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GRAPE
Green Resilient Agricultural Productive Ecosystems

# Food systems in transformation

The case of Nepal



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# Food systems in transformation: the case of Nepal

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## Short summary

Every year, global food systems produce, process, transport, and market essential food and agricultural products, but they also contribute to climate change, environmental degradation, food insecurity, malnutrition, public health issues such as obesity, epidemic of food-related non-communicable diseases, and food waste. Transforming these systems is urgent, considering the quick upshift of average temperature: the ten most recent years are the warmest on record (NASA, 2024). Multiple crisis in the last twenty years have shown that food systems are not able to adapt quickly to stress, unless by increasing the prices or reducing the availability of food items: this was shown at global scale during the Covid-19 pandemic (2020-2021), but even earlier, during the oil peak price crisis in 2007-2008, where food inflation led to political instability especially in developing economies. Current food systems, therefore, have numerous negative externalities on health and the environment and are not resilient under stress conditions; in developing economies, the coexistence of malnutrition, especially among children and women, with increasing obesity rate, is a symptom of neglected food justice. According to FSEC Commission report (Ruggeri Laderchi et al., 2024), the hidden costs imposed on people and the planet by current food systems are estimated to be $15 trillion annually, which is equivalent to 12 percent of the global GDP in 2020.

Strategies to achieve more sustainable and just food systems need to be harmonized and led by various actors, including ministries and local institutions dealing with agriculture, public health, environment, education, and civil society. Lessons learnt from the past suggest that silos reform, such as self -standing, top down “agricultural interventions”, produce limited-scale impact if they are not accompanied by interventions on diets, taxes, waste management and extensive education/knowledge. Moreover, despite similar problems are recurring everywhere in food systems with some clear global trends, their priority change place by place, even from municipality to municipality: one village may show a strong need of food loss management practices while the closest village may struggle with lack of roads and storage infrastructure. To this end, policy solutions need to be analyzed, prioritized, and tailored on a case-by-case basis.

In this report, we will illustrate what are food systems and what is meant for food systems transformation; an overview of food systems in Nepal will be presented, based on available data and sources. In the end, the view of stakeholders on how to transform food systems in the two provinces of Sudurpashchim and Karnali is provided, based on interviews gathered at local level (Provinces and Municipalities officials).

# छोटो सारांश

हरेक वर्ष, विश्वव्यापी खाद्य प्रणालीहरूले आवश्यक खाद्यान्न र कृषि उत्पादनहरूको उत्पादन, प्रशोधन, ढुवानी र बजारीकरण गर्दछ, तर तिनीहरूले जलवायु परिवर्तन, वातावरणीय ह्रास, खाद्य असुरक्षा, कुपोषण, मोटोपना जस्ता सार्वजनिक स्वास्थ्य समस्याहरूमा पनि योगदान पुऱ्याउँछन्। सरुवा रोग, र खाद्य अपशिष्ट। यी प्रणालीहरू परिवर्तन गर्न जरुरी छ, औसत तापक्रमको द्रुत अपशिफ्टलाई विचार गर्दै: हालैका दस वर्षहरू रेकर्डमा सबैभन्दा तातो छन् *(NASA, 2024)*। पछिल्लो बीस वर्षमा धेरै संकटहरूले देखाएको छ कि खाद्य प्रणालीहरूले तनावमा छिट्टै अनुकूलन गर्न सक्दैनन्, जबसम्म मूल्यवृद्धि वा खाद्य वस्तुहरूको उपलब्धता घटाउँदैन: यो कोविड-*19* महामारी *(२०२०-२०२१)* को समयमा विश्वव्यापी स्तरमा देखाइएको थियो। *)*, तर त्यसभन्दा अघि पनि, २००७-२००८ मा तेलको उच्चतम मूल्य संकटको समयमा, जहाँ खाद्य मुद्रास्फीतिले विशेष गरी विकासशील अर्थतन्त्रहरूमा राजनीतिक अस्थिरता निम्त्यायो। यसकारण, वर्तमान खाद्य प्रणालीहरूमा स्वास्थ्य र वातावरणमा धेरै नकारात्मक बाह्यताहरू छन् र तनाव अवस्थाहरूमा लचिलो छैनन्; विकासशील अर्थतन्त्रहरूमा कुपोषणको सहअस्तित्व, विशेष गरी बालबालिका र महिलाहरूमा बढ्दो मोटोपना दर, उपेक्षित खाद्य न्यायको लक्षण हो। *FSEC* आयोगको प्रतिवेदन *(Ruggeri Laderchi et al., 2024)* अनुसार हालको खाद्य प्रणालीद्वारा मानिसहरू र ग्रहमा लगाइएको लुकेको लागत वार्षिक रूपमा *$ 15* ट्रिलियन हुने अनुमान गरिएको छ, जुन *2020* मा विश्वव्यापी *GDP* को *12* प्रतिशत बराबर हो।

थप दिगो र न्यायोचित खाद्य प्रणालीहरू प्राप्त गर्नका लागि रणनीतिहरू कृषि, जनस्वास्थ्य, वातावरण, शिक्षा, र नागरिक समाजसँग सम्बन्धित मन्त्रालयहरू र स्थानीय निकायहरू लगायत विभिन्न कलाकारहरूद्वारा समन्वय र नेतृत्व गर्न आवश्यक छ। विगतबाट सिकेका पाठहरूले आहार, कर, फोहोर व्यवस्थापन र व्यापक शिक्षा/ज्ञानमा हस्तक्षेपको साथ नभएको खण्डमा सेल्फ-स्ट्यान्डिङ, माथिल्लो तहमा 'कृषि हस्तक्षेपहरू "जस्ता साइलो सुधारहरूले सीमित मात्रामा प्रभाव पार्ने सुझाव दिन्छ। यसबाहेक, केही स्पष्ट विश्वव्यापी प्रवृत्तिहरू भएका खाद्य प्रणालीहरूमा सबै ठाउँमा समान समस्याहरू दोहोरिन थाले पनि, तिनीहरूको प्राथमिकता स्थान अनुसार, नगरपालिकादेखि नगरपालिकासम्म पनि: एउटा गाउँले खाद्यान्न नोक्सान व्यवस्थापन अभ्यासहरूको बलियो आवश्यकता देखाउन सक्छ जबकि नजिकको गाउँले अभावको सामना गर्न सक्छ। सडक र भण्डारण पूर्वाधारको। यस उद्देश्यका लागि, नीतिगत समाधानहरू विश्लेषण, प्राथमिकता, र केस-दर-केस आधारमा अनुरूप हुन आवश्यक छ।

यस रिपोर्टमा, हामी खाद्य प्रणालीहरू के हुन् र खाद्य प्रणाली परिवर्तनको लागि के हो भनेर वर्णन गर्नेछौं; उपलब्ध तथ्याङ्क र स्रोतको आधारमा नेपालमा खाद्य प्रणालीको एक सिंहावलोकन प्रस्तुत गरिनेछ। अन्तमा, स्थानीय तह *(*प्रदेश र नगरपालिकाका अधिकारीहरू*)* मा भेला भएका अन्तर्वार्ताका आधारमा खाद्य प्रणालीलाई कसरी रूपान्तरण गर्ने भन्ने सरोकारवालाहरूको दृष्टिकोण प्रदान गरिन्छ।

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## Introduction: food systems in transformation

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Food systems are in transformation. Global megatrends such as climate change, demographic changes, migration and urbanization, technological improvements, spread of inexpensive ultra-processed foods, ever longer supply chains, and shift from primary production towards services are transforming the very foundations of food systems. The changes are visible at all levels of supply chains from local to global, and on consumption habits, where economic growth is often associated to shift in dietary patterns that are detrimental to human health (Popkin, 2003).
The global transformations result in increasing challenges with sustainability, resilience, and food justice. Paradoxically, as the efficiency of food production has increased, the efficiency of food systems in delivering nutritious food has declined (Benton and Bailey, 2019). *"Today's food systems are failing to provide decent livelihoods for many of those who work within them. Yield growth has been accompanied by unsustainable environmental degradation. (...) Critical trade-offs must be navigated, including between keeping food affordable for all, improving nutrition, paying the true environmental cost and enabling those who produce food to earn a decent wage"* (OECD, 2020).

| |
|---|
| The food system does not ensure justice and resiliency unless we work towards these achievements. |

Understanding how food systems work is crucial to improve the sought outcomes for consumers, producers and the environment alike while maintaining and improving overall sustainability, resilience, and justice.

The topic of food system transformation is high in the international agenda: at COP28 (UAE, 2023) a "Declaration calling for action to transform the food system" was presented and signed by 150 countries. During the same event, other two actions were initiated: the launch of the Alliance of Champions for Food Systems Transformation, led by Brazil, Norway, and Sierra Leone, aiming to drive systemic change in food systems, and the FAO's release of a roadmap to transform the food system to eradicate hunger while maintaining the 1.5-degree climate threshold.

Despite a broad consensus on the need for transformation, the exact direction remains unclear. Some pillars, such as the need for a more plant-based diet (Willet et al. 2019), reducing salt, sugar, and ultra-processed foods (WHO 2024), and creating more inclusive and sustainable agricultural systems (UN 2023), are less questioned. However, the practical implementation of these goals varies, leading to different proposals and approaches. As El-Hage Scialabba et al. (2023) noted, different approaches and transformation pathways can be broadly divided into those proposing structural changes and those advocating technical or technological fixes. For instance, questioning food justice within food systems involves structural changes, while proposing a climate-smart innovation for agriculture is a technical fix within an unchanged system.

The frequent mention of "resilience" in discussions, particularly after COVID-19, often lacks detailed specification, referring to various parameters or often reducing it to a local/global food system dichotomy (Wood et al. 2023). Consequently, there is no global consensus on what a resilient food system should look like (El-Hage Scialabba et al. 2023).

However, most notably definitions of food systems encompass local and global dimensions, different pillars of resiliency, all the stages of the food supply chain, actors and actions, from production to diets and food waste. Borrowing IFAD statement (2021), the transformation needs *"to ensure people are able to consume diets that are healthy, to produce food within planetary boundaries and to earn a decent living from their work in the food system. Livelihoods, nutrition and environmental goals are interlinked"*. In the IFAD definitions, three dimensions are highlighted: justice, resilience and sustainability. Before illustrating which transformation we should achieve and why, a question needs to be addressed.

## What are food systems and how to transform them?

According to UN (2021) *"Food systems embrace the entire range of actors and their interlinked value-adding activities involved in the production, aggregation, processing, distribution, consumption, and disposal (loss or waste) of food products that originate from agriculture (incl. livestock), forestry, fisheries, and food industries, and the broader economic, societal, and natural environments in which they are embedded."*

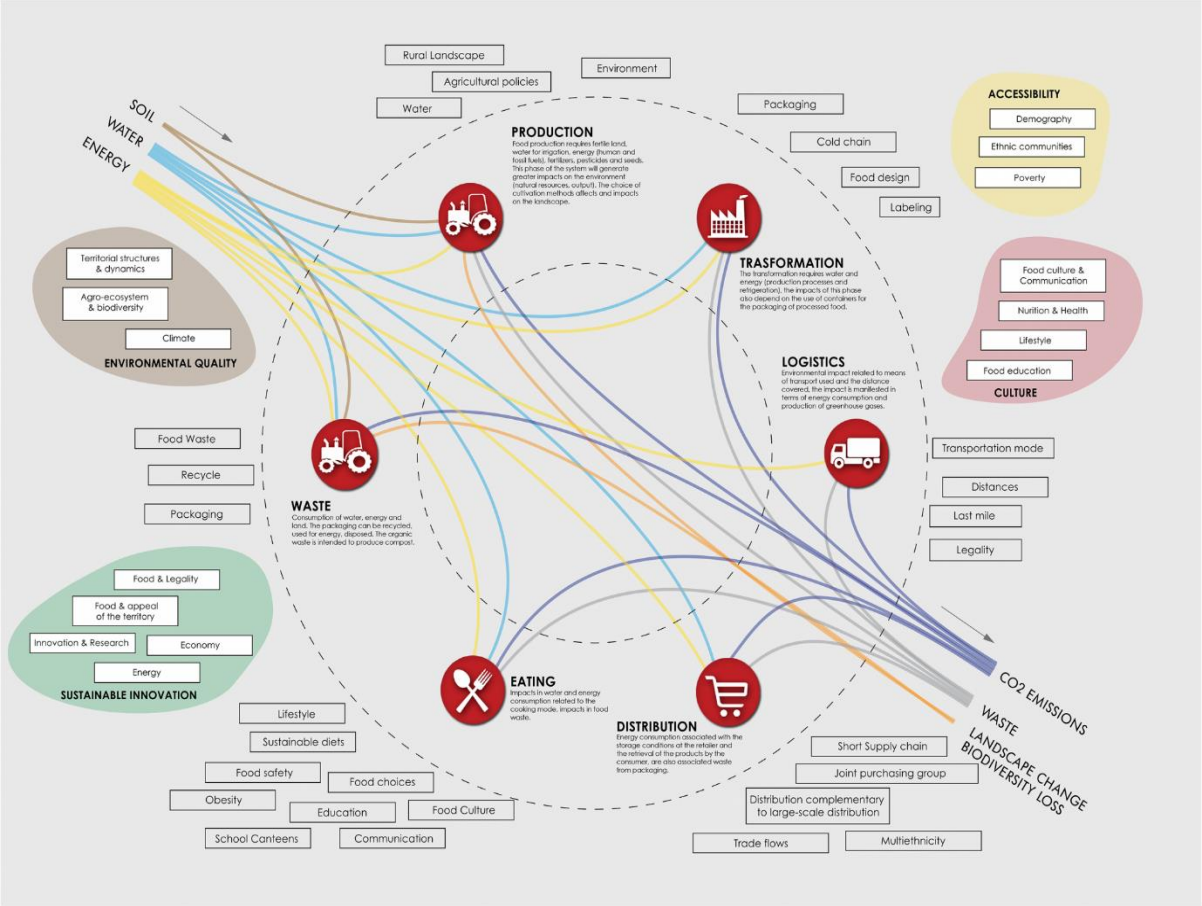


*Figure 1- Food system framework. Source: MUFPP, 2017*

As shown in Figure 1, a food system encompasses many dimensions and phenomena: production, processing, logistics, distribution, consumption and waste are all impacted by many elements, among which natural resource availability, policies in support of the agricultural production, infrastructures, norms and rules for marketing and food safety, food culture. These dimensions, in turn, affect the environment through GHG emissions, water pollution and waste production; they impact on the landscape and determine different degree of food security at micro (household) and macro (municipality or mountry) levels.

The interconnectedness of the food system's components makes it challenging to determine how to transform the entire food system and in which direction. Conflicting goals often emerge, such as the risk of harming local economies due to reduced consumption of specific food products following nutritional recommendations; or interest in keeping alive a food production highly impactful on environment. Resnick and Swinnen (2023) reports an example of conflicting goals in the food system transformation.

### The case of sugar in South Africa

In South Africa, the sugar industry played a crucial role, supporting the livelihoods of nearly half a million people, many of whom were women in rural areas. The sugar sector, however, faced a bitter dilemma. On the one hand, it was a lifeline for the community, providing jobs and economic stability. On the other hand, it was water intensive and a driver to the nation's growing obesity problem.

To tackle the health crisis, the Ministry of Health introduced a Health Promotion Levy in 2018, encouraging food and beverage companies to reduce their sugar use. This move led

to a decline in sugar production, which alarmed the Department of Trade and Industry. Concerned about the potential job losses for small-scale farmers, they devised the Sugar Industry Value Chain Masterplan. This initiative aimed to boost domestic sugar production and safeguard employment through tariff protections.

This potential conflict between health and economic goals highlighted the challenge of balancing diverse policy objectives. As the government strived for healthier food systems, it faced the risk of undermining industrial competitiveness and the livelihoods of its most vulnerable citizens.

*(Resnick and Swinnen, 2023)*

The basis for any policy strategy aimed at transforming food systems is, necessarily, an assessment of the *status quo* that identify the major criticalities and options for resolutions. Food system transformation is most impactful at local level where patterns of production, transportation, consumption, and waste change rapidly. Likewise, food system analysis to assess the *status quo* of production and consumption patterns needs to tackle the local level, where the trends of migration, changing consumption habits, environmental impacts and challenges brought by the climate change are evident and concrete. Due to its complex nature requiring diverse competencies and departments to work together, robust collaboration among stakeholders is essential, and an institutionalized process of food system planning is desirable to prioritize needs in each municipality, focus on data gaps, and elaborate evidence-based solutions through a participatory approach.

For the listed reasons above, science and policy converged on the need of focusing on food systems analysis and planning at municipal level in recent years. Municipalities manage multiple phenomena affected by the food system functioning, from rapid urbanization to rural abandonment, from nutritional transition to malnutrition and lack of food access, from management of food loss production in rural areas to food waste in urban ones. This is particularly true in transition economies like Nepal, which is experiencing rapid economic and social development, with GDP and population growing steadily since 2013, albeit with some interruptions due to external shocks (WB, 2022). The country also experiences high rural-to-urban migration rates, with Kathmandu Metropolitan City hosting thirty-five percent of all rural–urban migrants, eighty-six percent of whom are rural-urban migrants (Subedi 2021).

Not only cities are interested by transformations: major changes invest also vulnerable developing rural areas where all types of economic, social, and environmental pressures influence the traditional local food systems at once. Small-scale family farmers are still the foundation of food supply across global south (IFAD, 2021), especially in countries where most people still derive their livelihoods from local-scale agriculture, like Nepal. Local farmers play a critical role in reducing rural poverty and ensuring national food and nutrition security, especially in Nepal´s mountain-provinces. The capacity of the Nepalese food system to react to crisis was weak, as demonstrated during COVID19 (Adhikari et al., 2021), and inequality among provinces is a discriminating factor when it comes to food system resilience.

## Transforming food systems at Municipal level

The world is becoming increasingly urbanized, thus creating implications also for food systems. Currently, over half of the global population resides in urban areas, a significant rise from about one-third in 1950. This trend is projected to continue, with around two-thirds of the global population expected to live in cities by 2050 (UN, 2024). Cities, which house over half of the world's population, play a strategic role in developing sustainable food systems and promoting healthy diets. Current food systems face challenges in ensuring access to safe, local, diversified, fair, healthy, and nutrient-rich food, due to issues like unequal distribution, environmental degradation, resource scarcity, climate change, unsustainable production and consumption patterns, and food loss and waste. Accelerated urbanization significantly impacts economic, social, and environmental dimensions, necessitating a re-examination of how cities are provisioned with essential goods and services, including food and water. Hunger and malnutrition in all forms persist within cities, imposing substantial social and economic costs. Urban and peri-urban agriculture offers opportunities to integrate biodiversity into city landscapes and food systems, contributing to food security, ecosystem services, and human

well-being. Food policies intersect with various urban challenges and policies, such as poverty, health, sanitation, land use, transport, energy, education, and disaster preparedness, necessitating a comprehensive, interdisciplinary and transdisciplinary approach. Family farmers and smallholder food producers, particularly women, are key in maintaining resilient and equitable food systems, reconnecting consumers with producers through sustainable diets.

The City Region Food Systems (CRFS) approach and the Municipal Food System Planning have been the most important players in the field in the last ten years. While the first focuses on the relation between urban and rural areas (FAO, 2023) and is quite recent, the second is most focused on the urban policies and it find roots in late 1990*s* (Pothukuchi & Kaufman 1999). Both the approaches rely upon the participation of stakeholders, including citizens, in the food system planning process and both foresee the response to context-based needs, so solution cannot be transposed from a place to another without a preliminary, critical assessment. To foster collaboration and exchange of experiences, a forum has born around an international agreement has been signed in 2015, within EXPO, among mayors of 280 cities in the world, called Milan Urban Food Policy Pact (MUFPP, 2015). The agreement has the goal of "*developing sustainable food systems that are inclusive, resilient, safe and diverse, that provide healthy and affordable food to all people in a human rights-based framework, that minimise waste and conserve biodiversity while adapting to and mitigating impacts of climate change*", through the "*interdepartmental and cross-sector coordination at municipal and community levels, working to integrate urban food policy considerations into social, economic and environment policies, programmes and initiatives, such as, inter alia, food supply and*

*distribution, social protection, nutrition, equity, food production, education, food safety and waste reduction*" (MUFPP, 2015). Through the Pact, cities have the chance to discuss problems and solutions and exchange ideas on how to manage food system transformation.

Along the years, municipal food planning became an essential tool to manage urban growth. Some typical actions promoted in urban food planning are urban agriculture, which encourages rooftop farms and community gardens to provide fresh produce and boost community engagement; improvement of food distribution that guarantee access to affordable, healthy food through farmers' markets and local food hubs; management of food distribution in poor or remote areas ("food deserts"); support to food banks and nutrition assistance programs; education and capacity building initiatives about healthy food and cooking skills; initiatives to reduce food waste and composting fraction increase. For food systems to be integrated into urban planning processes, strong policies and coordinated governance—including inclusive laws and food policy councils—are essential. The forms of governance are wide and different: some municipalities centralize the topic whereas others are more bottom up, inclusive and deliberative. In some cases, such as Toronto or Livorno, there is an official, appointed Council within the municipality that coordinates the work about food systems, while sometimes it is just an additional function given to the Department of Agriculture of the city, such as in Nairobi or Bologna, with no pre-determined mechanism to ensure participation. Indeed, the way and the extent to which citizens and stakeholders are involved varies from city to city, where in some cases the participative methods and actors are officially recognized and agreed previously, sometimes it´s more an unplanned exercise.

The transformative capacity of food system in Nepal roots its potential in the annual planning of the municipalities (seven step planning process): the governance arrangement already foresees the engagement of actors from the civil society into the planning of the policy and budget exercise each year, and it is already set up to be flexible and inclusive. It could be adapted to include specific objectives related to food systems. This adaptation involves the collection/analysis of data on food consumption and production, the analysis of available resources, and the setting of food system priorities, and the collaboration with research centers and NGOs, private sector, farmers and citizens. To this end, a first wave of data collection has been run in the present project, gathering information through semi-structured, qualitative interviews and forecasting processes from 2022 until 2024.

Before illustrating the view of local stakeholders on how to transform food systems at municipal level, a quick overview of food systems in Nepal is provided, based on available data in English provided by Scopus, Web of Science and Google Scholar, plus the consultation of UN and EU Commission strategic reports and MOALD datasets.

# Food system in Nepal: an overview of the food supply chain


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## *Agricultural production*

With over 60% of the people working in agriculture (FAO, 2024) and over two-fifths of the population still living in poverty, Nepal is among the least developed nations in the world (Liu Y. Yang et al., 2023). Grain, vegetable, fruit, and cattle products are the primary food categories produced. Three important agricultural areas are horticulture, cattle raising, and crop cultivation. Rice is one of the main crops grown in all three agro-ecological regions (Terai, hills, and high hills) of Nepal, but still the production is not sufficient to cover the need of the country, with a 1,130,682 MT in 2021/2022 (MOALD, 2023). Maize, wheat, millet, and barley follow for production. Green leafy vegetables, potatoes, tomatoes, and cauliflower are among the commonly cultivated vegetables. Fruits used in horticulture include oranges, bananas, apples, and mangoes. Cattle, buffalo, goats, and fowl are the main animals raised for livestock production, which produces necessary dairy and meat products (WB, 2021).

## *Processing*

The majority of food processing in Nepal is done by small, family-run businesses that cater to local markets (FAO et. al, 2022). These businesses typically use traditional techniques including pickling, smoking, fermenting, and drying food. The industry produces a wide range of processed goods, including dried fruits, rice, lentils, spices, dairy products, and traditional snacks like gundruk (fermented leafy greens) and chiura (beaten rice). The sector faces many obstacles even with the existence of cottage industries making products like ghee and honey and a gradual transition to contemporary techniques. Efficiency and product quality are hindered by inadequate infrastructure, restricted access to contemporary technology, and low-quality control (NFSC, no date). Further exacerbating these problems are supply chain interruptions, regulatory barriers, restricted market access, budgetary limits, and a lack of skilled personnel. Governmental and non-governmental organizations must work together to upgrade infrastructure, open access to cutting-edge technologies, and promote market integration to solve these issues.

### *Distribution*

Nepal's geography, which varies from the lowland Terai to the high Himalayas, has a substantial impact on food distribution and poses transport and accessibility issues (World Bank, 2021). Food distribution infrastructure is still underdeveloped, with many rural areas lacking adequate roadways. This results in ineffective food product delivery and significant post-harvest losses (Adhikari, 2021). Local markets are essential for the distribution of agricultural products, especially for small-scale farmers. The market system is composed of both formal and informal sectors (Gauchan, 2018). Significant obstacles to improve the distribution are bad road conditions, expensive transportation, limited market access for small-scale farmers, intricate regulatory structures, and the persistent problem of regional differences in food security (World Bank, 2021; FAO et al., 2022). East and West Mountain food systems, for instance, both show limited or absent infrastructures to different extents, which affect the food security of the regions along with scarce production.

### *Consumption*

According to FAO et al., (2022), based on the Nepal Annual Household Survey 2015/16 data, over 80% of household food consumption (by value) was sourced from markets, with only 15% coming from home production (CBS, 2016). Household expenditure patterns indicate that food purchasing trends are relatively consistent across Nepal, from rural to urban areas and from the hills to the Terai, although there are slight differences in the mountainous regions where a lower proportion of food is purchased from markets. The 2016/17 survey revealed that the largest share of food expenditure was on grains and cereals (27.9%), followed by meat and fish (16.1%), and vegetables (12.4%). On average, Nepal's population consumed about 336.9 kg of basic staple foods per capita per year, with similar figures in both urban and rural areas. Major foods consumed in 2016/17 included coarse rice (68.9 kg), fine rice (43.0 kg), potatoes (29.9 kg), and wheat (21.2 kg) annually per capita. In 2015/16, per capita consumption was 38.5 kg of fine rice and 92.8 kg of coarse rice. Consumption patterns show a disparity between economic classes, with the poorest 20 percent consuming 249.8 kg of staple foods such as rice, potatoes, and wheat, compared to 420.9 kg consumed by the richest 20 percent. Over the past 20 years, there has been a relative decrease in cereal intake and an increase in the consumption of vegetable oil, animal products, starchy roots, milk, vegetables, and fruits, despite vegetable and fruits do not reach the recommended daily intake (World Bank, 2021a). This shift is reflected in the average annual calorie consumption from cereals decreasing from 65.3 percent (2000-02) to 56.2 percent (2016-18), with a growing proportion of calories coming from other foodstuffs, among which vegetable oils, animal products, starchy roots, tubers, and pulses and ultra-processed food (sugary drink and snacks) (FAO et al., 2022). The change patterns in diets, characteristics of urban areas and increase in salary and education level at the initial stage of the nutrition transition (Popkin, 2011), is already producing impacts: the prevalence of overweight and obesity (OWOB) is steadily increasing. According to Shakya et al., (2023), a sharp upward trend in OWOB rate is especially recorded in the 25-29 years group. The number of overweight and obese women in this age group has risen from 2.2% in 1996 to 24.7% in 2019. Men in the same age group (25–29 years) had an overweight-obesity prevalence of 8.8% in 2007, which rose to 25.4% in 2019. The prevalence of overweight and obesity changed a lot between 1996 and 2019. Compared to the first survey in 1996, there were nine times more people with overweight and 42 times more people with obesity in 2019. This change in OWOB reflects also a change in dietary patterns, especially in urban areas and for people with specific socioeconomic factors (education, income, and employment status): the age-standardized

prevalence of overweight/obesity is higher for individuals with higher education (23%) and high-income (32%) and those who are unemployed (42%) (Bhattarai et al. 2022).

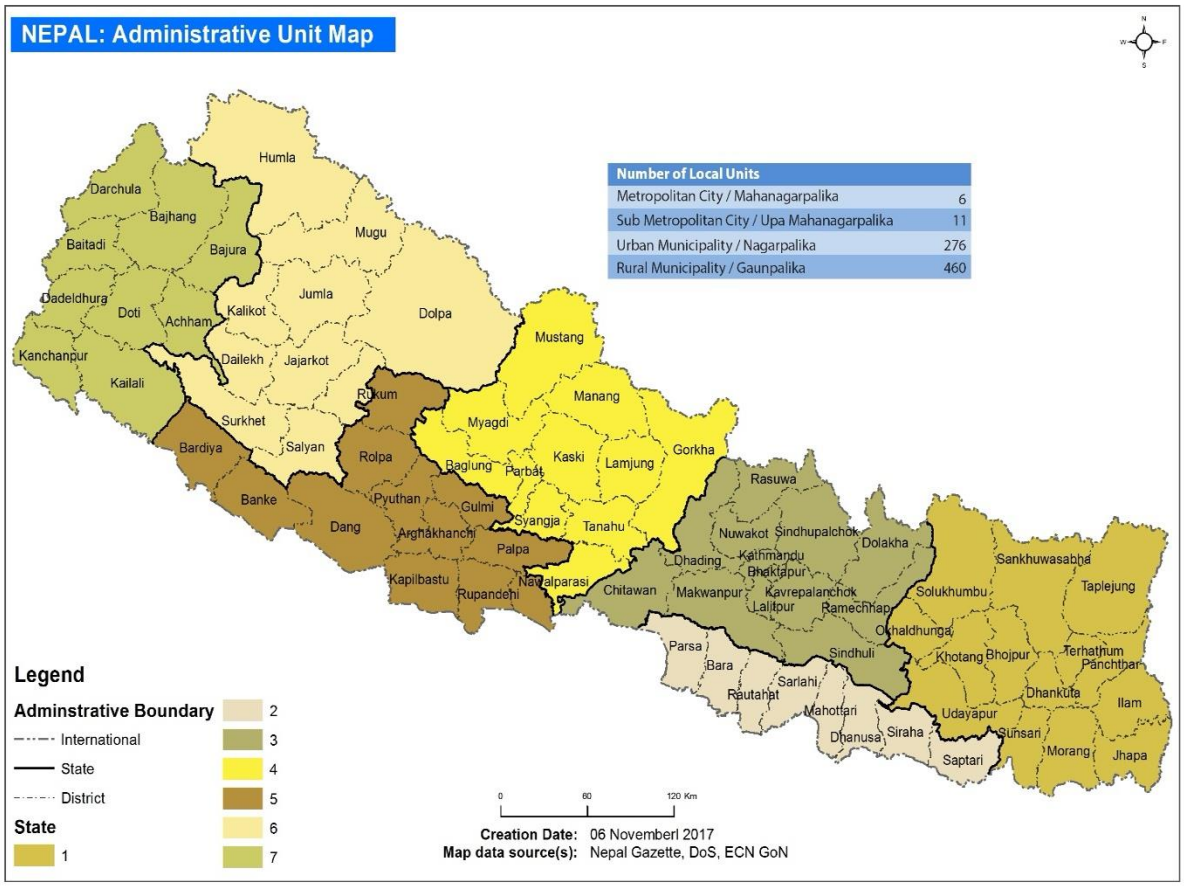
### *Food loss and waste*

Few data are available for food loss and waste in Nepal. With reference to food loss, some studies are available for post-harvest losses, run by Bhattarai (2018). Bhattarai reports that losses of horticultural products at different stages show that the total loss from loading, unloading, transportation to storage and at wholesale and retail market is 20-35% for fruits, 15-30% for vegetables, and 15-20% for potatoes. Household food waste, instead, is reported to be 93 kg per person per year, but the study is classified as “low confidence” from UNEP Food Waste Index Report (UNEP, 2024), meaning that it has been run through questionnaires, or on a small sample size or that methodology is not reported detailly. An accurate assessment run on representative samples and through high confidence methods is missing for all the stages of the food supply chain, as well as a qualitative study on household food waste in urban areas.

## Overview of the context: Sudurpashchim and Karnali provinces

Sudurpashchim and Karnali provinces, located in the far western and mid-western regions of Nepal, respectively, are among the least developed areas in the country. These provinces face severe challenges that impede the efficiency and inclusivity of their food systems. From a climate change perspective, the area is affected by many extreme phenomena and natural resource constraints: agriculture in Sudurpashchim and Karnali is heavily reliant on monsoons, which are becoming increasingly unpredictable due to climate change. This results in variable crop yields and higher risks of crop failure (FAO et al., 2022). Soil erosion, largely driven by deforestation and unsustainable farming practices, is a significant issue as well. The steep and rugged terrain exacerbates soil degradation, reducing agricultural productivity (World Bank, 2021). Water scarcity is also a problem: these provinces experience an over-reliance on rain-fed agriculture and inadequate water management systems. Seasonal droughts further worsen this problem, leading to reduced crop yields and food insecurity (IFPRI, 2024).

*Figure 2- Provinces of Nepal. Source: UN, 2018.*




Moreover, natural disasters such as landslides, floods, and earthquakes are also frequent in this area, and affect agricultural land and infrastructure (NPC, 2021). In addition to natural disasters, agricultural productivity is generally low due to outdated farming techniques, limited access to quality seeds and fertilizers, and lack of mechanization (Stads et al., 2019). Small and fragmented land holdings prevent economies of scale, hindering investments in modern farming practices and reducing overall productivity (FAO et al., 2022). These issues are exacerbated by the rural-urban migration and ageing of farming population, whereas many young people migrate to urban areas or abroad for better employment opportunities, leading to labor shortages

in agriculture and an aging farmer population in these provinces (Jaquet et al., 2016; Stads et al., 2019).

Social justice issues are also prevalent, starting from the long-lasting impact of casting system (UNDP, 2017) that hinders participation in decision making process (IFPRI, 2024) and crystalize economic disparity and unequal access to resources (World Bank, 2021). Being among the poorest areas in the country, diets and nutrition reflect scarcity of resources and unequal access to food, with macronutrient deficiency especially reported among women and children (FAO et al., 2022) and a widespread food insecurity, related to season (NPC, 2021).

To address the challenges of the food systems in the Sudurpashchim and Karnali provinces, a comprehensive set of interventions is required. Firstly, adopting climate-smart agricultural practices, such as the introduction of drought-resistant crop varieties and improved irrigation techniques, can enhance resilience to climate variability (FAO et al., 2022). Implementing soil conservation measures, including agroforestry and terracing, can mitigate soil erosion and improve land productivity (World Bank, 2021). To combat water scarcity, developing efficient water management systems and promoting rainwater harvesting can provide reliable water sources for agriculture during dry seasons (IFPRI, 2024). Strengthening disaster risk reduction strategies, such as early warning systems and resilient infrastructure development, can minimize the impacts of natural disasters on agricultural land and livelihoods. Modernizing agricultural practices through access to quality seeds, fertilizers, and mechanization can boost productivity and reduce labor shortages (Stads et al., 2019). Policies should also focus on land consolidation to enable economies of scale and attract investments in advanced farming technologies (ADB, 2019).

Addressing social justice issues requires promoting inclusive governance structures that ensure participation of marginalized groups, such as those still affected by the caste system impacts, in decision-making processes (ICIMOD, 2021). Strengthening policy capacity to integrate agricultural efficiency with social and environmental justice can bridge economic disparities and ensure equitable resource distribution (World Bank, 2021; Gautam et al., 2021). Lastly, improving nutrition and food security involves implementing community-based nutrition programs, enhancing dietary diversity (Jones et al, 2019), and ensuring food availability throughout the year (FAO et al., 2022). Since the nature of food system is complex, it needs transdisciplinary solutions but a strong harmonization of interventions, in order to avoid overlapping of projects and targeted areas, or the redundancy of interventions with low efficacy. To this end, considering the annual process of Planning of the Municipalities, a strong integration of all relevant department is recommended to plan the food systems transformation, by a joint discussion about common visions of future food systems, problems and their relevance in specific areas, and a coherent set of interventions. In order to ensure evidence-based solutions, it is also warmly recommended that universities, research centers and NGOs with a deep knowledge of the disciplines and the area are engaged in the discussion about food system transformation at municipal level. The use of participatory methods such as forecasting and back casting, if appropriately run, can open to the engagement of citizens and farmers so that interventions are more tailored not only to their needs (established through a top down, scientific assessment) but to the priorities they perceive as important. This may ensure a higher success rate in innovations adoption.

## Transforming food system in Nepal through Municipalities

According to the European Commission (2022), an effective institutional ecosystem to transform food systems should include traditionally marginalized and equity-seeking groups, providing evidence-based insights that can inform policy responses. It should be capable of generating evidence-based solutions, stimulating demand for new scientific research from a policy perspective, and engaging with a diverse range of audiences. The legitimacy of any given institution is contingent upon its independence, the transparency of its processes, and the degree to which it engages with relevant stakeholders. It is essential that collaboration occurs at the local, national, regional, and global levels, with data sharing and methodological transparency being of paramount importance. Also, the institution must be transparent, democratic, and inclusive, addressing the systemic barriers that limit stakeholder participation. In order to achieve this, it is necessary to allocate resources to overcome power imbalances and ensure broad participation. To this end, support should be extended to various ethnic groups, the youth, the elderly, and illiterate populations. This should be done through the provision of resources such as travel funds, legal assistance, and capacity-building programmes, with the aim of reducing participation barriers.

This is how Municipal food policies are (theoretically) built around the world, with different effort and focus on various aspects or actors according to single political choices and places. For instance, in Canada and US most of the effort is on democratization of food systems and improvement of food justice, while in Europe it is mostly enhancement of multi-stakeholder collaboration and the attempt to bring private and public stakeholders at the same table to achieve common goals. However, this is a generalization, as on both continents the focus can change according to a single municipality. In developing economies, the most common risk is to focus solely on agriculture and how to increase yields (FAO, 2021), leaving behind healthy consumption and social justice dynamics, such as inclusion and marginalization, outmigration, rural-urban missing connections.

Despite the differences, all municipal food policies have a common ground of bottom-up participation and tailoring of actions related to the local context. This ensures closer contact with citizens, and an in-depth knowledge of local context and needs by those who design the policy interventions.

As observed, the Municipal Planning System of Nepal is particularly suitable for a food system planning scheme, as it is already foreseen, by law, that municipalities plan their activities for the future years by a collaborative effort among different stakeholders.

In this section, the vision of local stakeholders about how to transform food systems at local level and what to expect from the municipality in 20 years is reported, as result of the forecasting workshop and interviews. This will highlight elements in common and differences. The section has been elaborated as a content analysis run on forecasting results and purposive interviews to key actors conducted in April-July 2024.

### The view of stakeholders

The Municipal Planning System in Nepal is highly conducive to implementing a food system planning scheme. By law, municipalities are required to collaboratively plan their activities for the coming years, involving multiple stakeholders. This section presents the vision of local stakeholders on transforming local food systems and their expectations from the municipality

in 20 years, as gathered from forecasting workshops with 19 Municipalities in 2023 and interviews (36) conducted by Luke between April and July 2024, both remotely and on-site. This content analysis highlights both common elements and differences across municipalities, helping to explore the potential for Municipal Food Planning strategies. The question in the forecasting was "how do you imagine the food system in your municipality in 20 years from now?", while the semi-structured interview reported a similar question among others.

### *Different Priorities and Visions of Municipalities*

The perspectives of three key groups—government, the private sector, and farmers/citizens—are grouped and analyzed. The section also comments on the vision of various municipalities, emphasizing shared views and differences, and evaluates whether there is room for the development of Municipal Food Planning strategies.

#### Government Perspective

Government officials at the municipal level play a pivotal role in developing and implementing policies that support agricultural and economic growth. Their responsibilities include constructing critical infrastructure such as roads, irrigation systems, and storage facilities, which are essential for boosting agricultural productivity and improving market access. These infrastructures are foundational to enhancing both local and regional economies by facilitating the movement, storage, and sale of agricultural products.

However, challenges persist in adapting national policies to meet local needs. Government officials must ensure that broad national directives are effectively localized, considering the specific geographic, environmental, and socio-economic conditions of their municipalities. This adaptation is crucial for making policies relevant and implementable. Yet, there are reports of conflicting goals and competencies, with unclear responsibility distribution between municipalities and provinces, particularly during the policy implementation phase.

Financial constraints are another common obstacle. Limited budgets often restrict the ability to fund necessary infrastructure projects or fully implement policies. To address this, government officials frequently seek partnerships with the private sector and external funding sources, such as grants, to overcome budget shortfalls. However, this solution does not ensure long-term safety, as private investors can step back anytime from investments.

#### Private Sector Involvement

The private sector is recognized as a key player in supporting the development of agricultural infrastructure and market access. Businesses, cooperatives, and investors provide both financial and technical support, playing an essential role in the agricultural value chain. Their involvement is particularly important in creating market facilities such as cold storage and direct sales channels, which help farmers avoid losses from spoilage or market delays. This is particularly beneficial in reducing the influence of middlemen, allowing farmers to receive fairer compensation for their products.

The private sector's contribution to innovation and the introduction of modern agricultural technologies is also notable. Private businesses have invested in tools and equipment that improve farming efficiency, aligning with broader goals of sustainable and climate-smart agriculture. This collaboration between the government and the private sector is framed as mutually beneficial, with private investments helping to bridge financial gaps and support long-term agricultural development projects.

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Farmers and the broader community, represented through vision statements from several municipalities, express concerns over access to quality seeds, financial limitations, and inadequate infrastructure, all of which hinder agricultural productivity. For instance, in Aalitaal Rural Municipality, the vision is to achieve food self-sufficiency through sustainable agricultural practices, despite challenges related to seed access and poor infrastructure. In Amargadhi Municipality, farmers face similar obstacles, with budget constraints and middlemen preventing direct market access. To combat these issues, the municipality supports agricultural cooperatives and sets floor prices to ensure fair compensation. Jorayal Rural Municipality emphasizes inclusivity, aiming to create a food-prosperous community through environmentally friendly practices and infrastructure development, engaging marginalized groups. In Badikedar Municipality, the focus is on fostering an inclusive agricultural community by expanding infrastructure and providing essential resources like seeds and organic products, while Bhairabi Rural Municipality envisions agricultural independence by involving unemployed youth in the sector and ensuring equal access to basic needs like education and healthcare.

### *Unique Municipal Visions and Challenges*

As emerged from the forecasting workshops and ToT, municipalities have distinct visions for addressing agricultural challenges and food system transformation, and these different visions should reflect different priorities and actions when translated into policy actions. Birendranagar Municipality, for instance, envisions long-term development focusing on agriculture and tourism, with the aim of creating an egalitarian society through sustainable infrastructure and economic growth; Dhangadhi Sub-Metropolitan City mostly focuses on industrialization driven by a competitive agricultural sector, aiming for economic resilience through advanced agricultural systems; Himali Rural Municipality aims to become an agricultural hub, specialized in the production of herbs, indigenous crops, and fruits, with policies supporting year-round food security. Swamikartik Rural Municipality focuses more on social equality and sustainable development, mentioning the importance of food sovereignty and the use of modern technologies to benefit farmers. Simikot Rural Municipality aims at becoming a green, urban area that combines organic agriculture with tourism to ensure food security and economic growth. As the visions are different, the only way to promote a bottom-up, shared project to

transform food systems is to test the local food councils/policies, to check whether this programmatic and governance arrangement can fit well to the different context. Further action is suggested for municipal officers, provincial representatives and the government, in collaboration with existing international networks.

## Conclusions

The potential of Municipal Food System Planning in Nepal for transforming food systems lies in its ability to bring local stakeholders together, aligning their efforts with national policies and ensuring tailored interventions for specific local contexts. Municipalities in Nepal already play a crucial role in formulating and implementing policies related to agriculture, infrastructure development, and market regulation. By engaging with local farmers, the private sector, and civil society, municipalities can act as catalysts for change, addressing the specific needs of their communities while ensuring that broader national food security goals are met.

One of the main advantages of Municipal Food System Planning is its localized approach. Municipalities have a unique understanding of the geographical, social, and economic realities of their regions, enabling them to implement tailored interventions that meet the specific needs of local farmers and communities. For example, some municipalities focus on promoting organic agriculture, while others prioritize infrastructure development such as irrigation systems and market access roads. By addressing local challenges like land fragmentation and labor shortages through mechanization or youth employment initiatives, municipalities can play a pivotal role in boosting agricultural productivity and ensuring food security.

Furthermore, municipalities are central to implementing climate-resilient practices, which are increasingly crucial in Nepal's diverse and fragile ecosystems. Local governments are well-positioned to promote sustainable agricultural practices, blending traditional methods with modern technologies to ensure that food systems are both productive and environmentally sustainable. By working closely with local farmers, municipalities can encourage the adoption of climate-smart technologies such as improved irrigation, soil management, and bio-pesticides, which not only increase productivity but also protect the environment.

Another important role of municipalities is in market regulation and the development of cooperatives. Municipalities can help establish cooperatives that allow farmers to bypass intermediaries, ensuring they receive fair prices for their products. This, combined with investments in storage facilities and transportation infrastructure, helps reduce post-harvest losses and provides farmers with better access to local and regional markets.

Moreover, Municipal Food System Planning fosters public-private partnerships. These partnerships are essential for overcoming financial limitations that municipalities face in implementing large-scale agricultural projects. By collaborating with the private sector, municipalities can secure the necessary investments for infrastructure development and technological innovation, further enhancing the efficiency and sustainability of local food systems.

In conclusion, Municipal Food System Planning in Nepal has the potential to significantly contribute to food system transformation by leveraging local knowledge, addressing region-specific challenges, and fostering collaborations among diverse stakeholders. Through infrastructure development, climate-smart agriculture, and market regulation, municipalities are well-positioned to drive sustainable and inclusive food system change. This approach aligns with broader national and international goals for food security and sustainability, making Municipal Food System Planning a critical component of Nepal's efforts to build a resilient and equitable food system.

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