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## FOOD SYSTEMS PROFILE - **BHUTAN**

Catalysing the sustainable and inclusive  
transformation of food systems



Bhutan



# **FOOD SYSTEMS PROFILE - BHUTAN**

Catalysing the sustainable and inclusive transformation of food systems

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# FOOD SYSTEMS PROFILE BHUTAN

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## Key messages

1. Bhutan faces the challenge of **feeding its growing and urbanizing population** with safe, healthy and nutritious food, **while preserving its unique environment**.
2. **Achieving food self-sufficiency is a challenge for Bhutan** because of limited arable land, rugged topography, the growing threat of climate-related risks and natural disasters, and substantial seasonal variations in water supply.
3. **Bhutan's food system** is dominated by small, fragmented and isolated landholdings that are characterized by **low productivity and high production costs**. With **little access to markets, inputs and services**, farmers have limited means and incentives to produce, while **the absence of aggregators** hinders the achievement of economies of scale and competitiveness. **Rural-urban migration**, particularly among young people seeking better prospects in urban areas, has led to **shortages in farm labour** and more **land being left fallow**.
4. As a consequence, **the area harvested and volume of production for several crops have dropped** over the past 15 years, forcing the country to **import large quantities of food**, mostly from India, to cover the shortfall in domestic production of essential foods.
5. The COVID-19 pandemic has stressed the need for Bhutan to find **a more balanced pathway** towards securing healthy and nutritious food for its people, while promoting economic growth and meeting its environmental commitments.
6. This means **making farming much more attractive**, for example, by improving production and market infrastructure and transport networks to facilitate market access by supporting and strengthening the participation of the private sector in supply-chain services; through strong and adapted research and extension programmes; by helping farmers develop climate-resilient approaches and diversification strategies; and by taking advantage of Bhutan's unique products through the development of adapted branding and certification systems.
7. In this context, **taking into account the aspirations of its young people** is of paramount importance, especially at a time when the reverse flow of migrants from urban to rural areas prompted by the pandemic could help breathe new life into the farming system.
8. In line with Bhutan's development philosophy of Gross National Happiness, **embracing policies promoting sustainable, healthy and diverse food diets** could contribute towards addressing **the double burden of malnutrition**. This is especially relevant as child malnutrition and mineral deficiencies persist, even as the country faces an increase in obesity and chronic diseases among its population due to changing food habits that increasingly include packaged and processed foods and sugary drinks.



## Food Systems Assessment Methodology and Process

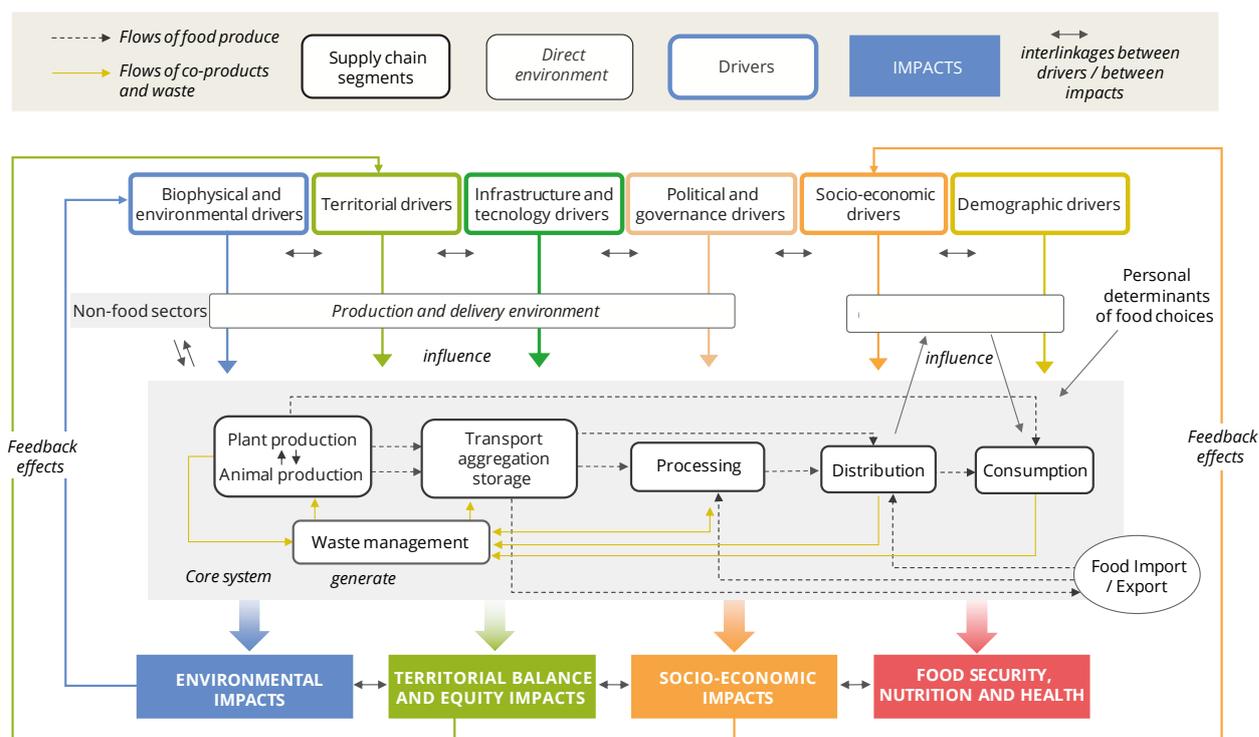
This brief is the result of a collaboration between the **Food and Agriculture Organization of the United Nations (FAO)**, the European Union, the French Agricultural Research Centre for International Development (CIRAD) and the Ministry of Agriculture of Bhutan, in close collaboration with FAO and CIRAD experts. It was implemented in Bhutan during February to April 2021. The methodology used for preparing this brief is the result of a global initiative of the European Union, FAO and CIRAD to support the sustainable and inclusive transformation of food systems.

This assessment methodology is described in detail in the joint 2021 publication entitled, "Catalysing the sustainable and inclusive transformation of food systems: Conceptual framework and method for national and territorial assessment".

The assessment integrates qualitative and quantitative data analysis with participatory processes by mobilising public, private and civil society stakeholders. The approach includes interviews with key stakeholders and a consultation workshop to refine systemic understanding of the food system and discuss potential levers to improve its sustainability. The assessment process, thus initiates participatory analysis and stakeholder discussion on the strategic opportunities and constraints to sustainable transformation of food systems.

The approach assesses the actors and their activities at the core of the system, together with their interactions along the food chain as well as the environments directly influencing their behaviour. Conditioned by long-term drivers, these actors generate impacts in different

**Figure 1. Analytical representation of the food system**



Source: Catalysing the sustainable and inclusive transformation of food systems: Methodological Note, FAO (2021).



dimensions that in turn influence drivers via a number of feedback loops (see figure 1).

The approach involves a detailed understanding of the key challenges along the four dimensions of sustainable and inclusive food systems: i) food security, nutrition and health; ii) inclusive economic growth, jobs and livelihoods; iii) sustainable natural resource use and environment; and iv) territorial balance and equity. Aimed at identifying critical issues affecting the sustainability and inclusivity of food systems, the assessment is both qualitative and quantitative in nature. Critical challenges and key food systems dynamics are specified in the form of **Key Sustainability Questions (KSQs)**, whose answers (see schematic representations for all KSQs) help identify **systemic levers** and areas of action that are essential to bring about desired **food system transformations**.



This approach is designed as a preliminary rapid assessment for food systems and can be implemented over a period of 8–12 weeks. The methodology has been applied in more than 50 countries as a first step to support the transition towards sustainable food systems.





## National context: key figures

<p><b>Population total (2020)<sup>1</sup></b> : 771 612</p> <p><b>Population growth (2020)<sup>1</sup></b>: 1.1%</p> <p><b>Urban population growth (2020)<sup>1</sup></b>: 2.8%</p> <p><b>Gini Index (2017)<sup>1</sup></b>: 37.4</p> <p><b>National GDP per capita, PPP 2011 (2018)<sup>1</sup></b>: USD 9 207</p> <p><b>Share of Agrifood System in GDP (2014)<sup>2</sup></b>: 23%</p> <p><b>Share of Agrifood System in employment (2014)<sup>2</sup></b>: 61%</p>	<p><b>Female employment in agriculture (2019)<sup>1</sup></b>: 64%</p> <p><b>Access to electricity (2017)<sup>1</sup></b>: 98%</p> <p><b>Mobile cellular subscriptions (2019)<sup>1</sup></b>: 96%</p> <p><b>Global Gender Gap Index (2020)<sup>3</sup></b>: 0.639</p> <p><b>Net Enrolment Rate, primary education (2020)<sup>4</sup></b>: 95%</p> <p><b>Net Enrolment Rate, secondary education (2020)<sup>4</sup></b>: 70%</p> <p><b>Forest cover, % of total land area (2018)<sup>5</sup></b>: 71%</p>
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**Sources:** <sup>(1)</sup>World Bank Data; <sup>(2)</sup>Thurlow, 2021; <sup>(3)</sup>World Economic Forum; <sup>(4)</sup>UNESCO; <sup>(5)</sup>Ministry of Agriculture and Forests (2018b).



## General background

Bhutan is a small, landlocked country, with a total land area of 38 394 km<sup>2</sup> and an estimated population of about 770 000. Located in the foothills of the Himalayas, the country is characterized by a mountainous terrain and rugged topography. Half of the territory is on slopes above a declivity of 50 percent, which are prone to very severe soil erosion, soil instability and soil losses of 8.6 tonnes/ha annually<sup>1</sup>. Total arable land is a mere 3 percent of the total area. The topography and location of Bhutan present significant challenges for the

country's development, among them, difficulties in providing domestic transportation, limited access to markets, high cost of providing health and educational services throughout the country, and vulnerability to natural disasters and climate-related risks. The uniqueness of Bhutan also shows through its diverse agroecological zones, which are a substantial source of biodiversity, snowy mountains, which supply abundant water resources, and location, nestled between the two largest consumer markets in the world – India and China.

## Strong drivers of food systems changes

### Strong economic growth driven by tourism and the hydropower sector

With a gross domestic product (GDP) of USD 2.5 billion in 2019 (5.5 percent growth compared to 2018), Bhutan is economically classified as a lower-middle income country by the World Bank.<sup>2</sup>

**Figure 1** shows the weight of Bhutan's main economic sectors in terms of GDP and employment:

- The primary sector (agriculture, livestock and forestry) accounted for 16 percent of GDP, but half of total employment;
- The secondary sector (manufacturing, electricity, construction) represented 36 percent of GDP, but only 14 percent of total employment;
- The tertiary sector (tourism, trade and insurance) accounted for almost half of GDP and 37 percent of total employment in 2019.

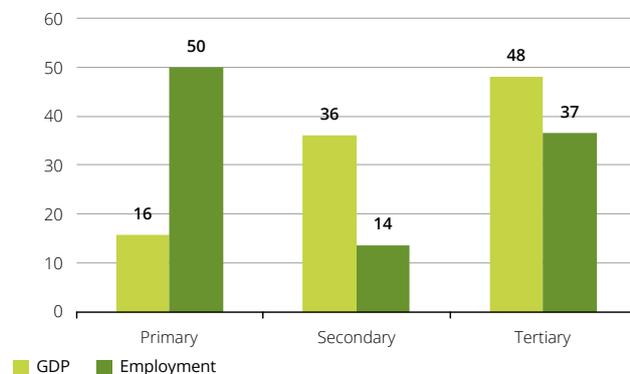
The tourism sector alone accounted for 9 percent of GDP and 16 percent of the labour force, while the electricity sector represented 13 percent of GDP, but less than 1.5 percent of total employment.

It is projected to grow in coming decades. Both sectors contribute significantly to Bhutan's foreign exchange income. In contrast, the manufacturing sector represented a mere 7 percent of GDP, and 8 percent of total employment (National Statistics Bureau, 2020a).

### Dynamic internal migration

The population of Bhutan is mainly rural, with 64 percent living in rural areas. Internal migration trends in Bhutan are dominated by rural-rural and rural-urban migration related to employment and education opportunities. In 2017, 62 percent

**Figure 1. GDP and employment by sector (2019)**



Source: FAOSTAT.

<sup>1</sup> Tenzin, et al.. (2019).

<sup>2</sup> As per UN classification, Bhutan is a Least Developed Country (LDC) and is set to graduate from this group by December 2023.



of the internal migrants came from rural areas, but only 29 percent of rural-urban movements represented internal migration (National Statistics Bureau). The latest data, however, indicate a deceleration in rural-to-urban migration, and a return flow of migrants from urban to rural areas.

### **Urbanization, with limited industrialization**

Between 2005 and 2017, Bhutan's population increased by 15 percent; the urban population expanded by more than 40 percent, while the rural population increased by only 3 percent. Half of the urban centres in Bhutan had fewer than 1 000 inhabitants. Thimphu and Phuentsholing alone accounted for 49 percent of the resident urban population (National Statistics Bureau).<sup>3</sup>

Urbanization affects food consumption and habits, and provides opportunities to promote the role of small businesses in the agrifood value chain, increasing domestic production. Urbanization in Bhutan, however, has not been accompanied by meaningful shifts of labour into the industrial sector, which consists mainly of cottage and small industries. In 2020, approximately 21 percent of the labour force was employed by the public sector (43 percent in urban areas). Overall, unemployment has been rising since 2016 to reach 5 percent. It is much higher in urban areas (10 percent) than in rural (3 percent) areas. Youth unemployment is very high (23 percent), especially in urban areas (33 percent).

### **A set of unique policies**

Bhutan's unique philosophy, Gross National Happiness, has guided the country's socio-economic development since the late 1980s. Based on this philosophy, the objective of the country's development path is to attain sustainable and equitable economic development, protect the environment,

and promote culture and good governance. Bhutan's strong commitment to sustainable development and environmental conservation takes various forms. These include, for example, the Constitution requiring that at least 60 percent of total land cover be maintained under forest, along with efforts towards becoming fully organic in the near future, and becoming a signatory to many environmental agreements and treaties.

### **The COVID-19 pandemic exposes food systems weaknesses**

Despite a limited number of cases of the COVID-19 virus, Bhutan's economy was still significantly affected by the pandemic. Economic growth is estimated to have declined to 1.5 percent in 2019–20 from 3.8 percent the previous year (World Bank). Lockdown and mobility restrictions in India caused disruptions in Bhutan's food supply and distribution, leading to food availability constraints and rising food prices. The consumer price index (CPI) for January 2021 increased by 9.3 percent, compared to January 2020. The price of food products soared by 17.3 percent, while non-food prices rose by 2.9 percent (National Statistics Bureau). Tourism, a major source of foreign currency and employment opportunities (especially for young people), was brought to a standstill by the pandemic, leading to a decline in revenue of 41 percent in 2019–20 compared to 2018–19. The reduction in employment opportunities, both inside Bhutan and abroad, is likely to threaten the food security of poor and vulnerable populations.<sup>4</sup> This has resulted in a strong interest in alternative employment (especially agriculture), mainly for men, as coping capacity was limited (seeking government help, curbing consumption). The country's vulnerability in securing adequate food exposed by the pandemic has led to the adoption of contingency plans that focus on domestic food production.

<sup>3</sup> With nearly 115 000 inhabitants, Thimphu is more than four times the size of the next-largest town, Phuentsholing.

<sup>4</sup> The COVID-19 pandemic has led to major deprivations (income loss, loss of livelihoods, food insecurity and indebtedness) and to increased vulnerability (National Statistics Bureau and UNDP).



## Key trends in food and agriculture

Spread across six agroecological zones, Bhutan's agriculture sector is very diverse. The alpine and cool temperate zones covering approximately half of the territory are mostly suited to growing barley, wheat, buckwheat and potatoes. Rice and vegetables are grown throughout the country, except in high-altitude zones. Maize grows along the dry-subtropical belt, and the humid subtropics in the South are suitable for a wide array of crops.

According to figures from the Ministry for Agriculture and Forests, Bhutan has an estimated 66 587 farms, of which 99 percent are cultivated by smallholder subsistence farmers. The average landholding is 3.7 acres (about 1.5 hectares). In 2019, agricultural landholdings in Bhutan covered a total area of approximately 250 000 acres (100 000 ha), of which about three-quarters were cultivated and a quarter (or 66 000 acres) were under fallow and therefore not used. In the wetlands, for example, the main reasons for the high percentage of land under fallow were poor access to irrigation (34 percent), crop damage due to wildlife (25 percent), and labour shortages (19 percent). Low soil fertility, conversion to other land uses, rotation practices and distance between the land and the home were also cited.

Several constraints contribute to the low competitiveness and decline of Bhutan's agricultural sector. These are crucial to explain the dissatisfaction with rural livelihoods, which is fuelling rural-urban migration and prevents agriculture from making a full contribution to meeting the Sustainable Development Goals.

The geographical dispersion and fragmentation of farms has limited access to many important inputs and services, including the following:

- **Irrigation:** only 18 percent of arable wetlands are irrigated and 61 percent of dryland has no irrigation facilities;
- **Agricultural inputs:** 95 percent of all farm holdings use organic fertilizers, 25 percent use chemical fertilizers (Katwal and Bazile, 2020) and slightly more than 9 percent of farm holdings use chemical pesticides;
- **Farm mechanization:** limited by steep landscapes and the small size of landholdings;
- **Information and knowledge:** agro-enterprises and extension services face difficulties in providing the necessary inputs, infrastructure, technical and advisory services to dispersed farmers;
- **Credit:** in addition to having difficulties finding collateral, farmers also lack financial literacy and access to credit institutions, which are often located far away (Table 4);
- **Market linkages:** bringing produce to markets is a main challenge for farmers. Some 37 percent of farmers used their production only for self-consumption, 53 percent operated mainly for self-consumption with some sales, and only 10 percent mainly directed their production for sale.

Large shifts in farm labour demographics through rural-urban migration have resulted in labour shortages, which are reported by half of the farm households. This trend has also contributed to an overall feminization of agriculture, and to large areas of land being left uncultivated.

The fragmentation and dispersion of farmland and the proximity to forested and protected areas result in persistent and widespread losses of crops and livestock to wildlife. This contributes to an increase in production costs, including for protective devices, such as electric fencing, continuous surveillance, increased health risks, injuries and casualties.

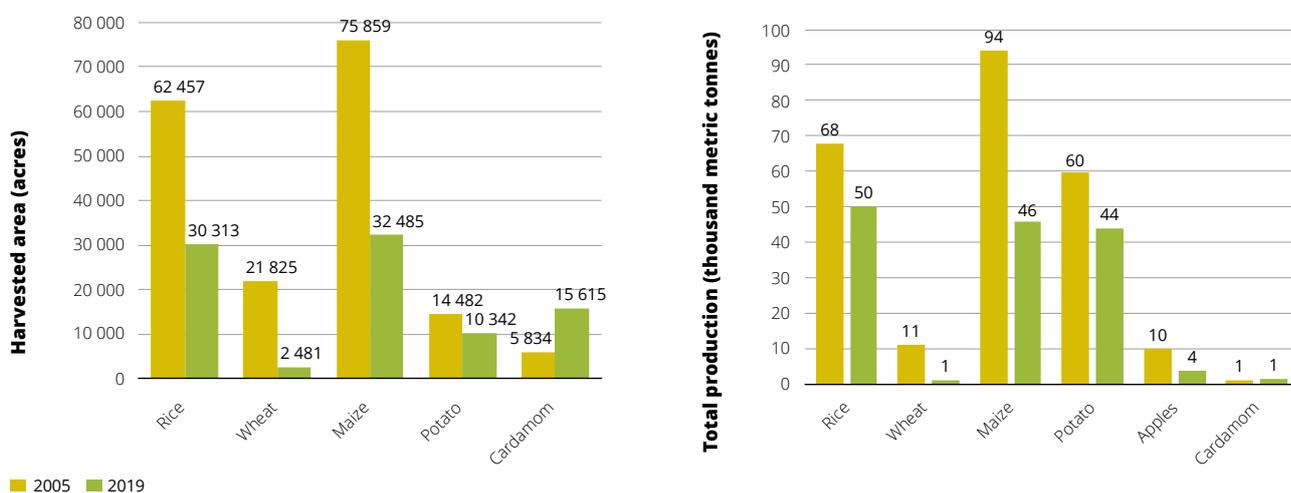
As a result of these constraints, 45 percent of farming households also rely on other economic activities for their livelihoods.



The area harvested and the volume of agricultural production have declined for several crops – including rice – between 2005 and 2019, as shown in Figure 2. Production of a few crops, however, seem to have increased, such as cardamom and areca nut. There has also been a rise in the production of poultry

and eggs. Despite these increases, however, Bhutan imports considerable volumes of dairy products and meat due to insufficient local processing capacity. Similarly, despite an increase in vegetable production over the past decade, Bhutan still relies on vegetable imports during the winter.

**Figure 2. Harvested area and production of various crops (2005–2019)**



**Note:** The number of apple-bearing trees dropped from 338 524 to 197 196 between 2005 and 2019.

**Sources:** Ministry of Agriculture and Forests (2015, 2020).

Aside from smallholder farmers, other important stakeholders in the food system are the following:

- Small-scale local food processors. Agribusinesses, which make up 20 percent of Bhutanese firms, are small: 91 percent have fewer than five employees, 6 percent have 5–19 employees, and only 3 percent are medium-sized enterprises (20–99 employees).
- A small number of cooperatives.
- State enterprises in charge of delivering essential services and/or ensuring market

access. The role of State-run enterprises allows only very limited scope for private sector operators to participate in agrifood systems in Bhutan. Agricultural commodity trade is organized through four auction yards spread along the border with India. The Food Corporation of Bhutan Limited coordinates the auctions and the Department of Agricultural Marketing and Cooperatives from the Ministry of Agriculture and Forests monitors them. Individual farmers, farmers' groups and cooperatives participate in the auctions, alongside buyers from India, Bangladesh and Bhutan.



## Assessing the performance of Bhutan’s food systems

### The double burden of malnutrition

Bhutan has seen a steady decline in malnutrition over the past 15 years, benefiting from economic growth, considerable efforts to improve maternal education, drinking water and sanitation, and implementation of health and nutrition

programmes. The average caloric intake for Bhutan was 3 112 kilocalories in 2007 and mean monthly food consumption expenditures doubled from Nu. 7 153 in 2012 (USD 97) to Nu. 14 718 (USD 199) in 2017. Child malnutrition and mineral deficiencies, however, remained widespread.

**Table 1. Health and nutrition indicators**

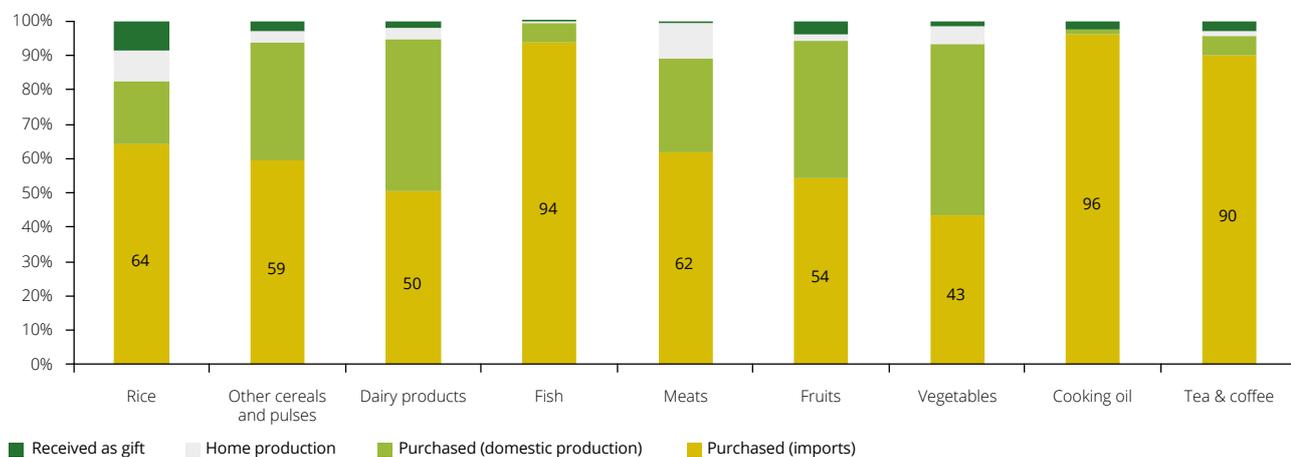
<b>Children under 5 years of age who are stunted (2015)<sup>1</sup></b>	<b>21.0%</b>
<b>Children under 5 years affected by wasting (2015)<sup>1</sup></b>	<b>4.3%</b>
<b>Prevalence of anaemia among children under 5 years of age (2015)<sup>1</sup></b>	<b>43.8%</b>
<b>Prevalence of anaemia among women of reproductive age (2015)<sup>1</sup></b>	<b>34.9%</b>
<b>Caloric consumption (kilocalories/adult equivalent/day)<sup>2</sup></b>	<b>3 112</b>

Source: <sup>(1)</sup>Ministry of Health (2016); <sup>(2)</sup>Tobgay et al. (2010).

The traditional Bhutanese diet mainly consists of cereals (predominantly rice), with a per capita consumption of 110 kg/year; consumption of fruits and vegetables is low. Food habits increasingly include more processed food and sugary drinks. On a per capita basis, Bhutanese households spend

20 percent of their food budget on dairy products, 13 percent on vegetables, 10 percent on rice, and 10 percent on other cereals and pulses. Figure 3 shows that 43 to 96 percent of household food expenditure was on imported food items. Reliance on imports was especially high for cooking oil and rice.

**Figure 3. Food consumption expenditure and share of food by source (2017)**



Source: National Statistics Bureau (2017).



Overall food demand in Bhutan is expected to increase by 46 percent by 2025, compared to 2007. Based on estimated price and income elasticities for various food items and official population projections, between 2007 and 2025, demand will increase the most rapidly for food taken outside the home, such as: noodles,

confectionery and biscuits (+66 percent), dairy products (+47 percent), fish and meat (+44 percent), and fruits (+43 percent). Demand for packed and processed food is expected to rise the fastest. These changes have already resulted in an increase in obesity and chronic diseases, as shown in Table 2.

**Table 2. Health and nutrition indicators**

<b>Share of all deaths caused by NCDs (2019)</b>	<b>69.0%</b>
<b>Prevalence of obesity in the overall population (2019)</b>	<b>11.4%</b>
<b>Prevalence of hypertension in adult population (women) (2019)</b>	<b>24.0%</b>
<b>Prevalence of hypertension in adult population (men) (2019)</b>	<b>31.6%</b>
<b>Prevalence of diabetes (women) (2019)</b>	<b>2.1%</b>
<b>Prevalence of diabetes (men) (2019)</b>	<b>1.8%</b>

Source: Ministry of Health (2020).

### Limited opportunities in rural areas

Steady growth and well-targeted pro-poor policies have enabled Bhutan to dramatically reduce the incidence and intensity of extreme and multidimensional poverty (World Bank Indicators).

Agriculture in Bhutan contributes much less to GDP than to employment (see Figure 1), indicating low labour productivity. Nevertheless, the value-added per worker reached about USD 1 420 in 2019 (compared to USD 1 200 in 2009), as shown in Table 3.

**Table 3. Economic indicators**

<b>Poverty headcount ratio at national poverty lines (% of population) (2017)<sup>1</sup></b>	<b>8.0%</b>
<b>Population living on less than USD 1.90 a day (2017)<sup>1</sup></b>	<b>1.5%</b>
<b>Value-added per worker (USD) (2019)<sup>1</sup></b>	<b>1 419</b>
<b>Share of agriculture and food in total import bill (excluding electricity) (2019)<sup>3</sup></b>	<b>17.0%</b>
<b>Overall Consumer Price Index inflation rate (2018)<sup>2</sup></b>	<b>3.1%</b>
<b>Food Consumer Price Index inflation rate (2018)<sup>2</sup></b>	<b>3.6%</b>

Sources: <sup>(1)</sup>World Bank Data; <sup>(2)</sup>National Statistics Bureau (2019); <sup>(3)</sup>Ministry of Agriculture and Forests and World Bank (2020).



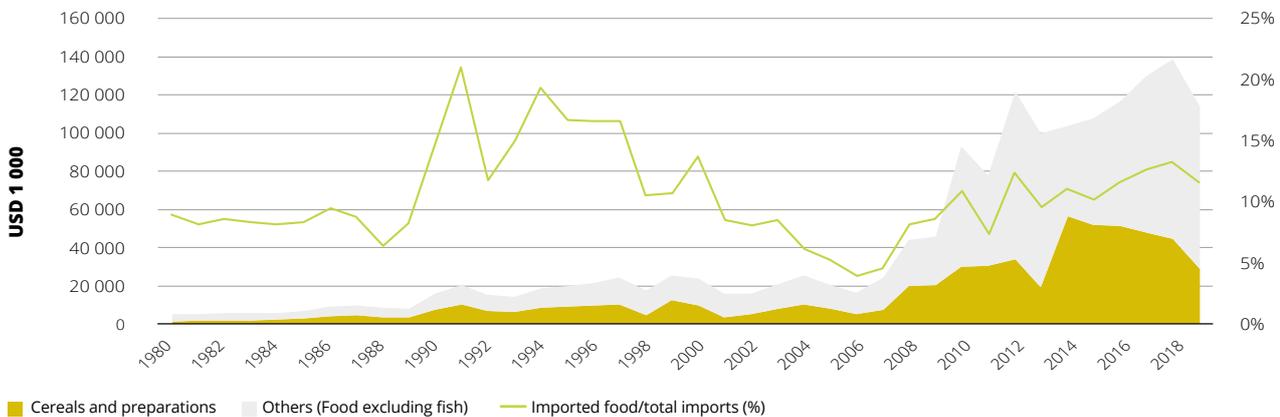
In 2017, the rate of participation in the labour market among the working-age population was higher in rural areas, with rural labour force participation rates reaching 76 percent for males and 60 percent for females. This reflects activities that demand constant engagement of household members, such as farming and animal herding. In terms of wealth distribution, the rural population, who are mainly employed in agriculture, represented 63 percent of the total population, but 97 percent of the poorest wealth quintile and 89 percent of the second poorest wealth quintile.

Trade represented 84 of the GDP in 2019. The largest partner, India, accounted for 84 percent of total export value and for 82 percent of total import value. The value was even higher for food, at 91 percent. Also in 2019, agriculture and food represented 15 percent of the country's

import bill and the food trade deficit with India reached Nu 7.7 billion (USD 109 million). In that same year, Bhutan is estimated to have achieved a little more than 35 percent self-sufficiency in rice production. It imported more than Nu 1.6 billion (USD 23.6 million) worth of rice (Ministry of Finance). Inflation was higher for food than for other items, as shown in Table 3. Given the weight of India in Bhutan's trade, price developments between the two countries are highly correlated.

Imports of processed food items, such as packaged biscuits, pasta and noodles, chips, confectionery and sweets, increased substantially between 2005 and 2019. Figure 4 shows this increase in food imports since 1980, which has become a major source of concern as Bhutan strives to achieve food self-sufficiency and nutrition security (Gross National Happiness Commission).

**Figure 4. Main imports in volume (1980–2019)**



Source: FAOSTAT.

**Significant discrepancies in territorial development**

As shown in Table 4, poverty was much more prevalent in rural areas. Despite a drop between 2007 and 2017, multidimensional poverty rates remained up to 10 times higher in remote districts as compared to Thimphu, often because of lack of access to basic infrastructure. More than 95 percent of all households had access

to electricity and improved water, but power outages were frequent in rural areas.

The median monthly income was lower in rural areas (Nu 10 400, equivalent to USD 141) than in urban areas (Nu 18 000, equivalent to USD 244). While 4 percent of rural households reported food insufficiency – not having enough food to feed all household members during the previous



12 months – this was the case for just 0.7 percent of households in urban areas. Food insecurity in

rural areas was particularly high in the Eastern and Southern parts of the country.

**Table 4. Territorial inequalities**

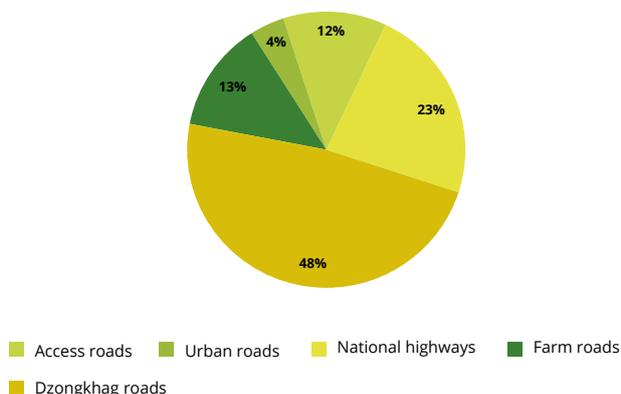
Share of the population living below the poverty line (rural)	12%
Share of the population living below the poverty line (urban)	0.8%
Share of population more than 1 hour away from a bank (urban)	4%
Share of population more than 1 hour away from a bank (rural)	52%
Share of population more than 1 hour away from a food market (urban)	4%
Share of population more than 1 hour away from a food market (rural)	28%

Source: National Statistics Bureau (2017).

Farmers are precluded from achieving fair returns by difficult production landscapes, lack of access to road infrastructure and markets, and long distances from the main consumption centres. They face problems ensuring the integrity, quality and timely delivery of their products, as well as accessing relevant information and advice. Also of note, there is very little manufacturing in rural areas, severely limiting opportunities to generate non-farm cash income.

Under the Government’s Road Sector Master Plan 2007–2027, road construction is emphasized as a means to develop rural areas, fight poverty and promote social justice and equity. In 2016, the country’s road network reached 11 176 km, distributed as shown in Figure 5. Despite this, in six districts, more than 15 percent of the population lived at least 30 minutes away from the main road access. Map 1 shows the geographical distribution of roads across Bhutan.

**Figure 5. Bhutan’s road network by type of road**



Source: Ministry of Transport (2017).

**Map 1. Bhutan road network**



Source: International Steering Committee for Global Mapping and Bhutan Land Commission. 2016. Roads, Bhutan. Cited 4 January 2022. <https://maps.princeton.edu/catalog/stanford-sn068jx1590>



### A food system that is still environmentally friendly

In comparison with other countries around the world, the negative impacts of the food systems on the environment remain limited in Bhutan, but they are not non-existent.

Current unsustainable farming practices, such as farming on steep slopes, burning of crop residues, failure to use cover crops, short-fallow shifting cultivation, poor design and maintenance of irrigation systems, and overgrazing contribute to land degradation

and may encourage deforestation to extend arable land. Such practices point to the urgent need for more operational extension services, a strong and innovative research agenda and a coherent set of economic incentives in the area of sustainable agriculture. With urban migration, waste disposal, particularly of non-biodegradable waste, is another environmental challenge faced by Bhutan.

Strict controls over the imports and use of synthetic inputs by the Government have helped to limit their levels of application as shown in Table 5.

**Table 5. Environmental indicators**

<b>Renewable internal freshwater resources per capita (m<sup>3</sup>) (2017)<sup>1</sup></b>	<b>104 618</b>
<b>Agricultural water withdrawal as % of total water withdrawal (2017)<sup>1</sup></b>	<b>94.1</b>
<b>Percentage of farmers using chemicals for plant protection (2019)<sup>2</sup></b>	<b>1.9%</b>
<b>Pesticide use (kg/hectare of arable land) (2019)<sup>3</sup></b>	<b>0.40</b>
<b>Insecticide use (kg/hectare of arable land) (2019)<sup>3</sup></b>	<b>0.22</b>
<b>Nitrogen use (kg/hectare of arable land) (2019)<sup>3</sup></b>	<b>8.5</b>

Sources: <sup>(1)</sup>FAO–AquaStat; <sup>(2)</sup>Ministry of Agriculture and Forests; <sup>(3)</sup>FAOSTAT.

Despite high overall freshwater availability per capita, Bhutan faces localized and seasonal water shortages. Water for small-scale irrigation comes from springs and aquifers, which are vulnerable to seasonal variations, climate change and disturbances caused by human activities.

The development and dissemination of water-saving and management technologies, including sprinklers, drip-irrigation and rainwater harvesting, may help improve the efficiency of water use and reduce water losses.

Economic development, the growing population and urbanization have led to an increase in the amount of solid waste generated in Bhutan, with a shift from biodegradable to non-biodegradable

waste. In 2019, Bhutan generated more than 170 tonnes of waste daily (0.2 kg per person per person), half of which was food waste and 33 percent of it plastic and paper-related waste. Households are estimated to generate more than 80 tonnes of total waste per day. In urban areas, they are estimated to generate 0.7 kg per household daily, which is almost twice the estimate of 0.4 kg per day for households in rural areas. Commercial establishments are estimated to generate 67 tonnes of total waste per day.

Food waste comprised 35 percent of the estimated waste, followed by plastic and paper-related waste, at 31 percent. In rural areas, rising non-biodegradable waste was attributed to the intensification of agriculture



and improved road connections, which offer farmers access to new practices and inputs, such as plastic mulching sheets, agrochemicals and higher-yielding crop varieties.

The share of greenhouse gas emissions from agriculture decreased by 8 percent between 1994 and 2015. Agriculture and livestock activities contributed 553 Gg CO<sub>2</sub>e, 14.5 percent

of total national emissions in 2015, most of it from livestock (390 Gg CO<sub>2</sub>e). Manure management contributed only 41 Gg CO<sub>2</sub>e (7 percent), and rice cultivation 53 Gg CO<sub>2</sub>e (9.5 percent). Some mitigation options in the agriculture sector are organic farming, reducing the use of synthetic nitrogen-containing fertilizers, crop selection and improved livestock sector practices.

**Table 6. Environmental indicators**

Forest area as a proportion of total land area (2017) <sup>1</sup>	71%
Total greenhouse gas emissions (Gg CO <sub>2</sub> eq) (2015) <sup>1</sup>	3 814
Carbon sequestration capacity (Gg CO <sub>2</sub> eq) (2015) <sup>1</sup>	9 387
Net greenhouse gas emissions (Gg CO <sub>2</sub> eq) (2015) <sup>1</sup>	-5 573
Greenhouse emissions from agriculture (Gg CO <sub>2</sub> eq) (2015) <sup>1</sup>	553
Energy consumption in agriculture (Tj CO <sub>2</sub> eq) (2019) <sup>2</sup>	243.8

Sources: <sup>(1)</sup>National Environment Commission (2020); <sup>(2)</sup>FAOSTAT.

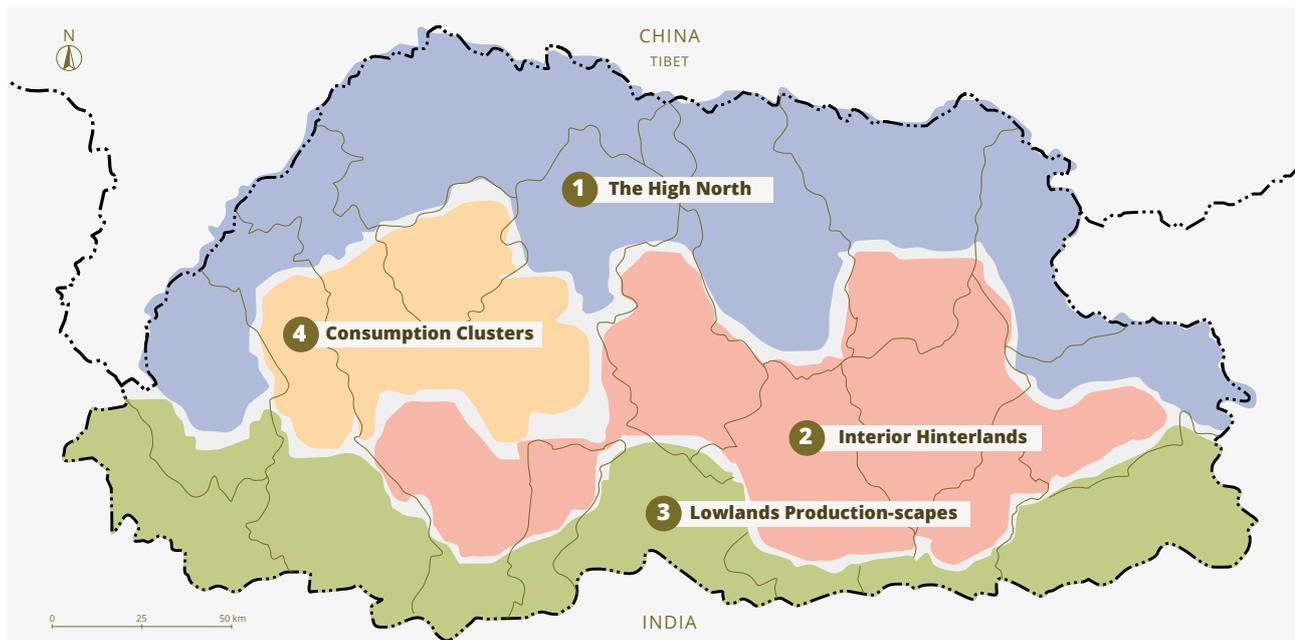




## Looking at the food systems through a territorial lens

Because the territory of Bhutan is very diverse, considering the food systems by region helps to identify challenges, opportunities and levers specific to each zone.

**Map 2. Territorialized food systems in Bhutan**



Source: Map conforms to UN. 2021. Map of Bhutan. <https://www.un.org/geospatial/content/bhutan-0>

### Zone 1: The High North

The very scarcely populated High North is characterized by high elevations (mostly above 3 000 metres above sea level) and landscapes that may be ill-suited to farming – forest, snowy areas, shrubs or steep slopes and rocky outcrops. Much of this area is protected. Food production is made difficult by the rough biophysical environment, limited accessibility and connectivity, weak extension and poor market conditions. Much of the food production is very seasonal, making people vulnerable to food insecurity in the winter.<sup>5</sup> Due to a decline in transhuman yak herding and in the variety of traditional food crops grown, including buckwheat, millet and

barley, food security relies on access to purchased food and the ability to earn an income to buy such supplies. Only 35 percent of farming households sell more than 10 percent of their production in this zone. Alternative income is generated through the collection of non-timber forest products, such as cordyceps, wild mushrooms and wild lemongrass, for high-end niche markets in Europe, China and Japan. Additional income is also generated by engaging in off-farm work or through sales of livestock. In some areas, such as Bumthang, earnings can be generated through tourism-related activities, such as trekking and bird-watching, though such pursuits are scarce in Eastern Bhutan.

<sup>5</sup> In Haa (resp. Gasa), 78 percent (resp. 74 percent) of households did not produce enough food for themselves over the year (Ministry of Agriculture and Forests, 2018).



**Levers and action points.** Cordyceps, matsutake and other wild mushrooms that have cosmetic, medicinal or aromatic uses, as well as high-altitude organic horticultural products, could offer farmers a way to boost their incomes.<sup>6</sup> Better valorisation of yak products and strengthening value-chain infrastructure and services are required to provide decent livelihoods to yak herders and supply traditional and healthy protein-based products to the Bhutanese.

### Zone 2: The Interior Hinterlands

The hinterlands are home to some 35–40 percent of Bhutan's population. Its many agroecological zones allow for a wide variety of crops. Despite these favourable conditions, production systems remain subsistence-based, a significant proportion of agricultural land is left fallow and production generates low income for farmers. This situation is mainly due to very limited road connectivity, lack of market access, and lack of processing and storage facilities and technologies. Widespread human-wildlife conflicts in the zone also limit production. High poverty rates in this zone – 33 percent in Dagana, 17 percent in Monggar – contribute to migration, mainly towards zone 4. The region also lacks tourist attractions.

**Levers and action points.** A key lever of intervention in this zone would be to support small farmers by encouraging the aggregation and marketing of crops. Substantial investment is needed in roads and market infrastructure. Reclaiming fallow land could expand production and income-earning opportunities. Mechanization to clear the land, irrigation support, road connectivity and access to markets are the key investment priorities. These areas are of particular importance because of higher population densities.

### Zone 3: Lowland Production-scapes

This zone covers the humid subtropical belt

of Southern Bhutan, where a wide range of economically important crops can be grown and exported. Cardamom, mandarin, areca nut and ginger can generate high value per acre. Infrastructure is generally good, including the zone's electrification and road connectivity. In this hot and humid area, however, crops face increased risks from pests and diseases, such as citrus greening, which has severely constricted mandarin production. Cultivation and management remain traditional, while access to modern technology and practices could increase yields. This area is the country's main gateway to the world, as 95 percent of all trade passes through the Southern border with India. Phuentsholing region alone accounts for 74 percent of all trade (Ministry of Finance).

**Levers and action points.** This zone offers a comparative advantage for the development of export-oriented industries because of the availability of cheap electricity, access to raw materials, easy access to transport and its large low-cost labour force from India. Increased exports of food products, such as cardamom and areca nut could boost this zone economically, but to do this, improved production, storage practices and quality standards are needed along with marketing and investment in infrastructure, such as cold-storage and packaging.

### Zone 4: Consumption clusters

Over the past two decades, the population of the area surrounding the Thimphu-Paro hub has grown rapidly with the urban built environment. Thimphu has tripled in size, from approximately 8 km<sup>2</sup> in 2002 to approximately 26 km<sup>2</sup>. This zone, which attracts many job-seeking young people, is home to approximately 20 percent of Bhutan's population and is the easiest to access, given the good road connectivity and proximity to the international airport. It also benefits from a skilled and young labour force, with the literacy

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<sup>6</sup> Many farmers complement their revenue by collecting and selling non-timber forest products, some of which are locally processed by small social enterprises into handicraft products (candles, soap) and essential oils, among others.



rate being the highest in the country. It also has the largest number of agribusinesses.

Thimphu, Chhukha (Phuentsholing) and Paro together attracted 41 percent of all recent internal migrants. The zone produces diverse products, including vegetables, livestock, cereals and fruits. It was traditionally a major apple-producing area, but production has dropped over the past decade and exports have plateaued due to the expansion of urban areas and a parallel increase in land prices. This has resulted in less production of apples as a means to make a livelihood. Increased land values have induced some farmers to sell their land for urban development. The remaining farmers are finding it difficult to sell their products to the urban population, which often prefers packaged

food imported from India. Production of rice is also declining in this zone. Being the largest consumption centre of the country, this zone faces an increase in both organic and inorganic waste. Paro, Thimphu and Punakha also accounted for 77 percent of tourism bed nights in 2018.

**Levers and action points.** Key levers in this zone include the promotion of sustainable consumption, a change in diets and, more generally, in lifestyles of citizens and tourists. Peri-urban food systems, such as terraces/vertical farming/hydroponics, could be promoted in this zone, but processing capacities also need to be developed for the food system to meet consumer demand for domestic and export markets.





## Challenges and trade-offs

As it progresses towards a sustainable food system, Bhutan faces several challenges and trade-offs:

**Strong environmental policies and their impact on Bhutan's agriculture:** Admirable environmental policies (minimum forest cover requirements, a 100 percent organic target by 2035, wildlife sanctuaries and corridors) adopted by the Government of Bhutan may appear to undermine the objective to feed the growing population.

The current fragmentation and dispersion of farms makes them more vulnerable to wildlife predation, and more difficult to reach, reducing productivity. Connecting small, scattered landholdings is a huge challenge in terms of transportation, logistics and market access. Bhutan's ambition to go wholly organic might also be perceived as another hurdle for farmers who use chemical fertilizers and pesticides to improve yields and reduce crop failure. Organic crop yields are lower than conventional yields (Feuerbacher et al., 2018), and prices are higher. A staggered approach to efforts directed to organic agriculture could help to limit the negative impact it has on food security, while Bhutan works on establishing institutions and infrastructure for organic inputs, certification and standards. The low level of chemical use means the conversion to organic agriculture may be relatively easy, if farmers' efforts are accompanied by strong public investment in supporting policies, extension and research.

By taking a phased approach, organic agriculture might be used to reach self-sufficiency for a number of well-identified and emblematic products (such as, leafy greens and traditional cereals). This could be done by focusing on a particular zone and aiming for self-sufficiency, while working simultaneously to establish the

institutions and programmes for developing organic inputs.

In this way, organic agriculture could be promoted in specific zones (high North, interior hinterlands), where it may be easier to implement, given lower pest and disease pressure, and availability of wild products. This requires appropriate conditions<sup>7</sup> for organic production and trade that could include developing research and specialized extension in organic farming techniques; expanding production of organic inputs and seeds; encouraging the creation of farmers' groups; improving market access (e.g. mutual recognition between Bhutan and India of participatory guarantee systems to open new markets and encourage the import of organic produce from India); and by improving consumer awareness.

**Should nutrition become a key pillar of happiness?** Reaching rice self-sufficiency is a top priority of the Government's policy agenda. The importance of this goal has been further highlighted by the COVID-19 pandemic. Bhutan, however, is currently unable to reach food self-sufficiency and recent trends point away from doing so in the near future. The country also faces a growing public health problem, as the consumption of processed food rises, especially in areas of lower or middle elevation where connections have been established and the harvesting of traditional crops are being abandoned. Imports play a major role in assuring food security, but nutritional content and quality might need as much effort and attention as environmental protection, if the Government were to ensure that the food system provides "healthy, balanced, and nutritious diets to contribute to health for all" – one of the four core goals of a sustainable food system. In the area of food safety, systematic and science-based import inspection and certification might also be areas for improvement.

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<sup>7</sup> The institutional framework for the development of organic agriculture already exists (National Organic Program).



**Is food sovereignty possible if rural areas offer poor prospects?** With young people attracted to the cities, and few incentives being offered to keep them in the countryside, Bhutan faces a major challenge to reach food sovereignty. The shortage of farm labour is mainly attributed to migration out of rural areas due to drudgery, high risks in farming and lack of modern facilities and decent services, as well as the desire among the young people to attain better urban jobs and earnings in other sectors, such as tourism. Bhutan's pro-poor development focuses on the empowerment of local government and rural investment, but satisfying young people's aspirations will be key, as they comprise a large percentage of migrants, and youth unemployment in the cities climbs to a staggering 33 percent.

**Can exports of niche products be promoted without compromising food security?** Exporting niche products has been a long-standing policy of the Government in achieving social and economic goals. In the context of agriculture, this has translated in the identification of high-value crops for export, such as spices (cardamom, ginger) and fruit (oranges). The Government may encourage efforts to identify and invest in high-value export crops to develop and spread innovative practices, such as new farming, marketing and processing techniques, new modes of coordination within

value chains, and use of standards, certification, branding and labelling.

**Exporting the vision:** Bhutan has an unmistakable comparative advantage in the production of high value-added agrifood products and already enjoys a positive image in that regard. Characterized by its pristine nature, biodiversity, carbon-negative status, strong culture and traditions, and Gross National Happiness philosophy, this image is conveyed by its leaders and in its tourism strategy. Exporting a small number of high-value, low-volume products, such as natural, organic, or wild-collected products through rural social enterprises working closely with farmers can further support the country's image as an environmental champion. Government efforts to develop Brand Bhutan for exports contribute to this objective of exporting a vision. Other tools could include certification systems promoting the sustainable sourcing of wild-collected products. Strengthening relations between establishments in the tourism and agriculture sectors, such as setting up sourcing platforms where hotels and restaurants could buy local farm products, could be beneficial and may offer a first step for this initiative, while providing economic opportunities. Bhutan could also strategically promote speciality products as part of the high-end tourism initiative, such as offering gift samples with costs covered by inclusion in tourist visa fees.





## Pathways towards making Bhutan's food systems more sustainable

Bhutan has unique opportunities to address its challenges and make its food systems contribute in a meaningful and sustainable way to the wealth and happiness of its population.

The key challenge, to find a balance that secures healthy and nutritious food for its population, and promotes economic growth while meeting its environmental commitments, will continue for the time being. From this perspective, food supply disruptions observed during the COVID-19 pandemic stress the need to scale up food production to meet existing demands, and to modernize the domestic food system.

There are several broad areas in which potential action may be needed to meet Bhutan's challenges to attain food system sustainability.

1. Improving infrastructure and road connectivity will facilitate access to markets. This is crucial to enhance availability and distribution of locally produced food and to make local products more competitive against imports. Complementary efforts include improving the connectivity of rural areas to other hard infrastructure, such as electricity supply, and soft infrastructure – the Internet.
2. Improving the value chain by encouraging better production and storage practices, quality standards and marketing. This would need to be accompanied by investment in promoting decentralized market infrastructure at the Dzongkhag level, such as cold storage, warehouses, and processing and packaging facilities, to reduce spoilage and losses.
3. Rehabilitation of fallow land – where possible – could help to increase productivity and contribute towards achieving food self-sufficiency goals. Given the multiple causes for land being left fallow (migration and labour shortages, isolation and exposure to wildlife damage, among other factors), this is a complex issue. However, in areas where rehabilitation is feasible, this should be carried out in an environmentally friendly way by doing the following: promoting climate-resilient approaches and diversification strategies (e.g. quinoa, egg and poultry production); encouraging peri-urban food production (low food miles); and incentivizing food-system investments through blended finance, soft loans, tax breaks or access to green finance. In the medium to long term, a “fallow land investment plan” should be considered as a key priority in the 12th Five Year Plan and in the upcoming 13th Five Year Plan budget.
4. Encouraging organized aggregation and marketing of crops to achieve some economies of scale and improve competitiveness, particularly in areas where cheaper imports are available.
5. Further promoting high-altitude horticultural products and non-timber forest products with specific uses for expanding sales in high-end markets in Asia and Europe. This would need to be accompanied by other actions, such as developing certification systems to promote the sustainable sourcing of wild-collected products.
6. Promoting sustainable consumption, healthy food and dietary diversity. The Government of Bhutan has already demonstrated that environmental policies can be the backbone of development policy. So, based on that, it can extend this approach to nutrition. This would take strong, creative and uncompromising policies targeting consumers that encourage behavioural changes towards healthy and diversified food diets, products and lifestyles, and raise awareness of food waste. Examples might include food and nutrition awareness campaigns; stronger support for locally sourced alternatives to unhealthy imports; supporting small agribusinesses willing to process local products (for which consumer preference is currently low); or aiming for full coverage of public-sector canteen needs (public administration, schools, universities, hospitals) by local farmers. This strategy should extend beyond the Thimphu-Paro-Punakha area to promote more even development. It would need to be



accompanied by developing processing capacity and improved marketing of local foods.

7. Leveraging the food system for inclusive development by improving prospects for young people in rural areas. Migration trends show the need to develop economic opportunities in the countryside to avoid rural depopulation and the uncontrolled development of cities. Incentives to improve prospects in the countryside could be provided for local private-sector companies to operate, if not in the most remote areas, at least close to secondary cities. The creation of hubs could gather a range of support services, such as inputs, microcredit and extension, and strengthen market access, possibly through the establishment

of food-based logistics companies, storage and processing facilities. COVID-induced urban to rural migration may present opportunities for investing in human capital, as part of efforts to revitalize the rural economy.

8. Strengthening private-sector participation by creating conditions for local agrifood small and medium enterprises to emerge that will connect small-scale farmers to markets through access to appropriate technology, finance, markets and use of digital tools and innovative technologies. Promoting and encouraging public-private partnership models to enhance the effectiveness and sustainability of services provided by State-owned enterprises.





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