





Sector Analysis Studies for the Commercial Agriculture for Smallholders and Agribusiness Programme

***Nepal:* Country Value Chain and Market Analysis Report FINAL**

Submitted to the IMC led EACDS Lot C framework (PO 7468) by LTS International Limited in partnership with Cardno Emerging Markets UK Limited

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Acronyms

|  |  |
| --- | --- |
| ADB | Asian Development Bank |
| ADS | Agricultural Development Strategy |
| AI | Artificial Insemination |
| ASEAN | Association of South-East Asian Nations |
| CASA | Commercial Agriculture for Smallholders and Agribusiness programme |
| CC | Collection Centre |
| CDC | Commonwealth Development Corporation |
| CEX | Commodity Exchange |
| DoA | Department of Agriculture |
| DFI | Development Finance Institution |
| DFID | UK Department For International Development |
| DFTQC | Department of Food Technology and Quality Control |
| FAO | Food and Agriculture Organisation |
| fob | Free on board |
| GDP | Gross Domestic Product |
| GMP | Good Manufacturing Practices |
| GoN | Government of Nepal |
| ha | Hectare |
| IATI | International Aid Transparency Initiative |
| ITC | International Trade Centre |
| kg | Kilogramme |
| LIFT | Livelihoods and Food Security Trust Fund |
| LTS | LTS International Limited |
| m | metre |
| MADB | Myanmar Agricultural Development Bank |
| MBRT | Methylene Blue Dye Reduction Test |
| MFI | Micro-Finance Institution |
| MIS | Market Information System |
| MoAD | Ministry of Agricultural Development |
| MPC | Milk Producing Cooperative |
| MRL | Maximum Residue Limit |
| MT | Metric Tonne |
| NGO | Non-government organisation |
| NPR | Nepalese Rupee |
| NRB | Nepal Rastra Bank |
| NTB | Non-Tariff Barrier |
| ODA | Official Development Assistance |
| OECD-DAC | Organisation for Economic Cooperation and Development – Development Assistance Committee |
| RDB | Refined, Bleached and De-odourised (oil) |
| RMP | Raw Milk Producer |
| SMAE | Small and Medium Agro-Enterprise |
| SME | Small and Medium Enterprise |
| SMIDB | Small and Medium Industrial Development Bank |
| SMP | Skimmed Milk Powder |
| SMS | Short Message Service |
| SNF | Solid Not Fat (test) |
| SPS | Sanitary Phyto-Sanitary |
| t | Tonne (metric) |
| TBT | Technical Barriers to Trade |
| ToR | Terms of Reference |
| UNDP | United Nations Development Programme |
| USAID | United States Agency for International Development |
| USD ($) | United States Dollar |
| VC | Value Chain |
| VCD | Value Chain Development |
| % | Percent |

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# Executive Summary

The Department for International Development (DFID) is in the process of finalising the Commercial Agriculture for Smallholders and Agribusiness programme (CASA). Fresh vegetable and dairy were selected as value chains that offer the most potential to increase economic opportunities for smallholder farmers in Nepal. The purpose of this Country Value Chain and Market Analysis Report is to provide examples of specific opportunities for intervention at the level of smallholder aggregation, supporting agribusinesses to prepare for investment and advancing enabling environment reforms to boost value chain growth and increase the ability of smallholders to participate in it.

Nepal is a low income country, classified as having ‘low’ fragility according to DFID, and a high proportion of the rural population live below the poverty line. Agriculture remains an important part of the economy, however, due to its mountainous topography only 21% of the land area is cultivatable and transport, especially in the hill and mountain zones, is challenging. On the other hand the three agro-climatic zones of lowland Terai, hills and high mountain, offer a comparative advantage for the production of some agricultural products.

The DFID funded Samarth rural market development programme is just completing its first five-year phase with a second phase due to start mid-2018. As Samarth has already supported similar activities within the vegetable and dairy value chains, it is proposed CASA funding could be used to finance all vegetable and dairy activities under Samarth Phase II.

**Fresh vegetables**

Vegetable are an important high-value crop, contributing 9.7% towards the Gross Domestic Product of Nepal. Vegetables provide subsistence for over 3.2 million families and are an important source of vitamins and minerals in the daily diet. Over 500,000 smallholders grow vegetables for the market covering an area of 280,807ha with the most common varieties being cauliflower, cabbage, onion and tomato.

Nepal has a comparative advantage in off-season vegetable production due to its climate. The hilly zone can continue to produce vegetables during the monsoon season when production in the lowland Terai of Nepal and India is not possible. Unmet domestic demand and import substitution could enable an additional 300,000 smallholder families to become commercial vegetable producers. Furthermore, Indian demand for fresh vegetables can be clearly seen from the increase in vegetable imports every year, which reached USD4.02 billion in 2015/16 from USD1.97 billion in 2011/12.

Women are most often responsible for small-scale vegetable production. Vegetable production is suitable for farmers with limited land as it produces high returns per square metre, however, can’t be located too far from consumption areas due to perishability. Poly-tunnels are now being introduced that can produce an income of USD300/week from a 1,500m² area, when used with irrigation and improved seeds. The controlled environment in the poly-tunnels makes vegetables more resilient to dry spells, likely to be more frequent and severe with climate change, and also decreases the use of agro-chemicals.

Smallholders sell the majority of fresh vegetables to local traders at collection centres, which then feed into the traditional supply chain for sale in regional wholesale markets. Little grading is carried out and the overall quality is low, with farmers receiving low average prices. The collection centres are often owned and managed by cooperatives, of which there are 189 specialising in fruit and vegetables. The collection centres have proved an effective way of aggregating smallholder produce and providing linkages to buyers.

The major constraints faced by the vegetable value chain are: a) unavailability of quality planting materials, b) poor producer knowledge on the use of fertilizers and pesticides, as well as poor soil fertility management, c) lack of irrigation facilities, d) labour shortages due to rural out-migration, e) high post-harvest losses due to improper handling and transportation, packaging, low-level technology, and poor facilities at collection centres, f) limited access to reliable market information, and g) failure to meet phyto-sanitary standards for export

Whilst traditional wholesale markets are an efficient means to supply lower end market segments, new market channels are emerging to supply the higher end market, which requires higher quality, better packaging and certification. A large proportion of this market segment is currently satisfied through imports. The new supply chain is characterised by the use of private ‘Packhouses’ owned by cooperatives or individual entrepreneurs with cooperative supply agreements. The packhouses provide support to farmer groups to ensure the quality and safety of vegetable production. At the packhouse, produce is cleaned, graded, packaged and kept in cold storage before distribution to retailers in urban centres.

High quality, labour intensive vegetable production offers potential to increase smallholder income, therefore, it is proposed to support development of the packhouse market channel. Smallholder vegetable producers will be reached through the packhouse operator they sell to, hence the packhouse is the key entry point. Smallholder vegetable production and quality will be increased through the provision of a demonstration poly-tunnel, drip irrigation, improved seeds and technical training for each collection centre ‘farmer cluster’. This will be managed by a Lead Farmer who will be trained to provide technical support to other farmers wishing to adopt the technology and the same farmers linked to financial service providers, if loans are required.

Collection centres could be upgraded to provide an early level of quality control and reduce post-harvest losses. Pesticide residue testing could be introduced to identify farmers who do not comply with maximum residue levels. Grading facilities will be provided at the collection centre and farmers paid accordingly. The packhouse could provide crates for transporting the produce from the collection centre to the packhouse and cold storage introduced, if necessary, to reduce post-harvest losses.

Packhouses could be upgraded through the introduction of hygienic washing equipment, packaging machinery and increased cold storage capacity, possibly on a cost-sharing basis. Technical assistance could be provided to prepare the packhouse and upstream suppliers for GlobalGAP certification.

Technical assistance could also be provided to improve the enabling environment. Indian authorities seldom recognise phyto-sanitary certificates issued by Nepalese quarantine offices, which causes uncertainty for vegetable exporters. A comprehensive plan is necessary to strengthen and harmonize Nepal’s SPS laboratories with regional and international standards in terms of provisioning equipment, test and certification capacity, human resources mobilization, co-location of facilities and improvement in the governance structure of such laboratories.

**Dairy**

Dairy contributes 8% towards Gross Domestic Product and 2.6 million farmers produce milk for home consumption as milk is an important source of calcium, protein and vitamin B. However, it is estimated 500,000 smallholder farmers produce milk for sale in the market and dairies employ over 130,000 people.

Dairy is ideal for smallholders as farmers with limited land can graze their cattle on common pasture or stall feed with bought in fodder. Women are mostly responsible for looking after dairy livestock and milking. Although smallholders own an average of two milking cows, smallholder dairying provides a daily income, there is a high demand for milk products in local and remote areas, processing and value addition are common practices (ghee, curd etc.), smallholder dairying does not require expensive inputs and cattle are considered to be investments and insurances against future financial needs.

Nepal produces over 1.8 million tonnes of milk a year and imports near USD12 million worth of dairy products a year (ITC, 2016). It is estimated the daily milk shortage amounts to 300-400 thousand litres/day and to meet this demand, there is a need for a minimum of 20,000 to 25,000 more smallholder farmers to be included as regular producers within the formal dairy value chain.

Most dairy farmers are members of cooperatives which provide collection centres with chilling vats to aggregate milk from its smallholder members for bulk collection by dairies. The collection centres have proved an effective way of linking smallholders to buyers and there are approximately 1,652 specialist dairy cooperatives across Nepal. The cooperative may transfer the chilled raw milk for processing at its own dairies, or sell on to private dairies. Cooperative or private dairies then pasteurise and further process the milk for sale to retailers and consumers. According to Nepal Dairy Association there are over 1,500 dairy processors within the country, of which fourteen are considered large with capacity to process over 10,000 litres/day. Around 100-150 dairies are of medium capacity with the ability to process 4,000 - 6,000 litres/day; and 100-150 dairies are small size with a capacity of 1,000 litres/day. The remaining 1,000 or so are cottage industries with a capacity of less than 100 litres/day.

Milk yields are low at about 10 litres/cow/day and milk cycle management poses several problems as demonstrated in ‘flush’ and ‘lean’ seasons where there is either over or under supply of raw milk. However, the quality of raw milk supplied by farmers to dairies is a major concern as it affects shelf-life and potential for processing. About 80% of the processed milk in Nepal is sold as pasteurized milk with only 20% being processed into value-added products such as yoghurt/curd, various cheeses, butter, ghee and ice-cream. Factors effecting quality include coagulation and souring due to lack of chilling facilities, high microbial content due to lack of hygiene and sanitation practices along the supply chain and adulteration with water, preservatives or not respecting milk withdrawal periods after administering veterinary medicines to the cows.

To improve milk quality along the supply chain, smallholder dairy farmers could be reached through the dairy they sell to; hence the dairy is the key entry point. Hygiene and sanitation training will be provided to farmers supplying the collection centre which the dairy sources from.

Collection centres hygiene and sanitation could be upgraded to provide an early level of quality control. Methylene Blue Dye Reduction Test and alcohol tests will be introduced in alignment with international standards as a basis for milk acceptance/rejection. Standards / quality grades will also be developed for milk quality based on butter fat and protein content testing at the collection centres.

Dairies could be upgraded to meet hygiene/sanitation standards. Additional cold storage and processing equipment will be introduced, possibly on a cost-sharing basis to add value and diversify dairy products produced. Technical assistance could be provided to prepare the dairy and upstream suppliers for Good Manufacturing Practice certification.

Technical assistance could also be provided to improve the enabling environment. This could include improving and amending the Food Act and laws and regulations associated with the dairy ‘Code of Conduct’; preparing national quality standards; and introducing a licensing scheme for dairies to formalise and regulate the sector and eradicate the sale of unfit for human consumption.

# Introduction

## Study Objectives

The Department for International Development (DFID) is in the process of finalising the Commercial Agriculture for Smallholders and Agribusiness programme (CASA). It is envisaged the programme will have four components: i) Country-level interventions; ii) Global knowledge and policy influencing activities; iii) Smallholder development facility; and iv) Community engagement activities.

The primary objective of this study is to enable DFID to identify the value chains, sub-national regions and stakeholders to form the basis for CASA’s country level interventions (Component 1) and to enable DFID to use this information to develop the Terms of Reference for the implementation of this component of the CASA programme. The studies are expected to:

* Identify two value chains in Sierra Leone, Mozambique, Uganda, Tanzania, Malawi, Myanmar and Nepal which offer the best potential to increase economic opportunities for smallholder farmers.
* Identify potential interventions within the recommended value chains which the programme could make to develop commercial agriculture in line with the CASA objectives and approach. The studies will identify opportunities to:
  + Establish, support or expand smallholder aggregation and access to markets, particularly for poorer farmers, women and those not currently engaged in commercial agriculture.
  + Support SME agribusinesses with significant smallholder supply chains to prepare for and attract early stage investment;
  + Support organisations which bring together stakeholders to advocate for regulatory reform and identify possible reforms which would boost growth in the value chain and increase the ability of smallholders to participate in it.

In addition to conducting sector analysis studies, findings from the studies will be synthesised into an overall recommended scope of activity for CASA in three countries of which one must be defined as a fragile or conflict affected state by DFID and one must be in Asia.[[1]](#footnote-2)

The purpose of this Country Value Chain and Market Analysis Report is to describe selected value chains and detailed rationale for their selection; provide examples of specific opportunities for intervention at the level of smallholder aggregation, supporting agribusinesses to prepare for investment and advancing enabling environment reforms; and describe the existing donor landscape of activities within the value chain.

## Methodology

This Country Value Chain and Market Analysis Report is largely the result of three weeks fieldwork carried out between 14th August and 1st September, 2017. The majority of the field work was carried out by the Study Country Lead, with support provided by the Core Consultant who also directly participated in the field work between 27th August and 1st September in Nepal.

The subject of the fieldwork, the fresh vegetable and dairy value chains, were selected through a desk-based short-listing and scoring process. Firstly a long-list of value chains was prepared based on area grown and value of production. The long-list was assessed using ‘Inclusion Criteria’ to create a short-list (Ref: Value Chain Short-List Report). The short-list was then assessed using a weighted scoring matrix (Ref: Short-Listed Value Chain Scoring Report) with the top two ranked value chains selected to undergo detailed fieldwork. The results of the ranking were shared and agreed with DFID Senior Advisors and Country Offices before the fieldwork could take place.

A Research Framework was prepared to guide semi-structured interviews and focus group discussions carried out during the fieldwork. The Research Framework was reviewed by DFID Senior Advisors and revised accordingly before use in the field.

The fieldwork involved travelling to main production areas and consulting with stakeholders such as:

* Private sector investors, banks, private equity funds, impact investors, DFIs (e.g. CDC), AgDevCo, multinational companies;
* Agribusinesses that are active in the value chain, small and large
* Farmers, producer organisations, cooperatives and other organisations representing smallholders in the value chain;
* Key government officials from the Ministry of Agriculture, Ministry of Trade and other relevant ministries
* NGOs and civil society organisations active in the value chain and in supporting smallholder’s access markets
* DFID country office advisers and staff from relevant commercial agriculture programmes
* Other donors are active in commercial agriculture and the proposed value chains

A full list of persons met is included in Annex A and documents reviewed are listed in Annex B.

Towards the end of the fieldwork a Review Workshop was held in Kathmandu with key value chain stakeholders on 1st September 2017. The purpose of the workshop was to solicit feedback on the proposed interventions.

## Limitations

The purpose of this Country Value Chain and Market Analysis Report is to provide examples of specific opportunities for intervention at the level of smallholder aggregation, supporting agribusinesses to prepare for investment and advancing enabling environment reforms to boost value chain growth and increase the ability of smallholders to participate in it.

Due to the limited time availability and budget, we had to first narrow the scope of the research to two value chains. This decision was based on desk research and the interests of DFID country offices and CASA focal staff at DFID in the UK. Given the short timeframes and the extensive terms of reference, there was limited scope to adjust these chains once fieldwork was underway. The fieldwork was conducted over a period of three weeks and could only focus on a limited number of geographic areas; limited stakeholder consultations and secondary data sources have been utilised to quickly identify possible opportunities for intervention for the CASA programme. Fieldwork review workshops have been conducted to gather stakeholder feedback on the findings and the identified opportunities.

Given the time and resource constraints it was not feasible to undertake detailed design or due diligence on the intervention opportunities identified. Detailed projections of intervention beneficiaries and income changes will also require more detailed design and will not be covered in the scope of this report. It is likely that other entry points and design options could be explored with more time for research and consultation. However, to meet the requirements of the terms of reference assumption-based calculations have been included. It is likely that these will be subject to amendment once detailed design work is undertaken by the CASA programme. All market systems interventions take place in complex environments where certainty about the types of actions which will generate intended results is limited – iterative and adaptive approaches to planning, target setting and implementation are recommended.

# Background

## Socio-Economic Setting

Nepal is classified as a low income country with a Gross Domestic Product (GDP) of USD21.14 billion, a land area of 147,180 km² and a population of 28.33 million growing at 1.4% per annum. The urban population remains very low at 19%. Forty-six percent of the population are aged below 20 years and there has been an increasing out-migration of youth from rural areas for the past 10 years.[[2]](#footnote-3)

Nepal has a Human Development Index of 0.558 and is ranked 144th out of 185 countries (UNDP 2014). Gross National Income (GNI) per capita is US$730 and GDP growth in 2016 was 0.8%. The proportion of population living below the poverty line remains high at 25%, with poverty in rural areas reaching as high as 45% in the Western Region.[[3]](#footnote-4)

Locked between India and China, at the feet of the Himalaya, Nepal has historically been among the poorest and most remote countries in the world. After the end of the civil conflict in 2006, the country has embarked on a number of reforms and investments that have slowly improved the competitiveness of the country and reduced poverty.

However, the pace of economic transformation in Nepal has been slow. The agriculture sector contributed 32% towards GDP in 2016 and is declining, compared with industry and service sectors which contributed 14% and 54% respectively.[[4]](#footnote-5) While there have been developments in infrastructure, energy, manufacturing and service sectors; agriculture still remains as one of the most important sectors of the country accounting for 68% of employment (ILO) and provides a significant share of exports.

## Agriculture Sector Performance

Due to its mountainous topography, only 21% of Nepal is cultivatable, however, it is richly endowed with agro-biodiversity. Rice, maize, millet, wheat, barley and buckwheat are the major staple food crops. Important cash crops include oilseeds, potato, pulses, livestock and horticulture; particularly off-season temperate fruit and vegetables. Important livestock products are milk, yoghurt, cheese, ghee, Chhurpi, meat, eggs and poultry. A summary of main agricultural output is provided in Table 1.

Table 1 Agricultural Output

|  |  |  |  |
| --- | --- | --- | --- |
| **Product** | **Area Planted (‘000ha)** | **Production**  **(‘000 MT)** | **Production Value**  **(‘000 $)** |
| Rice  Maize  Wheat  Millet  Fresh vegetables  Oil seeds  Lentil  Fresh fruit  Sugar cane  Pulses  Barley  Ginger | 1,363  892  754  271  255  207  206  110  66  31  28  24 | 4,299  2,232  1,883  304  3,929  182  253  965  2,998  33  35  276 | 1,406,410  323,450  297,127  55,179  644,633  56,551  92,628  336,833  98,445  18,240  4,143  187,018 |
| Cattle (head)  Buffalo (head) | 7,243,916  5,178,612 | Milk 532  Milk 1,167 | Meat 138,249; Milk 166,110  Meat 568,090; Milk 465,791 |

Source: FAOSTAT 2014

Average farm size is decreasing and is currently estimated at 0.7ha; however, 52% of farms are less than 0.5ha.[[5]](#footnote-6)

There are three main farming systems. The Terai region is a flat plain in the south running from east to west with an elevation ranging from 60 to 300m and is the most productive of the three agro-climatic zones. Over 50% of cultivated land is irrigated and most of this is in the Terai region. The Terai has a tropical to sub-tropical climate with the main tropical region in the east, and drier areas in the west. Rice/wheat is the most dominant cropping combination pattern in these regions but sugarcane, pulses, oilseeds and vegetables are also grown here.

The hill region is a wide belt of land aligned east to west in the middle part of Nepal. The elevation ranges from 300 to 2000 m. The hill region cropping pattern constitutes rice/wheat cultivation in the irrigated lands and maize/millet or maize/soybean in the rain-fed lands.

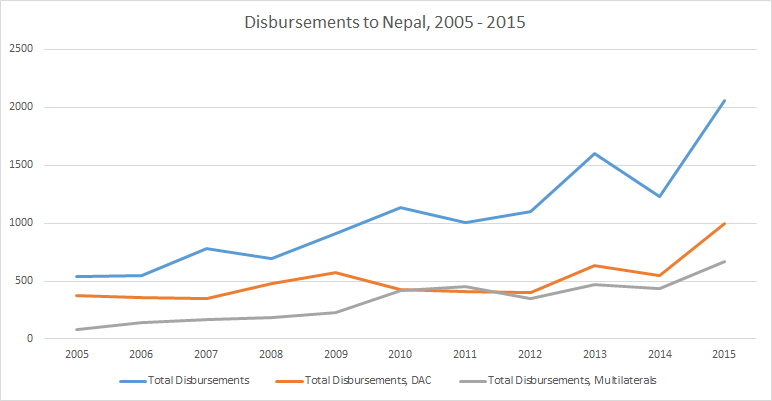
The mountain region occurs at elevations above 2000 m and has a dry and cool climate. In these high mountain areas cattle are raised on open pasture and short duration crops like potato, buckwheat, barley and mustard are grown mostly in the summer.

Agricultural growth is less than 3% and whilst Nepal exported agricultural goods worth USD269 million in 2013/14, its agricultural imports amounted to USD1.3 billion for the same period.[[6]](#footnote-7) Productivity and competitiveness of the agriculture sector are low, adoption of improved technology is limited and even though most cultivated area is devoted to cereals, there is a growing food trade deficit and malnutrition is high. Nonetheless, some sub-sectors such as dairy processing, poultry, spices and vegetable are showing some dynamism.[[7]](#footnote-8)

## Donor Landscape

Official Development Assistance (ODA) disbursements to Nepal have steadily increased over the last decade, and now exceeds USD 2 billion. Overall, there has been a 297% increase in disbursements between 2005 and 2015 (Figure 1).

Figure 1 Official Development Assistance Disbursements Nepal 2005-2012

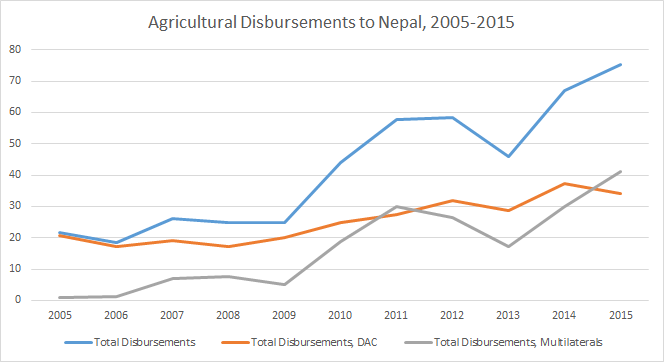


The spike between 2014 (USD 1.2bn) and 2015 (USD 2bn) can be partly explained by the sharp increase in humanitarian assistance, which rose from USD 15.7 million in 2014 to USD 246.7 million in 2015; very likely as a response to the earthquake which hit Nepal in April 2015.

Roughly half of funding to Nepal stems from the thirty OECD-DAC donors, who - when averaged between 2005 and 2015 - account for roughly 50% of funding. Using the latest OECD Common Reporting Standard figures (2015) the five largest donors are: the World Bank ($298m), the Asian Development Bank ($164m), the United States ($162m), the United Kingdom ($135m) and Norway ($61m).

Agricultural ODA disbursements steadily increased between 2005 ($21.8m) and 2015 ($75m) as presented in Figure 2. Between the same years, the amount of, and percentage of total, funding from multilaterals has rapidly increased. In 2005, multilaterals only accounted for roughly 4% of agricultural funding but by 2015 this had increased to roughly 55%. This can partly be explained by a significant increase by funds from both the World Bank, who increased their disbursements from roughly $0.9m to $26.7, and the Asian Development Bank, who increased from zero to $11.4m.

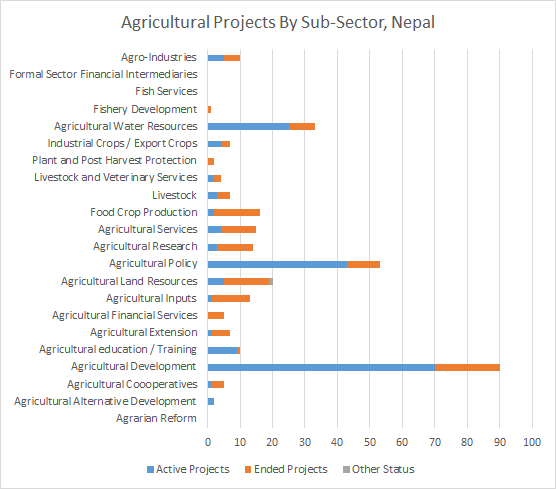
Figure 2 Agricultural ODA disbursements to Nepal 2005-2015



The five largest agricultural donors are: the World Bank ($26.7 million), the United States ($15 million), the Asian Development Bank ($11.4 million), Switzerland ($7.4 million) and Norway ($3 million).

There are 353 agricultural projects on IATI, of which 103 are listed as active. The highest concentration of projects are within the sub-sectors: “agricultural development”, “agricultural policy” and “agricultural water resources” and, as expected, the largest number of active projects are also within those three sub-sectors (Figure 3).

Figure 3 Nepal Agricultural Projects on IATI by Subsector



Evaluating the active projects most relevant to market access and commercialisation, it seems that most relate to strengthening Nepalese agricultural infrastructure. The Ministry of Foreign Affairs in Denmark are investing in agriculturally related infrastructure in Eastern rural Nepal, which extends to activities like rural roads, bridges and market infrastructure. Meanwhile, the World Bank are - among other things - investing in strengthening industry-wide partnerships along value chains, with the objective of forging better ties between producers, traders, processors and other stakeholders. Additionally, the Canadian International Development Research Centre have committed roughly CAD$750k to test terrace farming innovations, offer strategies for NGOs to improve food security and help 100,000 Nepalese entrepreneurs established / grow start-up companies to sell products. Lastly, the World Bank - through two projects - is channelling a combined $156.5m into Nepal for irrigation infrastructure and water resource management across dozens of locations. Specific donor projects related to smallholder commercialisation include the following:

|  |  |  |  |
| --- | --- | --- | --- |
| **Donor** | **Project** | **Duration** | **Budget** |
| World Bank | Project for Agriculture Commercialisation and Trade (PACT) | 2009-18 | USD23 million |
| DFID | SAMARTH II | 2018 - |  |
| Danida | UNATTI Inclusive Growth Programme | 2014-18 | DKK 400 million |
| USAID | Sustainable Action for Resilience and Food Security (SABAL) | 2014-19 | USD 59 million |

# Production and Consumption

## Fresh Vegetables

Although vegetables are the fourth largest crop grown by area after staple cereals, they are the second largest for value, after rice. Vegetables are emerging as important high value crops in Nepal. It is estimated the vegetable sub-sector involves some 500,000 households and contributes 9.7% to annual GDP. Approximately 280,807ha of vegetables were planted during the 2015/16 season. Main vegetables grown are shown in Table 2.

Table 2 Main Vegetables Grown

|  |  |  |
| --- | --- | --- |
| **Vegetable** | **Area Grown**  **(ha)** | **Quantity Harvested**  **(tonnes)** |
| **Cauliflower**  **Cabbage**  **Onion**  **Tomato**  **Radish**  **Broad Mustard Leaf**  **Carrot** | 34,967  28,071  20,070  20,046  16,916  12,792  2,934 | 550,049  484,037  238,591  386,825  268,120  151,775  37,725 |

Source: MoAD (2017) Statistical Information on Nepalese Agriculture 2015/16, GoN

However there is scope to significantly increase production. Over USD65 million of fresh vegetables are imported a year (ITC 2016) as can be seen in the Kalimati wholesale market, where 31% of produce sold is imported from India.

Smallholders account for almost all vegetable production in Nepal. It is estimated vegetable farming is an important source of subsistence for over 3.2 million families, however the majority (90%) of producers have less than 0.5ha of land available and grow mainly for subsistence, with only 18% growing for the market and only 5% deriving their main income from vegetables (7% in the hills and 4.5% in the Terai).

For 12% of growers, vegetable farming (income and consumption) sustains them all year round, with a further 37% being sustained for 4-6 months. The Teraiand hill areas produce 96% of the vegetables, with the Terai producing 57% and the hills 39% of total vegetable production.

Off-season vegetable production is now being recognised as an opportunity for Nepal due to its comparative advantage in climate. Between July and September, the agro-climatic conditions in the Terai plains of Nepal and India become unsuitable for vegetable cultivation due to water logging and flooding brought about by the monsoon, however cultivation is possible in the higher hill areas of Nepal. Tomato, cauliflower, cabbage, cucumber, onion and chili are the major off-season vegetables grown in the hill areas that can be sold to domestic consumers in the Terai or exported to India for premium prices. Indian demand for fresh vegetables can be clearly seen from the increase in vegetable imports in India every year, which reached US$4.02 billion in 2015/16 from US$1.97 billion in 2011/12.

The major constraints of the sector are: a) unavailability of quality planting materials, b) lack of knowledge among the producers of the proper usage of fertilizers and pesticides, as well as poor soil fertility management, c) lack of irrigation facilities, d) labour shortage, e) high postharvest loss due to improper handling, transportation, packaging, low-level technology, and poor facilities at collection centres, f) limited access to reliable market information, and g) failure to meet SPS standards for export.

Although the consumption of vegetables in Nepal is increasing because of rising urban incomes, the per capita consumption of vegetables is still very low at 101 kg per person/year (FAO). Seasonal price variations show there is an immense unmet demand for vegetables in the country and analysis conducted by IDE (Jobs in Agriculture Study, 2009) indicated that unmet domestic demand and import substitution could enable an additional 300,000 smallholder families to become commercial vegetable producers. There is even larger potential for vegetable exports.[[8]](#footnote-9)

Seasonal vegetable prices are shown in Figure 4. Overall prices are higher between April and October and lower between November and March.

Figure 4 Monthly Vegetable Prices 2016

Source: Kalimati Fruit and Vegetable Market Development Board

Figure 5 shows average current vegetable prices over the past five years. Although there has been an overall increase in vegetable prices since 2013, if inflation is accounted for, which has varied between 7% and 9% over these years, real prices haven’t increased at all.

Figure 5 Year on Year Vegetable Prices

Source: Kalimati Fruit and Vegetable Market Development Board

## Dairy

Milk is produced by both cattle and buffaloes. The number of milking cows and volume of milk production is summarized in Table 3.

Table 3 Dairy Livestock Production

|  |  |  |
| --- | --- | --- |
| **Dairy Livestock** | **Head** | **Milk Produced**  **(MT)** |
| **Cattle**  **Buffalo** | 1,026,135  1,355,384 | 643,806  1,210,441 |

Source: MoAD (2017) Statistical Information on Nepalese Agriculture 2015/16, GoN

Nepal produces over 1.8 million tonnes of milk a year and imports near USD12 million worth of dairy products a year (ITC, 2016). It is estimated the daily milk shortage amounts to 300-400 thousand litres/day and to meet this demand, there is a need for a minimum of 20,000 to 25,000 more smallholder farmers to be included as regular producers within the formal dairy value chain.

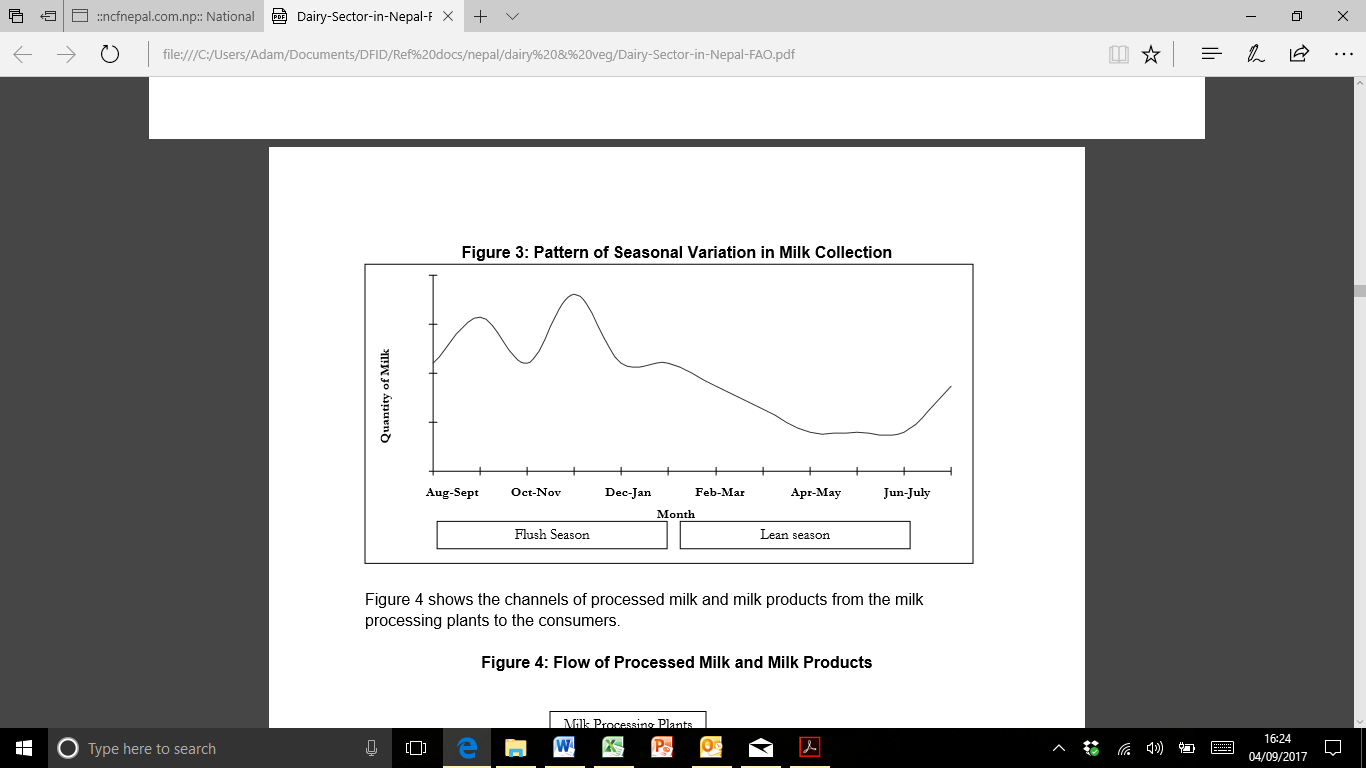
The majority of cattle and buffalo are located in the Eastern and Central Region in the Terai and hill zones. The dairy sector in Nepal contributes roughly 8% of GDP and is a major component of agricultural GDP. It is estimated there are 500,000 smallholder farmers are engaged in the formal dairy channel as producers and suppliers and an additional 2.6 million farmers produce milk for home consumption. The sector also employs over 130,000 people.[[9]](#footnote-10)

The majority of dairy cattle are Holstein and Jersey crosses and average ownership is two dairy animals per household. Milk yields are low at 1,821 litres/lactation for cattle and 1,288 litres/lactation for buffalo. Low yields are largely blamed on poor nutrition and health. Average milk produced by milk producing households is 11.05 litres/day, of which 9.36 litres/day is sold. The annual mean household income from milk sales is estimated at NRP 160,680 (USD1,607).[[10]](#footnote-11)

Milk consumption in Nepal is estimated at 58 litres/person/year, whilst FAO recommends a minimum milk consumption of 93 litres/milk/person/year. Nonetheless demand is increasing and there has been a sharp and sustained increase in the import of semi-processed milk and Skimmed Milk Powder (SMP), indicating a growing unmet demand.

A major challenge for dairy management is the milk cycle which produces ‘flush’ and ‘lean’ seasons as shown in Figure 6. Whist demand for milk is constant throughout the year, supply fluctuates considerably.

Figure 6 Dairy Flush and Lean Seasons



Source: Practical Action 2012

Fluctuations can be levelled out through scheduled calving and the use of concentrate feeds and preserved forage during the dry season, although this does raise production costs. If not, lean season supply deficiencies are met through imports.

A major constraint in the dairy supply chain is the quality of raw milk supplied by farmers to dairies which effects shelf-life and potential for processing. Factors effecting quality include coagulation and souring due to lack of chilling facilities, high microbial content due to lack of hygiene and sanitation practices along the supply chain and not respecting milk withdrawal periods after administering veterinary medicines to the cows.

Contamination of raw milk due to poor milking methods, inadequate cleaning of milk equipment and poor personal hygiene and subsequent multiplication of the micro-organisms over time is severe. Raw milk is often delivered to collection centres after three hours and to prevent deterioration preservatives are added. Management of collection centres is very poor in all respects of Good Manufacturing Practice (GMP) requirements. There is inadequate awareness and lack of specific knowledge and skills in handling milk among the collection centre personnel. The infrastructure, utensils, equipment and facilities at collection centres are of primitive state, many of them of non-food grade that are likely to further add contaminants to collected bulk milk.

Methylene Blue Dye Reduction Test (MBRT) appears to be the most reliable test for screening milk samples for quality. In the process of adoption of GMP, participatory development of voluntary standards first and the incentives accrued from reduced spoilage and enhanced shelf-life of milk products will help prepare market actors to become proactive in preparing and enforcing mandatory standards and legislative measures for regulating the raw milk quality.[[11]](#footnote-12)

# Development Characteristics

## Gender

Agricultural and forestry sectors in Nepal, account for 34% of GDP and employing 68% of Nepal's population. One study indicates that in 2010, 72.8% per cent of women and 60.2% of men were engaged in agricultural activities.[[12]](#footnote-13) However, participation in farming varies widely by region, gender, caste and ethnicity.[[13]](#footnote-14)

Gender roles in agriculture likewise vary enormously. Significant male out-migration for employment opportunities is shifting agricultural labour to women. Women generally perform the same agricultural activities conducted by men - apart from ploughing - and women often provide more agricultural labour. A key driver of feminization processes is men taking advantage of off-farm work opportunities, and male outmigration (In some cases, women are adopting less intensive farming practices, as well as abandoning their agricultural lands. In such cases, there can be a reduction in food production, causing food shortages. However, in other cases, overall household wealth is improved due to support given by remittances.[[14]](#footnote-15)

Studies on women's decision-making power suggest that women in many rural households, particularly in extended families, experience low agency. Women tend to have less education, fewer assets, less access to finance, limited decision-making authority, higher rates of illiteracy, and weak knowledge of their legal rights. Cultural norms ensure that women, rather than men, are responsible for household and care work.[[15]](#footnote-16) In 2011, 28.2% of all households were headed by women.[[16]](#footnote-17) In de jure and de facto women headed households, and in nuclear households, women can experience significant decision-making power. In many locations, women initiate discussions with men on farming, and share experiences, messages, and ideas readily with other women. Membership in farmer groups increases propensity to adopt improved varieties, as does training in improved technologies. Younger farmers, better educated farmers, larger households, and nearness to extension services all positively influence adoption whereas migrant off-farm work and the converse of all these factors reduces it.

**Fresh Vegetables**

Women often manage vegetable gardens (alongside, increasingly, cereals, livestock, and micro-businesses) and have historically played a key role in managing vegetable seed flow and genetic diversity[[17]](#footnote-18) Women are increasingly selling their produce, see themselves as professional farmers[[18]](#footnote-19) and actively seek agricultural information. At the same time, a study in mid-hills showed non-migrant men are increasingly taking a lead in commercial vegetable production with great differences in women's participation by caste[[19]](#footnote-20). Despite the importance of home gardens, their small size means that they have often been overlooked by policymakers and planners and thus not linked to broader commercialisation initiatives. There is therefore scope to promote women’s economic empowerment via the development of the vegetable value chain by focusing growing production, improving aggregation and marketing.

**Dairy**

In the Nepalese dairy sector. women are typically responsible for forage collection and transportation, cleaning the gutter and sheds, and feeding animals. Men are mostly though not exclusively involved in milking cows and selling milk[[20]](#footnote-21). However, these roles can be shared. Indeed, women are increasingly taking over all responsibilities in the absence of men[[21]](#footnote-22). Although women are involved in all aspects of dairy, their participation in dairy projects run by rural advisory services or donors is generally low. Therefore specific targeting of women by dairy producer organisations and extension services would be needed alongside work on intra-household dynamics in the value chain to promote the contribution of chain development activities to gender equality.

## Nutrition

About 28.6% of Nepal’s population is poor, with 9.6% suffering from “severe poverty.”[[22]](#footnote-23) The 2016 Global Hunger Index scores Nepal at 21.9, which is considered “serious”. Key factors contributing to that score include:

* 7.8% of the population is considered undernourished;
* 11.3% prevalence of wasting of children under 5 years;
* 37.4% prevalence of stunting among children under 5 years; and
* 3.6% mortality rate for children under 5 years.[[23]](#footnote-24)

Poverty is highest in rural areas, concentrated in the Western and Mid-Western Development regions of the country.[[24]](#footnote-25)

**Fresh Vegetables**

Vegetables play an important role in maintaining food security. Vegetables provide micro-nutrients, vitamins, minerals, fibre, and slow-release carbohydrates.[[25]](#footnote-26) On average, Nepalese households sell a little over half of the amount produced. Minimum per capita per day requirement of vegetables is 300 gm. Compared to this recommendation, consumption in Nepal is low with a deficiency of 60%.[[26]](#footnote-27)

Women’s Empowerment in Agriculture Index (WEAI) findings show a significant and positive association between women’s autonomy in agricultural production and almost all maternal and child outcomes including improved child nutrition. However, these associations do not pertain to women's own nutrition. An analysis of Nepal Demographic Health Survey (2006) data regarding women's participation in intra-household decision-making in relation to her own health care, making major household purchases, making purchases for daily household needs, and visits to her family or relatives showed that 37% of currently married women participated in all four decisions whilst 31% did not participate in any of them. Similar findings are reported by other researchers.[[27]](#footnote-28) Interventions to increase the nutritional impact of vegetable production should focus on strengthening women's entitlements to nutritious food, as well as that of children, within nuclear and extended households and not just upon maximising income from vegetable sales. Specific targeting to include groups that have significantly lower levels of income, seek health services less frequently, and subsequently suffer poor health and nutrition outcomes compared to other groups. A large number of studies have linked women’s income and greater bargaining power within the family to improved nutritional status, which in turn influences health outcomes and educational attainment.[[28]](#footnote-29)

**Dairy**

The cash needs of the farm families are met through the sale of milk, yoghurt, cheese, and ghee.[[29]](#footnote-30) Information about the volume that an average household consumes versus sells could not be found. However, milk contains numerous nutrients and it makes a significant contribution to meeting the body’s needs for calcium, magnesium, selenium, riboflavin, vitamin B12 and pantothenic acid (vitamin B5). Ensuring the safety of milk and dairy products is important to maintaining their nutritional values. Dairy production programmes have been found to be more effective in improving nutrition if they are targeted to women, include breeding improvements and awareness-raising on the nutritional value of milk. School-based programmes can also include children’s body composition and micronutrient status.[[30]](#footnote-31)

## Climate Change

Nepal is highly vulnerable to climate change. It is considered at “high risk” from climate change impacts over within the next three years, fourth among 16 countries.[[31]](#footnote-32) Given that it is a net importer of food it is essential that a productive and sustainable agricultural system is implemented to ensure food security for an ever-growing population. However, although agriculture is a significant contributor to the economy, the national agricultural research services lack sufficient capacity for timely delivery of location-specific agricultural technologies on a large scale.

A major portion of Nepal is mountainous; the country is home to 8 of the 10 highest mountains in the world, including Mount Everest.[[32]](#footnote-33) In addition, glaciers cover about 9.6% of Nepal’s total land area. Naturally, glaciers are particularly susceptible to changing temperatures.

Nepal is experiencing rising temperatures of 0.04-0.09◦C per year, including greater warming at higher altitudes. Warmer temperatures accelerate the melting of glaciers, creating glacial lakes, some of which may burst and cause flash floods in lower valleys. Glacial lake outburst floods may be one of the most important water-induced hazards in Nepal, with the potential to cause large socio-economic impacts in the country. Since women are so prominent in agriculture, both in livestock and vegetables, yet have lower decision-making power and lower access to resources, they are likely to find it harder to adapt to climate changes.[[33]](#footnote-34)

**Fresh Vegetables**

Climate change presents an important threat to production due to Nepal's general vulnerability to climate change.[[34]](#footnote-35) Vegetables are sensitive to extreme environmental conditions, and so high temperatures and reduced soil moisture are the major causes of low yields.. Increased UV radiation also impacts vegetable production. One study reported that farmers felt winter temperatures had increased affecting germination and development. Earlier planting is resulting in earlier harvesting but plants are more vulnerable to drought, pests and diseases. The latter is increasing pesticide use.[[35]](#footnote-36)

**Dairy**

A study of small farmers found that the majority thought productivity of dairy cows had declined as temperatures had risen.[[36]](#footnote-37) Other studies expect significant impacts ascribable to climate change because the productivity of livestock and availability of natural resources that support livestock are sensitive to climate change, affecting the areas of land suitable for livestock production. In Nepal, generally livestock-dependent communities are in regions highly prone to climate change. Dairy cows are more vulnerable than meat breeds to heat stress, poor nutrition and disease.

# Market Linkages

## Spatial Commodity Flows

Although there are some regional variations, both vegetables and dairy are widely grown across Nepal. Main consumption centres in the Central Region are Kathmandu (1,442,271 persons), Patan (183,310 persons), Birgunj (133,238 persons), Baratpur (107,157 persons) and Janakpur Dham (93,767 persons). Consumption centres in the Western Region are Pokhara (200,000 persons), Butwal (91,733 persons); and in the Eastern Region Biratnagar (182,324 persons) and Dharan Bazar (108,600 persons) as highlighted in Figure 7. These consumption centres are highlighted in red on the map below. Apart from the Kathmandu and Pokhara in the hilly zone, the other centres are along the border with India and are connected to the production areas in the hinterland by the north-south and east-west road network.

Figure 7 Main Consumption Areas in Nepal

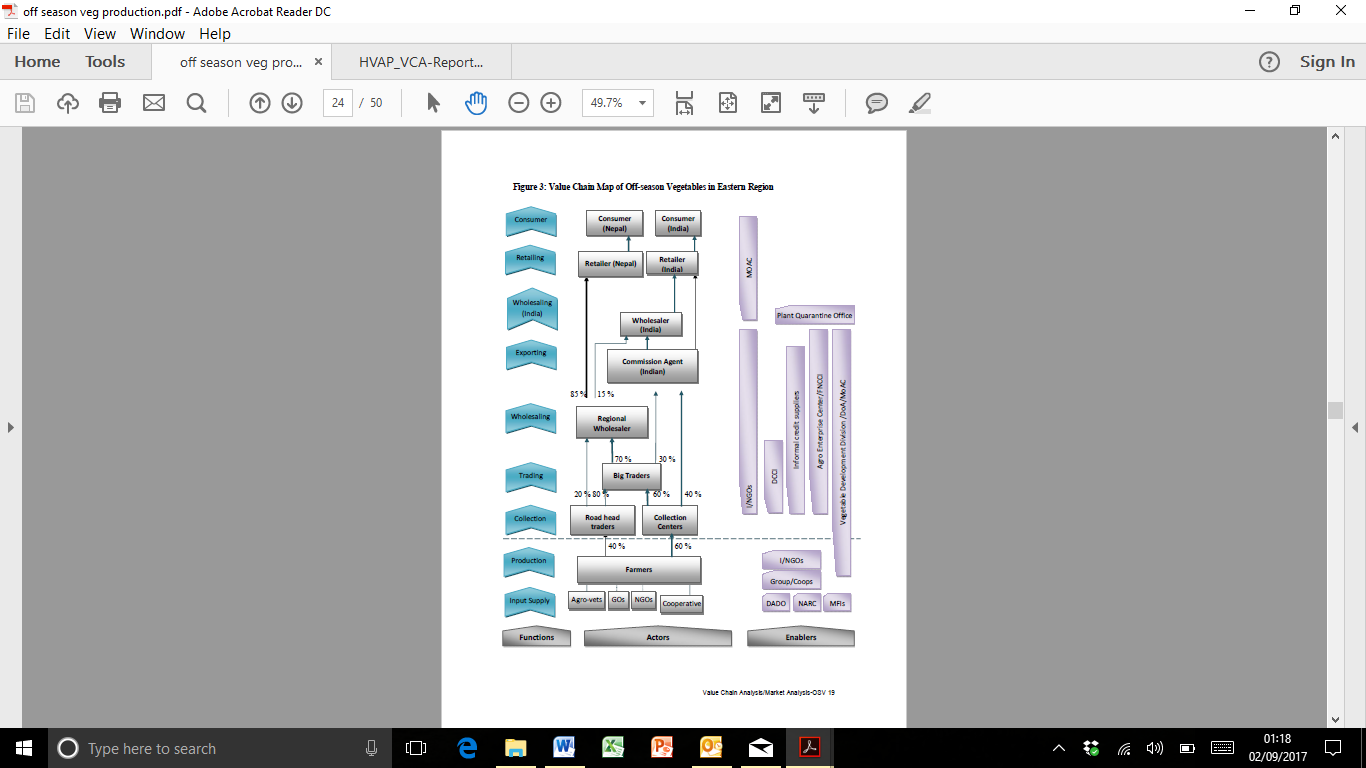
[](https://www.google.co.uk/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&ved=0ahUKEwjU7bbfwfzVAhWKKZQKHZ96C-UQjRwIBw&url=http://joltframework.com/nepal-maps.html&psig=AFQjCNGjNCl1NMbSd5FJIXDEilUXFISB-A&ust=1504098423482846)

Main urban centres

## Institutional Commodity Flows

Figure 8 provides a summary of the institutional commodity flows for fresh vegetables. Collection centres are an important means of aggregating produce and wholesalers/traders source 60% of produce via collection centres. The remaining 40% is sold through ’road-head’ traders, or local collectors, who will then sell 80% of their produce to the wholesalers/traders. Although some produce may be retailed for local consumption, the majority will be sold through a regional wholesale market to retailers.

Figure 8 Institutional Commodity Flow for Vegetables

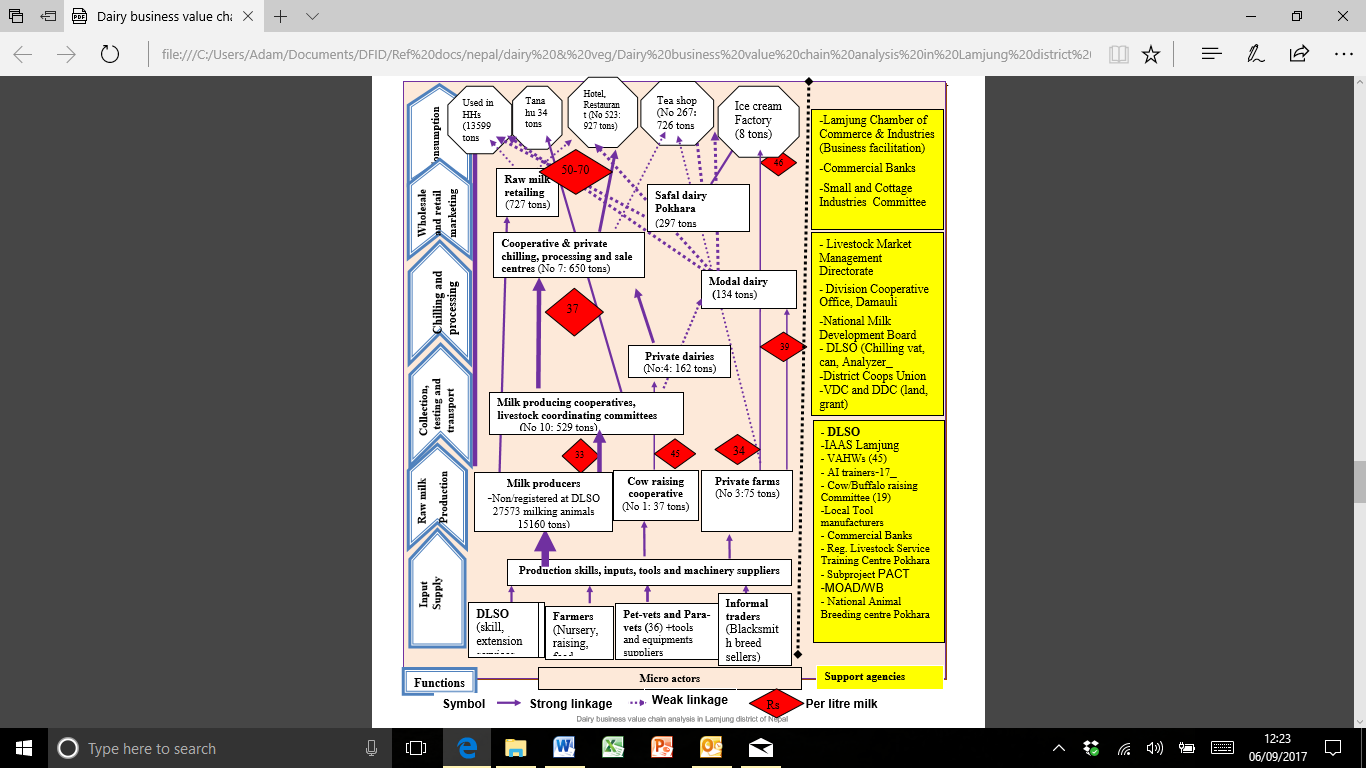


Source: USAID (2011) *Value Chain / Market Analysis of the Off-Season Vegetable Sub-Sector in Nepal*

Figure 9 provides a summary of the institutional commodity for milk. Most dairy farmers are members of cooperatives who provide collection centres with chilling vats to aggregate milk for bulk collection. The cooperative may transfer the chilled raw milk for processing at its own dairies or sell on to private dairies. Cooperative or private dairies then pasteurise and further process the milk for sale to retailers and consumers.

Of an estimated 1.45 million tonnes of milk produced annually, 65% is retained in the household level whilst 20% is sold through the unorganized rural and urban sectors and 15% is processed in the organized public and private sector.

Figure 9 Institutional Commodity Flow for Milk



Source: Practical Action (2012) *Dairy Sub-Sector: Analysis and Vision*, SAMARTH

### Stakeholder Analysis

*Farm Input Suppliers.*Farmers procure their vegetable seed, fertilisers, sprays, animal feeds and medicines from small district-based ‘Agro-vets’ who provide some extension advice but have limited capacity to provide embedded services.

*Smallholder Farmers.*Smallholders lack access to inputs, technology, finance, and knowledge. Although vegetable production volumes are small, profitability per square metre is high and smallholders are well suited to vegetable production which requires limited areas of land, is labour intensive and utilises family labour.

Dairy farming is widely practiced by smallholders across all geographical regions in Nepal including Yak milk production in the higher alpine areas. Dairy farming is ideal for smallholders as animals can be grazed on common pasture or stall fed and milk sales provides daily income.

*Vegetable Cooperatives and Collection Centres.* Marketing cooperatives that manage local collection centres are an important mechanism for aggregating smallholder produce. The cooperatives also provide technical assistance, finance, links with traders and carry out an important lobbying role with government.

*Dairy Cooperatives and Collection Centres:* In Nepal, most of the milk collection centres are managed by farmers’ cooperatives. Due to small production unit, inadequate rural infrastructure, scattered small farms, it’s practically impossible to sell small amounts of milk produced by small farmers to commercial dairy processors, therefore, collection centres provide a crucial role in smallholder dairy sector. Some collection centres provide a ‘Pass Book’ for all raw milk suppliers to record volumes supplied and also test the milk for temperature, butterfat and Solid Not Fat (SNF) content. Many dairy cooperatives in Nepal are now heading towards diversifying their function through engaging in small scale milk processing and product diversification to tap the local market opportunity.

The lack of basic infrastructure like dairy equipment, uninterrupted electricity, road network and information on quality are major constraints at collection centres. Many processors complain the deterioration of milk quality at collection centre due to mishandling. Alternatively, many milk collectors complain milk deterioration at farm level due to unhygienic practice.

*Dairy processers:* According to Nepal Dairy Association there are over 1,500 dairy processors within the country, out of which five have capacity to process over 50,000 litres/day and employ up to 150 staff (DDC, Sujal Dairy, Chitwan Milk, Sita Ram Gokul and Himalayan Dairy) and nine over 10,000 litres/day capacity. Around 100-150 dairies are of medium capacity with the ability to process 4,000 - 6,000 litres/day; another 100-150 are small size with a capacity of 1,000 litres/day and the remaining 1,000 or so are cottage industries with a capacity of less than 100 litres/day.

Only 20% of raw milk is processed into products such as yoghurt/curd, various cheeses, butter, ghee and ice-cream

## Financial Performance along the Marketing Chain

**Vegetables**

Table 4 shows margins along the tomato marketing chain if supplying the traditional wholesale market. Margins are quite high for collectors, wholesalers and retailers due to the high percentage of post-harvest losses,

Table 4 Margins Along the Tomato Marketing Chain (NPR/kg)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Farmers** | | **Collection Centre** | | **Wholesale** | | **Retail** | |
| **Item** | **Cost**  **(NPR)** | **Item** | **Cost**  **(NPR)** | **Item** | **Cost (NPR)** | **Item** | **Cost (NPR)** |
| Production |  | Collection cost | 0.5 | Trucking | 2 | Market charge | 0.2 |
| Seedling | 0.75 | Purchase | 18 | Load / unload | 0.25 | Transport | 0.25 |
| Fertilizers | 1.25 | Others | 0.25 | Taxes | 0.15 | Others | 0.25 |
| Pesticides | 0.8 | - | - | Purchase | 20.62 | Purchase | 26.76 |
| Labour | 3 | - | - | Purchase | 0.25 | - | - |
| Staking | 2.5 | - | - | - | - | - | - |
| Others | 0.25 | - | - | - | - | - | - |
| Total cost | 8.55 | Total Cost | 18.75 | Total Cost | 23.27 | Total Cost | 27.36 |
| Margin | 9.45 | Margin (15%) | 2.81 | Margin (15%) | 3.49 | Margin | 7.64 |
| Farm gate | 18 | Local trader price | 21.56 | Wholesale price | 26.76 | Retail Price | 35 |
| Loss (10%) | 1.8 | Loss (5%) | 1.07 | Loss (8%) | 2.14 | Loss (10%) | 3.5 |

Source: SNV (2011) *Value Chain Analysis of Off-Season Vegetables,* HVAP

**Dairy**

Table 5 shows margins along the dairy marketing chain. The analysis shows an equitable distribution of profit along the value chain with no unfair profit capture in any chain segment.

Table 5 Margins along the Dairy Marketing Chain (NPR/litre)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Value addition indicators** | **Producer** | **Collector** | **Processor** | **Distributor** | **Total** |
| Production cost/ buying price | 32.0 | 32.8 | 40.3 | 50.0 |  |
| Transport Cost | 0.0 | 1.2 | 2.5 | 0.0 | 3.7 |
| Testing / administrative cost | 0.0 | 2.5 | 0.5 | 0.0 | 3.0 |
| Processing cum chilling cost | 0.0 | 1.0 | 2.2 | 0.3 | 3.5 |
| Rent / labour cost | 3.0 | 0.3 | 1.3 | 0.5 | 5.0 |
| Packaging and labelling | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 |
| Total Cost | 26.0 | 37.8 | 47.9 | 50.8 |  |
| Added cost (in NRs and %) | 26.0 (66.2) | 5.0 (12.6) | 7.5 (19.1) | 0.8 (2.0) | 39.3 (100) |
| Sale Price (NRs) | 33.0 | 40.3 | 50.0 | 52.0 |  |
| Sale byproduct (cream (1%) | 0.0 | 0.0 | 4.0 | 0.0 | 4.0 |
| Profit in NRs (sales price-cost) and | 7.0 (21.3) | 2.6 (6.3) | 6.1 (12.3) | 1.2 (2.3) | 16.9 |
| Added Profit (%) | 41.6 | 15.1 | 36.3 | 7.1 | 100 |
| Note: Figures in parenthesis shows percentage  Unit – Nepalese Rupee (NRs) 1 US $ = 95 NRs | | | | | |

Source: Bandari, IJAM, 2015

Table 6 shows the value added by processing raw milk into various products such as ice-cream, cheese and yoghurt. Whilst cheese and yoghurt can double profits, ice-cream has the potential to add value twenty times over, although the market is limited.

Table 6 Processing Value Added (NPR/litre)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Cost Categories** | **Milk** | **Hot Milk** | **Tea** | **Ice-cream** | **Khoa** | **Paneer** | **Curd of yoghurt** |
| Market price of unit | 50.0 | 20.0 | 10.0 | 550.0 | 450.0 | 475.0 | 70.0 |
| One litre equals to | 1 | 4 | 10 | 0.7 | 0.2 | 0.2 | 0.9 |
| Buying price | 40.0 | 80.0 | 60.0 | 366.7 | 75.0 | 73.1 | 63.0 |
| Firewood for boiling | - | 3.5 | 3.5 | 7.0 | 3.5 | 3.0 | 1.0 |
| Labour | - | 0.5 | 0.5 | 15.0 | 7.0 | 5.0 | 0.5 |
| Citric acid | - |  |  | 0.0 |  | 2.0 |  |
| House rent | 0.3 | 0.2 | 0.0 | 1.0 | 1.0 | 1.0 | 0.5 |
| Other materials | - |  | 10.0 | 58.0 | 0.5 | 2.0 | 0.3 |
| Utensil and preservatives | 1.0 | 2.0 | 1.0 | 20.0 | 2.5 | 2.0 | 1.2 |
| Total value addition | 1.3 | 6.0 | 15.0 | 100.0 | 13.5 | 14.0 | 3.0 |
| Total cost | 41.3 | 46.0 | 55.0 | 140.0 | 53.5 | 54.0 | 43.0 |
| Profit | 8.8 | 34.0 | 45.0 | 226.7 | 21.5 | 19.1 | 20.0 |
| Compare profit |  | 288.6 | 414.2 | 2490.5 | 145.7 | 118.0 | 128.6 |
| Own estimates from field survey | | | | | | | |

Source: Bandari, IJAM, 2015

## Market Functions

### Transport

Considering Nepal’s terrain, transport will always present a challenge. Nonetheless, most agricultural goods are transported by hired trucks that link rural production areas to urban centres. Nepal ranks 124th out of 160 countries in the World Bank’s Logistics Performance Index which covers customs, infrastructure, international shipments, logistics quality and competence, tracking and tracing and timeliness. The worst score was for logistics quality and competence whereby Nepal ranks 140th out of 160 countries.[[37]](#footnote-38)

### Processing

No processing is undertaken for fresh vegetables. For dairy, raw milk is first pasteurised by heating it to kill bacteria, after which it is chilled. It can then be drunk fresh or processed into yoghurt/curd, various cheeses, butter, ghee and ice-cream. Processing offers significant potential for product diversification during the flush season, value addition, prolonging shelf-life and import substitution as only 20% of milk produced is currently processed.

### Storage

Post-harvest loss of fruits and vegetables can be as high as 25%, some of which is due to post-harvest deterioration and lack of cold storage. No cold storage is carried out in the traditional wholesale supply chain, even at the Kalimati wholesale market in Kathmandu, the largest in Nepal.

The dairy sector is growing and chilling centres operated by the government’s dairy agency are being phased out with the work being outsourced to private and cooperative collection centres. Each collection centre has cold storage vats and dairies also have facilities to chill in-coming milk quickly, as well as cold storage facilities. Few farmers have chilling facilities, which can present problems for isolated farmers who can only make deliveries to the collection centre once a day, even though they milk twice a day.

### Exchange

The majority of fresh vegetables are traded through wholesale markets, the largest of which is the Kalimati Fruit and Vegetable Market in Kathmandu. Kalimati is a terminal wholesale market established by the Ministry of Agriculture in 1986. The market covers 2.25ha with 350 registered wholesalers, 71 retailers and 260 cooperative and farmer groups. On average 700 tonnes of produce is traded every day, with a transactional value of NPR 35 million (USD350,000), 83% of which are fresh vegetables and 11% are fruits. The majority of produce comes from Makwanpur (8%), Kavre (13%), Kathmandu (6%) and Dhading (16%) in addition to India (31%) as the main source of imports. The market is managed by the Kalimati Fruit and Vegetable Wholesale Market Development Board, which has established rules and regulations for free and fair trading. Prices are determined by open negotiation between buyer and seller. In addition to providing mediation services the Board also provides daily price information in the market and on the market’s website.

Each wholesaler pays a monthly rent for a 90 square foot sales area, which finances the operation and maintenance of the market. The market is overcrowded and congested and cannot expand due to its inner city location. Waste management is a problem. There is only limited storage facilities and no cold storage or other packing facilities normally offered by markets.

The majority of milk is exchanged through cooperative and private raw milk collection centres.

## Intra-Firm Organisation

### Horizontal linkages

The cooperative movement is well established in Nepal and has proved an effective means of aggregating smallholders. According to the Department of Cooperatives, there are 33,509 cooperatives with over 6 million members. The majority of cooperative are multipurpose and offer savings and credit services, however there are 1,652 dairy cooperatives and 189 fruit and vegetable cooperatives. It is estimated cooperatives also provide over 50,000 jobs.[[38]](#footnote-39)

### Vertical linkages

Poor linkages between smallholder farmers and the market is a major constraint, particularly in the hills and mid-hills of Nepal. Contract farming is starting to develop for specialised organic or IPM vegetable crop production, otherwise there is very little vertical integration between producers and traders.

Collection centres are the main means of linking smallholders with traders for both vegetables and milk and the larger dairy processors may have agreements with cooperative managed collection centres for the delivery of certain volumes of milk on a daily basis.

# Finance and Investment

## Farmer Finance

Nepal has a wide variety of active microfinance institutions that provide financial services to the poor. These institutions are regulated by government acts such as: The Bank and Financial Institution Ordinance (2004), The Cooperative Act (1991), and The Financial Intermediary Act (1998). Three categories of second tier refinance institutions have been established to provide wholesale loans to different MFIs in Nepal: Rural Self-Reliance Fund, Rural Microfinance Development Center and Sana Kisan Bikas Bank (Small Farmers Development Bank). Microfinance institutions include:

* Twenty One Microfinance Development Banks classified under category ‘D’ by the NRB
* Five Regional Development Banks
* Over 20,000 Savings and Credit Cooperatives
* Forty-five Financial Intermediary NGOs licensed by the NRB.[[39]](#footnote-40)

## SMAE Finance

The Agricultural Development Bank Limited (ADBL) is an autonomous organization owned by the Government of Nepal. The bank has been working as a premier rural credit institution over the past three decades, contributing more than 67% of institutional credit supply in the country. The ADBL made loans of over NPR83 million in 2016, including NPR19 million to the agriculture sector, of which NPR8 million was for livestock.

In October 2010, Nepal Rastra Bank (NRB), the country’s central bank, directed commercial banks to plan to lend a minimum of 20% of total loans and advances in speciﬁc productive sectors and subsequently, the banks were mandated to lend to speciﬁc sectors with a minimum of 12% of total loans and advances to be invested in agriculture and energy sectors. Although the announcement was a positive step towards improving medium and large scale investment in the agricultural sector and has encouraged investments in the post-harvesting side of agriculture, this has not generated much enthusiasm among the Banking and Financial Institutions in the pre-harvesting ﬁnancing.[[40]](#footnote-41)

Several banks, such as the Bank of Kathmandu and Laxmi Bank provide loans to commercial farmers and agribusinesses for working and fixed capital financing, farm inputs, invoice financing for certain crops e.g. sugar, and financing to buy cold storage. Loans are typically for up to 80% of the asset, can be for up to five years for an amount of NPR 1-10 million.

# Enabling Environment

## Government Institutions, Policy, Strategy and Programmes

The Ministry of Agricultural Development (MoAD) has a Department for Agriculture and a Vegetable Development Directorate; and a Department of Livestock Services which produced a Dairy Development Policy in 2007.

The Agriculture Development Strategy (ADS) is the guiding policy document for Nepalese agriculture sector over the next 20 years.[[41]](#footnote-42) A 10-year action plan, envisages a transformation of the national agricultural sector towards a “a self-reliant, sustainable, competitive, and inclusive agricultural sector that drives economic growth and contributes to improved livelihoods and food and nutrition security leading to food sovereignty". The ADS includes 4 outcomes, 35 outputs and 232 activities, and has set a few important medium term (10 years) targets as below:

* Achieving self-suﬃciency in food grains from 5% trade deﬁcit in food grains to 0-5% trade surplus;
* Increase year round irrigation from 18% to 60%;
* Increase agribusiness’ share in gross domestic product (GDP) from 10% to 14%;
* Increase average annual growth of Agricultural GDP from 3% to 5%; and
* Reduce rural poverty from 27% to 16%

In order to achieve these targets, particularly related to agriculture’s contribution to the GDP and poverty reduction as stipulated in the ADS, agri-products need to meet the required standards and be available in both domestic and international markets. For that to happen, the agricultural sector needs to turn into a business, moving up from a subsistence economy and attracting further medium and large-scale investments from the private sector, particularly in pre-harvesting including investments in mechanisation and modernisation of the sector.[[42]](#footnote-43)

## Regulatory Framework

The Department for Food Technology and Quality Control (DFTQC) under MoAD are responsible for enforcing the Food Act to ensure the quality and safety of food. The DFTQC carries out inspections, has a laboratory and is the national enquiry point for SPS.

The main concern for vegetables is the excessive use of pesticides and food quality and safety is increasingly compromised in the post-production stages for reasons of infrastructure, hygiene and weak enforcement of existing regulations. Export opportunities are not realised as Indian authorities seldom recognise certificates issued by Nepalese quarantine offices. Stakeholders allege that acceptance is dependent mostly on whether or not there is scarcity of vegetables in the Indian market, which creates a sense of uncertainty among Nepalese producers and exporters. Such arbitrariness by Indian officials stems from the lack of harmonization of standards, tests and certification and lack of mutual recognition agreement between the two countries. Indian quarantine laboratories at the border are also not equipped to test vegetables. The Nepalese exporters at Gadda Chauki and Dhangadi must visit either Lucknow or Nainital, hundreds of kilometres away, for the SPS certificates. Such long distances mean longer time and higher costs.

A comprehensive plan is necessary to strengthen and harmonize Nepal’s SPS laboratories with regional and international standards in terms of provisioning equipment, test and certification capacity, human resources mobilization, co-location of facilities and improvement in the governance structure of such laboratories.

For dairy, the main concerns are adulteration and contamination of milk related to poor hygiene practices and lack of voluntary testing by collection centres. Although the DFTQC carries out periodic testing it is largely ineffective in enforcing the Food Act and ensuring consumer food safety. To provide value chain integrity and prepare for GMP certification, the Food Act and laws and regulations associated with the dairy ‘Code of Conduct’ need amending. The standard of the dairy products presently covered by the Food Act should be revised and standard for other dairy products which are out of scope of the present Food Act should be fixed with a goal of reaching the international standards as quickly as possible. Milk products should be graded based on the quality standards. Strict quality control measures should be applied in raw milk production and collection, processing, production and distribution of market milk and milk products. Licensing of dairies to formalise to better regulate the sector and eradicate the sale of unfit for human consumption is also required.

## Infrastructure and Utilities

Nepal has 27,990km of roads, of which only 43% are paved. The majority of highways run from east to west in the Terai region and although in good condition, often suffer from congestion. Feeder roads run north to south connecting the Terai to the hill and mountain regions, most of which are in poor condition and difficult to maintain due to the terrain and landslides.

Mobile phone coverage is 90% of the country and there are 111 subscriptions for every 100 inhabitants. It is estimated 20% of the population use the internet. Overall 76% of the population have access to electricity, with the average in rural areas being slightly less at 72%.

## Advocacy for Reform

The National Fruit & Vegetable Association of Nepal is the main multi-stakeholder group advocating for reform on behalf of the fruit and vegetable industry. It was established in 1977 and has 700 individual farmer members, 150 farmer group members including cooperatives and 500 trader members. The association’s main objectives are to develop and enforce standards amongst members, provide laboratory services for food safety testing and lobbying government for policy reform.

The National Dairy Development Board (NDDB) is an apex level policy-making body for dairy development in Nepal. The NDDB provides the following functions:

* Formulates and recommends policies on import and export of good necessary for production and promotion of milk and milk products as well as animal feeds, and accelerates the implementation of approved policies.
* Formulates and recommends pricing policy of milk to the government
* Encourages development of dairies through the medium of cooperatives.
* Registers dairy industries.
* Manages and mobilizes necessary national and foreign grant and loan assistance necessary for dairy industries.
* Provides technical assistance needed for establishing, improving, promoting and safeguarding, dairy industries.
* Monitors, evaluates and reviews dairy development programmes.

# Recommendations

The DFID funded Samarth rural market development programme is just completing its first five-year phase with a second phase due to start mid-2018. As Samarth has already supported similar activities within the vegetable and dairy value chains, it is proposed CASA funding is used to fund all vegetable and dairy activities under Samarth Phase II.

## Fresh Vegetables

Potential interventions for commercial smallholder development in the fresh vegetable value chain focuses upon the development of new packhouse supply chains and establishing backward linkages to vegetable producers for off-season vegetable production. Whereas traditional markets sell vegetables unwashed, ungraded and without packaging for an undifferentiated market, packhouses wash, grade and package vegetables to provide a quality assured product. Packhouses often source directly from producers, rather than wholesale markets, so can also guarantee standards such as Maximum Pesticide Levels, for which consumers are willing to pay a premium.

### Linking Smallholders with Markets and Agribusinesses

The use of collection centres is a widespread and effective means of linking smallholders with vegetable traders, who in turn supply large wholesale markets. Vegetable collection centres are often just central places where smallholders gather to sell their produce to visiting traders. None of the collection centres visited during the field work had storage, cleaning or grading facilities. Most collection centres are owned by cooperatives, although some are owned by independent farmer groups and buyers.

Therefore it is recommended that future interventions under CASA could support packhouses, as the main drivers/leaders of the business model, to establish partnerships with existing cooperatives and buy through their existing collection centres or establish their own collection centres and develop clusters of farm suppliers through Lead Farmers. It is proposed CASA would finance the upgrading or establishment of new collection centres in central locations. Packhouses visited sourced from up to 20 collection centres and each collection centre was supplied by up to 75 farmers. Therefore one packhouse has the potential to aggregate up to 1,500 smallholders.

To take advantage of the off-season potential, the collection centres could be located in the hilly zone within transportable distance of Pokhara and Kathmandu, where it is expected the packhouses would also be located. The packhouses could then supply retailers in the large urban centres of Pokhara and Kathmandu or transport down to other urban centres in the Terai along the Indian border or even export into India. Potential SMAEs, including cooperatives, with packhouse operations CASA could partner with are described under Section 8.1.2 below.

The potential for increased incomes for smallholders supplying packhouses through collection centres is calculated by using the example of selling graded tomatoes. The average poly-tunnel used by smallholders for vegetable production is 1,500m² in area and can produce 600kg tomatoes every week. Currently farmers receive an average ungraded price of NRP40/kg from traditional wholesalers, the equivalent to NPR24,000/week (USD240/week). If grading was carried out and 70% of tomatoes received a higher price of NRP60/kg, income would rise to NPR32,400/week, an increase of NPR8,400/week (35%). Assuming sales over eight months a year, annual income uplift would be the equivalent of USD 2,688/smallholder.

### Supporting Agribusiness to Prepare for Investment

Vegetable packhouses are still uncommon in Nepal, with most fresh produce being marketed through traditional wholesale markets. Although supermarkets have opened in major urban centres, few sell fresh produce, and those that do mostly source from the wholesale market.

Whilst traditional wholesale markets are an efficient means to supply lower end market segments, new supply chains are emerging to supply the higher end market, which requires higher quality, better packaging and certification. A large proportion of this market segment is currently satisfied through imports. The new supply chain is characterised by the use of private packhouses owned by cooperatives or individual entrepreneurs with cooperative supply agreements. As part of this study, four packhouses were visited, as described below. Three of the packhouses visited were cooperatives, which could be described as a social enterprise SMEs. Most packhouses visited were small and seeking to expand, to satisfy the growing demand for fresh vegetables. In addition to finance, common business development support requirements were:

* Strengthening supply linkages with vegetable farmers e.g. contract farming.
* Improved business management skills as the business expands.
* Technical skills in packhouse management.
* Meeting regulatory requirements e.g. export.
* Meeting market requirements e.g. quality standards, certification.

**Agricultural Development Multi-Purpose Cooperative (Krishico) – Kathmandu**

The cooperative has divisions for agriculture, savings & credit, health care and education. A useful synergy is that cooperative members can borrow from the savings & credit division to buy farm inputs and sell produce to the agriculture division.

The agriculture division trades under the ‘Krishico’ brand. The cooperative buys 32 varieties of vegetables from 1,800 members and non-member farmers in 27 districts across Nepal, via ten collection centres and twelve collection agents. Every day Krishico buys 3 tonnes of fresh vegetables and has an annual turnover of NPR350 million (USD 3.5 million).

In addition to finance and market access, the cooperative also provides technical support to its farmer members, ensuring they meet quality requirements, in particular maximum (pesticide) residue limits.

Krishico has a packhouse in Kathmandu which directly employs 72 personnel. The packhouse supplies cleaned, graded, packaged and branded produce to ten of its own retail shops and 400 other retailers.

Krishico is planning on increasing its number of retail shops to 30 and venture into export markets, however, it is struggling with chilled storage capacity and meeting export SPS requirements.

**N-Agro – Kathmandu**

N-Agro is a private limited company that specialises in the production and marketing of off-season vegetables. The company is promoting the use of greenhouses and IPM production techniques with 1,500 vegetable farmers in 20 clusters. N-Agro works through Lead Farmers and provides field technicians to ensure IPM compliance. The Lead Farmer is usually a larger and more progressive farmer who is able to coordinate with smaller farmers in his/her community. They are skilled in greenhouse and IPM vegetable production and provide technical support to neighbouring smaller farmers. Often the Lead Farmer sells inputs and buys produce from smaller farmers as part of his business, for which s/he makes a profit and the smaller farmers get access to inputs and market.

The packhouse employs six staff and sells produce to over 20 restaurants and retailers. N-Agro plans to expand its cold storage capacity and introduce Modified Atmosphere Packaging.

**The Bazaar – Pokhara**

The Bazaar is a cooperative sourcing organic vegetables from 26 groups with a total of 1,300 smallholders in Kaski district, some of which is carried out under contract farming. The cooperative has a turnover of NPR10.5 million year (USD105,000).

The Bazaar packhouse provides cleaning, grading, packaging and marketing services for its members and sells to high-end hotels, restaurants and retailers in Pokhara. The cooperative is currently seeking NPR 20 million for expand its hi-tech poly pac and pre & post-harvest cold storage facilities.

Options for CASA investment in SME development would depend on the use of the packhouse as the key entry point to reach smallholder farmers. For example investment could be used to set up collection clusters and use these to display and market equipment. For example, a demonstration poly tunnel, drip irrigation, improved seeds and technical training could be provided at each collection centre cluster. This could be managed by a Lead Farmer who will be trained to provide technical support to other farmers wishing to adopt the technology. Further interventions can facilitate linkage to financial service providers, if loans are required for farmers interested to invest in the technology themselves.

Collection centres could also be upgraded to provide an early level of quality control and reduce post-harvest losses. Pesticide residue testing would need to be introduced to identify farmers who do not comply with maximum residue levels. Grading facilities would also support efforts to improve quality and could be provided at the collection centre with farmers paid for produce according to its grade. The packhouse would need to be supported to provide crates for transporting the produce from the collection centre to the packhouse and cold storage introduced, if necessary, to reduce post-harvest losses.Packhouses can also be upgraded through the introduction of hygienic washing equipment, packaging machinery and increased cold storage capacity, possibly on a cost-sharing basis. Tests on vegetables in the wholesale market have shown high levels of bacterial contamination due to farmers washing the vegetables in dirty water, therefore, upgrading packhouses must include the provision of clean water. Technical assistance could be used to prepare the packhouse and upstream suppliers for GlobalGAP certification.

**Shree Krishak Sudar Fruits and Vegetable Cooperative, Charaudi, Dhading**

The cooperative has 1,155 members to which it provides collection, storage and marketing services for fruit and vegetables. It also provides farm inputs, technical advice and savings and credit services. The cooperative is currently seeking funding of NPR 30 million to expand its packhouse facilities including cold storage and refrigerated vehicles to transport vegetables to the lowland Terai.

### Enabling Environment

Through the National Fruit & Vegetable Association of Nepal, Technical Assistance could be provided to prepare national standards for economically important vegetables and a comprehensive plan to strengthen and harmonize Nepal’s SPS laboratories with regional and international standards in terms of provisioning equipment, test and certification capacity, human resources mobilization, co-location of facilities and improvement in the governance structure of such laboratories.

## Dairy

Potential interventions for commercial smallholder development in the dairy value chain could focus upon improved hygiene and services at collection centres, upgrading dairies to diversify into higher value products and providing pre-certification support for Good Manufacturing Practices (GMP).

### Linking Smallholders with Markets and Agribusinesses

The use of collection centres is a widespread and effective means of linking smallholders with dairy processors and most collection centres are owned by cooperatives, who may sell to retailers or onto larger independent private dairies in urban centres. Although milk can be sourced rural districts, commercial dairies need to be located near the large urban centres, where the majority of consumers reside.

Depending on individual circumstances, dairies can establish partnerships with existing cooperatives and buy through their existing collection centres or establish their own collection centres and develop clusters of raw milk suppliers. A small cooperative dairy visited had two collection centres which were supplied by an estimated 75 milk producers per collection centre. However, larger dairies exist that buy from several cooperatives, not just collection centres.

Potential increased income for smallholders supplying milk to dairies is calculated based on one cow producing 10 litre milk/day. Average ownership is two cows/household. If the milk has high microbial content, it is rejected and receives no income, or of low quality receives NPR33/litre. If the milk is high quality it receives NPR49/litre, a difference of NRP16/litre. Improved milk quality would increase incomes by NPR320/smallholder/day or NPR9,600/smallholder month (USD96/month), an increase of 48%.

### Supporting Agribusiness to Prepare for Investment

The dairy supply chain is well-established in Nepal. Dairy processors vary from small local dairies producing just pasteurised milk to large national conglomerates producing ice-cream. Examples of dairy processors include the following:

**Nepal Dairy**

Nepal dairy was established in 1981 as a private limited company and sources raw milk from private milk collectors and cooperatives in Chitwon, Kavre, Makwanpur, Sarlahi, Rauthad and Lalitpur and produces yoghurt, cheese, paneer, butter, ice-cream and milk. The factory has the capacity to process 10,000 litres milk/hour and employs over 300 staff. Nepal Dairy has a turnover of NRP350 million/year and is planning to expand through increased investment in chilling facilities

**Bhadrakali Multi-Purpose Cooperative**

The multi-purpose cooperative was established in 2009. The dairy division purchases milk from 300 smallholders around the two Kathmandu collection centres. The cooperative sells 1,100 litres/day pasteurised milk, 400 litres/day of yoghurt, 100kg/day paneer, 10kg/day butter and 50 litres/day whey, through five of its own retail outlets and 300 shops in Kathmandu. Annual turnover is NPR3.5 million.

The cooperative received a grant from the PACT Project/World Bank but is seeking an additional NRP10 million investment to purchase machinery & equipment and expand capacity.

**Sitaram Gokul Dairy**

Sitaram was stablished in 1994 as private limited company. It purchases up to 1 million litres of raw milk a year from private milk collectors and cooperatives in Panchkhal, Panauti, Makwanpur, Sarlahi, Rauthad, Lalitpur, Ilam, Bara, Parsa, Nawalparasi, Kapilvastu, Dang, Banke and Kailali to process into yoghurt, cheese, butter and milk based sweet etc.

The company is currently seeking NPR80-100 million for expansion and new product development.

**District Dairy Cooperative Association, Pokhara**

More than 300 dairy cooperatives, with 7,500 members, are affiliates of the district association which has its own chilling centre in Pokhara. The association buys 700,000 litres of milk a year and has a turnover of NPR 40 million. The Association is currently seeking NPR 50 million to improve genetics of its members dairy cattle, establish new collection centres and purchase refrigerated trucks to transport the milk from the collection centres to the central dairy.

**Nepal Dairy Producer Cooperative Organization, Jhapa**

The cooperative has 150 members who supply 3-5,000 litres of milk daily which it pasteurises and sells in the local town. The cooperative is seeking NPR 5 million to start processing and adding value to the milk.

Smallholder dairy farmers could be reached through the dairy they sell to, hence the dairy is the key entry point, as the main driver/leader of the business model. Hygiene and sanitation training will be provided to farmers supplying the collection centre which the dairy sources from. Milk cycle management interventions to address the flush and lean season fluctuations, such as scheduled calving and the use of concentrate feeds and preserved forage during the dry season, could also be supported.

Collection centres hygiene and sanitation could be upgraded to provide an early level of quality control. It is proposed CASA would finance the upgrading or establishment of new collection centres in central locations MBRT and alcohol tests could be introduced in alignment with international standards as a basis for milk acceptance/rejection. Standards / quality grades will also be developed for milk quality based on butter fat and SNF content testing at the collection centres.

Small and medium dairies will be upgraded to meet hygiene/sanitation standards. Additional cold storage and processing equipment will be introduced, possibly on a cost-sharing basis to add value and diversify dairy products produced and increase demand for milk. Increased processing is also a strategy to deal with the excess milk supply during the flush season. Technical assistance will be provided to prepare the dairy and upstream suppliers for GMP certification.

Most dairies visited were small and seeking to expand, to satisfy the growing demand for dairy products. In addition to finance, common business development support requirements were:

* Strengthening supply linkages with dairy farmers e.g. contract farming.
* Improved business management skills as the business expands.
* Technical skills in dairy management and processing.
* Meeting market requirements e.g. quality standards, certification

### Enabling Environment

The dairy sector is largely unregulated, or regulations are not enforced. This is a main concern for the formal industry stakeholders who feel consumer confidence in Nepalese dairy products is being undermined by the unscrupulous behaviour of the informal sector. Through the National Dairy Development Boardit is proposed to provide Technical Assistance to update and amend the Food Act and laws and regulations associated with the dairy ‘Code of Conduct’; prepare national quality standards; and introduce a licensing scheme for dairies to formalise and better regulate the sector to eradicate the sale of milk unfit for human consumption. This includes contaminated milk that has a high microbial content (e-coli), adulterated milk that has been watered down or preservatives added, or milk that has high medicinal residues as the withdrawal period for veterinary medicines is not observed.

# Annexes

## Annex A: Bibliography of Value Chain Resources

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## Annex B: Stakeholders Consulted

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Designation** | **Location** | |
| **Government** | | | |
| Dr. Yogendera Karki  Shyam Poudel  Dr. Bimal Kumar Nirmal  Shankar Aryal  Rewatiram Poudel  Kailash Prasad Dhungel  Babukaji Pant  Ramsharn Chimoriya  Hari Bhadur K.C  Arun Kafle  Tejendra Poudel  Keshav Aachhami  Balram Thapa  Ishowari Adhikari  Maniratna Aryal  Ajaya Adhikari  Manoj Dhital  Sabnam SiwakotI | Joint-secretary, Ministry of Agriculture Development  Joint-secretary, Ministry of Livestock Development  Director General, Department of Livestock Services  Director General, Department of Industry, MOI  Training Director, Department of Agriculture  Executive Director, National Dairy Development Board  Act. Director, National Dairy Development Board  Director General, Custom Department, MOF  Director, Horticulture Department, MOAD  Director, Seeds production Center, MOAD  CEO, Kalimati Fruit & Vegetable Market Development Board  Director, Production Department, MOLD  Director, Market Promotion Directories, MOLD  DGM, Dairy Development Cooperation, DDC  Sr. Agriculture Economist, MOAD  Sr. Postharvest Officer, MOAD  Sr. Market Officer, Kalimati Market, MOAD  Director, Horticulture Directories, MOAD | | Kathmandu  Kathmandu  Kathmandu  Kathmandu  Kathmandu  Kathmandu  Kathmandu  Kathmandu  Kathmandu  Kathmandu  Kathmandu  Kathmandu  Kathmandu  Kathmandu  Kathmandu  Kathmandu  Kathmandu  Kathmandu |
| **Donors / Projects** | | | |
| Dal Ram Pradhan  Govinda Sharma Acharya  Srijana Rana  Nirmal Dahal  Dr. Binod Sharma  Rudriksha Rai Parajuli  Subha Jee | National Team Leader, HIMALI/ADB  Project Director, Project for Commercial Agriculture & Trade, PACT/World Bank  Portfolio Manager (crops, livestock & ARD), SAMARTH, NMDP/DFID  Deputy Team Leader, Sakchyam Project –A2F/DFID  Programme Development Specialist, IDE Nepal  Livelihood Advisor, DFID  Programme Head, CONNET Project/DFID | | Kathmandu  Kathmandu  Kathmandu  Kathmandu  Kathmandu  Kathmandu  Kathmandu  Kathmandu |
| **Private Sector** | | | |
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