goma Acharya	Shishir Agrovet	Chakarta	9849765624
3.	Vegetables/potato	April 1	Moti ram Adhikari	Pandey Agrovet	Badalamji	9844815680
4.	**Government**					
5.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization /company**	**Address**	**Phone number**
6.	Vegetables/potato	March 29	Prakash Bhatrai	Krishi Shakha Karyalaya Bhairabi		9843963643
7.	Goat	March 30	Jagat Bista	Krishi Shakha Karyalaya Bhairabi		9848168794

Storage						
	Value chain	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization /company**	**Address**	**Phone number**
1.	Milk	April 2	Tek raj sharma	Sharma Dairy	Kushapani	9842306722

Producer						
	Value chain	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization /company**	**Address**	**Phone number**
1.	Vegetables	March 31	Nanda Jaisi		Selangi	9816589602
2.			Moti kami		Selangi	9816532871
3.			Hari sharma Jaishi		Selangi	9804580556
4.			Ganga pd. Upadhya		Selangi	9845559865
5.			Sher Bdr Shahi		Selangi	9844704043
6.	Orange, potatoes	March 31	Gajendra pd. Rijal		Dadimadi	9868120129
7.			Bhuwan Sara Rijal		Dadimadi	9844870571
8.			Mina devi Dhakal		Dadimadi	9824536948
9.			Gobind jaisi		Dadimadi	9868260590
10.			Bhim pd kadel		Dadimadi	9866726651
11.	Goat	March 31	Jagat bdr. Shahi	Saraswati Agro firm		9858064051
12.			Tek Bdr BK	Pratikshya Krishi Tatha Pashupaalan		9844704043
13.			Sher Bdr Shahi	RR Krishi Pashu Panchi Firm	Selangi	9844704043
14.			Aain Bdr. Shahi			
15.			Resham shahi			9822500064
16.	Turmeric	April 1	Milan khadka		Kushapani	9841546499
17.			Kishor Adhikari		Kushapani	9868950389
18.			Shobhakhar acharya		Kushapani	9864704130
19.			Laxmi pd Adhikari		Kushapani	9858051362
20.			Ganga pd Adhikari		Kushapani	9849346998

Province Karnali
District *Dailekh*
Municipality Bhagwatimai

Collector						
	Value chain	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization /company**	**Address**	**Phone number**
1.	Vegetable, potato	March 27	Sunita Khadka	Kadka Khudra Tatha Tarkari Falful Pasal	Ruma	9865023997
2.		April 8	Prakash Adhikari	Sonika Khudra tatha falful pasal	Bestada bazar	9848074082
3.		April 8	Amrita Kumari Thapa	Amrita Tarkari Pasal	Bestada bazar	9868032984
4.		April 8	Raju Shahi	Shahi Falful Tatha Tarkari Pasal	Ruma	9863158993

Input						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization /company**	**Address**	**Phone number**
1.	Vegetables, potatoes	April 2	Bhupendra Regmi	Regmi Agrovet	Bestada bazar	9811222078

Government						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization /company**	**Address**	**Phone number**
1.	Goat	April 5	Janak Thapa	Livestock Informative Center	Bestada bazar	9864795382
2.	Vegetables/potatoes		Niruta Gaha	krishi Sewa Kendra	Bestada bazar	9863452365

Financial						
S.N.	**Value chain**	**Date of Interview**	**Name**	**Name of the business/organization/company**	**Address**	**Phone number**
3.	Vegetable, Potato, goat	April 3	Khadka Bohara	Prabhu Bank	Bestada bazar	9844802168

4.		April 3	Gopal Basnet	NIC Asia Lagubitta	Bestada bazar	9848030301
5.		April 5	Nagendra Bdr Thapa	Chandra Surya Cooperatives	Bestada bazar	9868287509

Producer					
	Value chain	**Date of Interview**	**Name of the interviewee**	**Address**	**Phone number**
1.	Potatoes	April 6	Nabin kumar Bc	Manghar	9842503295
2.			Jaya bdr Thapa	Manghar	9845829708
3.			Basanti kumari Thapa Basnet	Manghar	9848279031
4.			Jagata Thapa	Manghar	9868178377
5.			Ram Bdr Thapa	Manghar	9864350863
6.	Goat	April 3	Netra Bdr Thapa	Jaghnath	9844897868
7.			Karna Bdr Thapa	Jaghnath	9816518910
8.			Jay Singh Thapa	Jaghnath	9866591439
9.			Nirmala Thapa	Jaghnath	9868145618
10.	Vegetables	April 3	Krishna Bdr. Thapa	Manghar dobato dada	9864795303
11.			Man Bdr bc	Manghar dobato dada	9815559054
12.			padma Bc	Manghar dobato dada	9868162029
13.			Mohan Thapa	Manghar dobato dada	9818113539
14.	Maize	April 6	Tanka Sharma	Sani Gau	9864878181
15.			Padam bdr Singh	Sani Gau	9819508682
16.			Dhan Bdr singh	Sani Gau	9848121982
17.			Bhagiram Sharma	Sani Gau	9864942166
18.			Bom Bdr Bc	Sani Gau	9868676054
19.	Orange	April 7	Purna Bdr Bhandari	Khora	9848090613
20.			Ratna Bdr shahi	Khora	9848007072
21.			Chitra Bdr Thapa	Khora	9844895111
22.			Prakash Shahi	Khora	9858026582
23.	Tumeric	April 7	Lok Bikram khadka	Katti	9869654964
24.			Krishna Kc	Katti	9848076303
25.			Nanda Ram Jaisi	Katti	9804598765
26.			Man Bdr Bc	Katti	9848121876

Province Karnali
District *Dailekh*
Municipality Naumule RM

Collector						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1.	Vegetables, potatoes	April 9	Krishab Pd jaisi	Shriti Krishi Tatha Pashu Panchi Firm	Ganesh Chowk	9812518841
2.			Laxmi khanal	Khanal Tarkari Pasal	Naumule Bazar	9742243910
3.			Sujan Thapa Magar	Thapa tarkari pasal	Naumule Bazar	9812922254
4.			Tulshi Jaisi	Sarswati Tarkari Tatha Falful Pasal	Naumule Bazar	9846546737
5.	Goat	April 9	Man Bdr Basnet	Goat collector	Salleri	9814501622

Input						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization /company**	**Address**	**Phone number**
1.	Vegetables/potatoes	April 11	Rita kumari Jaishi	Sambridhi Agrovet center	Naumule Bazar	9848341925

Government						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization /company**	**Address**	**Phone number**
1.	vegetables	April 11	Pradip Raj Salami	Departments of Agriculture services.	Naumule Bazar	9868917408
2.	Goat	April 11	Khagendra Neupane	Department of livestock services.	Thutey simal	9848190895

Storage						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**

1.	Vegetables, potatoes	April 11	Surya Bdr. Rokaya	Naumule Kishi Upaj Sankalan Kendra	Naumule Bazar	9848314352

Financial						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1.	Potato, vegetable, goat	April 5	Chanadra lal Balaami Magar	Shree naumule Laghu Uddham Krishi Sahakari Sanstha Ltd.	Dwari Bhadey	9748317955
2.		April 5	Saroj Hamal	NMB Bank	Naumule Bazar	9868264224
3.		April 5	Arjun Bdr. Chand	Shree Navajyoti Diyalo Krishi Sahakari Sanstha	Salleri	9848116932
4.		April 5	Kumar Thapa Magar	NIC Lagubitta Private Limited	Naumule Bazar	9863157334
5.		April 5	Krishna Pun Magar	Buddha Rural Multi-Purpose Cooperatives	Naumule Bazar	9801718833

Producer					
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Address**	**Phone number**
1.	Goat	April 10	Abiral Gharti	Sisneri	9815559339
2.			Jay Bdr Shahi	Sisneri	9804509454
3.			Top Bdr Singh	Sisneri	9847926666
4.			Khadka Bdr Singh	Sisneri	9742810864
5.			Bishnu Bdr Singh	Sisneri	
6.	potatoes	April 10	Lal Bdr Budha	Bhabarsaini	9815576094
7.			Bal Bdr Shahi	Bhabarsaini	9745505527
8.			Ratna Shahi	Bhabarsaini	9816549886
9.			Karuna Rawat	Bhabarsaini	9748314374
10.	Vegetables	April 10	Chabilal sunar	Thutey Simal	9819562223
11.			Kabilal Jaisi	Thutey Simal	9846039915
12.			Laxmi Jaisi	Thutey Simal	9848339540
13.			Padam Jung Bc	Thutey Simal	9819589389
14.			Arjun Hamal	Thutey Simal	9844842677

Province	Karnali
District	*Dailekh*
Municipality	Narayan

	Collector					
	Value chain	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization /company**	**Address**	**Phone number**
1.	vegetables/ poatoes	April 12	Mohamad Hasim Ali	Guddu Sabji Mandi	Devkota chowk	9800502925
2.			Laxmi Singh	Nishan Tarkari Pasal	Ganeshthan	9868917887

Input						
	Value chain	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization /company**	**Address**	**Phone number**
1.	Vegetables/p otatoes/Goat	April 4	Punney Psd. Sharma	Rupakheti Agrovet Center and Order Suppliers	Devkota chowk	9858050878

Government						
	Value chain	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization /company**	**Address**	**Phone number**
1.	Goat	April 11	Bhim Bista	District Livestock Office	Thaludada	9858025085

Province	*Sudurpashchim*
District	*Bajura*
Municipality	Budhinanda

Collector						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1.	Vegetable, Potato, Onion	March 28	Gorakh Bohara	Debit General Store	Kolti *Bajura*	9845149278
2.		March 29	Rejendra KC	Ranjenta Hardware	Kolti *Bajura*	9868239867
3.		March 30	Binkala Bista	Mamat General Store and Tarkari Pasal	Kolti *Bajura*	9865733810
4.	Vegetable, Potato, Onion, Citrus	March 30	Kopila Bohara	Bohara Tarkari Pasal	Kolti *Bajura*	9745513982
5.		March 31	Nira Bohara	Collection Center	Pandusain	9859000010
6.		April 6	Nandalal Bohara	Bohara Khudra Pasal and Collection Center	Kolti *Bajura*	9865984150
7.		March 30	Deepak Bohara	Utam Tarkari and Khudra pasal	Kolti *Bajura*	9845584219
8.	Apple	April 5	Nandalal Bohara	Bohara Khudra Pasal and Collection Center	Kolti *Bajura*	9865984150

Input						
S. N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1.	Vegetable, Potato, Onion	March 27	Sabina Shahi	Roshani Agrovet	Kolti Bazar	9865754711
2.	Vegetable, Potato, Onion	March 27	Dhana K Regmi	Raj Agrovet	Kolti Bazar	9867728258
3.	Vegetable, Potato, Onion	March 27	Krishna Bdr Shahi	Kishan Agrovet	Kolti Bazar	9860984715
4.	Apple, walnut, citrus	April 7	Bude Rawat	Kamal Falful Nursery	Gedegaun	9863086301

Government						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1.	Vegetable, Potato, turmeric, walnut, citrus	March 30	Jayalal BK	PeaceWin *Bajura*	Nawghar	9860240384
2.		March 30	Deepak Bdr Karki	Agriculture Section	Kolti *Bajura*	9848480453

Financial						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1.	Vegetable, Potato, Onion,	March 27	Man Bdr Baduwal	Kalika Cooperative	Birsain *Bajura*	9862108005
2.	Vegetable, Potato, Onion,	March 27	Maniram Joshi	Kishan Laghubit Bitiya Sastha	Kolti *Bajura*	9862108005
3.	Vegetable	March 27	Kalpana B.K	Nabajeeban Cooperative	Kolti *Bajura*	9749307665

Producer					
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Address**	**Phone number**
1.	Apple	April 5	Ubjan Rawat	Angaupani	983064179
2.			Purna Bdr Rawat	Angaupani	9868521416
3.			Dharma Bdr Bogati	Angaupani	9865883901
4.			Prem Rokaya	Angaupani	9848552543
5.			Pampha Bohara	Angaupani	9865882238
6.	Potato/vegetable	March 29	Parelal Khatri	Janshal	9865733944
7.			Laxmi Khatri	Janshal	9742238525
8.			Birendra Damai	Janshal	9865255514
9.			Gajindra Giri	Janshal	
10.			Karna Damai	Janshal	
11.		March 31	Sarad Timilsina	Birsain	9865799725
12.			Gorakh Bdr Chadara	Birsain	
13.			Nanda Padhya	Birsain	
14.			Bir Bdr B.K	Birsain	
15.			Mayawati	Birsain	9848694018
16.			Dhan Bdr B.K	Birsain	9868907637
17.			Puran Khatri	Birsain	9746248695
18.	Vegetable/citrus	March 31	Ran Bdr Bohara	Siradi	9868485504
19.			Sukabir Khadka	Siradi	984220065
20.			Dhan Bdr Bogati	Siradi	9746537753
21.			GagaAnsingh Aidi	Siradi	
22.			Aaula Chadara	Siradi	
23.			Abishara B.K	Siradi	
24.	Walnut	March 31	Sarad Timilsina	Birsain	9865799725
25.			Gorakh Bdr Chadara	Birsain	
26.			Nanda Padhya	Birsain	

27.			Bir Bdr B.K	Birsain	
28.			Mayawati	Birsain	9848694018

Province *Sudurpashchim*
District *Bajura*
Municipality Martadi

Government						
S. N	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1.	Apple, Indigenous Crops, Walnut, Citrus	March 30	Min Pd Jaishi	Agriculture Knowledge Center	Martadi	9848609999

Province *Sudurpashchim*
District *Bajura*
Municipality Swamikartik

Collector						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1.	Vegetable, Potato, Onion, Citrus	April 2	Khagendra Khatri	Aasha Tarkari and Khudra Pasal	Piluchaur Bazar	9867063117

	Government					
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1.	Potato/Vegetable/Apple/Onion	April 1	Naresh Rokaya	Agriculture Section	Swijiula	9742211876

	Financial					
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1.	Vegetable, Potato,	April 7	Dhurbaraj Joshi	Kisan Laghu Bitta Tatha Sahakari	Swijiula	9848668979

Province *Sudurpashchim*
District *Bajura*
Municipality Jagannath RM

	Financial					
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1	Vegetables	April 1	Layan Bahadur Shahi	Mero Micro Finance	Jagannath	9858054310/9848567386

	Province	*Sudurpashchim*
	District	*Bajura*
	Municipality	Himali RMC

	Collector					
S.N.	**Value chain**	**Date of Interview**	**Name**	**Name of the business/organization/company**	**Address**	**Phone number**
1	Vegetable, Potato, Onion, Citrus	April 3	Bal Bdr Budha	Tarkari Pasal	Dhulachaur	9748326800
2	Vegetable, Potato, Onion, Citrus	April 3	Parbhujung Shahi	Shahi Tarkari Pasal	Dhulachaur	9868938500

Input						
	Value chain	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1	Vegetable, Potato, Onion,	April 4	Parkash Pandya	Prinshu Pande Agrovet Center	Dhulachaur	

Government						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1	Potato, Citrus Fruit, Apple, Indigenous Crops	April 1	Navaraj Pandit	Agriculture Section	Dhulachaur	9848437043
2	Vegetable, Potato, turmeric, walnut, Apple,	April 3	Samjhana Pariyar	INF- Nepal	Dhulachaur	9848015751

Financial						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**

1	Vegetables, Potato, Onion	April 6	Jamana Malla	Mahila Uthan Krishi Cooperative	Dhulachaur *Bajura*	9848203017
2	Vegetable, Potato, turmeric, walnut, Apple,	April 3	Utam Bohara	Sanima Bank	Boldhik	9848400944
3	Vegetable, Potato,	April 6	Dhanu Pandit	Sunaulo Krishi Saving cooperative	Bandhu	9848609383

Province *Sudurpashchim*
District *Doti*
Municipality Jorayal

Producer

S.N.	Value chain	Date of Interview	Name of the interviewee	Address	Phone number
1	Potato/vegetable	April 5	Padam Bahadur Thapa Magar	Gaira	9848800047
2			Partap Thapa Magar	Gaira	9848826260
3			Pabitra Roka Magar	Gaira	
4			Manju Thapa Magar	Gaira	
5			Mina Thapa Magar	Gaira	

Collector

S.N.	Value chain	Date of Interview	Name of the interviewee	Name of the business/organization/company	Address	Phone number
1	Vegetables	April 5	Jharna Bohara	Ganesh Kirana Tatha Tarkari Sankalan Kendra	Gaira	9866932802

Input

S.N.	Value chain	Date of Interview	Name of the interviewee	Name of the business/organization/company	Address	Phone number
1	Vegetables	April 5	Yeshoda Bist	Shree Kedar Biubijan Kendra	Gaira	9848895253

Government

S.N.	Value chain	Date of Interview	Name of the interviewee	Name of the business/organization/company	Address	Phone number
1	Vegetable, Potato, Citrus Fruits	March 28	Bimal Prasad Bohara	Agriculture Knowledge Center *Doti*	Gaira	9846633878

Province	*Sudurpashchim*
District	*Doti*
Municipality	Badikedar

Government						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1	Ginger/Turmeric/Citrus/Goat	April 11	Mahesh Datta Bhatta	Badikedar Rural Municipality	Khadyuli	9841764822

Financial						
	Value chain	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1	Goat/Ginger/Turmeric	April 11	Mina Bohara	Laxmi Sarswati Multipurpose Cooperatve Ltd	Bipinagar	9842237668
2	Ginger/Turmeric	April 11	Ganga Thapa Magar	Sangalo Krishi Sahakari Sanstha Ltd	Barchhen	9862423232

Province	*Sudurpashchim*
District	*Kailali*
Municipality	Dhangadhi Sub Metro Politian City

Producer						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1	Vegetables	March 31	Anita Rana	Sitaram Agriculture Cooperative Group	*Kailali* Gau	9804669748
2			Anarkali Rana	Sitaram Agriculture Cooperative Group	*Kailali* Gau	
3			kalawati Rana	Sitaram Agriculture Cooperative Group	*Kailali* Gau	
4			Ram kumari Rana	Sitaram Agriculture Cooperative Group	*Kailali* Gau	
5			Anita Rana	Sitaram Agriculture Cooperative Group	*Kailali* Gau	
6	Onion/garlic/ vegetable	April 3	Ram Kisun Chaudhary	Mahila Jagriti Krisak Samuha	Jai Tole	9843413320
7			Pradeshu Chaiudhary	Mahila Jagriti Krisak Samuha	Jai Tole	
8			Jugamani Chaudhary	Mahila Jagriti Krisak Samuha	Jai Tole	
9			Chandra Kala Chaudhary	Mahila Jagriti Krisak Samuha	Jai Tole	
10	Potato/vegetable	March 30	Shanti Chaudhary	Bangra Women Agriculture Group	Banngra Katan tole	9843366500

11			Shanta Chaudhary	Bangra Women Agriculture Group	Banngra Katan tole	
12			Renu Chaudhary	Bangra Women Agriculture Group	Banngra Katan tole	
13			Sabina Chaudhary	Bangra Women Agriculture Group	Banngra Katan tole	
14			Bina Rana	Sitaram Agriculture Cooperative Group	*Kailali* Gau	9814605930
15			Batasu Rana	Sitaram Agriculture Cooperative Group	*Kailali* Gau	
16			Samala Rana	Sitaram Agriculture Cooperative Group	*Kailali* Gau	
17			Balu Kumari Rana	Sitaram Agriculture Cooperative Group	*Kailali* Gau	
18			Parwati Rana	Sitaram Agriculture Cooperative Group	*Kailali* Gau	

Collector

S.N.	Value chain	Date of Interview	Name of the interviewee	Name of the business/organization/company	Address	Phone number
1.	Potato	March 28	Shamvu Shah			9858421162
2.	Vegetables	March 28	Rajaram Chaudhary	Jaya Ma Shree Janaki Stor	Dakshinakali tol	9848498582
3.	Vegetables and Potato	March 29	Bhawan Singh Chaisare	Trinagar Krisi Upaj Hat Bazar	Dakshinakali tol	9848442605
4.	Onion	April 3	Ramesh Sunar	Sudur Pashchim Trade Pvt.Ltd.	Dakshinakali tol	9866226960
5.	Onion, Garlic Potato and Vegetables	April 4	Binod Shah	Chandra Surya Store	Dakshinakali tol	9848420226

Input

S.N.	Value chain	Date of Interview	Name of the interviewee	Name of the business/organization/company	Address	Phone number
1	Potato	March 28	Chakra Bahadur Mahara	Jaya kaphali Agrovet Center	Rajpur	9858423259
2	Potato and Vegetables	March 29	Laxmi Kant Dhakal	Farmer Help Center	Chatakpur	9858420560

Government

S.N.	Value chain	Date of Interview	Name of the interviewee	Name of the business/organization/company	Phone number
1.	Vegetables and Goat	March 30	Hem Raj Awasthi	Veterinary Hospital and Veterinary specialist center	9848611127
2.	Vegetables and Goat	March 30	Janak Raj Bohara	Agriculture Knowledge Center	9868461922

3.	Vegetables	March 30	Lok raj Upadhyay	Dhangadhi Sub Metro Politian City	9858488143
4.	Vegetables and Goat	March 30	Anil Koirala	Ministry of Land Management, Agriculture and Cooperative	9848886489

Financial						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1	Vegetables, Onion and Potato	April 1	Chitra Raj Joshi	Muktinath Development Bank	Chaurah a	9848451469
2	Vegetables, Onion and Potato	April 2	Lokraj joshi	Sudur Pashchimanchal Multi-Purpose Cooperative	Fulbari	9858488006

	Province	*Sudurpashchim*
	District	*Kailali*
	Municipality	Godawari Municipality

Collector						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1.	Vegetables	April 4	Bir Bahadur Mali	Ganyapdhura Mali Vegetable and Fruit Pasal	Attariya	9744356900
2.	Potato	April 4	Nar Bahadur Airi	Surya Chandra and Manisa Trader	Attariya	9848624457
3.	Potato	April 4	Amar Singh Mahara	H. D. Trader	Attariya	9815688177

Input						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1.	Potato, Onoin and Vegetables	April 5	Dil Bahadur Bom	Sudur Farmer Vet firm	Attariya	9851183142
2.	Vegetables and Onion	April 5	Kabiraj Bhatta	Basuling Veterinary Medicine Center	Attariya	9858420561

Government						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**

1.	Vegetables, Potato and Onion/ Garlic	April 7	Nandi Malla	Godawari Muncipality	Attariya	9848425004

Financial						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1.	Vegetables, Potato, onion	April 4	Uma Kumari Bist	Sundar Sudurpashchim Agriculture Cooperative	Attariya	9848838298
2.	Vegetables, Potato, onion	April 4	Nrip Khadka	Sana Kisan Sahakari Sanstha	Attariya	9858423809
3.	Vegetables, Potato, onion	April4	Gobind Prashad Joshi	Prabhu Bank Limited Attariya Branch, *Kailali*	Attariya	9848862925

Producer						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1.	Onion and Garlic	April 6	karn Bahdur Saud	Hatkholi Women Group	Hatkholi	9866239200
2.			Prem Bahadur Saud	Hatkholi Women Group	Hatkholi	
3.			Shobhan Singh Saud	Hatkholi Women Group	Hatkholi	
4.			Gorakha bahadur Saud	Hatkholi Women Group	Hatkholi	
5.			Sabitra BK	Hatkholi Women Group	Hatkholi	
6.	Potato		Gopal Singh Saud	Shaileshwari Banana and Fruit, Vegetables Group	Lalpur	9848497214
7.			Khem Bahadur Saud	Shaileshwari Banana and Fruit, Vegetables Group	Lalpur	
8.			Jahari Saud	Shaileshwari Banana and Fruit, Vegetables Group	Lalpur	
9.			Nar Bahadur Saud	Shaileshwari Banana and Fruit, Vegetables Group	Lalpur	
10.			Dirgha Bahadur Saud	Shaileshwari Banana and Fruit, Vegetables Group	Lalpur	
11.			Narayan Chaudhary	Saptarangi Farmer Group	Haraiya	9868578007
12.			Kumari Chaudhary	Saptarangi Farmer Group	Haraiya	
13.			Rajani Chaudhary	Saptarangi Farmer Group	Haraiya	

14.			Kailashpati Chaudhary	Saptarangi Farmer Group	Haraiya	
15.			Mitan Chaudhary	Saptarangi Farmer Group	Haraiya	

	Province	*Sudurpashchim*
	District	*Kailali*
	Municipality	*Chure* Rural Muncipality

Processor						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1.	Ginger	April 11	Gahendra Khadayat	The Organic Valley	Sahajpur	9843641388

Collector						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1.	Vegetables	April 10	Resham Thapa	Bipin Kirana Pasal	Faltude	9868542240
2.		April 10	Nawal Kishor Shah	DR Vegetables Fruit & Retail Shop	Sahajpur	9865687568
3.	Honey	April 10	Lalit Shah	Samjhan Hotel	Sahajpur	9848500352
4.	Ginger	April 10	Khagendra Khadayat	D and C Kirana Pasal	Sahajpur	9848545520

Input						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1.	Vegetables	April 10	Anil Rana	Dipendra Agrovet	Sahajpur	9843251296

Government						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1.	Ginger, Vegetables, Orange and Honey	April 11	Gorakha Bahadur Singh	*Chure* Rural Muncipality	Sahajpur	9848776129

Producer						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1.	Ginger	April 11	Yogendra Bahadur Shah	Sarswati Women Agriculture Group	Sahajpur	9848511080

2.			Amar Bohara	Sarswati Women Agriculture Group	Sahajpur	
3.			Gopal Bahadur Bohara	Sarswati Women Agriculture Group	Sahajpur	
4.			Sharada Bohara	Sarswati Women Agriculture Group	Sahajpur	
5.			Laxmi Thapa	Sarswati Women Agriculture Group	Sahajpur	
6.			Pusp Khadayat	Sarswati Women Agriculture Group	Sahajpur	
7.	Vegetables	April 11	Dhan Singh Dhami	Hariyali Agriculture & Orange Group	Gharkheda	9863394833
8.			Nara Devi Bohara	Hariyali Agriculture & Orange Group	Gharkheda	
9.			Basanti Dhami	Hariyali Agriculture & Orange Group	Gharkheda	
10.			Man Bahadur Dhami	Hariyali Agriculture & Orange Group	Gharkheda	
11.			Bhuwan Aachrya	Hariyali Agriculture & Orange Group	Gharkheda	
12.	Orange	April 11	Pratap dhami	Hariyali Agriculture & Orange Group	Gharkheda	9865774872
13.			Hukum Thapa	Hariyali Agriculture & Orange Group	Gharkheda	
14.			Lal Singh Dhami	Hariyali Agriculture & Orange Group	Gharkheda	
15.			Jagat Singh Thagunna	Hariyali Agriculture & Orange Group	Gharkheda	
16.			Santa Thagunna	Hariyali Agriculture & Orange Group	Gharkheda	

	Province	*Sudurpashchim*
	District	Dadeldhula
	Municipality	Amargadi

Input						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1.	Vegetables	March 28	Lok Raj Pandey	Laxmi Agrovet Center	Bagbazar	9848826603
2.	Vegetable, potato, citrus	March 28	Tek Raj Pandey	United Seeds International and Agro Pvt.Ltd.	Bagbazar	9848733583
3.	Vegetable, potato, citrus	March 28	Karna Bahadur Saud	United Seeds International and Agro Pvt.Ltd.	Bagbazar	9858751675

Collector						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1.	Vegetable/potato/citrus	March 30	Bahadur Singha Saud	Saud Tarkari Sankalan and suppliers	Bagbazar	9848743103
2.	Vegetable/potato/citrus	March 31	Markesh Rawal	Ghanteshwor Kirana Tatha Tarkari Pasal	Bagbazar	9868758382

3.	Vegetable/potato/citrus	March 31	Dharma Singh Saud	Rabin Rijan Tarkari Tatha Falful Supplers	Bagbazar	9848728041
4.	Vegetable/potato/citrus	April 1	Ramesh Bahadur Bhandari	Bhandari Tarkari Tatha Falful Pasal	Bagbazar	9848731058
5.	Vegetable/potato/citrus	April 2	Laxmi Devi Ayer	Sarshoti and Prince Tarkari	Syaule	9842883636
6.	Vegetable/potato/citrus	April 2	Keshav Bagadur Khadayat	Madilek Tarkari Falful Supplaers	Bagbazar	9848871400
7.	Vegetable/potato/citrus	April 3	Tek Raj Paneru	Paneru Khudra Tatha Tarkari Pasal	Bagbazar	9848774114

Storage						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1.	Potato & Potato Seeds	March 29	Bhoraj Bhatta	Ugratara Seed Bhandar Pvt. Ltd	Bhatcada	9858751195

Government						
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Name of the business/organization/company**	**Address**	**Phone number**
1.	Potato, Vegetables, Citrus Fruit	March 30	Khemraj Paneru	Agriculture Knowledge Center	Tufandada	9848708811

Producer					
S.N.	**Value chain**	**Date of Interview**	**Name of the interviewee**	**Address**	**Phone number**
1.	Potato	March 29	Kabi Raj Awasthi	Taribata	9869446059
2.	Potato	March 29	Surendra Bahadur Budha	Taribata	9865683000
3.	Potato	March 29	Prasad Dutt Awasthi	Taribata	9848991560
4.	Potato	March 29	Dammari Devi Saud	Taribata	

ANNEX 6 – CROP CALENDAR

Figure 53 Crop Calendar of selected value chains in project cluster[88]

88 The Crop growing phase denotes the duration required for the crop to grow until first fruiting.

RAPID ASSESSMENT OF AGRICULTURAL VALUE CHAINS IN SUDURPASHCHIM AND KARNALI PROVINCES

Citation: Neeraj, Alina Adhikari, Aju Nyachhyon, Ashta Prajapati, Rakesh Kothari, Shradha Bhatta, and Mallika Thapa. Rep. *Rapid Assessment of Agricultural Value chains in Sudurpashchim and Karnali Provinces*. iDE Nepal. for GIZ GRAPE-LPED. July 2022.

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