

Sustaining Municipal Food and Nutrition Security Using Food Balance Sheet Approach

A Compiled Report on Food Balance Sheet of Nawalpur Region



Vijaya Development Resources Center

Gaundakot Municipality-8, Nawalparasi (East)

Supported by :

OPEN SOCIETY POLICY CENTER

New York, America

Message From Chairperson

Vijaya Development Resource Centre (VDRC- Nepal), initially established as Vijaya Youth Club, is a non-profit, non-political member based national level social development organization. It has been working in the community development sector for the last 40 years with a vision of Equitable, peaceful, affluent and self-reliant society. Established as a local self-help group in 1979, it is now recognized as a national level Social Development Non-Government Organization with multi-disciplinary human resources and good infrastructure facilities.

VDRC-Nepal has successfully completed a number of community development projects across the country and has made a significant contribution in bringing positive changes through a people-centered development and governance approach. It has successfully demonstrated how a holistic community development model can be applied for sustainable livelihoods in rural areas. Furthermore, it has been able to mobilize local resources and developed the foundations for a center for social learning. VDRC-Nepal has experienced four institutional development stages pioneering different development paradigms and models; namely, initial stage as a self-help group, institutional development stage as an intermediary organization, professionalism stage as a resource organization, and innovation stage as pioneering a holistic community development model.

From the last year the COVID-19 pandemic is communicating in different strains and forms all over Nepal. This have resulted in slowdown of agriculture, education and health sector. The major impact was also seen in the employment sector as fourteen lakh people lost their job while more than thirty percent people came under poverty line. In this crisis situation there is an immense need to increase the production, boost the supply chain and make the people adopt healthy food habits. COVID-19 raised severe problem for creating ample environment for agriculture production due to which production got declined. To boost every aspects of food production, distribution and consumption, need of a response program was felt. VDRC-Nepal with Open Society Policy Center (OSPC), New York, USA launched a program named **Sustaining Municipal Food and Nutritional Security Through Food Balance Approach** which was to be implemented in five municipal bodies of Nawalpur district and Chitwan. I appreciate that this program collected the data based reality on food production, supply and consumption of respective municipal bodies and constructed the food balance sheet.

I hope this document will help to picturize the actual scenario of the local level on food production, import, export, consumption as well as the problems inhibiting the agriculture and livestock production. Further this document prepared by joint collaboration with local municipal bodies will help in making plan and policies for abundant and sustainable food production.

At the end I want to thank all the stakeholders, municipal bodies and their officials, FBS working team for the admirable work in the form of this report and completion of the program.



Laxmi Gautam

Chairperson

Vijaya Development Resource Center (VDRC)



Government of Nepal
National Planning Commission
Singha Durbar, Kathmandu

Dil Bahadur Gurung, PhD
Member

Ref:-

Date: 30 September 2021

Foreword

I am delighted to go through this report on Food Balance Sheet of Nawalpur Region of Gandaki province. I would like to thank VDRC-Nepal's team for the outstanding initiative in bringing this report to this level. I think, this report will add an additional knowledge in agriculture and livestock sector. The report has highlighted the major factors of the food production system on quantitative terms and also suggested plausible measures objectively to eliminate production barriers at the local level.

I highly appreciate for producing this report in the right time since the outputs are expected to contribute to address the gaps in agriculture and food security as identified in the 15th Development Periodic Plan. Core work at this depth if implemented effectively would help to contribute to achieve food security at municipal level. More importantly, this document would be instrumental to other municipalities in formulating their plans for the varying duration and rolling out activities accordingly in a bid to achieve zero hunger as planned in Sustainable Development Goals (SDG).

I have realized the difficulties faced by the team members and efforts put in mustering the information especially the statistics of this nature. NPC has long realized the need for such disaggregated data at municipal level to prepare and implement evidence based plan. This initiative could be replicated to other municipalities and therefore I request all municipalities to work on collecting similar information so that FBS of this kind could be developed by each municipalities.

The right to food for all citizens have been well accorded by the constitution of Nepal but the realization of this right needs concerted efforts by all levels of Government. In this context, the municipalities need to explore, plan and invest on transformative arrangements for producing enough food locally to meet the internal demand. This has been contextually and precisely addressed by this task. Therefore, I would like to congratulate VDRC-Nepal for their innovation and exemplary work in a short and difficult time of the pandemic. The concerns on agriculture and livestock production and the management of supply chain is rising due to the nationwide lock down and limited mobility during the pandemic. Availability of such FBS will help to plan for managing adequate food supply during such crisis thereby improving food security of people.

I wish VDRC-Nepal to continue innovating as they have been for the last four decades and become a reliable partner in support of policy formulation and program implementation especially on food security, poverty alleviation and other related sectors. Finally, the cornerstone VDRC-Nepal has put upon would be taken up by concerned stakeholders in successive plans of the relevant municipalities. I firmly believe other municipalities will also take an advantage of the partnership with VDRC-Nepal in learning and sharing to prepare an important document like this so that they can proceed for developing an evidence based plan and policies.

I wish VDRC-Nepal all the best for their upcoming endeavors.

Thank You!

.....
Dil Bahadur Gurung, PhD
Member

Acknowledgment

This report presents the results of the Food Balance Sheets (FBS) of all four local municipal bodies of Nawalpur district and one ward of Bharatpur Metropolitan of the fiscal year 2020/21. The report has highlighted the picture of food production, distribution, and consumption at municipal level. The use of data indicators had helped to figure out the context more accurately and appropriately.

This piece of work was not possible without continuous support and feedback from the mayor, vice-mayor, Chief Administrative Officer, ward president, agriculture and livestock officials of Gaidakot Municipality, Devchuli Municipality, Bulingar Rural Municipality, BinayeTriveni Rural Municipality, and Bharatpur Metropolitan ward number -14. And Agriculture Knowledge Center (AKC), Chitwan and Nawalpur.

We highly acknowledge the assiduous efforts of expert duo, Dr. Badri Bastakoti and Dr. Ram Chandra Bastakoti, for data authentication and validation. We are indebted to our Project Advisor and Resource Person Mr. Tulasi Prasad Paudel (Senior Agriculture Scientist) for his immense support, guidance and contributions throughout the FBS compilation. His technical assistance and mentoring in analyzing potentiality and opportunities related to data identification, classification, collection, analysis, and interpretation have been worthful asset for the compilation of this work. Valuable inputs from Mr. Krishna Sapkota (Vice President -VDRC) and Mr. Bhumi Chapagain (Secretary-VDRC) were remained worth acknowledging from conceptualization to the end of the project.

Sincere gratitude is also extended to the Ministry of Agriculture and Livestock Development, Department of Irrigation, Central Bureau of Statistics, Food Management and Trading Company Ltd, and other state agencies, who have directly or indirectly helped in collecting information related to different commodities as well as to validate the data obtained.

VDRC-Nepal also owes its sincere thanks to our partner: Open Society Policy Centre, New York, USA for their financial support in course of the implementation of the project in the targeted location.

Last but not the least, we are also thankful to our FBS team for their untiring efforts to draft and finalize the report. The team comprised of officials under the guidance of Ms Neeta Yogi (Ex-Project Manager) and Mr. Adarsha Sigdel (Project Manager), Mr. Sheetal Aryal (Data Analyst), Facilitators Ms. Gyanu Sapkota, Mr. Badri Lamsal and Mr. Prem Prasad Sapkota 'Raju' and Senior Finance Officer Mr. Kalidas Gaudel.



Keshab Prasad Sapkota

Executive Director

30 September 2021

Table of Content

| | |
|--|----|
| Executive Summary | v |
| 1. Introduction..... | 1 |
| 2. Background..... | 1 |
| 2.1. The COVID-19 pandemic and food security in Nepal | 2 |
| 2.2. Sustainable development Goal and Food Security | 2 |
| 2.3. Establishment of Food Banks | 3 |
| 2.4. Strengthening Agriculture Marketing and Ensuring Farmer’s rights..... | 3 |
| 2.5. The Necessity of Food Inventory System..... | 4 |
| 3. Justification of study | 5 |
| 4. Methods and Methodology | 6 |
| 4.1. Selection of study area | 6 |
| 4.2. Implementation arrangements..... | 6 |
| 4.3. Major Elements of Food Balance Sheet..... | 6 |
| 4.4. Working Model of Food Balance Sheet..... | 8 |
| 4.5. Primary Data Collection | 8 |
| 4.6. Data Sources | 8 |
| 5. Result and Discussion | 9 |
| 5.1. Self-sufficiency Ratio..... | 9 |
| 5.2. Import Dependency Ratio | 10 |
| 5.3. Total Calorie Requirement..... | 10 |
| 5.4. Calorie supplied by different food groups | 11 |
| 5.5. Protein supplied by different food groups..... | 11 |
| 5.6. Fat supplied by different food groups | 12 |
| 5.7. Dietary supply of cereals | 13 |
| 5.8. Dietary supply of pulses..... | 13 |
| 5.9. Dietary supply of meat..... | 14 |
| 5.10. Dietary supply by different food groups | 14 |
| 6. Challenges and Limitations..... | 15 |
| 7. Lesson Learnt..... | 15 |
| 7.1. Data backup and data sourcing | 15 |
| 7.2. The urgency of implementation of Food Balance Sheet..... | 15 |
| 7.3. Documentation of diversified food production and consumption..... | 15 |
| 8. Way Forward/Recommendations..... | 15 |
| 9. Conclusion | 16 |
| 10. References..... | 18 |
| 11. Annex | 19 |

Executive Summary

A food balance sheet is a factual statistical sheet that elaborates the conditions and patterns of food production, distribution, and consumption in a particular frame of time. The concept of the food balance sheet is old but its application in Nepal is at an early stage. It is a great indicator to determine the status of a country in malnutrition, self-sufficiency, and import dependency. It could further track the progress as aimed by different strategical goals sets by the government like Sustainable Development Goal (SDGs), Agriculture Development Strategy, Five Year plan, etc. It also acts as a monitoring and evaluation tool for national agricultural policies. One of the main applications of FBS is to calculate derived indicators which can be used to analyze a wide range of concepts, including hunger, malnutrition, import dependence, and food self-sufficiency. Among the major outputs of the FBS is the computation of Dietary Energy Supply (DES), which is an important indicator in determining the levels of undernourishment in a given country.

The current scenario of food and nutrition is more dependent on import than self-production. There had been a huge gap between demand and supply that had resulted in severe impacts on nutrition and dietary intake leading to malnutrition and food insecurity. Similarly, trends are alike at the local government level with national status. After the declaration of the Constitution of Nepal in 2015, Nepal has been divided into provinces and local government levels which have further opened up space for self-progress and development. Likewise, for sustainable agriculture production, efficient distribution, and diversified consumption local government can plan and implement strategies on local priorities and preferences. FBS could be an effective tool to draw their status of food production and consumption in the current scenario. Calamities like earthquakes, floods, landslides, and an outbreak of the COVID-19 pandemic have forced the local government and national government to rethink the level of preparedness for these uncertainties. FBS could picturize the real scenario on food production and consumption so that challenges and limitations could be addressed in time and reduce the hazardous effect of natural or biological challenges.

Different governmental and non-governmental agencies were communicated for the data related to the production, import, export, and consumption of the different commodities. But major of data was collected was the primary source of data as secondary data was unavailable in most of the agriculture-related offices. A household-based survey was conducted by stratified purposive sampling method to detect every variation within the municipal area. Information on the area and agriculture area was obtained through the municipal/ ward profile. Elements related to the food balance sheet were calculated subsequently with the related formulas. Data analysis and validation were carried out with rigorous discussion with agri- depart officials of the municipality. The elaboration of the data and their respective findings were elaborated.

In the study report, rice was the major staple food, paddy occupied the higher cropping area and consumption of rice was highest amongst the cereals. The consumption of wheat was majorly in the form of wheat flour which was majorly imported and was the second-most consumed cereal while the major production of maize was utilized for animal feed. In the major study areas, lentil was the major source of pulses while the hilly side was more dependent on black gram and beans. Majorly in Bharatpur Metropolitan ward no 14, Gaindakot and Devchuli municipality there was significant production of kidney beans. Majorly imported legume crop was chickpea as it was the minimum produced legume crop. In all the municipal bodies major population imported oil rather than producing it. Oil of rapeseed was majorly consumed but currently, the use of sunflower oil and soya-bean oil has increased. The major vegetables produced and self-sufficient were green leafy vegetables, pumpkin, and colocasia. The major population was involved in subsistence farming which was the major source for vegetable supply. The hilly rural municipality i.e. Bulingtar had an abundance production of colocasia and pumpkin. In other municipal bodies also pumpkin was a bit underutilized and need to be diversified in terms of product. Major import on vegetable was more on cauliflower, cabbage, tomato, chilies, and mushroom. Among the fruits, Banana was found to be most consumed while major import was on apple and orange. Papaya was self-sufficient and was needed to be prioritized to make it a major fruit crop. Amongst the imported fruits, orange was found to be mostly imported while pomegranate was least imported. Eggs and milk

were found to be sufficiently produced in the area, therefore; these were found to be significantly exported. Chicken was the most consumed meat while pork was the least consumed. Although pork, buff, fish were found to be consumed in the area, the consumption entirely depended on the import while goat, poultry were reared for the meat.

Major dietary requirement for calories and protein was supplied by cereals as it covered the major production areas. All the municipal bodies had enough calories supplied except Bharatpur-14 with minimal margin. The major dietary supply was covered by cereal and majorly by paddy while vegetables, animal sources, pulses oilseeds, and fruit provide dietary supply followingly.

Thus as a whole construction of FBS in different five municipal bodies namely Gaindakot and Devchuli Municipality, Bulingar and BinayeTriveni RM and Bharatpur Metropolitan ward no-14 have laid out the insights on food production and supply system and will be a great piece of an asset for planning and policy making.

1. Introduction

Food Balance Sheet (FBS) is a statistical tool that helps to precisely provide an overview of the patterns and conditions of food production, distribution and supply at the defined level of government. The major concept of the FBS is to figure out the status of the food system in terms of understanding the self-sufficiency ability and import dependency. This has been in use to explore, identify and adopt strategies to improve the internal adequacy of food each municipality, province or nation require. In addition, the strategy can be used as a tool to help support collaborating entities in collectively acquiring the food security. Literature suggest that this tool has been in use globally especially under the crisis situation. The same has recurred due to the Coronavirus pandemic which, from very beginning, showed impacts of erratic food prices and severe disruption of supply chain.

Vijaya Development Resource Center (VDRC-Nepal) has taken such impacts of the pandemic in a level that interferes the overall livelihood of the citizens of the country and has accordingly decided to help municipalities use the tool in understanding the food security status and to develop locally feasible strategies in overcoming the shortfalls in the supply and distribution of food. Four municipalities from Nawalpur and a ward from Bharatpur Metropolis has been selected for this purpose.

2. Background

Two-thirds of the population of Nepal is engaged in agriculture, contributing to 26% of the national GDP. Due to its flatlands, rivers, and fertile soil, most of the country's agriculture takes place in the Terai area, though each of Nepal's ecological belts has its more favored crops and crop calendars. While Nepal's overall demand for food increases over time, unregulated urbanization of plains and fertile land, particularly in the Terai, has put downward pressure on the food supply in the country. Nepal is importing more agricultural goods than ever (food imports have increased fourfold from 2011 to 2018), and this makes domestic agriculture crucial to the country's food security. About 43% of Nepal is covered in forest and 24% (3.56 million ha) is agricultural land, but over half of all farmers cultivate on less than a hectare of land. The land distribution per person however is varied across districts. In Nepal, around 4.6 million people are food-insecure, with 20 percent of households mildly food-insecure, 22 percent moderately food-insecure, and 10 percent severely food-insecure, according to the 2016 Nepal Demographic and Health Survey (DHS). Remote and low productive remote areas, where rain-fed subsistence agriculture is more pervasive, is found to be more prevalent of food insecurity in Nepal. According to the MoH (2017), the prevalence of severely food insecure population in the rural area is 12% while the same is 9% in urban settlement. Geographically, mountain and hilly zone seem to be more prevalent of food insecurity than terai zone, 14%, and 9 % respectively in mountain and terai zone. Low farm productivity, limited livelihood opportunities, and weak market connectivity caused by poor infrastructure, together with geographical heterogeneity, gender, and caste disparities are considered as underlying causes of food insecurity and undernutrition in Nepal (MoALD, 2018).

The Right to Food and Food Sovereignty Act, 2018, declares the right of all Nepali people to be free from hunger and to be able to access sufficient nutritious food all year round. The act also defines the right to food sovereignty, as the right of Nepali people to freely pursue the occupation of farmer or food producer, with adequate means and resources. The 2015 Constitution's declaration on the basic rights of Nepalese people, in which particular mention is made of food sovereignty. The Right to Food and Food Sovereignty Act was drafted as a landmark piece of legislation, one of few framework laws in the world declaring food to be a basic right. The Right to Food and Food Sovereignty Act holds the Government of Nepal accountable for ensuring its people's food security and the wellbeing of its farmers.

The government is implementing the Agriculture Development Strategy (ADS), Multi-sector Nutrition Plan (MSNP) II (2018-2022), and Zero Hunger Challenge National Action Plan (2016 - 2025) aiming to comprehensively improve the food security and nutrition status of the population. Further, the Fifteenth Plan (2019/20-2023/24) has a high priority to improve food security and nutrition. The Local Government Operation Act (LGOA) 2017 mandates the local governments to formulate, implement, monitor, evaluate and regulate policy, legislation, standards, norms related to the development projects and programs including Food and nutrition security. It also mandates local governments to

implement the projects and delivery of services related to (a) agriculture and animal husbandry, (b) basic education and public health, (c) collection and documentation of data, and (d) formulation of local policies, legislations, standards, planning, implementation, monitoring and evaluation of agricultural and health-related activities. Therefore, this act will have several implications for food and nutritional security. This new structure of the country also affects to ensure production and availability of food, for better livelihood and employment of all groups of people for better access to food, education on food, health, and nutrition. Better food utilization, supplementary water, and health security to ensure holistic intake, to parallel empowerment of historically disadvantaged and vulnerable groups like women and indigenous communities, for example, for social protection and equitable distribution of food resources and agricultural production. Moving on from the MDGs, the SDGs have set new targets for food security in the signatory countries, including Nepal (LWF, 2017).

2.1. The COVID-19 pandemic and food security in Nepal

The government of Nepal (GoN) ordered a national lockdown as a response to the spread of the novel coronavirus (COVID-19) around the world, urging people to stay at home and closing schools while restricting the operation of businesses and markets. Food security is aggravated by COVID 19 because, during lockdown restriction of movement, closing down all the restaurant, production, markets, malls except emergency needs though they are steps designed to slow the spread of COVID-19 and to mitigate potentially devastating economic and social effects in Nepal, and reflect measures taken by most countries. While the restrictions on movement and activity in Nepal may be exacerbating food security issues across the country, they are steps designed to slow the spread of COVID-19 and to mitigate potentially devastating economic and social effects in Nepal, and reflect measures taken by most countries. The most affected sectors of Agriculture and Livestock, sectors are considered to be poultry, dairy, vegetables, and livestock production. This lockdown causes transportation difficulties that have been pushing down demand for goods in urban settings in some cases and also decreased demand for milk by 60% due to difficulties in accessing markets and consumer anxiety. Sudurpaschim Province is reported to be insufficient by 68 percent on the stock of food and non-food commodities. Due to this confinement, a majority of traders reported a low demand for both food and non-food commodities. Due to this lockdown income of many people losses and difficulties in movement demand for food and non-food items has decreased compared to the previous week. Due to the current COVID-19 crisis and lockdown, resulting in a limited movement of trucks and vehicles carrying goods, limited transportation services and supply of commodities have been affecting food security (WFP, 2020). The estimated stock market of Nepal is three months but not spread across the country uniformly. The sustained suspension of rice or other food goods exports could affect food security in the country. Nepal imported a total of 25,770 metric tons of food goods from major trade posts in Biratnagar, Birgunj, Kakarbhitta, and Bhairahawa. However, Humla, Bajura, Bajhang, Lamjung, Gorkha, and Dhading districts seem to be hard to access markets with low food stock levels. Karnali Province has organized at least one airlift to Humla district and has plans for more in Mugu and Dolpa districts. According to MoFAGA, ‘most affected households’ based on criteria are: wage labors working in informal sectors, like in construction work, agriculture, transport services, porters in tourism and other sectors, garment industry, small trader, baby caretaker and deprived people with no caretakers (old age, disabled, pregnant, orphan, and people taking refuge in old age homes, monastery, church, temple, etc). In all mid-hill districts since the lockdown prices have increased by 30- 60% on average in vegetable items in the market and limited items are available (Shrestha & Thapa, 2020).

2.2. Sustainable development Goal and Food Security

The Sustainable Development Goal to “End hunger, achieve food security and improved nutrition and promote sustainable agriculture” (SDG2) recognizes the interlinkages among supporting sustainable agriculture, empowering small farmers, promoting gender equality, ending rural poverty, ensuring healthy lifestyles, tackling climate change, and other issues addressed within the set of 17 Sustainable Development Goals in the Post-2015 Development Agenda.

Beyond adequate calories intake, proper nutrition has other dimensions that deserve attention, including micronutrient availability and healthy diets. Inadequate micronutrient intake of mothers and infants can have long-term developmental impacts. Unhealthy diets and lifestyles are closely linked to the growing incidence of non-communicable diseases in both developed and developing countries. Sustainable

development goals Nepal is committed to being part of the global Sustainable Development Agenda 2030 after a big lesson learned and encouraging achievements from MDGs. SDG 2 has major targets of ending hunger by 2030 and ensuring access by all people safe, nutritious, and sufficient food all year round, ending all forms of malnutrition, doubling agricultural productivity, ensuring sustainable food production systems, and maintaining by 2020 the genetic diversity of seeds, cultivated plants and farmed at the national, regional and international levels.

2.3. Establishment of Food Banks

The current scenario on global and national health and the economy is depressing due to the detrimental effect of the COVID-19 pandemic. The further effect of a pandemic can be seen in the economy and livelihood of people. As the country's main economy is backed up by an agriculture production system, the slowdown in the agriculture market system has further crashed the economy. Similar trends can be observed in the case of production due to the unavailability of inputs in time as well as the accessibility of food to the consumer is threatened. This has set an alarming signal presenting the inadequacy of food, food supply system, and food storage system. The most basic preparatory steps to be considered to deal with natural disasters and pandemics is the availability of indispensable needs like food, water, shelter, treatment, etc. For the significant allocation of food material during the needy time's concept of food bank was brought. The food bank works on the concept to accumulate the food and food reserves and distribute them to needy people. Agriculture experts and scientists of Nepal have established the National Food Bank Limited with an investment of Rs.2 billion to industrialize the agricultural sector of the country (www.investpaper.com/news/national-food-bank-in-nepal/). The food bank has been established to industrialize the agriculture sector in the near future by properly managing the necessary knowledge, skills, seeds, and fertilizers required for this sector. The bank has been established by skilled manpower, experts, and agricultural scientists working in the field of agriculture. The main objective of the organization is the marketing of the agriculture sector by making its presence in all 77 districts of the seven provinces. The bank is carrying out its plan to increase employment, increase production, and move the country towards self-reliance through big investments in agriculture. The bank will itself produce food grains, nuts, green vegetables, fruits, milk, yogurt, fish, meat, tea, herbs, and other food items. Moreover, the bank aims to cooperate with farmers across the country as well as with agricultural companies, cooperatives, groups, and all organizations related to the agricultural sector. The bank plans to produce agricultural products by renting unused land including private, government institutions and 'guthi' land. So far, the work of leasing the land and producing has started in Kailali, Kanchanpur, Bardiya, Jhapa, Morang, Sunsari, Dhanusha, Chitwan, Rupandehi, and other districts. The food bank, which is working with short-term, mid-term, and long-term objectives, has given priority to the production of paddy, wheat, maize, millet, potato, mustard, and nuts in the first phase. In the second phase, the production of fish, meat, fruits, milk, vegetables, etc. will be emphasized and in the third phase, these products will be exported to different countries by storing, processing, grading, and packaging.

2.4. Strengthening Agriculture Marketing and Ensuring Farmer's rights

Nepal, being, an agricultural country, has a really poor status on production and if production goes better there is a severe shortage of market for the production. The presence of a middleman, weak marketing channels, lack of public market facilities is the major drawbacks for the weak performance of the market system in Nepal. There is no appropriate development in the field of agriculture market to solve the issues on marketing, value addition of the food products, and the reasonable price for the producer.

For addressing the issues on market there is an immense need to develop a mechanism to link the farmers and producers to a market system that is sustainable, eco-friendly, and economically sound. Previously there is no marketing framework to support the production at the local and provincial levels. The concept to develop a marketing channel at the local and provincial level is to make local production available for local people at a reasonable price. The other objective is to make the agriculture market and agriculture economy of local level self-resilient and self-sustaining. Province level collaboration for the supply and distribution of the agriculture commodities that are sufficient and surplus in that province to another province. That will support marketing and value chain development of the specialized product that will be affordable, easy access, and sustainable. Coordination between local level bodies with nearby for assuring to develop a marketing channel to provide the agriculture products at a decent rate and build a common storage house on the private-public partnership can address the market-related problems of the

farmer.

According to the Department of Customs statistics, cereal tops the list of agro imports followed by edible oil, vegetables, fruits and nuts, and seeds. The cereal import bill amounted to Rs56.88 billion, almost a fifth of the total agriculture import bill. Of the total cereal imports, rice accounts for Rs22.23 billion, and maize comes second with Rs14.75 billion. Imports of maize have been growing at an alarming rate and it's due to the demand for livestock feed. Besides, Nepal spends Rs15 billion on the imports of animal fodder alone. After cereals, the biggest import bill is for vegetable fats and oils which stands at Rs 50.24 billion, up from Rs 37.12 billion in the previous fiscal year. This data elaboration shows the dependency of the country on different edible commodities which is more inclined to India to fulfill the import demands. This is a quite serious situation so there is a need to address the problem and find out the alternate ways to reduce the huge dependency on imports. The current production pool is not that much worse to support the consumption of the country population but lack of proper allocation and distribution patterns the market is dominated by Indian products. As our production is not as commercial as India due to their massive production the production cost and marketing cost of the agricultural product is low which makes the market-dominant by import product than local production. The urgency shown by the government to eliminate the import dependency is not satisfactory. The creation of a production-based support system to enhance and promote the production of the major cereal and other food commodities and infrastructure support for promoting the market and value addition should have been the major agenda of the government to deal with the import dependency issues. The major drawback for the Nepalese market system is its inability to connect the rural market system to the urban market as well as promotion of local production from subsidies, transportation subsidies, etc. Thus the promotion of local production through the provision of inputs based on need-based assessment and development of marketing channels for more fluent supply, consumer-based market, and subsidy-based market system is the current need of the Nepalese market.

2.5. The Necessity of Food Inventory System

The existing scenario on food production, distribution and consumption system is not so praiseworthy. The recent wave of COVID-19 pandemic had further threatened the current status of food security in alarming rate. Likewise, disasters like flood, landslides etc. have seriously inhibited the food production and disrupted the supply chain. This series of calamities and pandemic have compelled the consumer to depend on minimum and less nutritious food supply and overall leading to food insecure situation. Preparedness for the situation with the establishment of food banks could be a great solution to deal with the havoc situation. But before the development and establishment of food bank there is a need for the assessment about the production, supply and consumption of particular locality. That leads to the necessity of a food inventory system. To define every elements and status on food supply chain system food balance sheet could be a great tool as it helps to assess the real scenario on food production, distribution and consumption. It further picturize the per capita supply and intake which could help to determine the exact status and help to plan the necessary strategy and recommend policies for secured food and nutrition supply.

The first attempts at preparing Food Balance Sheets date back to World War I. Food Balance Sheets (FBS) were the major source of data, especially in 1936, when the Mixed Committee of the League of Nations requested its Sub-Committee on Nutritional Statistics handling problems of nutrition to prepare a systematic international comparison of food consumption data.

During the Second World War, there was a considerable increase in the use of FBS. This prompted the Inter-Allied Committee on Post-War Requirements to use them in 1942/43 in their studies of post-war requirements in European countries. Germany constructed its own FBS as well as for its occupied territories. A detailed technique was developed and employed by a joint committee of experts from Canada, the United States of America, and the United Kingdom in the report, "*Food consumption level in the United States of America, Canada, and the United Kingdom*". FBS played an important role during food allocation and distribution in the period of worldwide food shortages after the war.

In 1948, during a Food and Agriculture Organisation (FAO) conference in Washington, FBS was given considerable importance owing to its usefulness in analyzing the food situation at the country level. It was recommended that FAO should develop, encourage and assist governments to develop and publish their FBS.

3. Justification of study

After the verification and study of different published papers and documents, no strong document was found addressing the current scenarios of food production, consumption, and distribution in Nepal especially those disaggregated at municipal level. Major documents from the MoALD have few published documents figuring the current scenario of self-sufficiency. The government has declared self-sufficiency in major livestock production albeit issues in the production and distribution in sustaining the self-sufficiency claim. The major aim for the construction of the food balance sheet is to draw the situation of production, consumption, and distribution within the locality and determine the status of food consumption as more self-sustaining or import-dependent.

The country is largely dependent in agriculture products due to lack of commercialization and use of the improved seed, fertilizer and crop protection measures have declined the production., the prevalence of disease outbreaks, lack of timely medication, scientific feed formulation, and adoption of high-performing breeds are the major problems while market i.e. distribution sector is poor in both agriculture and livestock production due to which even produced goods are not able to penetrate the market. All this problem has been timely recognized and likewise, solutions have been rendered but lack of proper implementation had led to minor upgrades. On the other side the agriculture system followed by our country and the data source proving it is not aligned well. Our agriculture data management system is poor since no aggregation of data is done from the local level to central government which has ultimately untracked the policy and plans oriented towards agriculture development. To vitalize the need for agriculture information and scenario on the production system, the construction of a food balance sheet will be a great approach to address the situation and determine either it is self-sufficient or import-dependent. Furthermore, the lack of blueprints related to trends of production, consumption, and distribution had led to serious drawbacks on effective plans and policymaking. The need assessment of a particular location in terms of agriculture production, consumption, and distribution could be fulfilled by imaging the context through the food balance sheet. Last year outbreak of the COVID-19 pandemic had challenged the food production, supply and distribution system that have threatened food and nutritional security. Similarly, different havoc conditions like natural calamities, a disease outbreak in crops have led to hazardous effects in production and consumption pitching towards food and nutritional insecurity. The occurrence of different disasters and uncertainties on climatic conditions have highlighted the preparedness for the worst situation. This could be only assured through proper planning and policymaking to demarcate the weak situations in the production of different commodities and ending its insecurity leading to preparation for self-sufficiency. Like-wise if the production of a certain commodity cannot be assured then import-dependent commodities should be imported sustainably and at a minimum price with good quality within the country and different local level governments. Construction of food balance sheet could visualize the actuality of the situation on agriculture production, supply, and consumption system. Majorly for the municipal areas where there is food insecurity and less production, the local government can plan an extensive farming-based program with a subsidy-based budget for the active participation of the locals. That could create new employment opportunities and increase the production of food commodities. Local-level strategy for planning food security could be done as recommended by food balance sheet majorly working on the limitation on production of edible commodities, production-based problem and as a whole maintaining a continuous market chain with inter-municipal bodies to overcome the less production and promote the import locally on reasonable price. Promotion of local food production to a business level and planning on value aid up of the produced material could provide employment and stabilize the income generation. The information on agriculture able area, area on public ownership, and other public lands could be obtained through food balance sheet. The land on public ownership could be utilized and provided under lease for commercial vegetable or agriculture farming. The support on local and provincial levels for the commercial farm could be financially increased to ensure the bumper production that could feed the local people at the local level.

Thus, the construction of a food balance sheet aims to intervene in the policy and planning on agriculture production through visualizing the facts of the agriculture system so that effective anchorage can be provided to different elements based on their present performance.

4. Methods and Methodology

4.1. Selection of study area

The study area was Bharatpur ward 14 of Bharatpur Metropolitan, Chitwan of Bagmati Province, Gaiindakot Municipality, Devchuli Municipality, Bulintar and Binaye Triveni Rural Municipality, Nawalpur of Gandaki Province. The selection of the municipal bodies of Nawalpur district was to picturize the scenario of trends on production and consumption so that in future for total results district can self-lunch program yearly to draw the situation and take steps accordingly for amplifying the status of production and consumption. This program will be a pilot approach for the local municipal bodies and Nawalpur district for budget-based construction of food balance sheets yearly both in policy and its outcomes in the field.

4.2. Implementation arrangements

For the implementation and construction of food balance, a four-member working staff was created under the management of the project manager where the data collection formats and data processing was done by a data analyst and further documentation and logistic support were carried by two facilitators. The consent for constructing the food balance sheet of the respected municipality was taken and all the major activities were conducted under the supervision of the Mayor. Continuous follow-up and communication with Mayor and agri-officials were carried out. For the introduction and orientation about the food balance sheet and its working modality inception meeting was carried out. The inception meeting was chaired by the Mayor in the presence of vice-mayor, ward president, and agriculture & livestock depart officials. Quarterly meeting with experts, monthly meeting with project advisor, and weekly-based updates and communication was with local stakeholders. Due to lack of secondary data primary data collection was carried out which was supported by an agri-technician of the ward. The data obtained from the ward was triangulated by focus group discussion and processed by data analyst and produced a concrete outcome. The major lead farmers involved in different agriculture cooperatives were major participants of FGD. Respective municipal officials from the agriculture and livestock department facilitated and supervised the focus group discussion. The output data was validated under the presence of municipal level stakeholders and further, the data was verified by the project advisor and experts. The major insights of the experts were taken in terms of data calculation and associated methodology. The data validation meeting conducted at the municipal level allowed reviewing the data and amending the correction to be needed that will be compiled in the final report.

4.3. Major Elements of Food Balance Sheet

The major components of FBS are as follows

a. Supply

The major supply of food is sourced from production, import, export and stocks.

b. Utilization

It refers to the total amount of commodity consumed. The consumption may be seed, feed, food and industrial uses.

c. Per Capita Food Supply

It refers to the total calorie, protein and fat supplied from the total food consumed.

Total Production

It refers to the total production of a particular commodity in a particular location over a particular time. Total Production was calculated with the average data productivity of a particular commodity and total cropped area. The total cropped area was calculated by multiplying the adoption percentage with the total agriculture area. If the total cropped area was not present then average household production was multiplied with total household producing the commodity.

Total Production (qt)= Average productivity (qt/kattha) × Total cropped area (kattha)

Total Import

Total import refers to the total product purchased from another territory to a given territory. Total import was calculated by the total import recorded by the major importers and wholesalers bought from other places than within the municipality. Commodities with not major imports were calculated by multiplying the average quantity of imports and total household involvement in imports.

Total Import (qt)= Average quantity of import per household (qt)× Total importing household

Total Export

Total export is defined as goods sold to another country or transboundary. Total export was calculated by total commodity exported outside the ward through major vendors or directly by producers. Further unrecorded export quantity was calculated by multiplying the average quantity of export per household and total household involved in export.

Total export (qt)= Average quantity of export per household (qt) × Total exporting household

Total Feed

Feed is defined as all quantities of commodities— both domestically produced and imported—that are available for feeding livestock or poultry. The total feed is calculated by the average feed consumed in the household following subsistence livestock rearing multiplied by the total household involved in animal husbandry. Feed consumption in commercial animal husbandry was more due to which it was added as average feed consumed per animal per shed multiplied by the total commercial shed and total animal.

Total feed (qt)= Feed required in subsistence animal husbandry + Feed required in commercial animal husbandry

Feed required in subsistence animal husbandry (qt)= Average quantity of feed per household (qt)× Total household doing subsistence animal husbandry

Feed required in commercial animal husbandry (qt)= Average quantity of feed per commercial household (qt) × Total household doing commercial animal husbandry

Total Seed

Seed is defined as a miniature plant consisting of reserved food material and seed coat. Seed is considered as a progeny for the continuation of another plant life cycle. The total seed was calculated by multiplying the seed rate as recommended by the government of Nepal and the total cropped area.

Total Seed (qt)= Seed rate (qt/kattha) × Total cropped area

Total Waste

Total waste is defined as the quantity of products that don't pass through the supply chain. Loss may be considered as food loss and food waste. The amount of produce that is lost through the post-harvest, processing loss, and other loss before reaching to plate is called food loss. The amount of food that is lost after serving on the plate is called food waste.

The total waste was assumed as the total waste during the post-harvest and processing loss and the waste after the food is served. The total waste for the different types of the commodity was different by the durability and storability.

Total Waste (qt)= Total food waste +Total food Loss.

Total Waste (qt) = Average food waste/loss % × Total production (qt)

Total Food

Total food was calculated by eliminating the exports, wastages, feed use and seed use from the total production.

4.4. Working Model of Food Balance Sheet

The working equation or model of food balance was;

$$\text{Production} + \text{Imports} = \text{Exports} + \text{Feed} + \text{Seed} + \text{Waste} + \text{Food} + \text{Stocks}$$

Self-sufficiency Ratio

Self-Sufficiency Ratio (SSR) is the ratio that shows to determines whether a particular locality has sufficient local production for local consumption. It is the ratio of production to the sum of production plus import minus export and multiplied by 100. A ratio of less than 100 percent indicates the inadequacy of food production to cope with the demand of the population; equal to 100 percent indicates that food production capacity of the sector is just enough to support the food needs of the population; a ratio of greater than 100 percent indicates that domestic production is more than enough to support the domestic requirements, the higher the ratio the greater the self-sufficiency.

$$\text{SSR} = \frac{\text{Total Production}}{\text{Total Production} + \text{Total Import} - \text{Total Export}} \times 100$$

Import Dependency Ratio

Import dependency ratio (IDR) is the extent of dependency on importation to domestic consumption. It is the ratio of quantity imported to the sum of production plus import minus export and multiplied by 100. The higher ratio implies a greater dependency on importation.

$$\text{IDR} = \frac{\text{Total Import}}{\text{Total Production} + \text{Total Import} - \text{Total Export}} \times 100$$

4.5. Primary Data Collection

Both the primary and secondary data were used to construct the Food Balance Sheet. Due to the limited availability of secondary data, the need for primary data collection was taken into consideration. Different sources for secondary data were explored like Agriculture and Livestock department of respective Palikas, Agriculture Knowledge Center, Veterinary Hospital and Livestock Service Expert Center, Central Bureau of Statistics, etc., and also from, pocket, block, zone offices, etc. Data related to population, land size, productivity will be relied on secondary sources, whereas utilization patterns like consumption, livestock feed, etc. along with information of export will be collected from primary data collection sources.

With limited resources and lack of time, Primary data collection was done by household survey Stratified sampling was done to picture the differentiation in agriculture adoption patterns. To capture the actual scenario of agriculture production, consumption, and market within the distributed population, objective-based verified and identified households were taken as a sample. Agriculture households based on landholding and amount of production were classified based on data available from the agriculture department of the related municipality. The major strata for sampling were high-scale, mid-scale, and small-scale farmer households and were defined as stratified sampling. As along with that association of household with the major agriculture group and cooperatives, different members were taken based on defined strata so that actual scenarios within the different agriculture groups and cooperatives could be analyzed. With the limited no of households taken, the maximum effort was done to recognize the household that could be representative of the total members of the cooperatives within three different strata. The data was accumulated by the answers of the respondent from the structured questionnaire. Major data associated with consumption was accumulated by primary data collection while the cropping area, cropping patterns, production, and productivity were obtained by secondary data collection.

Furthermore, focus group discussion with the board members of different cooperatives and farmers groups was done for further validation and triangulation on the consumption and production patterns. Also, a validation workshop with the mayor, vice-mayor, ward chairpersons, agriculture and livestock officials was organized to validate and endorse the collected data.

4.6. Data Sources

Various sources of data were used to find out the secondary data and different methodological approach like primary data collection was also done to calculate data that were not available in the secondary

database. As we know well about the data management system of our country which is insufficient to construct the complete food balance sheet. So various methods were used to extract data i.e. both primary and secondary data. Secondary data on production was obtained through the agriculture knowledge center, agriculture service center, agriculture department of the municipality, zone office, and documents referring from the previous District agriculture development office.

Crop Production Data: The crop production data of the recent year was not available due to which a major portion of it was obtained through primary data collection. Crop production was calculated by multiplying cropped area and average productivity. Average productivity was calculated from the primary data collected from sample households. For the total production of a low adopting crop, production is calculated by multiplying average productivity, coefficient of a household adopting the practices, and total household.

Trade Data: Trade-based data that includes export and import were obtained from ward profile data and agriculture and livestock service center. Products with minimum import or export were calculated based on the average import or export multiplied with the coefficient of household doing import/export and total household.

Livestock Data: Livestock data was majorly obtained from ward profile, district livestock services office, and livestock department of the municipality. Lacking data on livestock production was obtained from primary data collection.

Seed Data: Data on the amount of a certain food commodity used as the seed was calculated by multiplying the standard seed rate provided by agriculture information and training center and total cropped area. With the use of different hybrids seed replacement rate was also taken into account.

Feed Data: Major portion of the total feed used was obtained by household survey while the remaining was obtained from wholesale feed suppliers.

Data on Loss: Total loss was calculated based on the average loss percentage of cereals, vegetables, pulses, oilseeds, fruits, and animal products that includes both food loss and food waste out of total production.

Tourism Data: Tourism-based consumption was calculated by the household-based survey in the food service providers in the major tourist location.

5. Result and Discussion

The topic discusses the overall result of FBS among several municipal bodies of Bagmati and Gandaki province of Nepal.

5.1. Self-sufficiency Ratio

Cereals and pulses were found to be self-sufficient in all municipal bodies in Bharatpur 14 while it was not self-sufficient in all other municipal bodies. Vegetables and fruits were found to be insufficient in all municipal bodies while animal products were self-sufficient in all municipal bodies except Devchuli and Bulingtar. In Bharatpur 14, animal products were found to be almost three times more self-sufficient.

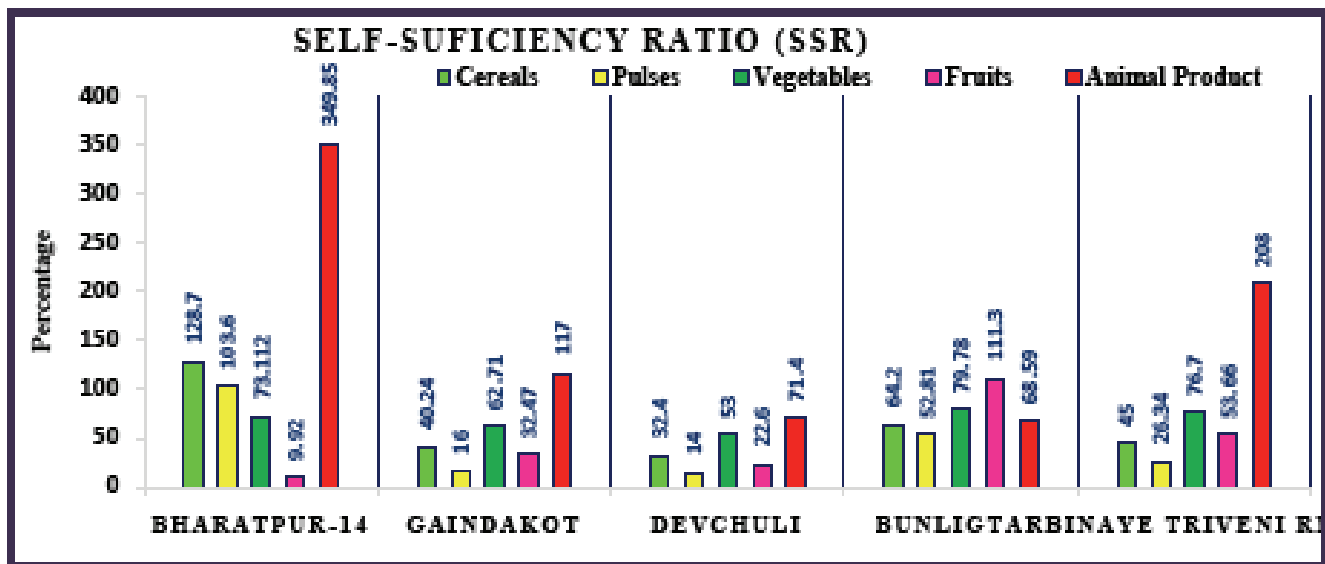


Fig1: Self-Sufficiency ratio of different municipal bodies

5.2. Import Dependency Ratio

The maximum import dependency in cereals was observed in Devchuli municipality which was followed by Gaindakot municipality while minimum import was observed in Bharatpur 14. Major import in pulses was observed in Gaindakot municipality while minimum import was seen in Bharatpur 14. Similarly, vegetables were found to be imported in maximum quantity in Devchuli municipality and were imported in a minimum amount in Gaindakot municipality.

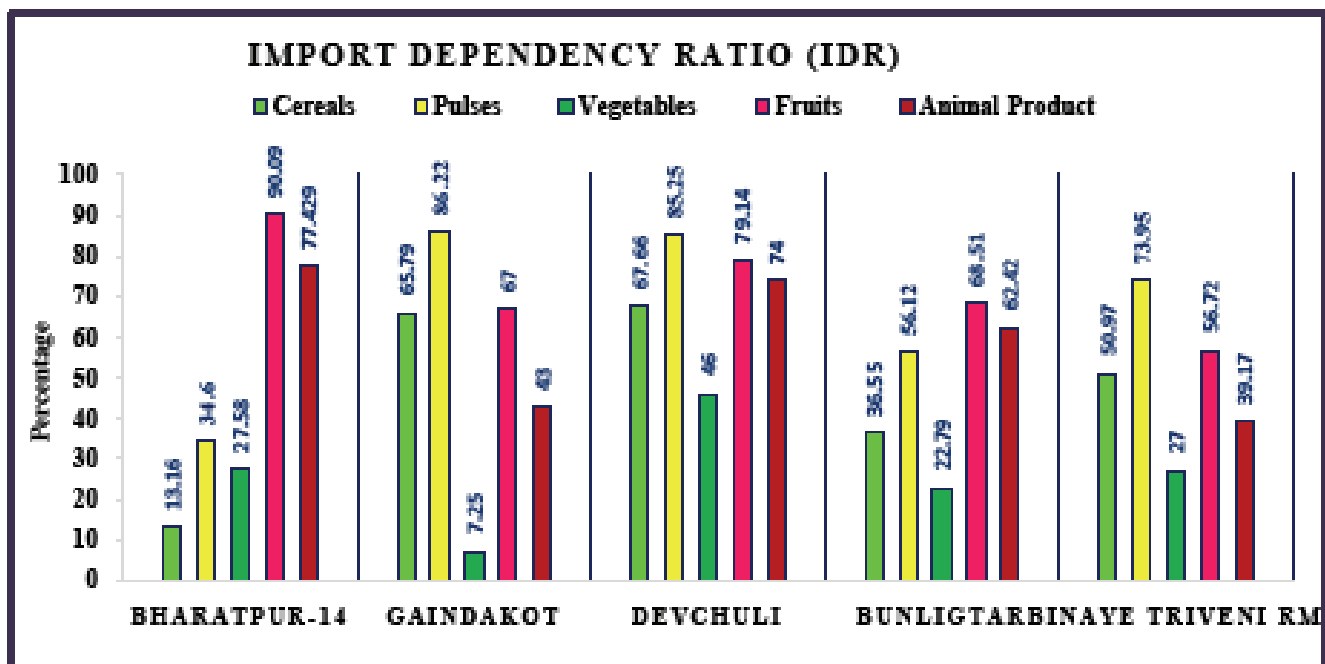


Fig 2: Import Dependency ratio of different municipal bodies

Maximum import on fruits was observed in every municipal body and the food group was imported in a maximum amount in Bharatpur 14. In addition to this, animal products were imported in a maximum amount in Devchuli municipality and were least imported in Binayee Triveni rural municipality.

5.3. Total Calorie Requirement

The total calorie attained was higher compared to the total calorie required by population in all the municipal bodies except Bharatpur 14. In Bharatpur 14, it was found that the total calorie attained was slightly less than the total calorie required. It might be due to less affordability of food among vulnerable and underprivileged populations residing in the ward.

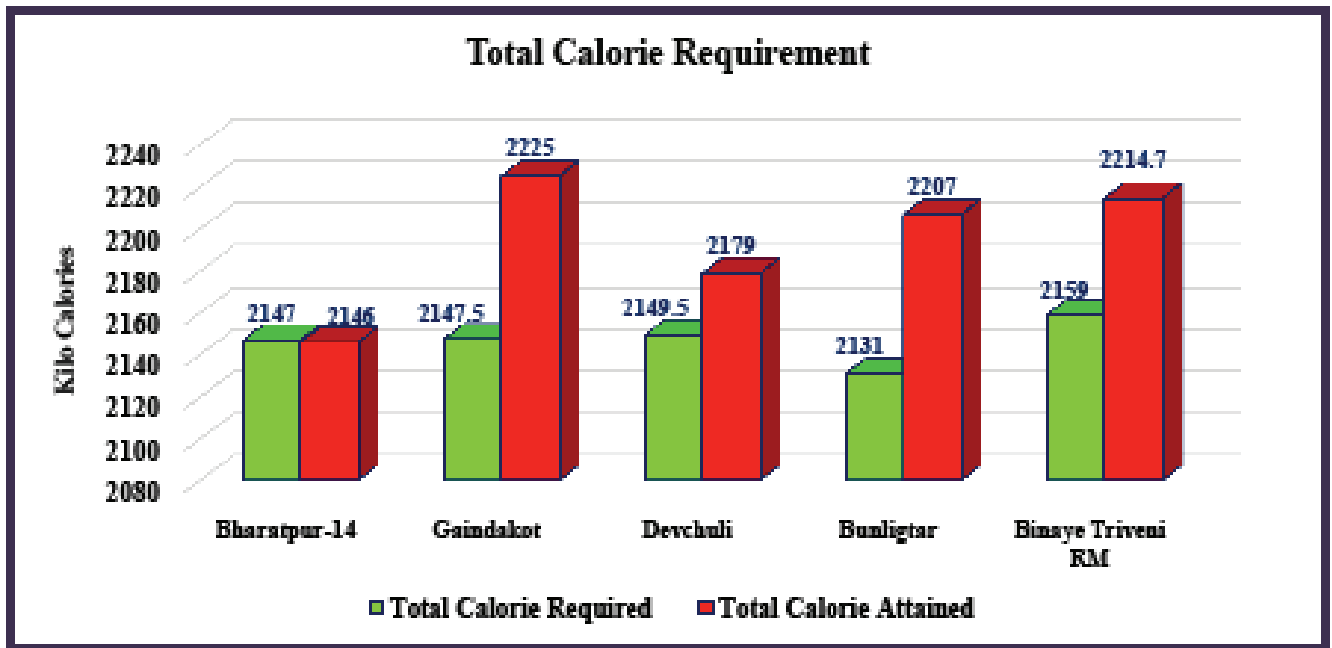


Fig 3: Total calorie requirement and attained in different municipal bodies

5.4. Calorie supplied by different food groups

Total calorie supplied by cereals was found to be maximum while fruits supplied minimum amount of calories in all municipal bodies. The amount of calories supplied by cereals was found to be maximum in Bulingtar rural municipality while it was minimum in the case of Gaindakot municipality. Similarly, the amount of calories supplied by pulses was found to be maximum in Binayee Triveni rural municipality while it was minimum in the case of Bulingtar rural municipality. In addition to this, the amount of calories supplied by vegetables was found to be maximum in Gaindakot municipality and the minimum calories were supplied by vegetables in Binayee Triveni rural municipality. Fruits supplied maximum calories in Gaindakot municipality and the amount of calories supplied by fruits was minimum in Binayee Triveni rural municipality. Also, animal products supplied maximum calories in Binayee Triveni rural municipality and the products supplied minimum calories in Bulingtar rural municipality.

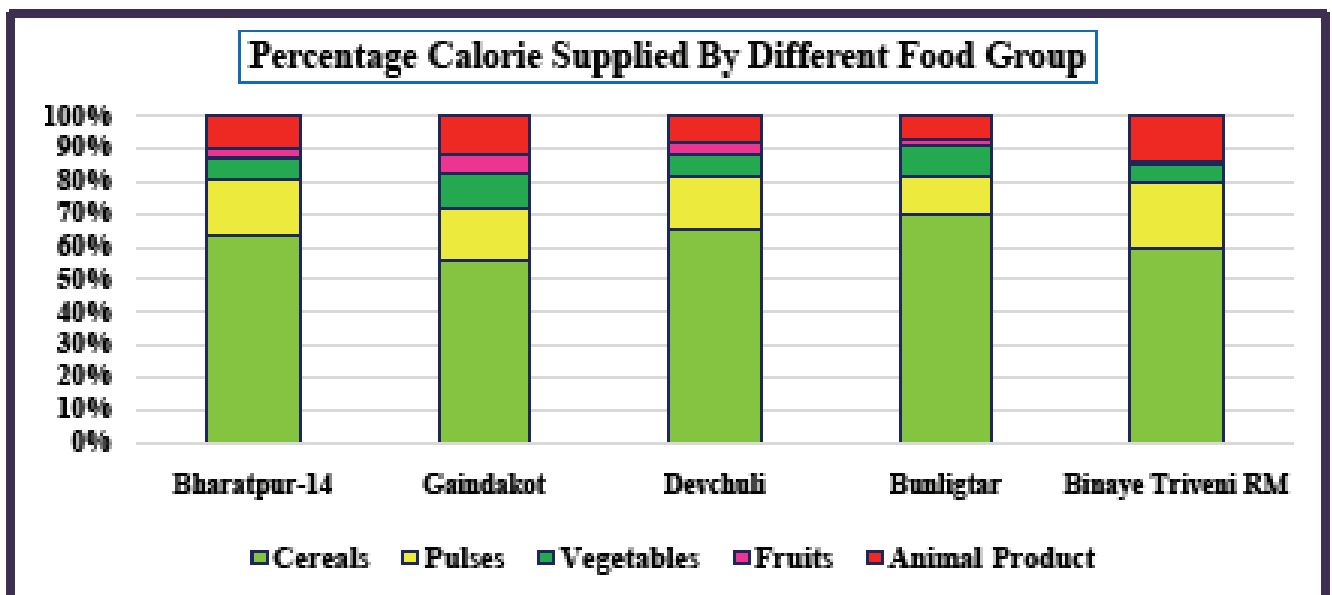


Fig 4: Percentage calorie supplied by different food groups

5.5. Protein supplied by different food groups

It was found that in all municipal bodies protein supplied by cereals was found to be maximum except Gaindakot municipality while fruits supplied minimum amount of protein. The amount of protein supplied by cereals was found to be maximum in Bulingtar rural municipality and Bharatpur 14 while

it was minimum in the case of Gaindakot municipality. Similarly, the amount of protein supplied by pulses was found to be maximum in Devchuli municipality while in the case of Binayee Triveni rural municipality, the amount of protein supplied by pulses was found to be minimum.

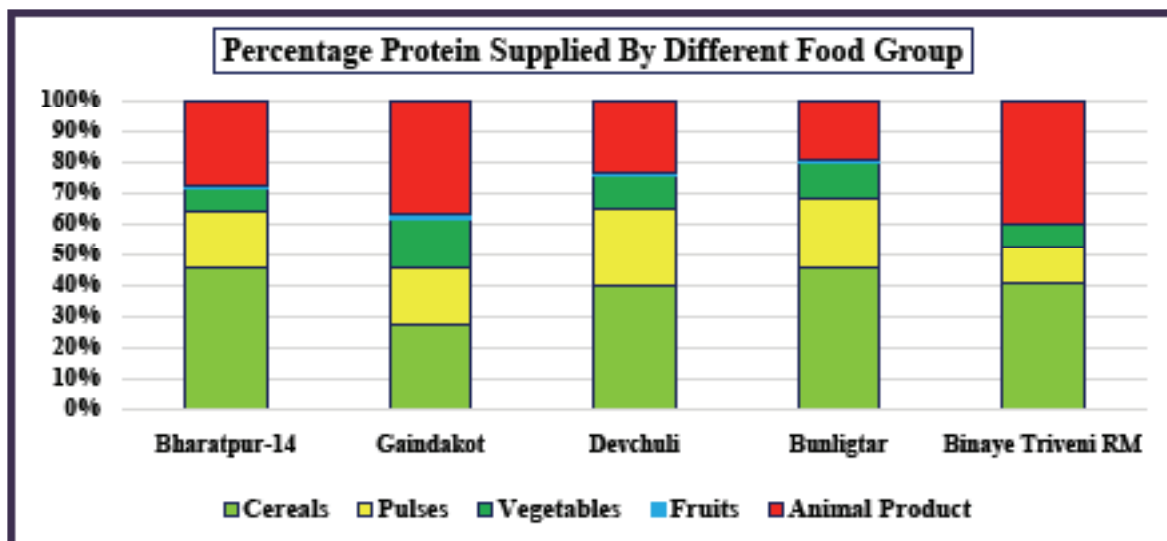


Fig 5: Percentage protein supplied by different food group

In addition to this, the amount of protein supplied by vegetables was found to be maximum in Gaindakot municipality and the minimum protein was supplied by vegetables in Binayee Triveni rural municipality. Fruits supplied maximum protein in Gaindakot municipality and the amount of protein supplied by fruits was minimum in Binayee Triveni rural municipality. Also, animal products supplied maximum protein in Binayee Triveni rural municipality and the products supplied minimum protein in Bulingtar rural municipality.

5.6. Fat supplied by different food groups

It was found that in all municipal bodies fat supplied by animal products was found to be maximum except Devchuli municipality where pulses supplied maximum fat while fruits supplied minimum amount of fat. The amount of fat supplied by cereals was found to be maximum in Bulingtar rural municipality while it was minimum in the case of Gaindakot municipality. Similarly, the amount of fat supplied by pulses was found to be maximum in Devchuli municipality while in the case of Binayee Triveni rural municipality, the amount of fat supplied by pulses was found to be minimum. In addition to this, the amount of fat supplied by vegetables was found to be maximum in Bulingtar rural municipality and the minimum fat was supplied by vegetables in Gaindakot and Devchuli municipalities. Fruits supplied maximum fat in Devchuli municipality and Bulingtar rural municipality and the amount of fat supplied by fruits was minimum in Binayee Triveni rural municipality. Also, animal products supplied the maximum amount of fat in Binayee Triveni rural municipality and the products supplied the minimum amount of fat in Devchuli municipality.

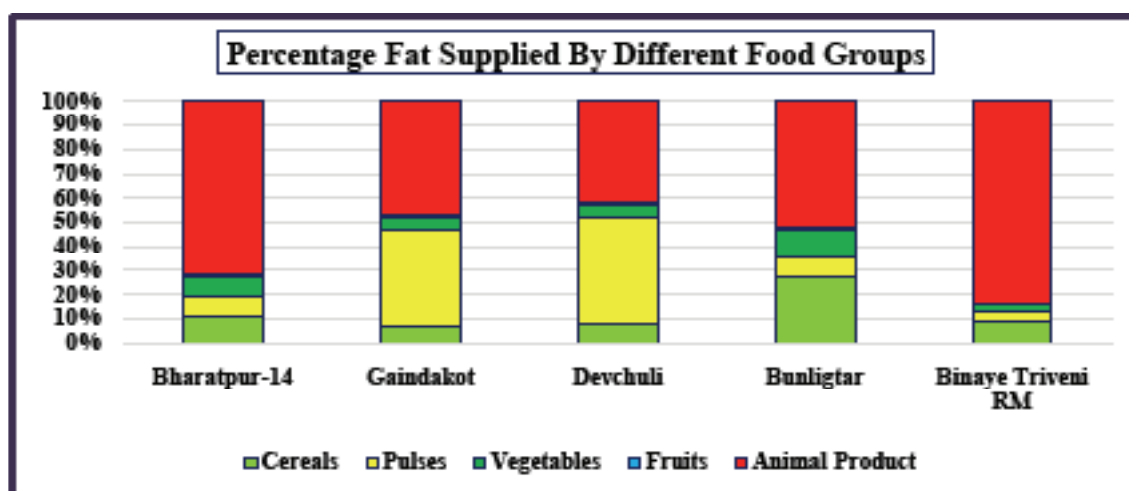


Fig 6: Percentage fat supplied by different food groups

5.7. Dietary supply of Cereals

It was found that paddy provided the maximum dietary supply in cereals in all municipal bodies. It was wheat that provided maximum dietary supply after paddy in all municipal bodies except Bulingtar rural municipality, where maize followed paddy. Similarly, the amount of dietary supply by maize was maximum in Gaindakot municipality and it was least in Devchuli municipality. There was some contribution of millet in all municipal bodies except Bharatpur 14. The amount of dietary supply by millet was maximum in Bulingtar rural municipality while it was least in Binayee Triveni rural municipality. It was found that barley also contributed to dietary supply in Binayee Triveni rural municipality.

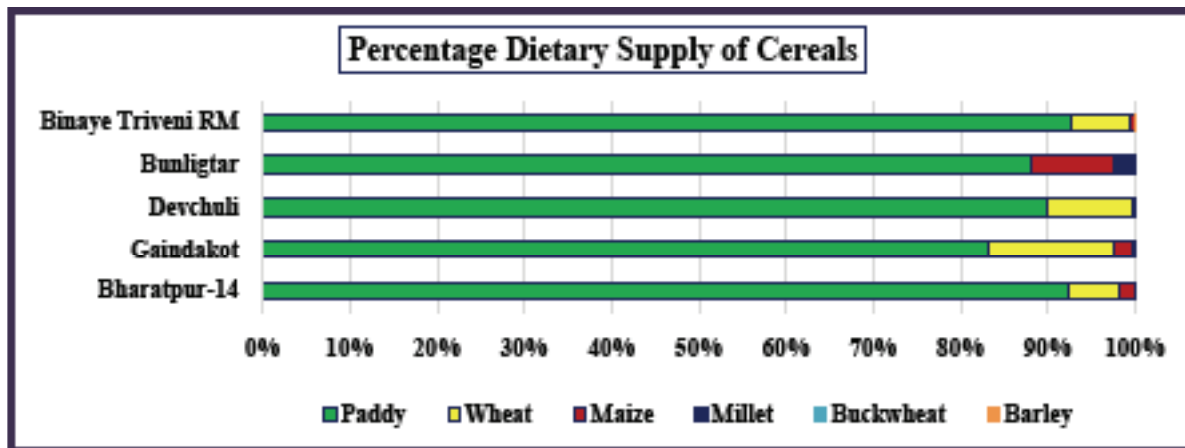


Fig 7: Percentage dietary supply of cereals

5.8. Dietary supply of pulses

In pulses, beans provided maximum dietary supply in Bulingtar rural municipality while beans provided minimum dietary supply in Gaindakot municipality. Similarly, Soybean provided maximum dietary supply in Bharatpur 14 while it provided minimum dietary supply in Devchuli municipality. In addition to this, lentils provided maximum dietary supply in Gaindakot municipality and the dietary supply was found to be least in Bulingtar rural municipality. Kidney beans provided dietary supply in all municipal bodies except Bulingtar rural municipality. Chickpea was found to be the maximum consumed as pulses in Gaindakot municipality while it was found to be least consumed in Bulingtar rural municipality. Pea was found to be mostly consumed as pulse in Devchuli municipality and it was least consumed in Bharatpur 14. Pigeon pea was found to be consumed as pulse in Binayee Triveni rural municipality and Horse gram was found to be consumed as pulse in Gaindakot municipality. Black gram was found to be consumed in significant amounts as pulse in all municipal bodies except Bharatpur 14 and it was found to be mostly consumed in Bulingtar rural municipality and was least consumed in Binayee Triveni rural municipality.

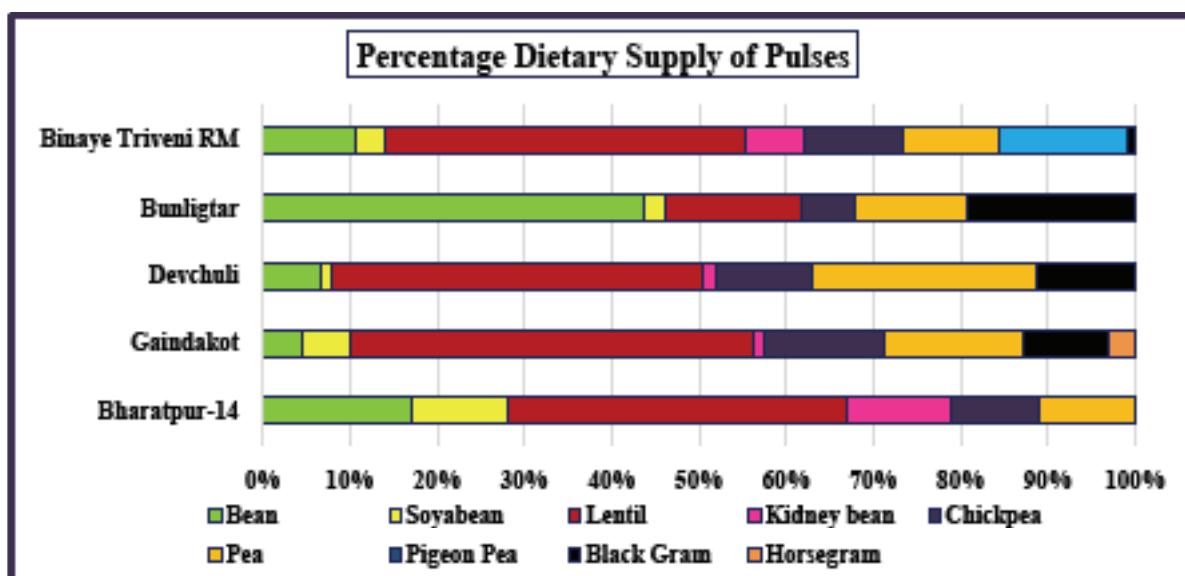


Fig 8: Percentage dietary supply of pulses

5.9. Dietary supply of meat

Taking an account of consumption of meat in different municipal bodies, Chicken was found to be mostly consumed meat-type except in Gaindakot municipality where buff was popular. Chicken was mostly consumed in Bharatpur 14 while it was least consumed in Gaindakot municipality. Mutton was found to be mostly consumed in Gaindakot municipality while it was found to be least consumed in Devchuli municipality.

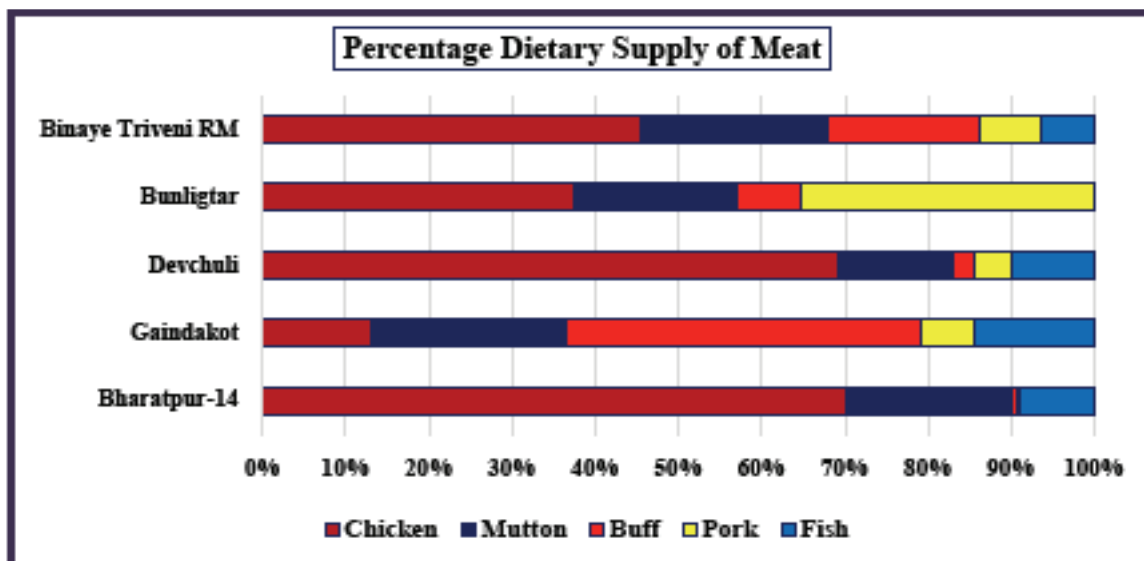


Fig 9: Percentage dietary supply of meat

Buff provided maximum dietary supply in Gaindakot municipality while it provided least dietary supply in Bharatpur 14. Pork was mostly consumed in Bulingtar rural municipality and it was least consumed in Bharatpur 14. Similarly, fish was least consumed in Binayee Triveni rural municipality while it was mostly consumed in Gaindakot municipality.

5.10. Dietary supply by different food groups

In all municipal bodies, the major dietary contribution was done by cereals and it was found to be maximum in Bharatpur 14 while the least dietary supply by cereals was found in Gaindakot municipality. Similarly, pulses provided maximum dietary supply in Devchuli municipality while the food group provided the least dietary supply in Gaindakot municipality. In vegetables, the amount of dietary supply was found to be maximum in Bulingtar rural municipality while it was found to be minimum in Bharatpur 14. Taking an account of fruits, it was found that the amount of dietary supply by fruits was found to be maximum in Gaindakot municipality while the dietary supply by fruits was found to be minimum in Bulingtar rural municipality. In addition to this, the amount of dietary supply by animal products was found to be maximum in Binayee Triveni rural municipality while it was supplied in the least in Bulingtar rural municipality.

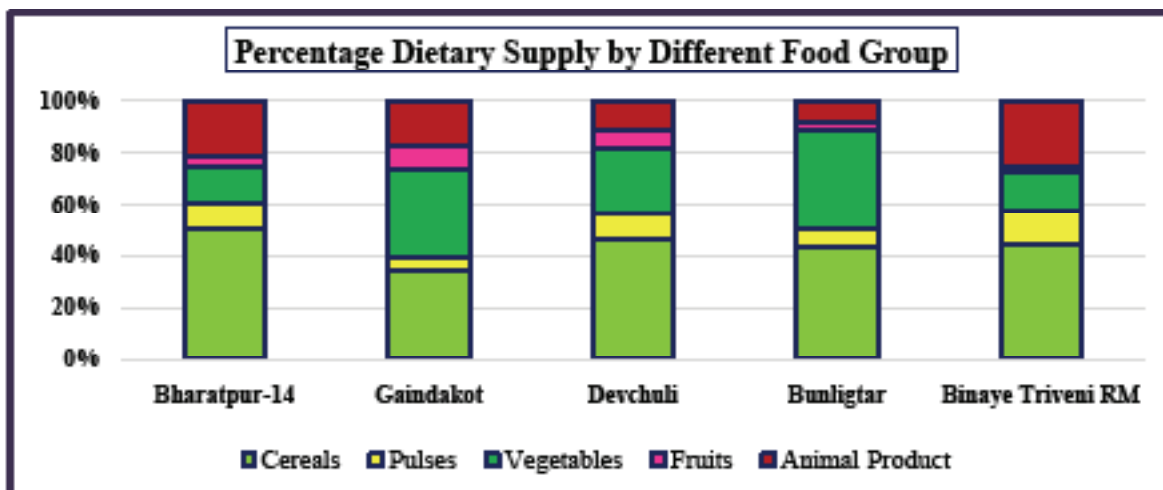


Fig 10: Percentage dietary supply of different food groups

7. Challenges and Limitations

The most prominent challenge was to acquire data related to production, import, export and consumption from secondary sources. Lack of digital data set further led to the compulsion for taking primary data. It was assumed that enough secondary data was present for the construction of the food balance sheet but later due to lack of data primary data collection was done. Like-wise data related to stocks were not present as the total stock was not under the governmental agencies and had an open market that enabled the consumers to buy and consume when needed. The transaction within two municipal areas was not recorded and trans boundary import and export of goods were much frequent due to which it was difficult to calculate. As earlier food balance sheet was assumed to be constructed using secondary data but later primary data collection was also done. Due to the limited resources for primary data collection vibrant sampling couldn't be done.

Further limitations of the study were it figured out last year's trends and gave no regard to the present production trend. A holistic scenario on present conditions and reasons for it could not be achieved as it lags to clear why and how the trends increase or decrease in terms of production and consumption. Commodity majorly used in consumption was used but those which support in the economy were not much prioritized like the spice crop, cash crop, etc. Along with the locality and different patterns of consumption, consumption in form of beverages and other alcoholic stuff is not recorded. As our ethnical variation suggests the variation of consumption of alcoholic substances produced from the local product so it should be kept on a note to report it on FBS as it also acts as a source of energy. The Standard Technical Conversion Factors were used to generate Food Balance Sheet following global standards but it would have been more precise if local standards were used. There is a need to get the most updated country-specific conversion factors to improve the quality of the FBS generated.

7. Lesson Learnt

The construction of FBS has comprised of many data related to different aspects of the agriculture system including primary source of data. Different governmental sources and agencies were kept in close contact for the data accumulation but certain differences were seen in the process and kept in concern that could help for the construction of more fine and well oriented FBS. The major lessons learned are:

7.1. Data backup and data sourcing

The data relating to the whole agriculture system is much poor so there is a regular need to update the data related to agriculture and livestock at the local level which keeps records and trend analysis of the current and previous scenario. The construction of FBS had facilitated us to consult and coordinate with local bodies, the district knowledge center, agriculture and livestock service center. The concept of FBS has further made clear to local government for frequent update and upload of data related to agriculture production and consumption

7.2. The urgency of implementation of Food Balance Sheet

The real need and concerned outcomes of FBS have highlighted its importance on policy and planning for local government bodies. Our approach towards the construction of FBS has made a great realization to the local government for yearly construction of FBS. This had been a great responsibility of us communicating with every local government about the need of FBS for policy and planning regulation of local bodies.

7.3. Documentation of diversified food production and consumption

FBS has observed the different food habits of different local bodies under ethnicity, caste, sex, religion, ecological niche, etc. But variation in food in the served plate is not quite impressive. Under diversified production, there is no diversified consumption within a particular locality in terms of nutrients like protein, fat, vitamin, calories resulting unbalanced diet. So, it will be a great scope of FBS in the near future if it can incorporate the diversified food consumption factor. It will help to address the need for a balanced diet and the need for a change of food habits.

8. Way Forward/ Recommendations

The major components of the agriculture system are production, distribution and consumption. With regards to production, distribution and consumption different governmental and non-governmental organization have been working intensively to uplift the status for making self-sustaining, market-friendly, and secured food and nutrition. Like-wise through different agencies, there is vast input in the agriculture system but there is no efficient mechanism to evaluate whether the input had increased or decreased or have no effect on different components. For analyzing and evaluating the scenario food balance sheet had been a great tool. It simply states the condition of production, imports, exports, feed, seed, stocks, waste, total consumption and total uptake. This simply takes into account from production to consumption so that efforts and effects of major inputs applied at different levels could be evaluated. FBS also draws the recent context on production, distribution and consumption system. This will be a great tool for the local level to determine their position in terms of self-sustainability and import dependency. Local government bodies can set plans and policies to address the concerning issues to form a resilient food ecosystem. FBS could be a great tool for all local bodies all over the country which could analyze the current situation at the local level and take steps accordingly. Thus, the government can reform the situation on the micro-level and overall leap forward in terms of food and nutrition security.

Currently, the major issue in our country is low production that has threatened food and nutritional security. The concern is not up to food and nutritional security as those who are food secure do not have diversified food habits leading to malnutrition and an unbalanced diet. It is a major concern that has to be addressed as soon as possible before any havoc condition arises. Government stakeholders and other concerned agencies should discuss the terms and conditions on which they can assure food and a nutritional secure state. Sidewise promotion and priority on diversified food intake should be done with change on food habit. Nepalese have much more dependence on cereals for energy due to which major import and consumption is concerned towards cereals. National debates should be carried out to change the food habit so that people can be aware of a balanced diet and diversified food habits. It will further enhance the underexploited and underutilized food crops that grow at the local level. It is now how we count on the food crops it is just how we achieve food security either by the imported food crops or with the indigenous food crops, the choice is ours. That is why a serious debate should penetrate the agriculture system to sustain our production with the adoption of underutilized food crops and use of improved varieties as well as acquiring balance and nutrient-rich diet through diverse food consumption.

Recent progress to resolve issues related to food and nutrient security is the initiation for the development of food banks. Our country had been hit hard by natural disasters and disease outbreaks over the last decade which has raised a thoughtful concern for a secured source of food and nutrition in these conditions. The issues related to malnutrition, unbalanced diet, and lack of diversified food products have been raised in these difficult conditions. The concept of a food bank is a great approach for preparedness during disasters and conditions like covid-19. The development of food banks in association with SAARC countries could help during the distress caused by pandemics and calamities. The concept of a food bank suggests its direct supply of food materials that may be raw or processed to the needy ones during hard times. FBS tool could help various countries to contribute to other needy countries in accordance with their surplus production and total demand of the needy country. Thus, FBS helps food banks to synchronize and develop harmony in supply and demand within the supplier and consumer and helps to fight against difficulties with the smart act.

9. Conclusion

In the present condition with the increasing population and occurrence of different types of disasters, pandemics, and disease outbreaks there is the biggest threat over food security and optimum supply of nutrients to every individual. Even use of specialized types of machinery, hybrid and improved seeds, fertilizers are not able to sufficiently provide food and nutrition to the population. Particularly in developing countries, the situation is much worse. Lack of concise data on the amount of production, supply, demand, and consumption have made them stand in the middle of nowhere for designing policy and plan to deal with the situation. To deal with such a situation development of the FBS tool was done to minimize the error in planning and policy-making which helped to recognize the attributes to be focused on for optimum food production and distribution. Further, it was supposed to help to determine the general patterns of food habits so that production or import could be facilitated.

In the total study areas, the animal product was found to be more self-sufficient while in Bulingtar RM

the fruit production was found to be self-sufficient. While the import dependency was majorly observed in pulses, fruits, and a bit less on cereals. This shows that major production is oriented towards cereal, vegetable, and animal production. Likewise, poor diversified food habits had led to less priority in the production of fruits and pulses. The total calorie requirement to the total calorie acquired is satisfactory in all municipal bodies where all populations are supplied with the full amount of required calorie. But due to the presence of many ultra-poor and underprivileged groups in Bharatpur-14, the total acquired calorie was a bit less. Majorly the calorie and protein requirement was fulfilled by cereals and legumes while the major fat was supplied by the animal source. The majority of the dietary supply of cereal was covered by paddy, dietary supply of pulses by lentil and bean, dietary supply of animal source by chicken meat. The percentage of dietary supply by different food groups was majorly dominated by cereals followed by vegetables, animal sources, pulses, and fruits.

The construction of FBS to picturize the real status of agriculture production, distribution, and consumption system have derived fruitful agendas that would be a milestone for local government planning and policy-making for declaring local municipal level as food sufficient as well making strategies for local import. FBS has further shown the way out for developing sustainable agriculture production and a resilient economy. Determining standards of production, the status of the supply system, and patterns of consumption by FBS have facilitated the prediction of the future of food production and food habits. Food balance sheet could help in the establishment of food banks after assessing the status food supply system and could further recommend for strengthening the high risk factor on production, supply and consumption. Food balance sheet could analyze the patterns of food consumption and food habit that could help to create balance between production and consumption. Thus use of food balance sheet as food inventory tool in policy planning could help in strengthening the major elements of food supply system and minimize the threats of food insecurity.

10. References

- a. Food-based dietary guidelines for Nepalese (2004) (revised 2012). <http://www.fao.org/nutrition/education/food-dietary-guidelines/regions/countries/nepal/en/>
- b. Kenya National Bureau of Statistics (May 2019), Enhanced Food Balance Sheets for Kenya 2014-2018 Results. <https://www.afdb.org/en/documents/food-balance-sheets-kenya-2014-2018-results>
- c. Philippine Statistics Authority, 2015-2017 Food Balance Sheets of the Philippines. https://psa.gov.ph/sites/default/files/2015-2017%20FBS%20Report_1.pdf
- d. Ministry of Agriculture and Livestock Department, <https://www.moald.gov.np/>
- e. The Food Security Atlas of Nepal, https://www.npc.gov.np/images/category/Food_Security_Atlas_2019.pdf
- f. Central Bureau of Statistics Nepal, https://www.npc.gov.np/en/page/99/department/central_bureau_of_statistics_cbs_
- g. Ward profile of Bharatpur Sub metropolitan city.
- h. Annual Report (2076-2077), Agriculture Knowledge Center, Tanahun, <https://tanahun.akc.gov.np/>
- i. Final report (2075/2077), Bharatpur Metropolitan City <https://bharatpurmun.gov.np/en/annual-progress-report>

11. Annex

Status of Cereals in several municipal bodies.

Bharatpur 14

Cereal Crop

| Cereal Crop | Total Production (qt.) | Total Export (qt.) | Total Import (qt.) | Total Waste (qt.) | Total Feed (qt.) | Total Seed (qt.) | Total Food (qt.) | Import Dependency Ratio (IDR) | Self-Sufficiency Ratio (SSR) |
|-------------|------------------------|--------------------|--------------------|-------------------|------------------|------------------|------------------|-------------------------------|------------------------------|
| Paddy | 53077.12 | 21645.89 | 1024.235 | 5307.712 | 797.568 | 523.9133 | 31491 | 3.787 | 196.262 |
| Wheat | 1429.27 | 301.1269 | 582.4409 | 142.927 | 24.39945 | 250.2524 | 1293.005 | 34.04924 | 83.55451 |
| Maize | 7120.417 | 539.7405 | 111.2432 | 1068.062 | 5096.8 | 81.41249 | 445.6444 | 1.662351 | 106.4032 |
| Potato | 2273.324 | 152.4737 | 1342.041 | 227.3324 | | 0 | 3235.559 | 38.75492 | 65.64815 |
| Barley | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Bulingtar Rural municipality

Cereal Crop

| Cereal Crop | Total Production (qt.) | Total Export (qt.) | Total Import (qt.) | Total Waste (qt.) | Total Feed (qt.) | Total Seed (qt.) | Total Food (qt.) | Import Dependency Ratio (IDR) | Self-Sufficiency Ratio (SSR) |
|-------------|------------------------|--------------------|--------------------|-------------------|------------------|------------------|------------------|-------------------------------|------------------------------|
| Paddy | 37348.83 | 571.80 | 11573.75 | 7469.766 | 433.1439 | 501.2606 | 39946.61 | 23.93 | 77.24 |
| Wheat | 99.99 | 18.9 | 539.87 | 503.64 | 12.2132 | 9.2274 | 108.0926 | 86.94119 | 16.10249 |
| Maize | 19155.79 | 143.2318 | 1048.327 | 3831.158 | 11493.47 | 526.37 | 4209.883 | 5.225727 | 95.48826 |
| Potato | 1733.27 | 23.6082 | 3071.298 | 670.7649 | 0 | 0 | 4110.195 | 64.2402 | 36.2536 |
| Millet | 3720.527 | 12.2679 | 92.6463 | 744.1054 | 1860.264 | 14.597 | 1181.94 | 2.43748 | 97.88528 |

Gaindakot municipality

| Crops | Total Production (qt) | Total Export (qt) | Total Import (qt) | Total Waste (qt) | Total Feed (qt) | Total Seed (qt) | Total Food (qt) | Import Dependency Ratio (IDR) (%) | Self Sufficiency Ratio (SSR) (%) |
|--------|-----------------------|-------------------|-------------------|------------------|-----------------|-----------------|-----------------|-----------------------------------|----------------------------------|
| Paddy | 121242.604 | 7132.198 | 11248.14 | 2990.388 | 1155.385 | 1024.5 | 120188.2741 | 8.972775 | 96.71666 |
| Wheat | 207.248942 | 25.9255 | 19732.66 | 10.11375 | 76.21803 | 17.097 | 19810.55866 | 99.08947 | 1.04072 |
| Maize | 62883.27 | 13570 | 43627.3 | 12576.65 | 76780.4 | 520.9 | 3062.5 | 46.94 | 67.65 |
| Millet | 76.54 | 21.11 | 483.6 | 6.9 | 0 | 0.7 | 531.4387016 | 89.71678 | 14.1994 |
| Potato | 3126.27 | 38.97 | 21242.5 | 312.63 | 0.58 | 0 | 24016.59911 | 87.31061 | 12.84956 |

Devchuli municipality

| Crops | Total production (qt) | Total Municipal export (qt) | Total Municipal import (qt) | Total Waste (qt) | Total Feed (qt) | Total Seed (qt) | Total Food (qt) | Import Dependency Ratio (IDR) (%) | Self Sufficiency Ratio (SSR) (%) |
|-------|-----------------------|-----------------------------|-----------------------------|------------------|-----------------|-----------------|-----------------|-----------------------------------|----------------------------------|
| Paddy | 69536.859 | 95.1647014 | 35275.8578 | 6953.686 | 68.854523 | 883.58867 | 96811.4 | 33.6867 | 66.4042 |
| Wheat | 292.5250219 | 5.84118355 | 9353.7656 | 29.25250219 | 0.8499421 | 111.509361 | 9498.838 | 97.02624 | 3.03435 |

| | | | | | | | | | |
|-----------|-------------|-------------|-------------|-------------|-----------|------------|----------|----------|----------|
| Maize | 12786.18387 | 31.92068163 | 1071.951034 | 1917.92758 | 11401.028 | 369.665327 | 137.5937 | 7.753034 | 92.47784 |
| Millet | 0.078259487 | | 124.4731497 | 0.007043354 | | 0.03607852 | 124.5083 | 99.93717 | 0.062833 |
| Buckwheat | 0.000444925 | | 2.029453528 | 4.44925E-05 | 0.0010841 | 0.00184431 | 2.026926 | 99.97808 | 0.021919 |

Binayee Triveni Rural municipality

| Crops | Total production (Qt) | Total Export (Qt) | Total import (Qt) | Total Waste (Qt) | Total Feed (Qt) | Total Seed (Qt) | Total Food (Qt) | IDR (%) | SSR (%) |
|-----------|-----------------------|-------------------|-------------------|------------------|-----------------|-----------------|-----------------|----------|-------------|
| Paddy | 91574.00115 | 640.0454955 | 2791.75309 | 9157.400115 | 12316.62756 | 1437.540215 | 70814.14086 | 2.978642 | 97.7042504 |
| Wheat | 183.9503098 | 0.428677686 | 5131.406 | 18.39503098 | 15.6110124 | 52.13338814 | 5228.788201 | 96.54705 | 3.4610125 |
| Maize | 20815.25134 | 22.282751 | 1543.238352 | 3122.287701 | 18462.04779 | 406.3988306 | 345.4726206 | 6.909133 | 93.1906272 |
| Millet | 0.669564374 | 0.285785124 | 55.63879132 | 0.060260794 | | 0.466286557 | 55.49602322 | 99.31496 | 1.19516896 |
| Barley | 0.000245975 | | 359.5631841 | 0.0000245975 | 357.2114 | 0.006746274 | 2.345259183 | 99.99993 | 0.000068409 |
| Sugarcane | 20252.80097 | 13840.94813 | 6.255836364 | 2025.280097 | | | 4392.828584 | 0.097472 | 315.557152 |

Status of Pulses & Oilseed in several municipal bodies

Bharatpur 14

| Pulses/Oil Seed Crop | Total Production (qt.) | Total Export (qt.) | Total Import (qt.) | Total Waste (qt.) | Total Feed (qt.) | Total Seed (qt.) | Total Food (qt.) | Import Dependency Ratio (IDR) | Self-Sufficiency Ratio (SSR) |
|----------------------|------------------------|--------------------|--------------------|-------------------|------------------|------------------|------------------|-------------------------------|------------------------------|
| Cowpea | 203.6317 | 30.5808 | 67.36285 | 20.363174 | 0 | 10.6379 | 209.4127 | 28.01955 | 84.70052 |
| Chickpea | 0 | 0 | 186.0775 | 0 | 0 | 0 | 186.0775 | 100 | 0 |
| Kidney-bean | 1623.56 | 1166.724 | 1.845928 | 162.35597 | 0 | 72.63271 | 223.6929 | 0.402442 | 353.9622 |
| Lentil | 444.6233 | 2.19384 | 367.6344 | 23.031487 | 0 | 45.97411 | 741.0583 | 45.38338 | 54.88744 |
| Soybean | 225.4906 | 0.6648 | 5.411871 | 22.54906 | 0 | 5.77869 | 201.9099 | 2.350558 | 97.93819 |
| Bean | 326.6001 | 0 | 29.00655 | 32.660008 | 0 | 4.252605 | 318.694 | 8.156921 | 91.84308 |
| Rapeseed | 1051.925 | 6.648 | 1464.786 | 54.489694 | 0 | 27.23966 | 2428.333 | 58.35656 | 41.9083 |

Bulingtar rural municipalality

| Pulses/Oil Seed Crop | Total Production (qt.) | Total Export (qt.) | Total Import (qt.) | Total Waste (qt.) | Total Feed (qt.) | Total Seed (qt.) | Total Food (qt.) | Import Dependency Ratio (IDR) | Self-Sufficiency Ratio (SSR) |
|----------------------|------------------------|--------------------|--------------------|-------------------|------------------|------------------|------------------|-------------------------------|------------------------------|
| Cowpea | 761.072 | 14.319 | 220.7802 | 53.9327 | 0 | 53.66 | 859.9405 | 22.81888 | 78.66107 |
| Chickpea | 0 | 0 | 407.5352 | 0 | 0 | 0 | 407.5352 | 100 | 0 |
| Black Gram | 1327.55 | 1.0284 | 35.208 | 37.08966 | 0 | 55.93 | 1268.71 | 2.585535 | 97.48999 |
| Lentil | 122.3525 | 0 | 963.8786 | 43.71077 | 0 | 8.86 | 1033.66 | 88.73605 | 11.26395 |
| Soybean | 298.98 | 216.945 | 275.7612 | 23.062 | 0 | 184.9434 | 149.7908 | 77.07214 | 83.56154 |
| Bean | 3001.698 | 11.008 | 49.28 | 55.07267 | 0 | 99.536 | 2885.361 | 1.621069 | 98.74104 |
| Rapeseed | 55.19 | 0 | 258135.6 | 38728.62 | 0 | 6.24 | 219455.9 | 99.97862 | 0.021376 |

Gaindakot municipality

| Crops | Total Production (qt) | Total Export (qt) | Total Import (qt) | Total Waste (qt) | Total Feed (qt) | Total Seed (qt) | Total Food (qt) | Import Dependency Ratio (IDR) (%) | Self Sufficiency Ratio (SSR) (%) |
|-------------|-----------------------|-------------------|-------------------|------------------|-----------------|-----------------|-----------------|-----------------------------------|----------------------------------|
| Horse gram | 1.15 | 0 | 461.83 | 0.057671 | 0.01 | 0 | 462.92 | 99.75 | 0.25 |
| Black gram | 36.22 | 2.19 | 1382.56 | 3.62 | 0 | 1.44 | 1411.52 | 97.6 | 2.56 |
| Pea | 851 | 31.83 | 1549.23 | 42.55 | 0 | 0 | 2325.85 | 65.41 | 35.93 |
| Chickpea | 0.58 | 0 | 1960.68 | 0.03 | 0 | 0 | 1961.22 | 99.97 | 0.03 |
| Kidney bean | 130.43 | 4.5 | 93.14 | 6.52 | 0 | 0 | 212.54 | 42.51 | 59.54 |
| Lentil | 84.27 | 8.82 | 6671.88 | 4.36 | 37.54 | 10.5 | 6694.9 | 98.88 | 1.25 |
| Soybean | 3.22 | 1.33 | 805.06 | 0.32 | 0.58 | 0.01 | 806.04 | 99.76 | 0.4 |
| Bean | 88.64 | 44.24 | 627.67 | 8.86 | 0 | 4.44 | 658.75 | 93.39 | 13.19 |
| Rapeseed | 3553.06 | 351.93 | 2596.7 | 184.05 | 0 | 55.44 | 5558.31 | 44.79 | 61.28 |

Devchuli municipality

| Crops | Total production (qt) | Total export (qt) | Total import (qt) | Total Waste (qt) | Total Feed (qt) | Total Seed (qt) | Total Food (qt) | Import Dependency Ratio (IDR) (%) | Self Sufficiency Ratio (SSR) (%) |
|-------------|-----------------------|-------------------|-------------------|------------------|-----------------|-----------------|-----------------|-----------------------------------|----------------------------------|
| Pea | 1922.073553 | 0.015177537 | 1013.061571 | 134.5451487 | 0.0444485 | 126.971211 | 2673.559 | 34.51517 | 65.48534942 |
| Chickpea | 0.020745995 | | 1157.821125 | 0.001203268 | | 0.00572775 | 1157.83494 | 99.99821 | 0.001792 |
| Kidney bean | 14.07330888 | 0.002710274 | 145.0105256 | 1.407330888 | | 2.82261631 | 154.8512 | 91.15508 | 8.846624 |
| Lentil | 58.92665912 | | 4411.464437 | 3.417746229 | 0.0043364 | 32.2306225 | 4434.738 | 98.68185 | 1.318154 |
| Soybean | 6.046371593 | 0.055525376 | 142.6048859 | 0.604637159 | 0.0829344 | 1.03561515 | 146.8725 | 95.96836 | 4.069008 |
| Bean | 20.65742496 | 0.027102745 | 658.9495754 | 2.065742496 | | 0.63272723 | 676.8814 | 96.96425 | 3.039735 |
| Black gram | 24.98352608 | 0.096147852 | 1160.118896 | 2.498352608 | 0.0086729 | 2.56998171 | 1179.929 | 97.89981 | 2.108303 |
| Rapeseed | 3442.17786 | 0.05420549 | 9119.14651 | 178.3048132 | | 85.0520326 | 12297.91 | 72.59733 | 27.4031 |

Binayee Triveni rural municipality

| Crops | Total Production (Qt) | Total Export (Qt) | Total Import (Qt) | Total Waste (Qt) | Total Feed (Qt) | Total Seed (Qt) | Total Food (Qt) | IDR (%) | SSR (%) |
|-------------|-----------------------|-------------------|-------------------|------------------|-----------------|-----------------|-----------------|----------|------------|
| Pea | 130.633078 | 4.117003519 | 426.8841379 | 9.144315463 | | 11.98782469 | 532.2680723 | 77.13841 | 23.6055345 |
| Chickpea | 0.16964717 | | 548.6109705 | 0.009839536 | | 0.151970123 | 548.618808 | 99.96909 | 0.03091348 |
| Kidney bean | 4.930462425 | | 322.525 | 0.493046243 | | 1.767803226 | 325.194613 | 98.49431 | 1.50568947 |
| Lentil | 830.9125452 | 16.62554959 | 1351.368514 | 48.19292762 | 0.004286777 | 131.4968459 | 1985.961449 | 62.39998 | 38.3677155 |
| Soybean | 0.002410555 | | 152.9133945 | 0.000241055 | | 0.027778774 | 152.8877852 | 99.99842 | 0.00157639 |
| Bean | 552.3154183 | 6.275841322 | 28.23291178 | 55.23154183 | | 6.877888229 | 512.1630587 | 4.916292 | 96.1765415 |
| Black gram | 0.904292892 | 0.102882645 | 51.74391833 | 0.135384844 | | 0.537273228 | 51.8726705 | 98.47482 | 1.72097676 |
| Pigeon pea | 0.904292892 | | 695.6483902 | 0.072343431 | | 0.319239795 | 696.1610999 | 99.87018 | 0.12982405 |
| Rapeseed | 16071.71119 | 3.395466819 | 5181.13273 | 832.5146398 | 0.071090827 | 214.6041522 | 20202.25857 | 24.38243 | 75.6335452 |

Status of vegetables in several municipal bodies

Bharatpur 14

| Vegetables | Total Production (qt.) | Total Export (qt.) | Total Import (qt.) | Total Waste (qt.) | Total Feed (qt.) | Total Seed (qt.) | Total Food (qt.) | Import Dependency Ratio (IDR) | Self-Sufficiency Ratio (SSR) |
|-----------------------|------------------------|--------------------|--------------------|-------------------|------------------|------------------|------------------|-------------------------------|------------------------------|
| Cauliflower | 424.347 | 1.316304 | 403.1374 | 84.869405 | 0 | 0 | 741.2987 | 48.79605 | 51.36328 |
| Cabbage | 305.7415 | 1.170048 | 105.4692 | 61.148304 | 0 | 0 | 348.8924 | 25.72164 | 74.56371 |
| Tomato | 155.9416 | 0 | 1074.982 | 31.18833 | 0 | 0 | 1199.735 | 87.33133 | 12.66867 |
| Carrot | 827.9707 | 0 | 27.4784 | 165.59415 | 0 | 0 | 689.855 | 3.212161 | 96.78784 |
| Green Leafy Vegetable | 3230.928 | 0 | | 969.2784 | 0 | 0 | 2261.65 | 0 | 100 |
| Pumpkin | 1351.405 | 49.0352 | 5.9832 | 270.28109 | 0 | 0 | 1038.072 | 0.457308 | 103.2905 |

Bulingtar rural municipality

| Vegetables | Total Production (qt.) | Total Export (qt.) | Total Import (qt.) | Total Waste (qt.) | Total Feed (qt.) | Total Seed (qt.) | Total Food (qt.) | Import Dependency Ratio (IDR) | Self-Sufficiency Ratio (SSR) |
|-----------------------|------------------------|--------------------|--------------------|-------------------|------------------|------------------|------------------|-------------------------------|------------------------------|
| Cauliflower | 801.9942 | 24.47 | 241.05 | 110.8187 | 0 | 0 | 907.7555 | 23.66543 | 78.73694 |
| Cabbage | 1424.8 | 55.69 | 189.626 | 179.3412 | 0 | 0 | 1379.395 | 12.16537 | 91.4074 |
| Tomato | 2649.8 | 43.389 | 767.1818 | 169.5706 | 0 | 0 | 3204.022 | 22.74079 | 78.54534 |
| Carrot | 0 | 0 | 31.11152 | 15.55576 | 0 | 0 | 15.55576 | 100 | 0 |
| Green Leafy Vegetable | 8989.429 | 298.2592 | 3.214 | 4251.927 | 0 | 0 | 4442.457 | 0.036966 | 103.3935 |
| Pumpkin | 36474 | 535.4524 | 0 | 10942.2 | 14589.6 | 0 | 24996.35 | 0 | 101.4899 |
| <i>Colocasia</i> | 1705.735 | 106.1096 | 15.47862 | 233.6578 | 0 | 0 | 1381.446 | 0.958367 | 105.6115 |

Gaindakot municipality

| Crops | Total Production (qt) | Total Export (qt) | Total Import (qt) | Total Waste (qt) | Total Feed (qt) | Total Seed (qt) | Total Food (qt) | Import Dependency Ratio (IDR) (%) | Self-Sufficiency Ratio (SSR) (%) |
|------------------------|-----------------------|-------------------|-------------------|------------------|-----------------|-----------------|-----------------|-----------------------------------|----------------------------------|
| Cauliflower | 13876.97 | 202.04 | 8284.6 | 2775.4 | 0.069 | 0 | 19184.08 | 37.73 | 63.19 |
| Cabbage | 12541.84 | 217.28 | 2085.59 | 2508.37 | 0 | 0 | 11901.79 | 14.47 | 87.03 |
| Tomato | 3492.07 | 112.90 | 18992.8 | 698.41 | 0 | 0 | 21673.54 | 84.89 | 15.6 |
| Carrot | 1448.46 | 0.05 | 637.12 | 289.69 | 0 | 0 | 1795.85 | 30.55 | 69.45 |
| Green Leafy Vegetables | 48998.68 | 279.35 | 104.27 | 14699.6 | 0 | 0 | 34124 | 0.21 | 100.35 |
| Chilies | 3668.4 | 37.26 | 5579.76 | 550.26 | 0 | 0 | 8660.64 | 60.58 | 39.8 |
| Pumpkin | 23839.91 | 548.54 | 58.48 | 4767.98 | 0.58 | 0 | 18581.29 | 0.25 | 102.01 |

Devchuli municipality

| Crops | Total production (qt) | Total export (qt) | Total import (qt) | Total waste (qt) | Total feed (qt) | Total seed (qt) | Total food (qt) | Import Dependency Ratio (IDR) (%) | Self-Sufficiency Ratio (SSR) (%) |
|-------|-----------------------|-------------------|-------------------|------------------|-----------------|-----------------|-----------------|-----------------------------------|----------------------------------|
| | | | | | | | | | |

| | | | | | | | | | |
|------------------------|-------------|-------------|-------------|-------------|-----------|--|----------|----------|----------|
| Potato | 1416.593457 | 3.062610158 | 11768.41561 | 141.6593457 | 0.1192521 | | 13040.17 | 89.27677 | 10.74647 |
| Cauliflower | 4212.069002 | 2.336256598 | 3235.261146 | 842.4138004 | | | 6602.58 | 43.45552 | 56.57586 |
| Cabbage | 3655.497877 | 1.631797443 | 1549.945745 | 731.0995754 | | | 4472.712 | 29.78482 | 70.24654 |
| Tomato | 5110.752654 | 17.88243722 | 9742.037155 | 1022.150531 | | | 13812.76 | 65.66969 | 34.45086 |
| Carrot | 133.550943 | 0.005420549 | 163.6685971 | 26.7101886 | | | 270.5039 | 55.06757 | 44.93425 |
| Green Leafy vegetables | 9077.981423 | 0.368597329 | 199.1061045 | 2723.394427 | | | 6553.325 | 2.146299 | 97.85767 |
| Pumpkin | 9078.23673 | 7.544429138 | 50.25309625 | 1815.647346 | | | 7305.298 | 0.550964 | 99.53175 |
| Chilly | 198.5127219 | 0.377245936 | 1021.101596 | 11.91076331 | | | 1207.326 | 83.74922 | 16.28172 |
| Colocasia | 1304.328723 | | 18.49243687 | 130.4328723 | | | 1192.388 | 1.397954 | 98.60205 |
| Mushroom | 14.36174445 | | 822.6529724 | 0.718087222 | | | 836.2966 | 98.28417 | 1.715829 |

Binayee Triveni rural municipality

| Crops | Total Production (Qt) | Total Export (Qt) | Total Import (Qt) | Total Waste (Qt) | Total Feed (Qt) | Total Seed (Qt) | Total Food (Qt) | IDR (%) | SSR (%) |
|-------------|-----------------------|-------------------|-------------------|------------------|-----------------|-----------------|-----------------|----------|------------|
| Potato | 10044.34967 | 186.4852489 | 3040.019913 | 1004.434967 | | | 11893.44937 | 23.56991 | 77.8759478 |
| Cauliflower | 3358.996986 | 302.7047408 | 495.597617 | 671.7993973 | | | 2880.090465 | 13.95307 | 94.5692889 |
| Cabbage | 3457.678326 | 198.4225923 | 535.2511111 | 691.5356651 | | | 3102.971179 | 14.10595 | 91.1232597 |
| Tomato | 2885.093514 | 147.7947672 | 885.0084848 | 577.0187027 | | | 3045.288528 | 24.43218 | 79.6479517 |
| Carrot | 23.43438017 | 1.343190083 | 267.7260444 | 4.686876033 | | | 285.1303585 | 92.37754 | 8.0859167 |
| GLV | 3714.180167 | 36.50975698 | 35.48498623 | 1114.25405 | | | 2598.901346 | 0.955656 | 100.027598 |
| Pumpkin | 436.402373 | 20.58790346 | 73.28559947 | 87.28047459 | | | 401.8195944 | 14.98376 | 89.2255799 |
| Chilly | 627.5690909 | 52.2272314 | 375.0141379 | 37.65414545 | | | 912.701852 | 39.46039 | 66.0351587 |
| Colocasia | 279.6676246 | 17.16843469 | 12.59621636 | 27.96676246 | | | 247.1286438 | 4.578854 | 101.662048 |
| Mushroom | 508.8333393 | 86.09099132 | 392.9003448 | 25.44166697 | | | 790.2010259 | 48.17064 | 62.3843435 |

Status of fruits in several municipal bodies

Bharatpur 14

| Fruits | Total Production (qt.) | Total Export (qt.) | Total Import (qt.) | Total Waste (qt.) | Total Feed (qt.) | Total Seed (qt.) | Total Food (qt.) | Import Dependency Ratio (IDR) | Self-Sufficiency Ratio(SSR) |
|-------------|------------------------|--------------------|--------------------|-------------------|------------------|------------------|------------------|-------------------------------|-----------------------------|
| Banana | 3397.881 | 57.888 | 49660.56 | 679.57629 | 0 | 0 | 52320.98 | 93.69819 | 103.2905 |
| Mango | 196.8532 | 0 | 178.7395 | 29.527973 | 0 | 0 | 346.0646 | 47.58865 | 6.41103 |
| Orange | 0 | 0 | 670.6946 | 0 | 0 | 0 | 670.6946 | 100 | 52.41135 |
| Pomegranate | 0 | 0 | 32.7886 | 0 | 0 | 0 | 32.7886 | 100 | 0 |
| Apple | 0 | 0 | 520.76 | 0 | 0 | 0 | 520.76 | 100 | 0 |
| Litchi | 0.93072 | 0 | 126.1777 | 0.093072 | 0 | 0 | 127.0153 | 99.26777 | 0 |

Bulingtar rural municipality

| Fruits | Total Production (qt.) | Total Export (qt.) | Total Import (qt.) | Total Waste (qt.) | Total Feed (qt.) | Total Seed (qt.) | Total Food (qt.) | Import Dependency Ratio (IDR) | Self-Sufficiency Ratio(SSR) |
|--------|------------------------|--------------------|--------------------|-------------------|------------------|------------------|------------------|-------------------------------|-----------------------------|
|--------|------------------------|--------------------|--------------------|-------------------|------------------|------------------|------------------|-------------------------------|-----------------------------|

| | | | | | | | | | |
|-------------|----------|--------|----------|----------|---|---|----------|----------|----------|
| Banana | 100285.3 | 7933.9 | 12064.69 | 20057.06 | 0 | 0 | 84359.03 | 11.55444 | 96.04391 |
| Mango | 193.177 | 0 | 474.455 | 19.3177 | 0 | 0 | 648.3143 | 71.06535 | 28.93465 |
| Orange | 2200 | 2000 | 309.778 | 220 | 0 | 0 | 289.778 | 60.76724 | 431.5604 |
| Pomegranate | 0 | 0 | 44.1192 | 4.41192 | 0 | 0 | 39.70728 | 100 | 0 |
| Apple | 0 | 0 | 252.6975 | 25.26975 | 0 | 0 | 227.4278 | 100 | 0 |

Gaindakot municipality

| Crops | Total Production (qt) | Total Export (qt) | Total Import (qt) | Total Waste (qt) | Total Feed (qt) | Total Seed (qt) | Total Food (qt) | Import Dependency Ratio (IDR) (%) | Self Sufficiency Ratio (SSR) (%) |
|-------------|-----------------------|-------------------|-------------------|------------------|-----------------|-----------------|-----------------|-----------------------------------|----------------------------------|
| Banana | 2917.53 | 54.5 | 11183.55 | 437.63 | 0 | 0 | 13608.95 | 79.62 | 20.77 |
| Mango | 7930.02 | 4.61 | 2592.54 | 1189.5 | 0 | 0 | 9328.44 | 24.65 | 75.39 |
| Orange | 0 | 0 | 6014.29 | 0 | 0 | 0 | 6014.29 | 100 | 0 |
| Papaya | 5744.26 | 0.14 | 1.49 | 861.64 | 0 | 0 | 4883.97 | 0.026 | 99.98 |
| Pomegranate | 0.93 | 0 | 1582.82 | 0.09 | 0 | 0 | 1583.66 | 99.94 | 0.06 |
| Apple | 0 | 0 | 4332.8 | 0 | 0.2 | 0 | 4332.6 | 100 | 0 |

Devchuli municipality

| Crops | Total production (qt) | Total municipal export (qt) | Total municipal import (qt) | Total waste (qt) | Total feed (qt) | Total seed (qt) | Total food (qt) | Import Dependency Ratio (IDR) (%) | Self Sufficiency Ratio (SSR) (%) |
|-----------|-----------------------|-----------------------------|-----------------------------|------------------|-----------------|-----------------|-----------------|-----------------------------------|----------------------------------|
| Banana | 304.9546634 | 7.18981613 | 4508.333344 | 60.9909327 | | | 4745.108 | 93.80444 | 6.345161 |
| Mango | 715.6317137 | 1.691211273 | 1127.950106 | 107.3447571 | | | 1734.546 | 61.23871 | 38.85311 |
| Orange | | | 10481.4087 | 0.010841098 | | | 10481.51 | 100 | 0 |
| Litchi | 11.66974183 | | 619.1595745 | 1.166974183 | | | 629.6623 | 98.1501 | 1.849905 |
| Apple | | | 2513.761146 | | | | 2513.761 | 100 | 0 |
| Pineapple | 1.803958691 | 0.048784941 | 379.3874735 | 0.360791738 | | | 380.7819 | 99.5395 | 0.473303 |
| Papaya | 599.6650315 | 0.005432082 | 21.85565337 | 119.9330063 | | | 501.5822 | 3.516511 | 96.48436 |

Binayee Triveni rural municipality

| Crops | Total Production (Qt) | Total Export (Qt) | Total Import (Qt) | Total Waste (Qt) | Total Feed (Qt) | Total Seed (Qt) | Total Food (Qt) | IDR (%) | SSR (%) |
|--------|-----------------------|-------------------|-------------------|------------------|-----------------|-----------------|-----------------|----------|------------|
| Banana | 46609.12427 | 15517.12091 | 1072.508184 | 9321.824854 | | | 22842.68669 | 3.334446 | 144.908541 |
| Mango | 1677.26481 | 363.8855064 | 796.575 | 251.5897216 | | | 1858.364583 | 37.75319 | 79.4929448 |
| Orange | | | 999.9383333 | | | | 999.9383333 | 100 | 0 |
| Litchi | 97.7385124 | 0.428677686 | 349.7959111 | 9.77385124 | | | 437.3318946 | 78.23561 | 21.8602676 |
| Apple | | | 1015.7875 | | | | 1015.7875 | 100 | 0 |
| Papaya | 24.5633025 | 0.171471074 | 6.738754603 | 4.912660499 | | | 26.21792552 | 21.64673 | 78.90408 |

Status of animal products in several municipal bodies

Bharatpur 14

| Animal Product | Total Production (qt.) | Total Export (qt.) | Total Import (qt.) | Total Waste (qt.) | Total Feed (qt.) | Total Seed (qt.) | Total Food (qt.) | Import Dependency Ratio (IDR) | Self-Sufficiency Ratio (SSR) |
|------------------|------------------------|--------------------|--------------------|-------------------|------------------|------------------|------------------|-------------------------------|------------------------------|
| Chicken/Duck Egg | 1020600 | 1000000 | 352570 | 20412 | 0 | 0 | 352758 | 94.47973 | 273.4946 |
| Chicken Meat | 941220 | 894000 | 1333.744 | 47061 | 0 | 0 | 1492.744 | 2.746944 | 1938.512 |
| Milk | 1886746 | 1440000 | 360000 | 94337.28 | 0 | 0 | 712408.3 | 44.62373 | 233.8712 |
| Goat Meat | 13.098 | 13.7392 | 426.8016 | 0.6549 | 0 | 0 | 425.5055 | 100.1505 | 3.073491 |
| Buffalo Meat | 0 | 0 | 14.39824 | 1.0078767 | 0 | 0 | 13.39036 | 100 | 0 |
| Pig | 0 | 0 | 4.430227 | 0.3101159 | 0 | 0 | 4.120111 | 100 | 0 |
| Fish | 0 | 0 | 203.4049 | 14.238341 | 0 | 0 | 189.1665 | 100 | 0 |

Bulingtar rural municipality

| Animal Products | Total Production (qt.) | Total Export (qt.) | Total Import (qt.) | Total Waste (qt.) | Total Feed (qt.) | Total Seed (qt.) | Total Food (qt.) | Import Dependency Ratio (IDR) | Self-Sufficiency Ratio (SSR) |
|------------------|------------------------|--------------------|--------------------|-------------------|------------------|------------------|------------------|-------------------------------|------------------------------|
| Chicken/Duck Egg | 101759 | 0 | 638782.5 | 10523.73 | 0 | 0 | 730017.8 | 86.25884 | 13.74116 |
| Cow Milk | 46281.6 | 480 | 4306.76 | 5031.517 | 0 | 0 | 45076.84 | 8.594893 | 92.36303 |
| Buffalo Milk | 396581.9 | 0 | 46484.08 | 19923.59 | 0 | 0 | 423142.4 | 10.49146 | 89.50854 |
| Chicken Meat | 1204.94 | 675.804 | 1029.758 | 142.9427 | 0 | 0 | 1415.951 | 66.05696 | 77.29454 |
| Goat Meat | 1232.583 | 728.6759 | 271.8 | 28.86172 | 0 | 0 | 746.8456 | 35.03899 | 158.898 |
| Buffalo Meat | 85.59 | 215.0914 | 461.456 | 35.61433 | 0 | 0 | 296.3403 | 139.0118 | 25.78365 |
| Pig | 316.1933 | 223.72 | 1284.726 | 43.28615 | 0 | 0 | 1333.913 | 93.28541 | 22.95915 |

Gaindakot municipality

| Animal Products | Total Production | Total Export | Total Import | Total Waste | Total Feed | Total Seed | Total Food | Import Dependency Ratio (IDR) (%) | Self-Sufficiency Ratio (SSR) (%) |
|------------------------|------------------|--------------|--------------|-------------|------------|------------|-------------|-----------------------------------|----------------------------------|
| Milk (Cow and Buffalo) | 20154000 Liters | 15115500 | 0 | 1007700 | 0 | 0 | 4030800 | 0 | 400 |
| Chicken/Duck (Egg) | 2080000 pieces | 577193.8 | 3139990 | 41600 | 0 | 0 | 4601195.698 | 67.63 | 44.8 |
| Chicken/Duck (Meat) | 6116.02 quintal | 4000 | 2288.88 | 181.437 | 0 | 0 | 3701.628 | 51.96213 | 138.8458 |
| Goat Meat | 2400 quintal | 920 | 5397.323 | 197.8635 | 0 | 0 | 6679.46 | 78.48 | 34.8973 |
| Buffalo Meat | 13750 | 650 | 68.34046 | 962.5 | 0 | 0 | 12205.84 | 0.518975 | 104.4171 |
| Pig Meat | 1800 | 19.03163 | 58.70436 | 1.38064 | 0 | 0 | 1838.292 | 3.191022 | 97.84349 |
| Fish | 10 | 0 | 4095.6 | 0.5 | 0 | 0 | 4105.107 | 99.75643 | 0.243569 |

Devchuli municipality

| Products | Total production | Total export | Total import | Total waste | Total feed | Total seed | Total food | Import Dependency Ratio (IDR) (%) | Self Sufficiency Ratio (SSR) (%) |
|----------------------|---------------------|--------------|--------------|-------------|------------|------------|------------|-----------------------------------|----------------------------------|
| Chicken/Duck (Eggs) | 507220.4528 pieces | 11489.39556 | 3160879.756 | 10144.40906 | | | 3646466 | 86.44288 | 13.87133 |
| Milk (Cow & Buffalo) | 4509200.57 liters | 3132000 | 29264.9475 | 46672.82367 | | | 1359793 | 2.080744 | 320.6051 |
| Chicken/Duck (Meat) | 6886.37 quintal | 4320 | 4429.5 | 128.3184871 | | | 5070.976 | 63.31593 | 98.43479 |
| Goat (Meat) | 45.095 quintal | 27 | 1332.102073 | 2.25475 | | | 1347.942 | 98.65983 | 3.339883 |
| Buffalo (Meat) | 27.04745516 quintal | 5.056288062 | 233.8235099 | 1.893321861 | | | 253.9214 | 91.40348 | 10.57307 |
| Pig (Meat) | 235.2642918 quintal | 142.4243021 | 360.4594586 | 16.46850042 | | | 436.8309 | 79.51906 | 51.90041 |
| Fish (Meat) | 8.260916602 quintal | 2.656068986 | 995.7006369 | 0.41304583 | | | 1000.892 | 99.44025 | 0.825015 |

Binayee Triveni rural municipality

| Commodities | Total Production | Total Export | Total Import | Total Waste | Total Feed | Total Seed | Total Food | IDR (%) | SSR (%) |
|---------------------|------------------|--------------|--------------|-------------|------------|------------|-------------|----------|------------|
| Chicken/Duck (Eggs) | 109620000 | 93600000 | | 2192400 | | | 10620000 | 0 | 684.269663 |
| Milk (Cow & Buff) | 5328000 | 540000 | 216000 | 266400 | | | 3204000 | 4.316547 | 106.47482 |
| Chicken/Duck (Meat) | 8922.928715 | 7758.532535 | 1715.603822 | 446.1464358 | | | 2880 | 59.56958 | 309.823913 |
| Goat (Meat) | 899.429741 | 360 | 900.5702585 | 44.97148705 | | | 1440 | 62.5396 | 62.4603987 |
| Buffalo (Meat) | 1878.908982 | 810 | 83.09101851 | 131.5236287 | | | 1152 | 7.212762 | 163.099738 |
| Pig (Meat) | 628.732562 | 360 | 199.267438 | 44.01127934 | | | 468 | 42.57851 | 134.344565 |
| Fish | 14.2892562 | 13.43190083 | 413.6892988 | 0.71446281 | | | 413.8321913 | 99.79318 | 3.44695972 |

Per Year Individual Food and total nutrients supplied in several municipal bodies

Bharatpur 14

| Crops | Per Year Individual Food | Total Calorie Intake per day (K Cal) | Total Protein Intake per day (gm) | Total Fat Intake per day (gm) |
|-------------|--------------------------|--------------------------------------|-----------------------------------|-------------------------------|
| Paddy | 1.859 | 1230.512 | 24.253 | 1.783 |
| Wheat | 0.117792 | 81.98339 | 2.591429 | 0.212026 |
| Maize | 0.040598 | 38.03978 | 1.234624 | 0.400419 |
| Potato | 0.294758 | 78.33295 | 1.29209 | 0.080756 |
| Cowpea | 0.019077 | 16.8822 | 1.259632 | 0.052267 |
| Chickpea | 0.016952 | 17.27668 | 0.966008 | 0.260079 |
| Kidney-bean | 0.020378 | 19.31754 | 1.278531 | 0.07258 |
| Lentil | 0.06751 | 63.44099 | 4.642475 | 0.129471 |

| | | | | |
|-----------------------|----------|----------|----------|----------|
| Soybean | 0.018394 | 21.77032 | 1.678129 | 0.891979 |
| Bean | 0.029033 | 3.818024 | 0.954506 | 0.095451 |
| Rapeseed | 0.22122 | 234.554 | 0 | 0.260616 |
| Cauliflower | 0.067532 | 5.550575 | 1.091613 | 0.240525 |
| Cabbage | 0.031784 | 2.351141 | 0.156743 | 0.008708 |
| Tomato | 0.109295 | 6.288225 | 0.389271 | 0.029944 |
| Carrot | 0.062845 | 8.230177 | 0.154961 | 0.034436 |
| Green Leafy Vegetable | 0.206035 | 34.4333 | 1.128961 | 1.473294 |
| Pumpkin | 0.094568 | 6.477257 | 0.362726 | 0.025909 |
| Banana | 4.766419 | 30.29614 | 0.313408 | 0.078352 |
| Mango | 0.031526 | 6.478015 | 0.095011 | 0.005182 |
| Orange | 0.0611 | 8.035067 | 0.117178 | 0.033479 |
| Pomegranate | 0.002987 | 0.531936 | 0.013094 | 0.000818 |
| Apple | 0.047441 | 7.668547 | 0.025995 | 0.064988 |
| Litchi | 0.011571 | 1.933791 | 0.034872 | 0.00634 |
| Chicken/Duck Egg | 32.13611 | 15.23163 | 1.170987 | 1.170987 |
| Chicken Meat | 0.135988 | 69.67073 | 7.004331 | 6.557246 |
| Milk | 64.90009 | 119.1317 | 5.689871 | 7.290147 |
| Goat Meat | 0.038763 | 12.53172 | 2.272702 | 0.382324 |
| Buffalo Meat | 0.00122 | 0.287418 | 0.064836 | 0.003008 |
| Pig | 0.000375 | 0.11723 | 0.01923 | 0.004525 |
| Fish | 0.017233 | 4.579726 | 0.788468 | 0.066099 |
| Total | | 2145.752 | 61.045 | 21.715 |

Bulingtar rural municipality

| Crops | Per Year Individual Food | Total Calorie Intake per day (K Cal) | Total Protein Intake per day (gm) | Total Fat Intake per day (gm) |
|------------|--------------------------|--------------------------------------|-----------------------------------|-------------------------------|
| Paddy | 1.599402 | 1297.64 | 25.57 | 2.6866 |
| Wheat | 0.005307 | 3.693659 | 0.116754 | 0.013086 |
| Maize | 0.206691 | 193.6667 | 6.285673 | 2.038597 |
| Potato | 0.201797 | 53.62817 | 0.884588 | 0.055287 |
| Millet | 0.058029 | 51.19292 | 1.160585 | 0.206679 |
| Cowpea | 0.04222 | 37.36196 | 2.787688 | 0.115672 |
| Chickpea | 0.020009 | 20.39233 | 1.140216 | 0.306981 |
| Black Gram | 0.062289 | 59.21757 | 3.583772 | 0.273049 |
| Lentil | 0.050749 | 47.69037 | 3.489879 | 0.097327 |
| Soyabean | 0.007354 | 8.704175 | 0.670947 | 0.356629 |
| Bean | 0.141661 | 18.62946 | 4.657364 | 0.465736 |

| | | | | |
|-----------------------|----------|----------|----------|----------|
| Rapeseed | 10.77454 | 114.2397 | 0 | 12.6933 |
| Cauliflower | 0.044568 | 3.663101 | 0.72041 | 0.158734 |
| Cabbage | 0.067724 | 5.009693 | 0.33398 | 0.018554 |
| Tomato | 0.157307 | 9.05052 | 0.56027 | 0.043098 |
| Carrot | 0.000764 | 0.100018 | 0.001883 | 0.000418 |
| Green Leafy Vegetable | 0.21811 | 36.4512 | 1.195121 | 1.559633 |
| Pumpkin | 1.227236 | 84.05728 | 4.707207 | 0.336229 |
| Colocasia | 0.067824 | 18.02455 | 0.55746 | 0.018582 |
| Banana | 4.141743 | 26.31452 | 0.272708 | 0.068055 |
| Mango | 0.03183 | 6.54042 | 0.095926 | 0.005232 |
| Orange | 0.014227 | 1.870964 | 0.027285 | 0.007796 |
| Pomegranate | 0.001949 | 0.34717 | 0.008546 | 0.000534 |
| Apple | 0.011166 | 1.804904 | 0.006118 | 0.015296 |
| Chicken/Duck Egg | 35.84141 | 16.98784 | 1306.002 | 1306.002 |
| Cow Milk | 2.213121 | 4.062441 | 0.194027 | 0.248597 |
| Buffalo Milk | 20.77486 | 59.7633 | 2.447449 | 3.699633 |
| Chicken Meat | 0.069518 | 35.61629 | 3.580675 | 3.352121 |
| Goat Meat | 0.036668 | 11.85418 | 2.149826 | 0.361653 |
| Buffalo Meat | 0.014549 | 3.428056 | 0.773306 | 0.035875 |
| Pig | 0.065491 | 20.45461 | 3.355273 | 0.789476 |
| Total | | 2206.62 | 67.92 | 30.8388 |

Gaindakot municipality

| Crops | Per Year Individual Food (quintal) | Total Calorie Intake per day (K Cal) | Total Protein Intake per day (gm) | Total Fat Intake per day (gm) |
|-------------|------------------------------------|--------------------------------------|-----------------------------------|-------------------------------|
| Paddy | 1.572877313 | 1040.68458 | 20.51204 | 1.508239 |
| Wheat | 0.259256392 | 180.442449 | 5.703641 | 0.466662 |
| Maize | 0.040078903 | 37.5533829 | 1.218838 | 0.395299 |
| Millet | 0.006954821 | 6.13548551 | 0.139096 | 0.024771 |
| Potato | 0.314299911 | 83.5262778 | 1.377753 | 0.08611 |
| Horse gram | 0.00605811 | 5.34441455 | 0.350375 | 0.014108 |
| Black gram | 0.018472298 | 17.4095078 | 1.06279 | 0.080974 |
| Pea | 0.03043785 | 26.6018468 | 1.64281 | 0.158444 |
| Chickpea | 0.025666085 | 26.1583111 | 1.462615 | 0.393781 |
| Kidney bean | 0.002781527 | 2.63673508 | 0.174512 | 0.009907 |
| Lentil | 0.087614733 | 82.3338451 | 6.025013 | 0.168028 |
| Soybean | 0.010548435 | 11.8778268 | 0.962364 | 0.511527 |
| Bean | 0.008620928 | 7.79426331 | 0.533789 | 0.033539 |

| | | | | |
|------------------------|--------------------|------------|----------|----------|
| Rapeseed | 0.115391168 | 171.031841 | 6.322804 | 5.209339 |
| Cauliflower | 0.251057818 | 20.6348892 | 4.058195 | 0 |
| Cabbage | 0.155756077 | 11.5216824 | 0.768112 | 0.042673 |
| Tomato | 0.283636813 | 16.3188304 | 1.010213 | 0.077709 |
| Carrot | 0.023501888 | 3.07778145 | 0.05795 | 0.012878 |
| Green Leafy Vegetables | 0.446573246 | 74.632789 | 6.239791 | 1.345837 |
| Chilly | 0.113339886 | 9.00508681 | 0.900509 | 0.186312 |
| Pumpkin | 0.243169238 | 16.6554272 | 0.932704 | 0.066622 |
| Banana | 0.178097264 | 56.6007742 | 0.585525 | 0.146381 |
| Mango | 0.122079295 | 25.0847866 | 0.36791 | 0.020068 |
| Orange | 0.07870772 | 10.3506043 | 0.150946 | 0.043128 |
| Papaya | 0.063915458 | 5.60354698 | 0.105067 | 0.017511 |
| Pomegranate | 0.020724983 | 3.69075035 | 0.090849 | 0.005678 |
| Apple | 0.056699867 | 9.1651839 | 0.031068 | 0.077671 |
| Chicken/Duck (Egg) | 60.2148286 pieces | 14.2698932 | 4.966816 | 4.966816 |
| Milk (Cow and Buffalo) | 52.75018649 liters | 96.8291094 | 4.624674 | 5.925363 |
| Chicken/Duck (Meat) | 0.048442385 | 24.8184276 | 2.495115 | 2.335852 |
| Goat Meat | 0.087412612 | 28.2594197 | 5.125013 | 0.862152 |
| Buffalo Meat | 0.15973513 | 37.6362223 | 8.490032 | 0.393867 |
| Pig Meat | 0.024057321 | 7.51379349 | 1.232526 | 0.290006 |
| Fish | 0.053722623 | 53.8698083 | 9.552324 | 1.639644 |
| Total | | 2225.06957 | 99.27378 | 34.85832 |

Devchuli municipality

| Commodities | Per year Individual Food | Total calorie intake per day (Kcal) | Total protein intake per day (gm) | Total fat intake per day (gm) |
|-------------|--------------------------|-------------------------------------|-----------------------------------|-------------------------------|
| Paddy | 1.95039 | 1290.46 | 25.4352 | 1.87024 |
| Wheat | 0.191366 | 133.1908 | 4.210054 | 0.344459 |
| Maize | 0.002772 | 2.597325 | 0.084299 | 0.02734 |
| Potato | 0.262711 | 69.81625 | 1.151608 | 0.071976 |
| Millet | 0.002508 | 2.212869 | 0.050168 | 0.008934 |
| Buckwheat | 4.0835E-05 | 0.035017 | 0.000682 | 0.000145 |
| Pea | 0.053862222 | 47.07411 | 2.907084 | 0.280379 |
| Chickpea | 0.023326046 | 23.77339 | 1.329265 | 0.357879 |
| Kidney bean | 0.003119672 | 2.957278 | 0.195727 | 0.011111 |
| Lentil | 0.089343401 | 83.95832 | 6.143889 | 0.171344 |
| Soybean | 0.002958933 | 3.331839 | 0.269952 | 0.143488 |
| Bean | 0.01363663 | 12.32901 | 0.84435 | 0.053052 |
| Black gram | 0.023771164 | 22.40351 | 1.367656 | 0.104202 |

| | | | | |
|------------------------|-----------------|----------|----------|----------|
| Rapeseed | 0.247756982 | 157.906 | 5.837562 | 11.58756 |
| Cauliflower | 0.133017307 | 10.93293 | 2.150143 | 0.874634 |
| Cabbage | 0.090108432 | 6.665555 | 0.44437 | 0.024687 |
| Tomato | 0.278275416 | 16.01037 | 0.991118 | 0.07624 |
| Carrot | 0.005449643 | 0.713679 | 0.013437 | 0.002986 |
| Green Leafy Vegetables | 0.132024991 | 22.06445 | 1.844733 | 0.397884 |
| Pumpkin | 0.147174448 | 10.08044 | 0.564505 | 0.040322 |
| Chilly | 0.024323112 | 1.932521 | 0.193252 | 0.039983 |
| Colocasia | 0.024022167 | 6.383973 | 0.197442 | 0.006581 |
| Mushroom | 0.016848251 | 1.707905 | 0.138479 | 0.009232 |
| Banana | 0.007966348 | 30.38125 | 0.314289 | 0.078572 |
| Mango | 0.034944615 | 7.1804 | 0.105313 | 0.005744 |
| Orange | 0.21116317 | 27.7694 | 0.40497 | 0.115706 |
| Litchi | 0.012685342 | 2.120016 | 0.03823 | 0.006951 |
| Apple | 0.05064289 | 8.186111 | 0.02775 | 0.069374 |
| Pineapple | 0.007671331 | 0.966798 | 0.008407 | 0.002102 |
| Papaya | 0.010105007 | 0.885918 | 0.016611 | 0.002768 |
| Chicken/ Duck (Egg) | 73.46267 pieces | 17.53699 | 1.905753 | 1.348219 |
| Milk (Cow & Buffalo) | 27.39474 liters | 50.286 | 2.401 | 3.077 |
| Chicken/Duck (Meat) | 0.102 | 52.340 | 5.262 | 4.926 |
| Goat (Meat) | 0.027156 | 8.7792 | 1.59216 | 0.26784 |
| Buffalo (Meat) | 0.005115566 | 1.205311 | 0.271896 | 0.012614 |
| Pig (Meat) | 0.008800511 | 2.748653 | 0.450875 | 0.106088 |
| Fish (Meat) | 0.020164241 | 20.21949 | 3.585368 | 0.615424 |
| Total | | 2159.146 | 72.75033 | 27.1394 |

Binayee Triveni rural municipality

| Commodities | Per year Individual Food | Total Calorie Intake per Day (Kcal) | Total Protein Intake per Day (gm) | Total Fat Intake per Day (gm) |
|-------------|--------------------------|-------------------------------------|-----------------------------------|-------------------------------|
| Paddy | 1.83072157 | 1211.285638 | 23.87461548 | 1.755486 |
| Wheat | 0.13517717 | 94.0833119 | 2.97389779 | 0.243319 |
| Maize | 0.00893133 | 8.368530105 | 0.271610188 | 0.08809 |
| Millet | 0.00143471 | 1.2656895 | 0.028694203 | 0.000393 |
| Barley | 6.0631E-05 | 0.05581354 | 0.001910285 | 0.000216 |
| Sugarcane | 0.11356554 | 0.248910769 | 0 | 0 |
| Pea | 0.01376045 | 12.02625869 | 0.742687449 | 0.07163 |
| Chickpea | 0.01418316 | 14.4551657 | 0.808245824 | 0.217605 |
| Kidney bean | 0.00840709 | 7.969459792 | 0.527458466 | 0.029943 |
| Lentil | 0.05134204 | 48.24745129 | 3.530644394 | 0.098464 |
| Soybean | 0.00395253 | 4.450656262 | 0.360600617 | 0.191671 |

| | | | | |
|---------------------|------------|-------------|-------------|----------|
| Bean | 0.01324069 | 11.97103313 | 0.81983439 | 0.051512 |
| Black gram | 0.00134104 | 1.263881893 | 0.077155581 | 0.005879 |
| Pigeon pea | 0.01799749 | 16.51824874 | 1.099572976 | 0.083824 |
| Rapeseed | 0.5222786 | 332.8703315 | 0.123057424 | 0.244269 |
| Potato | 0.30747523 | 81.71259533 | 1.347836624 | 0.08424 |
| Cauliflower | 0.0744575 | 6.119794325 | 1.203559551 | 0.489584 |
| Cabbage | 0.08021952 | 5.934046544 | 0.395603103 | 0.021978 |
| Tomato | 0.07872828 | 4.52957217 | 0.280402087 | 0.021569 |
| Carrot | 0.00737133 | 0.965341105 | 0.018175879 | 0.004039 |
| GLV | 0.06718806 | 11.22868947 | 0.93879207 | 0.202485 |
| Pumpkin | 0.01038804 | 0.711509269 | 0.039844519 | 0.002846 |
| Chilly | 0.02359561 | 1.874719825 | 0.187471983 | 0.038787 |
| Colocasia | 0.00638889 | 1.697869327 | 0.052511422 | 0.00175 |
| Mushroom | 0.02042866 | 2.07085054 | 0.167906801 | 0.011194 |
| Banana | 0.59054023 | 1.876785393 | 0.019415021 | 0.004854 |
| Mango | 0.04804334 | 9.871919964 | 0.144788159 | 0.007898 |
| Orange | 0.02585089 | 3.399569291 | 0.049577052 | 0.014165 |
| Litchi | 0.01130612 | 1.88951537 | 0.034073228 | 0.006195 |
| Apple | 0.02626063 | 4.244869255 | 0.014389387 | 0.035973 |
| Papaya | 0.0006778 | 0.059423434 | 0.001114189 | 0.000186 |
| Chicken/Duck (Eggs) | 274.553398 | 65.06539439 | 7.070690258 | 5.002137 |
| Milk (Cow & Buff) | 82.8313642 | 152.0466138 | 7.261927823 | 9.304345 |
| Chicken/Duck (Meat) | 0.07445516 | 38.14551975 | 3.834950648 | 3.590167 |
| Goat (Meat) | 0.03722758 | 12.03521746 | 2.182658082 | 0.367176 |
| Buffalo (Meat) | 0.02978206 | 7.017143739 | 1.582937076 | 0.073435 |
| Pig (Meat) | 0.01209896 | 3.778854296 | 0.619864696 | 0.145851 |
| Fish | 0.01069859 | 10.72790202 | 1.902297381 | 0.326527 |
| Total | | 2214.752 | 67.054 | 24.582 |

Calorie consumption status of several municipal bodies

Bharatpur 14

| Age group | Actual population | Recommended Calorie (Kcal) | Actual calorie Needed (Kcal) |
|-----------|-------------------|----------------------------|------------------------------|
| 0-18 | 2803 | 1829.411 | 5127839 |
| 18-30 | 2024 | 2433.333 | 4925066 |
| 30-60 | 5527 | 2216.666 | 12251513 |
| 60+ | 623 | 2025 | 1261575 |
| | | Total calorie required | 23565993 |
| | | Average calorie required | 2146.852 |

Bulingtar municipality

| Age group | Actual population | Recommended calorie (Kcal) | Actual calorie Needed (Kcal) |
|-----------|-------------------|----------------------------|------------------------------|
| 0-18 | 6456.656 | 1829.411 | 11811877.51 |
| 18-30 | 4888.32 | 2433.333 | 11894910.37 |
| 30-60 | 7475.056 | 2216.666 | 16569702.48 |
| 60+ | 1547.968 | 2025 | 3134635.2 |
| | | Total calorie required | 43411125.56 |
| | | Average calorie required | 2131.339629 |

Gaindakot municipality

| Age Group | Actual population | Recommended calorie (Kcal) | Total Calorie needed (Kcal) |
|--------------|-------------------|----------------------------|-----------------------------|
| 0-18 | 19363 | 1829.411 | 35422885.19 |
| 18-30 | 17132 | 2433.333 | 41687860.96 |
| 30-60 | 32124 | 2216.666 | 71208178.58 |
| 60 and above | 7794.126 | 2025 | 15783105.15 |
| | | Total calorie required | 164102029.9 |
| | | Average calorie required | 2147.566905 |

Devchuli municipality

| Age group | Population | Recommended calorie (Kcal) | Total calorie required (Kcal) |
|-----------|------------|----------------------------|-------------------------------|
| 0-18 | 13898.36 | 1829.411 | 25425813 |
| 18-30 | 13401.99 | 2433.333 | 32611505 |
| 30-60 | 17869.32 | 2216.666 | 39610314 |
| 60+ | 4467.33 | 2025 | 9046343.3 |
| | | Total calorie required | 106693975 |
| | | Average calorie required | 2149.4848 |

Binayee Triveni rural municipality

| Age group | Population | Recommended calorie (Kcal) | Total Calorie required (Kcal) |
|-----------|-------------|----------------------------|-------------------------------|
| 0-18 | 10934.05653 | 1829.411 | 20002883.3 |
| 18-30 | 9712.85022 | 2433.333 | 23634598.97 |
| 30-60 | 15108.87812 | 2216.666 | 33491336.43 |
| 60+ | 3152.4163 | 2025 | 6383643.007 |
| | 38908.20117 | Total calorie required | 83512461.7 |
| | | Average calorie required | 2159.004723 |



Inception Meeting



Focus Group Discussion (FGD)



Household Survey



Triangulation and Validation Meeting

(This Compiled Report Consist of Agriculture and Livestock Data of Year 2077 B.S.)

Vijaya Development Resources Center

Gaindakot Municipality-8, Nawalparasi (East)