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Fill the Nutrient Gap Bhutan

Report

December 2022

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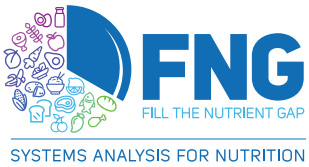

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Foreword

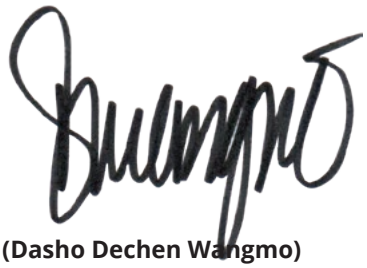
The Ministry of Health is pleased to present the report of the 2022 Fill the Nutrient Gap (FNG) Bhutan. The report is a culmination of a joint initiative that recognised the need for gaining a deeper understanding of the nutrition situation in Bhutan and barriers preventing households from consuming a nutritious diet.

The Government, in partnership with the United Nations World Food Programme and with support from the World Bank, carried out the FNG analysis to inform and strengthen policies and programmes for effective interventions towards sustainable food systems for healthy, nutritious diets and improved human capital development.

The FNG findings will support the implementation of national strategic plans such as the National Nutrition Strategy and Action Plan and the National School Feeding and Nutrition Strategy and will inform the development of the 13th Five-Year Plan. This forthcoming Five-Year Plan recognises malnutrition as an impediment to the country's development and to the health of its population, making food and nutrition security one of the National Key Result Areas (NKRA).

Bhutan has made great progress in the fight against malnutrition. However, multiple forms of malnutrition - stunting, micronutrient deficiencies, and overweight and obesity - continue to be a public health challenge. Lack of access to healthy and nutritious foods remains a major constraint preventing households and individuals from consuming high-quality diets.

Understanding the cost and affordability of nutritious diets and how these are changing over time is critical for implementation of evidence-based interventions. Thus, FNG will provide an essential contribution in this regard and will facilitate the implementation of current and potential interventions to bring nutritious diets within reach, provide a basis for good health across the lifecycle, and support the human capital development of the nation.



(Dasho Dechen Wangmo)

Executive Summary

Context

Bhutan has made substantial progress in poverty reduction in recent years, with household poverty declining from 23 percent to 8 percent between 2007 and 2017. Nevertheless, malnutrition remains a major concern. The country is facing a triple burden with over a fifth of children under five stunted, a high prevalence of micronutrient deficiencies reflected in high rates of anemia and outbreaks of vitamin B deficiency, and a rapid increase in overweight and obesity.

The triple burden of malnutrition poses a major obstacle to human capital development in Bhutan, and progress in addressing malnutrition has been uneven, with worse nutrition outcomes among households in rural areas and in lower wealth quintiles. To prevent all forms of malnutrition, all individuals need to be able to access and afford healthy, nutrient-dense and diverse diets, including the most vulnerable individuals such as children under 2 and pregnant and lactating women.

The Royal Government of Bhutan has prioritized the fight against malnutrition as one of the most effective entry points for human development, poverty reduction and economic development. This is reflected in landmark policies such as The Food and Nutrition Security Policy of Kingdom of Bhutan (2014), the 12th Five Year Plan (2019-2023) which identifies food and nutrition security as a National Key Result Area and, more recently, the National Nutrition Strategy and Action Plan (2020-2025).

Methodology

Fill the Nutrient Gap (FNG) is a multi-sectoral stakeholder engagement and analytical process which seeks to characterize the obstacles that households face to accessing and consuming a nutritious diet and prioritize actions to overcome them. It consists of two main components: a country-specific review of secondary literature to characterize the food system and nutrition situation, and a linear optimization exercise using Cost of the Diet (CotD) software to estimate the cost of meeting nutrient needs across the life cycle in Bhutan.

Based on the CotD results and household expenditure data, the portion of the population that cannot afford to meet their nutrient needs was estimated. This was followed by the modelling of stakeholder-identified interventions across multiple sectors to assess their contribution to reducing non-affordability. The implications of the findings were discussed with stakeholders working across multiple systems including food, health and education, to reach a shared understanding of the main barriers. Using this information, stakeholders prioritized interventions for improving access to nutritious foods.

FNG Bhutan process

The FNG process in Bhutan was undertaken by the World Food Programme (WFP) in collaboration with the Ministry of Health, to support the implementation of the National Nutrition Strategy and Action Plan while ensuring that WFP's strategic planning process continues to align with national nutrition priorities. With funding from the World Bank, the FNG exercise was initiated in early 2022 with technical assistance from the Systems Analysis for Nutrition team at WFP headquarters.

The stakeholder engagement and analytical processes took place throughout 2022. After baseline diet cost and affordability results were shared, stakeholders participated in a prioritization exercise to identify those interventions that should be simulated and compared. As the modelling simulation was carried out, national experts from the health, education and agriculture sectors provided inputs and validated the findings. A final multistakeholder workshop was convened in December 2022 in which attendees identified priorities for sectoral actions for nutrition based on the FNG results.

Main findings

1. **Poor dietary quality and overconsumption of staples are key drivers of malnutrition in Bhutan.** Bhutan has made significant progress in reducing poverty and improving food security and nutritional outcomes. However, high rates of stunting and micronutrient deficiencies remain a major obstacle to human capital development, while overweight and obesity are emerging as a public health concern.

2. **Meeting nutrient needs costs more than four times as much as meeting only energy needs. Nearly 3 in 10 households (27 percent) cannot afford to meet their nutrient needs.** The FNG analysis found that, on average, a nutritious diet costs at least Ngultrum (Nu) 436 per day for a five-person household (Nu 13,285 monthly), which is 4.4 times more than a diet that meets only energy needs. FNG estimates suggest that nationally at least 27 percent of households cannot afford a diet that meets their nutrient needs. These findings indicate that while energy-dense staples such as rice are cheap and plentiful, nutritious foods such as vegetables, fruit and animal source foods are out of reach for many.

3. **Dietary patterns and suboptimal food choices make nutritious diets less affordable, particularly for individuals with elevated nutritional needs.**
   Current dietary patterns, which include high consumption of starchy staples and processed foods high in sugar and sodium, push a nutritious diet even further out of reach and increase the risk of overweight. Animal source foods provide an essential source of nutrients such as iron, which is needed in increased amounts during certain stages of the life cycle, particularly for adolescent girls and during pregnancy and lactation. For individuals following vegetarian diets, it becomes more expensive or even impossible to meet nutrient needs.

4. **Shocks, such as disruptions in supply chains, threaten to increase the proportion of households that cannot afford a nutritious diet and to reverse progress that has been made in the fight against malnutrition.**
   The food system in Bhutan is characterized by small landholdings, low productivity and market inefficiencies, and remains vulnerable to external shocks. Supply chain disruptions caused by the COVID-19 pandemic and the subsequent global food crisis have exposed the vulnerability of the food system and threaten to reverse the progress that has been made in improving nutrition outcomes.

5. **Suboptimal infant and young child feeding practices and unhealthy snacking increase the cost of meeting nutrient needs and the risk of malnutrition in children under 2 years of age.**
   Suboptimal breastfeeding, low diversity of complementary foods, and consumption of unhealthy snacks increase the cost of the nutritious diet and the risk of malnutrition in children under 2 years of age. However, the FNG found that provision of multiple-micronutrient powders and improved feeding practices with nutrient-dense foods can help to lower the risk of malnutrition.

6. **Adolescent girls and pregnant and lactating women are especially vulnerable to malnutrition, but targeted interventions can make an essential contribution to closing the nutrient gap.**
   Adolescent girls and pregnant and lactating women are especially vulnerable to malnutrition because they require high levels of nutrients such as iron, which come from foods that are expensive in Bhutan (e.g., animal source foods). Targeted interventions, including supplementation with iron and folic acid tablets, are essential and should be continued. The FNG also found that if taken daily, a multiple-micronutrient tablet can make an even greater contribution to closing the nutrient gap for these individuals.

7. **Schools play an essential role in ensuring access to good nutrition through provision of diverse and fortified meals and targeted supplementation.**
   The National School Feeding and Nutrition Programme continues to provide an excellent channel to deliver nutritious meals to young people in Bhutan. Fortified rice makes an excellent base for school meals and should be continued. However, it needs to be complemented by nutritious local foods which are often expensive. Micronutrient supplementation in schools can further bring down the cost of meeting the nutrient needs of children and adolescents.

8. **Strengthening food systems can improve food producer and processer incomes while increasing availability of, and access to, nutritious foods for consumers.**
   Strengthening the food system by promoting nutrition-sensitive agriculture and diversifying production beyond staples to include more vegetables, fruit and animal source foods, can improve producer incomes while increasing the availability of nutritious foods at the markets. Commercial rice fortification should be scaled up; even at a slight price premium, it can be a cost-effective way for households to access nutritious diets.

9. **Actions across multiple sectors will be essential to bring healthy, nutritious diets within reach of the most vulnerable.**
   A combination of nutrition actions across multiple sectors is essential to bring healthy, nutritious diets within reach of the most vulnerable. Diversifying the food system, fortification of rice and other staples, targeted supplementation, promotion of optimal infant and young child feeding practices, and healthy school meals should all form part of a package of actions for nutrition.

10. **Timely monitoring of cost and affordability of nutritious diets, coupled with a robust nutrition information system, is essential to support coordinated actions to eliminate malnutrition in Bhutan.**
    The ongoing impacts of COVID-19, the global food crisis, and climatic and other shocks, continue to affect the kingdom's food system and national and household economies. Timely monitoring of the cost and affordability of nutritious diets and a robust nutrition information system are essential to support coordinated actions to mitigate the impact of shocks and eliminate malnutrition in Bhutan.

Fill The Nutrient Gap **Bhutan**

Introduction to Fill the Nutrient Gap (FNG) Bhutan

The Royal Government of Bhutan has made great progress in the fight against malnutrition. Yet despite the gains of recent decades, Bhutan still faces a triple burden of malnutrition with high rates of stunting, micronutrient deficiencies and, increasingly, overweight and related non-communicable diseases.

Government commitment to addressing malnutrition is reflected in a multitude of recent policies and initiatives including the National Nutrition Strategy and Action Plan (2021–2025), the Food Security and Nutrition Policy of the Kingdom of Bhutan (2023, forthcoming), and the National Health Policy (2011), as well as the draft National School Feeding and Nutrition Strategy (forthcoming). Food and nutrition security was also recognized as a National Key Result Area (NKRA) in the 12th Five Year Plan (2018–2023). (1–4)

The World Food Programme, with support of the Ministry of Health, initiated the Fill the Nutrient Gap process in Bhutan in late 2021. It aims to build a deeper understanding of the barriers that households face in accessing a nutrient-adequate diet and to generate evidence around the most efficient packages of multisectoral interventions to bring nutrient-adequate diets within reach of the most vulnerable.

Building consensus for improved nutrition

Nutrition is a crucial pillar in the development of a healthy, productive nation. Good nutrition enhances physical and cognitive development, prevents disease, and increases the potential of the workforce and society. Improving diets, especially of children and women, brings immediate and long-term health, education and economic benefits. The two Lancet series (2013 and 2021) on maternal and child undernutrition identified a variety of nutrition interventions that have proven effective. Improving the nutrition situation in a country requires coordinated actions across the food, social protection, health and education systems, that are grounded in a good understanding of the local context, its opportunities and bottlenecks, and a synthesis of global and local evidence.

Fill the Nutrient Gap (FNG) is an analytical process comprised of a secondary literature review in combination with Cost of the Diet (CotD) linear optimization software to understand local drivers that affect the availability, cost and affordability of a nutritious diet. Stakeholder identified solutions for improving availability of nutritious foods, lowering their cost and/or increasing income, are then modelled using the CotD software to assess their potential to improve access to nutritious diets. In this way, the context-specific potential for impact of proven packages interventions across sectors can be quantified.

This report presents an overview of the process, methodology and main findings of the FNG in Bhutan and the recommendations generated by national stakeholders. By calculating the cost and affordability of a nutritious diet, comparing interventions, contextualizing findings, and generating recommendations, the FNG process supports the Royal Government of Bhutan in its efforts to transform the food system to deliver healthy and nutritious diets for all and to build the long-term health and human capital of the population.

FILL THE NUTRIENT GAP: SITUATION ASSESSMENT FOR MULTISECTORAL DECISION-MAKING ON THE PREVENTION OF MALNUTRITION

Malnutrition has two direct causes: inadequate dietary intake and disease. The FNG assessment focuses on gaps in dietary intake to inform national policies and actions that can be taken across food, social protection, and health systems to improve nutrition, with a focus on the most vulnerable populations. The FNG considers whether nutritious foods are available, accessible, and affordable in a specific context, and identifies the barriers that lead to gaps in nutrient intake. The analysis focuses on the extent to which vulnerable people have choices in the foods they consume and how those choices are made. The FNG process identifies and models the impacts of context-appropriate interventions to improve diets and nutrient intake across food, health, education, and social protection systems. The results are used to identify entry points across systems, to refine programmes, and to make recommendations to policymakers.

The assessment comprises two components:

1. A country-specific review of secondary data and information on factors that reflect or affect dietary intake. This includes malnutrition trends over time, characteristics of the food system and food environment, and population behaviour related to food and feeding.
2. An assessment of the extent to which economic barriers prevent adequate nutrient intake. This uses the Cost of the Diet (CotD) linear programming software developed by Save the Children (UK), and includes modelling of the economic impact of possible interventions to increase nutrient intake and fill nutrient gaps.

Preventing malnutrition, including through improved access to nutritious foods, cannot be achieved by one sector alone. FNG is designed to inform multisectoral decision making and therefore engages stakeholders from all sectors including food, health, agriculture, education, and social protection.

It is the stakeholders who define the scope and focus of the assessment. They contribute data and sources of information for identification of context-specific barriers and entry points and together with the analytical team develop a shared understanding of the issues and possible solutions. They then identify appropriate nutrition-specific and nutrition-sensitive interventions that can be implemented by different sectors using their existing delivery platforms. These could be social safety nets, food processing and markets, antenatal care, school feeding programmes, etc.

The FNG methodology was developed by WFP with technical support from partners including the University of California Davis, the International Food Policy Research Institute (IFPRI, Washington DC), Epicentre (Paris), Harvard University (Boston), Mahidol University (Bangkok), Save the Children (UK), and UNICEF.

Between 2016 and late 2022, FNG analyses were completed in over 40 countries and at the time of writing, were ongoing in several more.

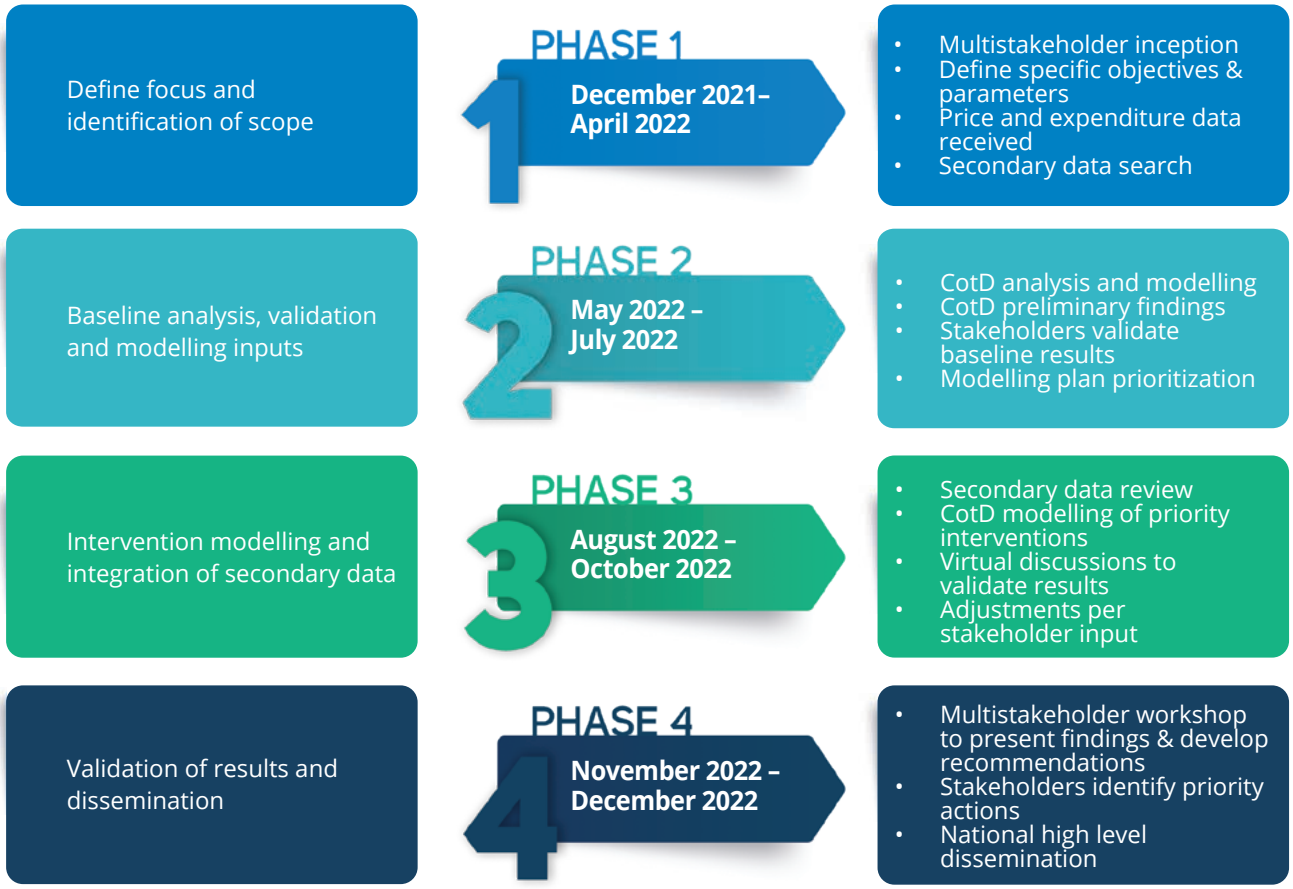
For more information on the concept and the method of the analysis, see Bose I, Baldi G, Kiess L, de Pee S, The 'Fill the Nutrient Gap' Analysis: An approach to strengthen nutrition situation analysis and decision-making toward multisectoral policies and systems change. Matern Child Nutr 2019: DOI: 10.1111/mcn.12793

Process and Scope of the Analysis

Process of the FNG Analysis in Bhutan

The FNG analysis was conducted by WFP Bhutan from December 2021 to December 2022 with technical assistance from the Systems Analysis for Nutrition team at WFP's headquarters in Rome, working in close collaboration with the Ministry of Health of the Royal Government of Bhutan. Stakeholder consultations took place virtually or in hybrid modality, and the final results validation workshop and national high level dissemination event were held in person in Thimphu in December 2022 (Figure 1).

Figure 1: The Fill the Nutrient Gap (FNG) process followed in Bhutan



Scope and Focus of the FNG Analysis

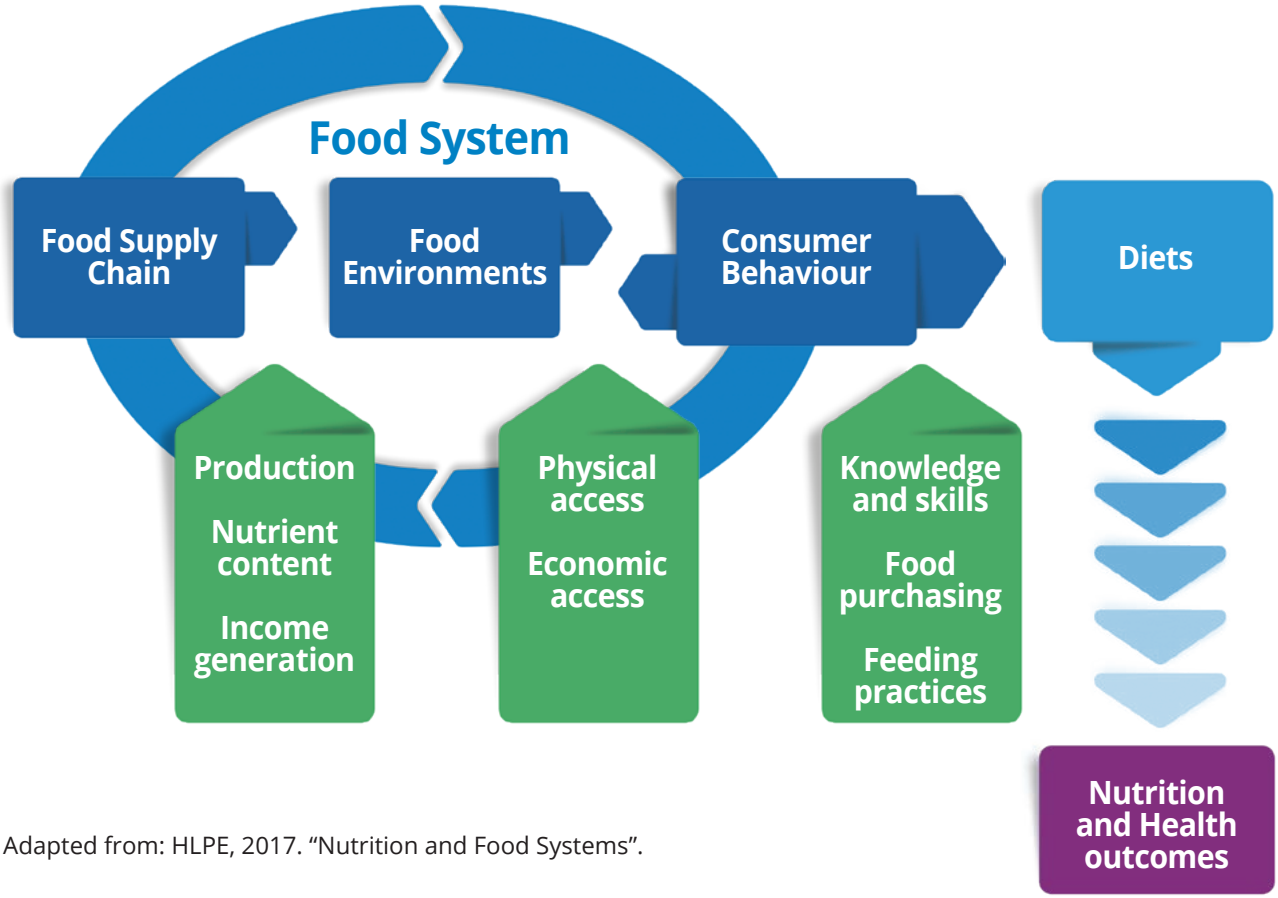
Long-term solutions to malnutrition require transformation of the food system along food supply chains, food environments and consumer behaviour patterns (Figure 2). The FNG analysis provides a framework for strengthened situation analysis and multisectoral decision making that identifies context-specific barriers to adequate nutrient intake among specific target groups. The analysis identifies nutrient gaps and barriers to adequate nutrient intake for different target groups across the life cycle.

The overall objectives of the FNG are to support the Royal Government of Bhutan in implementation of the National Nutrition Strategy and Action Plan (2021–2025), to complement national initiatives for food systems transformation, and to accelerate progress toward enhancing human capital development in the country.

The specific objectives of the FNG include:

- Support implementation of National Nutrition Strategy and Action Plan (2021-2025)
- Support action on the recommendations from the National Nutrition Survey (2015)
- Provide evidence for decision making to optimize ongoing programmes
- Complement efforts to increase investment for nutrition
- Provide baseline cost and affordability data for nutrition data monitoring
- Inform strategic planning process in alignment with national priorities

Figure 2: Food systems for diets, and nutrition and health outcomes framework

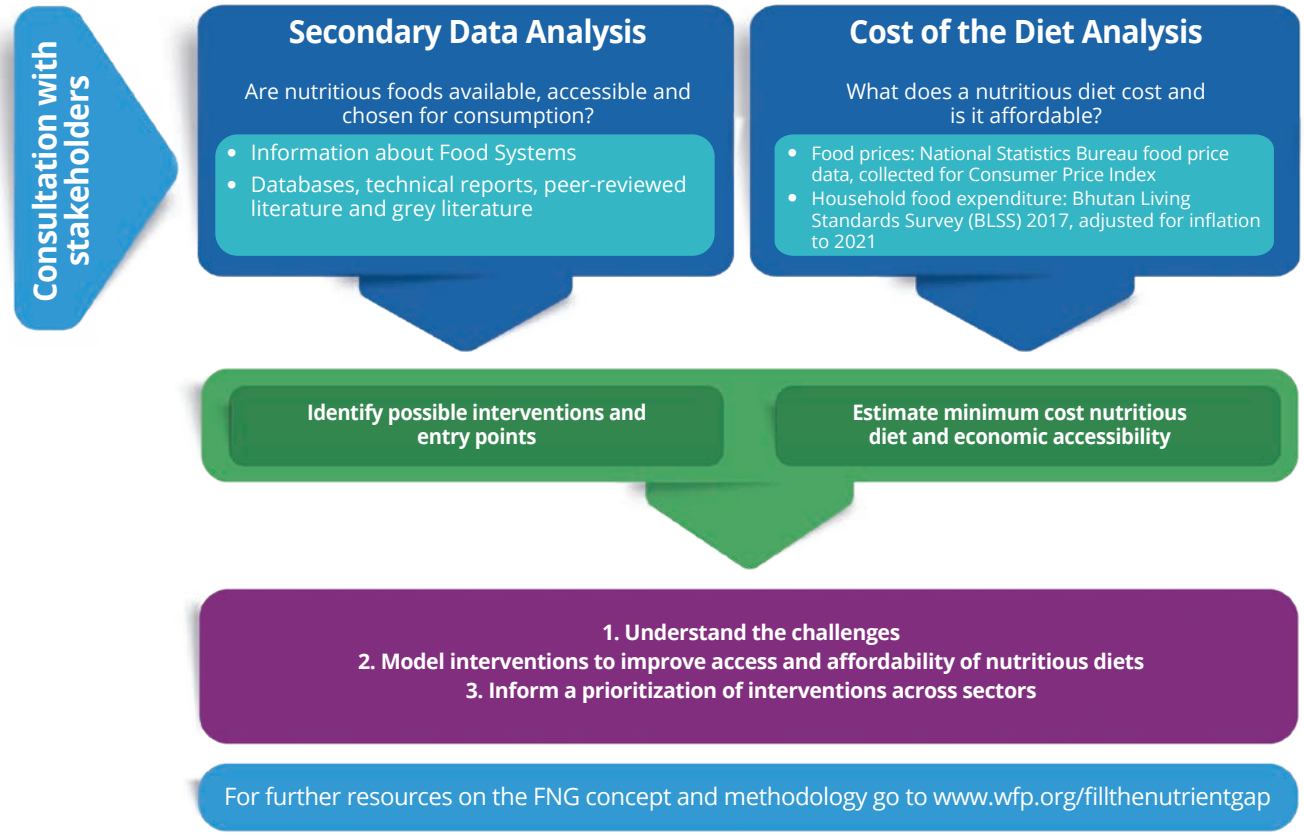


Adapted from: HLPE, 2017. "Nutrition and Food Systems".

Methodology

The FNG analysis is composed of a secondary literature analysis and a quantitative CotD analysis (Figure 3). The secondary analysis identifies barriers to accessing nutrient adequate and healthy diets, platforms for reaching nutritionally vulnerable groups in the population, and opportunities for policy and programme interventions to improve access to nutritious foods through multiple sectors, including agriculture and food systems, education and health. CotD analysis uses linear optimization to provide a detailed look at availability, cost and affordability of nutritious diets.

Figure 3: FNG analytical framework



Cost of the Diet (CotD)

COST OF THE DIET (CotD) ANALYSIS

The CotD software uses linear programming to understand the extent to which poverty, food availability and food prices may affect the ability of people to meet their nutrient needs. Using price data collected from markets or from secondary sources, the software calculates the amount, combination, and lowest possible cost of local foods that are required to provide individuals or households with their average needs for energy, and their recommended intake of protein, fat and micronutrients[1]. These diets are calculated within defined constraints to prevent the inclusion of unrealistic types or amounts of food and the provision of excessive amounts of nutrients.

The FNG approach defines the 'Staple Adjusted Nutritious Diet' as the lowest cost nutritious diet that includes a typical staple food and excludes foods that are prohibited[2]. This diet is referred to as the 'nutritious diet' throughout this summary. It meets requirements for nutrients, including protein, nine vitamins and four minerals, and does not exceed energy and fat requirements. The nutritious diet can be caulcuated for a range of individuals across the life-cycle. The nutritious diet is conceptually similar to the 'nutrient-adequate' diet estimated as the second level of diet quality in the State of Food Insecurity (SOFI) report. It diverges from the methodology used in calculating the "healthy diet" in SOFI report as the "healthy diet" is calculated using food-based dietary guidelines (FBDG) and not linear optimization. The reference individual for calculating the "healthy diet" is an adult with an energy balance at 2,330 kcal/day. While the FNG staple adjusted nutritious diet is strictly an economic benchmark for meeting micronutrient needs, the "healthy diet" is both an economic benchmark and is designed to reflect dietary customs.

Population expenditure data is compared to the cost of the nutritious diet and is used to estimate the proportion of the population that would not be able to afford it. This non-affordability can be estimated and compared across different regions, seasons or countries. The estimate of non-affordability is a conservative estimate of the share of households unable to afford the lowest cost nutritious diet, assuming optimized selection of nutritious foods. The real cost and non-affordability of a nutritious diet is likely to be higher, as reflected by a healthy diet, which includes foods from several food groups and has greater diversity within food groups.

[1] As defined by the Food and Agricultural Organization (FAO) and the World Health Organization (WHO).
[2] This diet is not intended to reflect what individuals or households are currently eating nor should it be used to develop food-based recommendations or dietary guidelines. Foods that are prohibited could be for customary or public health reasons, e.g., raw meat during pregnancy in some parts of the world.

Data sources for CotD analysis

The CotD analysis was undertaken for each of the three regions of Bhutan: West, Central and East (Figure 5). National estimates of the costs and affordability of nutritious diets were calculated as a population-weighted average of the three regions. Existing food price data for over 100 items was provided to WFP from the National Statistics Bureau, as regularly collected for the monitoring of the consumer price index (CPI). From this monthly price dataset, the FNG selected two months each from 2020, 2021 and 2022 to capture seasonal variation and the impacts of the COVID-19 pandemic and subsequent global food crisis on food prices. Price data were aggregated from the district level to arrive at a regional average price for each food item. Household food expenditure data were drawn from the 2017 Bhutan Living Standards Survey (BLSS) (5) and were adjusted to the same period as the price data using the food CPI factor. (6)

Modelled household & main target groups for the analysis

The FNG estimated a nutritious diet for a model household of five members, including:

- a breastfed child (12–23 months);
- a school-age child (6–7 years);
- an adolescent girl (14–15 years);
- a lactating woman; and
- an adult man.

The household size of five was drawn from the average size of households in the lowest wealth quintile in the 2017 BLSS. The household composition considers nutrient requirements at different stages of the life cycle.

The CotD models are adjusted to reflect the most commonly consumed staple food within the country.

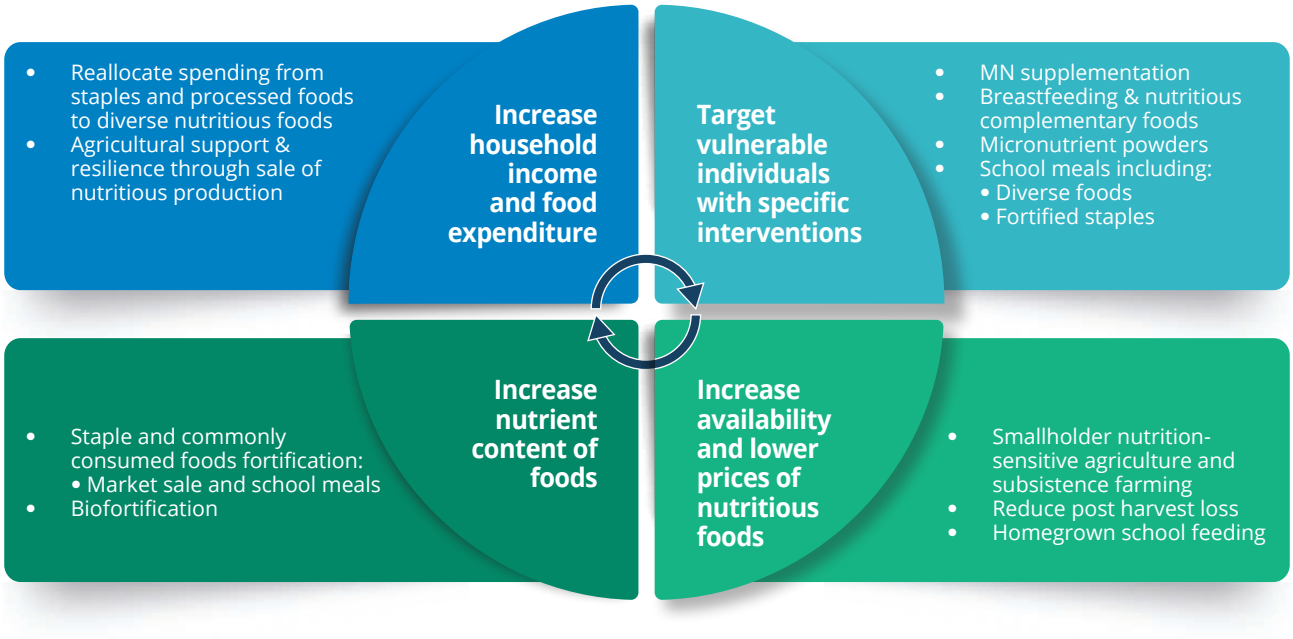
For Bhutan, rice is identified as the primary staple across all regions of the country. A minimum two portions of rice per day, constituting approximately half of daily caloric intake, was therefore included in the modelled diet for all regions.

Half of the staple adjustment was specified as imported rice and half was domestic rice, in line with consumption patterns reflected in the BLSS. Additional details on all parameters of the CotD models are available in the supplementary FNG technical annex.

Intervention modelling

The selection of potential interventions for modelling was informed by secondary data review and stakeholder consultations. At the stakeholder workshop held in June 2022, attendees participated in an exercise to identify and rank interventions to be modelled, which are shown in Figure 4.

Figure 4: Modelling of interventions prioritized from different sectors to improve access and affordability of nutritious diets



Considerations for interpretation and data gaps

The FNG estimates the cost and affordability of a diet that meets energy and nutrient needs across the lifecycle. These estimates are economic indicators, and they should not be interpreted as reflecting a recommended diet, nor do they reflect actual consumption patterns.

There are also limitations in the data that may influence the estimates. As described, the food price data is collected for monitoring of the CPI, and the food list doesn't include all foods available at local markets or consumed by households (e.g., wild and gathered foods are not included). Only one price point is collected per dzongkhag (district), therefore the food list may not reflect food availability in remote areas and results cannot be disaggregated by urban or rural context.

As the food list used for the CotD analysis is aggregated at the regional level, it does not reflect potential inter-district variations in availability and price.

Importantly, the household expenditure data used for the affordability estimates are from the 2017 BLSS, substantially older than the food price data. While best efforts were made to adjust the expenditure data to the current period and to conduct a sensitivity analysis, the expenditure data does not capture recent changes in spending patterns such as those arising from the impacts of the COVID-19 pandemic and the subsequent global food crisis.

Finally, while the models consider the market cost of a nutritious diet for households, the FNG does not calculate programme implementation costs or cost-benefit ratios.

Findings

1.
Poor dietary quality and overconsumption of staples are key drivers of malnutrition in Bhutan.

- Bhutan has made significant progress in reducing poverty and improving food security and nutritional outcomes.
- However, high rates of stunting and micronutrient deficiencies remain a major obstacle to human capital development, while overweight and obesity are emerging as a public health concern.

Although recent national nutrition data is not available, existing data indicates that Bhutan has made substantial progress in reducing poverty, with the number of households living below the poverty line declining from 23 percent in 2007 to 8 percent in 2017. (7) The proportion of stunted children under 5 decreased from 37 to 22 percent between 2008 and 2015. (8) The number of children experiencing acute malnutrition was very low at 4.3 percent, and iodine deficiency disorder has been virtually eliminated. (8)

Despite progress made, the stunting rate remains high. According to the latest data available, it affects one in five children. (8) Data is limited but evidence suggests that micronutrient deficiencies are widespread, with the prevalence of anaemia in children aged 6–23 months at 43.8 percent, and outbreaks of specific vitamin deficiencies observed in vulnerable groups in recent years. (8,9)

There are great disparities in malnutrition outcomes observed between regions, urban and rural locations, and wealth quintiles. (8) The prevalence of overweight and obesity is rapidly increasing alongside undernutrition and micronutrient deficiencies, putting additional strain on the health system. While the rate of overweight among children under 5 was relatively low in 2015 at 3.9 percent, that figure is above the regional average of 2.5 percent. (8,10) Among adults, 34 percent are overweight and 11 percent are obese, with a higher prevalence among women than men, in urban areas and in wealthier households. (12) Recent events, including the COVID-19 pandemic and global food crisis, risk reversing progress made in combatting malnutrition.

Low quality diets that are very high in starchy staples (and, increasingly, in processed foods) and low in diversity of nutrient-dense foods such as vegetables, fruit and animal-source foods, are a common determinant of malnutrition in Bhutan. For example, the Bhutanese diet is characterised by an over-consumption of rice. A recent study suggests that during the last 15 years, per capita annual consumption of rice averaged 147.7 kg, approximately 1478 kilocalories daily. (11)

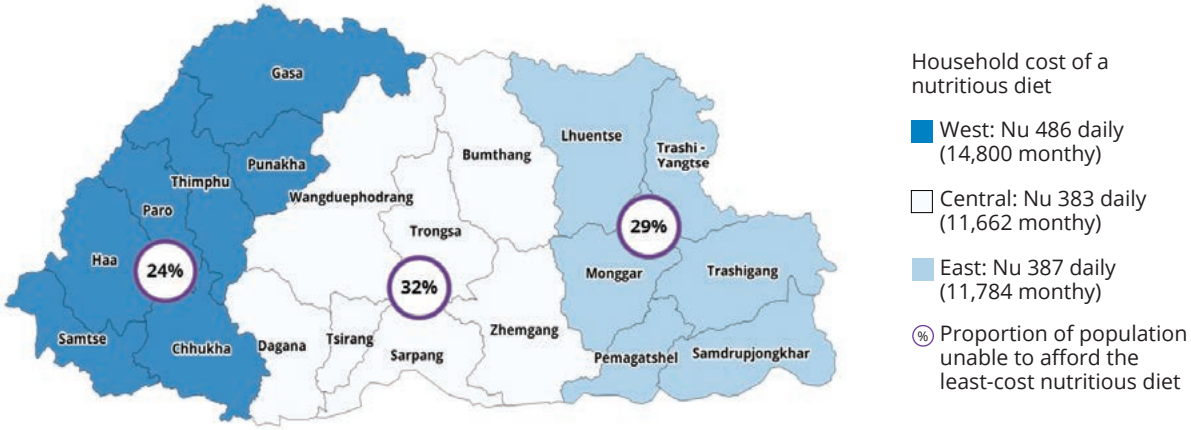
Recent data suggests that 86 percent of individuals are not consuming the recommended five servings of fruit and vegetables daily. (12) Data from the 2015 National Nutrition Survey indicate that among children under 2, only 17 percent consumed iron-rich foods and 15 percent received minimum dietary diversity (NNS 2015). (8,11)

2.
Meeting nutrient needs costs more than four times as much as meeting only energy needs. Nearly 3 in 10 households (27 percent) cannot afford to meet their nutrient needs.

- The FNG analysis found that, on average, a nutritious diet costs at least Ngultrum (Nu.) 436 per day for a five-person household (Nu. 13,285 monthly), which is 4.4 times more than a diet that meets only energy needs.
- FNG estimates suggest that nationally at least 27 percent of households cannot afford a diet that meets their nutrient needs.
- These findings indicate that while energy-dense staples such as rice are cheap and plentiful, nutritious foods such as vegetables, fruit and animal source foods are out of reach for many.

Using the list of local foods and their market prices, the FNG uses CotD software to calculate the lowest-cost diet that meets the energy and micronutrient requirements of the five-person model household. Based on September 2021 food prices, the analysis estimates that, on average, a nutritious diet costs at least Ngultrum (Nu.) 436 per day for a five-person household (Nu. 13,285 monthly), or a per-capita average of Nu. 87 daily (Nu. 2,657 monthly). The daily cost of a nutritious diet varied regionally: Nu. 486 in the West, Nu. 387 in the East, and Nu 383 in the Central region (Figure 5).

Figure 5: Cost and non-affordability of a nutritious diet in Bhutan



The cost of a nutritious diet was found to be 4.4 times more expensive than a diet that meets only energy needs (Nu. 99 per household per day). This higher cost of a nutritious diet indicates that while the Bhutanese food system is delivering to meet its population's caloric needs, it is not efficiently delivering nutrient-dense foods.

The FNG then compared the cost of a diet that meets nutrient need against the distribution of household food expenditure to estimate the minimum proportion of households that cannot afford the nutritious diet. As previously noted, household expenditure data was taken from the 2017 BLSS and adjusted to the same time period as the food price data (September 2021) using the food consumer price index (CPI) published by the National Statistics Bureau.

It is estimated that at least 27 percent of households nationally cannot afford a diet that provides the recommended nutrient intake across the lifecycle. Non-affordability varied across regions from 24 percent in the West to 29 percent in the East and 32 percent in the Central region (Figure 5).

When looking at the cost distribution within the household, it is most expensive to meet the nutrient needs of an adolescent girl and lactating adult woman, who together constitute about two-thirds of the household cost of the nutritious diet, indicating their higher nutritional vulnerability. The FNG also identified the limiting nutrients, which are those that are most expensive to meet in the local food environment per individual (Table 1).

Table 1: Liming nutrients per individual. (W = West; C = Central; E = East; A = All regions)

Child under 2 years	School age child (6-7 years)	Adolescent girl (14-15 years)	Lactating adult woman
Iron (A) Vitamin B_1 (A) Vitamin C (A) Folic Acid (A) Vitamin A (W) Zinc (W)	Vitamin A (A) Vitamin C (A) Calcium (A) Iron (W, E) Folic Acid (W, C) Vitamin B_1 (C)	Iron (A) Vitamin B_1 (A) Vitamin C (W) Folic acid (W)	Iron (A) Vitamin C (A) Folic acid (A) Pantothenic acid (A)

In contrast to a diet that only meets nutrient needs, the FNG defines a healthy diet as one that contains foods from diverse food groups in line with food-based dietary guidelines. A healthy diet promotes all dimensions of individual health and helps prevent malnutrition in all its forms and diet-related non-communicable diseases (NCDs).

Analysis found that the cost of a healthy diet was Nu. 399 daily (Nu. 12,155 monthly) and varied regionally from Nu. 358 in the Central region, Nu. 419 in the East, and Nu. 412 in the West. These estimates are comparable to the cost of a nutritious diet, but they were lower than the cost of a nutritious diet in the North and Central regions and higher in East.

It should be noted that the healthy diet conforms to dietary guidelines for the general population, but it may not meet all nutrient requirements for individuals with elevated nutrient needs. Post-hoc analysis reveals that the healthy diet basket falls short of recommended intake of iron, folic acid, calcium and vitamin A for all individuals. Of note, the healthy diet basket meets only half of folic acid and about one-third of iron requirements for an adolescent girl and lactating woman.

3.
Dietary patterns and suboptimal food choices make nutritious diets less affordable, particularly for individuals with elevated nutritional needs.

- Current dietary patterns, which include high consumption of starchy staples and processed foods high in sugar and sodium, push a nutritious diet even further out of reach and increase the risk of overweight.
- Animal source foods provide an essential source of nutrients such as iron, which is needed in increased amounts during certain stages of the life cycle, particularly for adolescent girls and during pregnancy and lactation.
- For individuals restricting animal-source foods or following vegetarian diets, it becomes more expensive or even impossible to meet nutrient needs.

Nutritious diets are unaffordable for a large portion of households in Bhutan. Current dietary practices – such as high consumption of staples, increasing consumption of high calorie, ultra-processed foods, and restricted intakes of certain animal source foods - increase the cost of meeting nutrient needs and thus the proportion of the population who cannot afford nutritious diets, while at the same time increasing the risk of overweight and obesity.

Diets in Bhutan are characterized by low dietary diversity, high intake of starchy staples, high levels of salt and fat, and an increasing trend to consume processed foods. While staple-heavy diets are common across all segments of society, dietary quality is also lower among households with a lower wealth status. For example, households in the lowest wealth quintile consumed vitamin C rich fruits, vegetables, and dark green leafy vegetables less frequently, and had lower average Food Consumption Scores (FCS) than households in the highest wealth quintiles. (8)

The FNG analysis examined the impact of the current very high levels of rice consumption (11) on the cost of a nutritious diet. The results showed that at the current estimated level of per capita rice consumption (scaled to energy needs of the individuals in the model household), it was impossible to meet nutrient needs without exceeding energy requirements for everyone in the household except the adult man. A sensitivity analysis was undertaken to determine the highest level of rice intake per individual at which it was still possible to meet nutrient needs (Table 2). At these very high levels, the cost of a household nutritious diet would be sixty percent higher than the minimum cost of a nutritious diet, with the greatest increase faced by the young child and the adolescent girl (Table 2).

Table 2: Individual rice consumption and impact on the cost of a nutritious diet

Individual	Estimated daily rice consumption (g)*	Maximum daily rice intake at which it is possible to meet remaining nutrient needs (g)	Increase in cost of the nutritious diet at the maximum rice level compared to FNG baseline
Child, 12-23 months	114g	113g	213%
Child, 6-7 years	306g	294g	45%
Adolescent girl	499g	399g	74%
Adult woman, lactating	562g	516g	28%
Adult man	560g	574g	43%

*Estimated individual rice consumption is calculated based on the per capita estimates from Tashi et al., 2022, for a five-person household, allocated between individuals by relative energy requirements.

Diets restricting animal source foods, such as vegetarian diets, are practiced for many reasons in Bhutan. In a recent survey, 14 percent of respondents self-reported as vegetarian, with the rate higher among women than men and among wealthier quintiles, and highest in the 15–24 age group. (12) However, all groups including those that did not self-identify as vegetarian, have low consumption of animal source foods. On average, households reported weekly consumption of flesh foods 1.5 times, fish 1.5 times, dairy 3.2 times and eggs 2.5 times. (12)

Animal source foods serve as a dense source of many essential nutrients, thus are often selected in the CotD optimization models. The FNG found that they were very expensive locally and, as a result, canned sardines were commonly selected by the software as cost-effective for their relative nutrient-density, despite the fact that they are not commonly consumed in practice. When the amount of sardines in the model is restricted, the cost of the diet increases greatly: the cost of meeting nutrient needs is up to 29 percent higher if sardines are restricted to one serving per day and 53 percent higher if restricted to one serving per week.

The FNG analysis further explored the impact of diets that progressively restrict animal-source foods: restricting flesh foods such as chicken and beef but allowing fish, then progressively also restricting fish. In all models, eggs and dairy were allowed, consistent with the information provided by stakeholders about dietary practices.

When meat was restricted but fish was allowed without limit, the cost of the diet increased an average of seven percent. When fish was restricted to once per day, the cost of the diet more than doubled, and when fish was restricted to just once weekly or excluded from diets, it was no longer possible to meet household nutrient needs using locally available foods. These findings underscore the importance of nutrient-dense, animal source foods if nutrient needs are to be met through the diet and reflects the fact that they are very expensive in Bhutan.

Intake of high energy, low nutrient ultra-processed foods is high and increasing, with 60 percent of households nationally reporting that they consume processed foods always, often or sometimes. (12) Replacing more nutritious foods with these types of ultra-processed foods is making it more expensive to meet nutrient needs or pushing nutritious diets out of reach.

The FNG examined the impact on diet cost of consuming high calorie, imported instant noodles. For the model, the least-expensive brand found in the food list was used. Results found that when the noodles were consumed three times weekly by all individuals, the household cost of a nutritious diet increased by 28 percent; if consumed daily, it was no longer possible to meet household nutrient needs. The greatest negative impact was on the child under 2 and the adolescent girl, whose cost of the diet increased 66 and 71 percent respectively when the noodles were consumed three times weekly.

4.
Shocks, such as disruptions in supply chains, threaten to increase the proportion of households that cannot afford a nutritious diet and to reverse progress that has been made in the fight against malnutrition.

- The food system in Bhutan is characterized by small landholdings, low productivity and market inefficiencies, and remains vulnerable to external shocks.
- Supply chain disruptions caused by the COVID-19 pandemic and the subsequent global food crisis have exposed the vulnerability of the food system and threaten to reverse the progress that has been made in improving nutrition outcomes.

The agricultural sector in Bhutan is characterized by low productivity, small landholdings, limited arable land, low levels of mechanization, rugged terrain and climate risks. (13) With 99 percent of farms cultivated by subsistence farmers, the average farm size is just 1.5 hectares. (13) Agriculture constitutes half of total employment and 64 percent of female employment yet contributes just 16 percent of Gross Domestic Product (GDP). (14) The country is also facing a trend of urban migration and international emigration, especially among the youth, who see limited non-farm rural livelihood opportunities.

Producers in the food system face barriers such as low access to credit and financial services, which further exacerbates market inefficiencies. The rural population on average lives very far from markets and there is limited road infrastructure and limited cold chain and post-harvest storage technologies, resulting in high post-harvest losses. In recent decades the area harvested for important crops such as rice and maize has declined, and the yield per hectare has increased only marginally or not at all. (15)

These structural factors undermine the resilience of the food system and increase Bhutan's reliance on imports, leaving it vulnerable to external shocks. The economic shocks resulting from the COVID-19 pandemic response and the recent global food crisis have highlighted these structural weaknesses in Bhutan's food system. Pandemic containment measures resulted in a loss of livelihoods in many sectors, increasing indebtedness and a decline in consumer purchasing power.

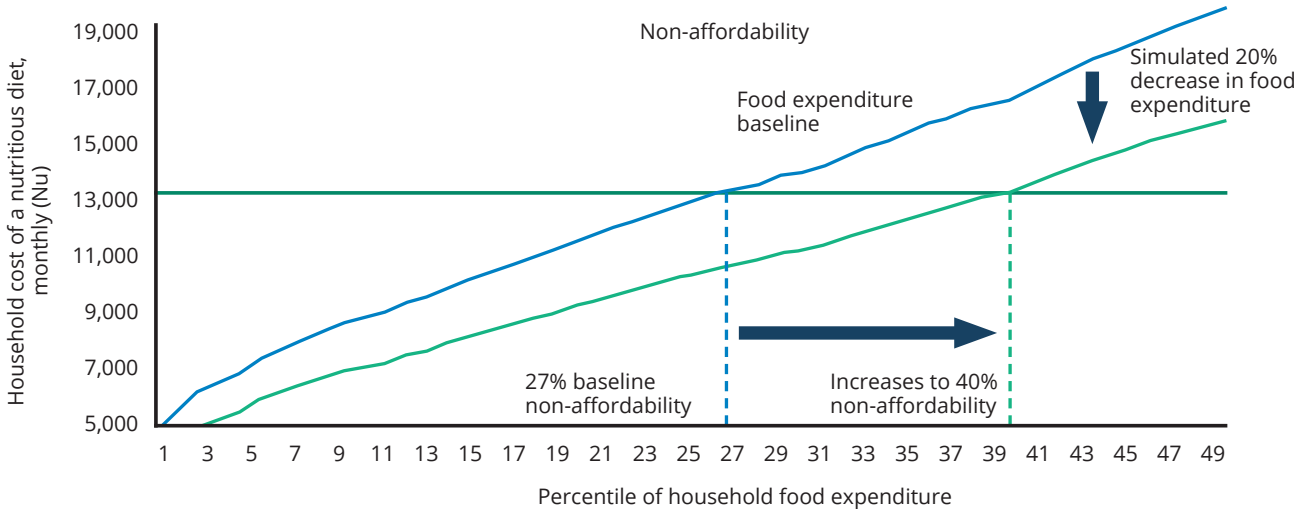
While GDP was positive at 4 percent in 2021, it declined 10 percent in 2020 after averaging more than 5 percent growth for the previous five years. (16) Pandemic restrictions in India affected the food supply to Bhutan, which saw a 20 percent increase in food CPI between early 2020 and mid-2022. (6)

FNG baseline estimates of the affordability of a nutritious diet are based on household food expenditure data from the 2017 BLSS, adjusted to the same period as the food price data (September 2021) using the food CPI, as previously described. This methodology assumes that household food expenditure has kept pace with the rate of inflation, which may not be the case if households face severe income shocks that erode purchasing power, likely during the recent pandemic period.

The FNG used a sensitivity analysis to explore the impact of varying degrees of loss of purchasing power on the non-affordability of a nutritious diet. Relative to the baseline food expenditure for September 2021 (which is calculated based on 2017 BLSS data), the FNG simulated a 5, 10 and 20 percent loss in household expenditure. In this model, food prices remain unchanged, but the expenditure curve shifts down as the estimates of household food expenditure are reduced (Figure 6).

Results indicate that a five percent decline in food expenditure would increase the portion of the population unable to afford a nutritious diet from 27 to 29 percent. A 10 percent loss would increase that portion to 33 percent, and a 20 percent loss in purchasing power would make 40 percent of the population unable to afford a nutritious diet. While the exact figures are not known, these results suggest that if food expenditure has declined due to recent shocks, fewer households are likely to have access to nutritious diets than estimated in the baseline.

Figure 6: A decrease in purchasing power makes a nutritious diet less affordable in Bhutan



5.
Suboptimal infant and young child feeding practices and unhealthy snacking increase the cost of meeting nutrient needs and the risk of malnutrition in children under 2 years of age.

- Suboptimal breastfeeding, low diversity of complementary foods, and consumption of unhealthy snacks increase the cost of the nutritious diet and the risk of malnutrition in children under 2 years of age.
- However, the FNG found that provision of multiple micronutrient powders and improved feeding practices with nutrient-dense foods can help to lower the risk of malnutrition.

No recent data on infant and young child feeding practices is available. However, existing data from 2015 suggest that infant and young child feeding practices are suboptimal, contributing to putting nutritious diets for children further out of reach. Although 99 percent of mothers report ever breastfeeding their children, only 51 percent of children under six months nationally were exclusively breastfed, with this figure ranging from 34 percent in the West to 78 percent in the East. (8)

For children aged 6–23 months, complementary feeding practices fall far short of the ideal: while 67 percent of children received a minimum meal frequency (MMF), a proxy for the caloric sufficiency of the diet, only 15 percent received minimum dietary diversity (MDD), a proxy for the micronutrient density of diets. (8) Only 17 percent of children were fed iron-rich foods, a figure that was as low as 14 percent in rural areas. (8) Across the three regions of Bhutan, the FNG estimate of non-affordability was strongly negatively correlated with the proportion of children receiving MDD (r= -0.86) and iron-rich foods (r= -0.92), suggesting a strong relationship between economic access to nutritious foods and the quality of diets of children under 2 years of age.

The FNG found that if a child aged 12–23 months receives half of the recommended feedings of breastmilk, the cost of the diet increases 11 percent on average. For a child receiving no breastmilk, all nutrient needs must be met through the local diet, increasing the cost of the diet by nearly 40 percent.

Consumption of sugary snacks and beverages is on the rise in young children, increasing the risk of micronutrient deficiencies and of overweight and obesity later in life. FNG results showed that daily consumption of one sugary cookie (30 g) or one half can of soft drink (165 ml), increased the cost of the diet for a child under 2 55 percent and 53 percent respectively. If the child consumes both items in the same day, it becomes impossible to meet nutrient needs without exceeding the daily kilocalorie target, increasing the risk of overweight.

Micronutrient powder delivers essential micronutrients such as iron, zinc, vitamin A and B vitamins, that complement breastmilk and reduce the nutrient gap to be met through complementary feeding. The FNG found that in an optimized diet, the addition of micronutrient powder reduces the cost of the diet by 34 to 44 percent across regions.

The analysis also examined the impact of adding micronutrient powder to existing, culturally appropriate complementary feeding recipes. Complementary feeding recipes were shared by the Nutrition Programme of the Department of Public Health, and included kabche thub (kabche flour, vegetables, egg and butter), rice flour porridge (with chicken), egg rice, and grain and meat porridge. (17) Details of the recipes modelled are available in the technical annex to the report. While these recipes all deliver some essential nutrients and are more likely to reflect the actual dietary habits in Bhutan, they are more expensive than the optimized diet. However, adding micronutrient powder to these recipes would be an effective way to increase the nutritional value, which would reduce the cost of meeting nutrient needs by 10 to 35 percent.

6.
Adolescent girls and pregnant and lactating women are especially vulnerable to malnutrition, but targeted interventions can make an essential contribution to closing the nutrient gap.

- Adolescent girls and pregnant and lactating women are especially vulnerable to malnutrition because they require high levels of nutrients such as iron, which come from foods that are expensive in Bhutan (e.g., animal source foods).
- Targeted interventions, including supplementation with iron and folic acid tablets, are essential and should be continued.
- The FNG also found that if taken daily, a multiple micronutrient supplement (MMS) can make an even greater contribution to closing the nutrient gap for these individuals.

Adolescent girls and pregnant and lactating women are particularly nutritionally vulnerable due to their elevated physiological requirements. Of all household members their nutrient needs are the most expensive. While the recommended energy intake for an adolescent girl is 11 percent lower than for an adult man, her recommended iron intake is 2.2 times higher. To meet these nutrient needs within her calorie limit, she must consume nutrient dense foods such as animal source foods, which are very expensive locally.

Although data on micronutrient status is scarce, the existing data have shown a persistent high prevalence of anaemia among women and girls and indicate that their diets are not meeting their nutrient needs. Nationally, in 2015, anaemia was found to affect 35 percent of all women of reproductive age and 31 percent of adolescent girls. (8) Rates of anaemia varied from 29 to 40 percent across regions, indicating a problem of moderate to severe public health significance across the country, per WHO thresholds of anaemia prevalence.

Supplementation with an iron-folic acid (IFA) or multiple micronutrient tablet is a recommended intervention to address anaemia and other micronutrient deficiencies among these vulnerable groups. To date, the scale-up of IFA for delivery through boarding schools and health clinics has been a success in Bhutan. However, challenges remain, especially with acceptance and adherence. IFA is poorly tolerated, especially among adolescent girls, who report experiencing side effects such as nausea, likely due to the high dose of iron in the supplement. The MMS has been identified by the Ministry of Health as an alternative solution and is currently planned for scale-up to pregnant and lactating women. MMS has been well received in other contexts because it does not typically cause the same side effects.

The FNG analysis found that for an adolescent girl, an IFA taken once per week can reduce the cost of the optimized diet by 27 percent, compared to 15 percent for an MMS. However, as the frequency of supplementation increases, MMS becomes more advantageous as it meets other nutrient needs in addition to iron and folic acid: if taken daily, MMS reduces the cost of the diet by 56 percent compared to 48 percent for the IFA (Figure 7). The MMS could therefore be a viable alternative to the IFA, especially at increased frequency.

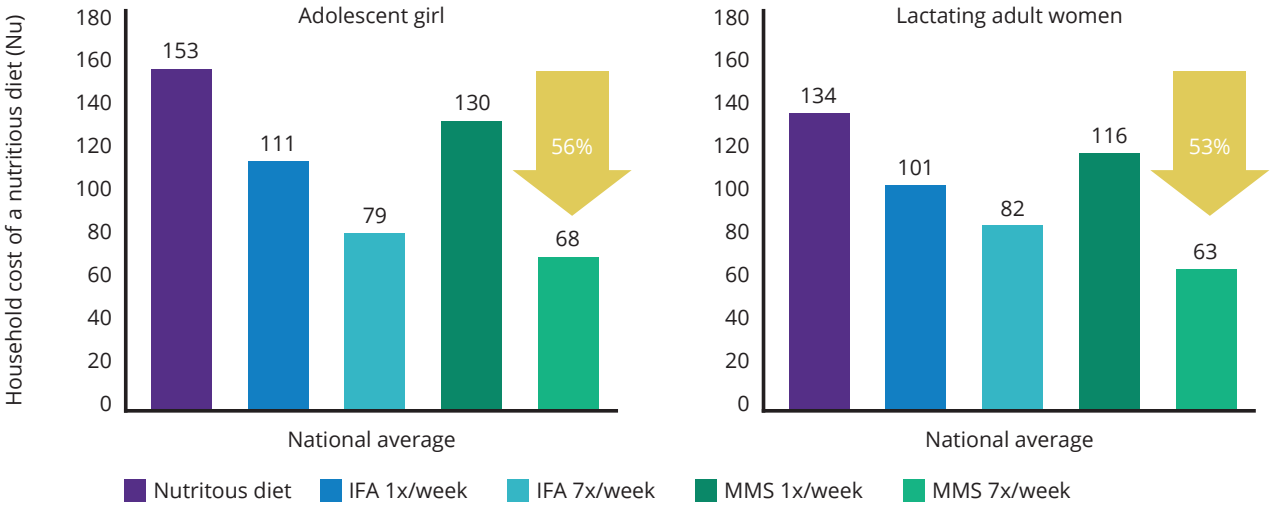
Supplementation is effective for all adolescent girls but becomes even more important for girls following a vegetarian diet or one that is low in animal source foods.

Vegetarian here refers to a diet that excludes fish and meat but allows eggs and dairy products. The FNG found that without a supplement, it was not possible to meet the nutrient needs of an adolescent girl following a vegetarian diet using locally available foods. If an IFA is introduced once per week, it becomes possible to meet nutrient needs but is still nearly four times more expensive than the optimized nutritious diet in which meat and fish are included. Compared to an unrestricted diet that includes meat and fish, if the supplements are taken daily, the cost of the nutritious diet can be reduced by 48 percent for an IFA and 31 percent for an MMS. Given the low acceptance of IFA, daily administration may not be a viable option, thus, MMS taken at higher frequency may represent a more feasible intervention for this group.

The pattern is similar for a lactating adult woman. When taken once per week, an IFA can reduce the cost of a nutritious diet by 25 percent, compared to 13 percent for an MMS. However, as the frequency increases, the MMS becomes more advantageous: taken daily, the MMS reduces the cost of a nutritious diet by 53 percent, while the daily IFA reduces the cost by 39 percent (Figure 7).

Supplementation makes an important contribution to addressing iron deficiency anaemia and is an essential strategy for bringing nutritious diets within reach for adolescent girls and pregnant and lactating women, especially those with low iron intakes from diets with limited animal source foods. While scale-up and distribution of IFA has been a success in Bhutan, it has also faced challenges from low acceptance and tolerance. MMS, which delivers less iron alongside other micronutrients, represents a viable opportunity to meet nutrient needs while avoiding unpleasant side effects. FNG analysis finds that MMS can substantially reduce the cost of the diet and may even make a greater contribution than IFA when taken with increased frequency.

Figure 7: Impact of nutritional supplementation on the cost of a nutritious diet for an adolescent girl and a lactating adult woman (unrestricted, non-vegetarian diet)



7.
Schools play an essential role in ensuring access to good nutrition through provision of diverse and fortified meals and targeted supplementation.

- The National School Feeding and Nutrition Programme continues to provide an excellent channel to deliver nutritious meals to young people in Bhutan.
- Fortified rice makes an excellent base for school meals and should be continued. However, it needs to be complemented by nutritious local foods which are often expensive.
- Micronutrient supplementation in schools can further bring down the cost of meeting the nutrient needs of children and adolescents.

The FNG models school meals for students in three age groups: 6–7 years, 10–11 years, and adolescent girls of 14–15 years. For each age group, the analysis examines the nutritional contribution of a centrally procured non-perishable ration, improved menus using diverse locally procured fresh foods, and nutritional supplements. The results for boarding students, who are modelled to receive three meals daily, are presented here.

Currently, a non-perishable ration is centrally procured and distributed to schools across the country. Per Ministry of Education guidelines, this ration consists of the following quantities per student per day: 400g fortified rice, 60g dal (lentils), 45g oil, 1g tea, 5g milk powder (as tea lightener), 5g sugar (for tea), 5g iodized salt, 39g/week chickpea and 6g/week of processed cheese. (18) Rice is fortified as per national standards. (19) In addition to the non-perishable ration, a cash stipend is provided to schools for local procurement of fresh foods.

The inclusion of 400g rice daily provides an excess of kilocalories for a school age child. If consumed in its entirety, this portion provides 60–97 percent of the daily calorie target for the age groups examined. Although the rice is fortified, other nutrient needs remain, in particular vitamin C, vitamin B_2 (riboflavin), calcium, magnesium and iron. These needs must be met using other foods. If all 400g of rice is consumed, it becomes expensive or impossible to meet these nutrient requirements without exceeding the child's kilocalorie budget. Furthermore, if the entire non-perishable ration is consumed, the recommended energy intake will be exceeded yet some nutrient needs will remain unmet.

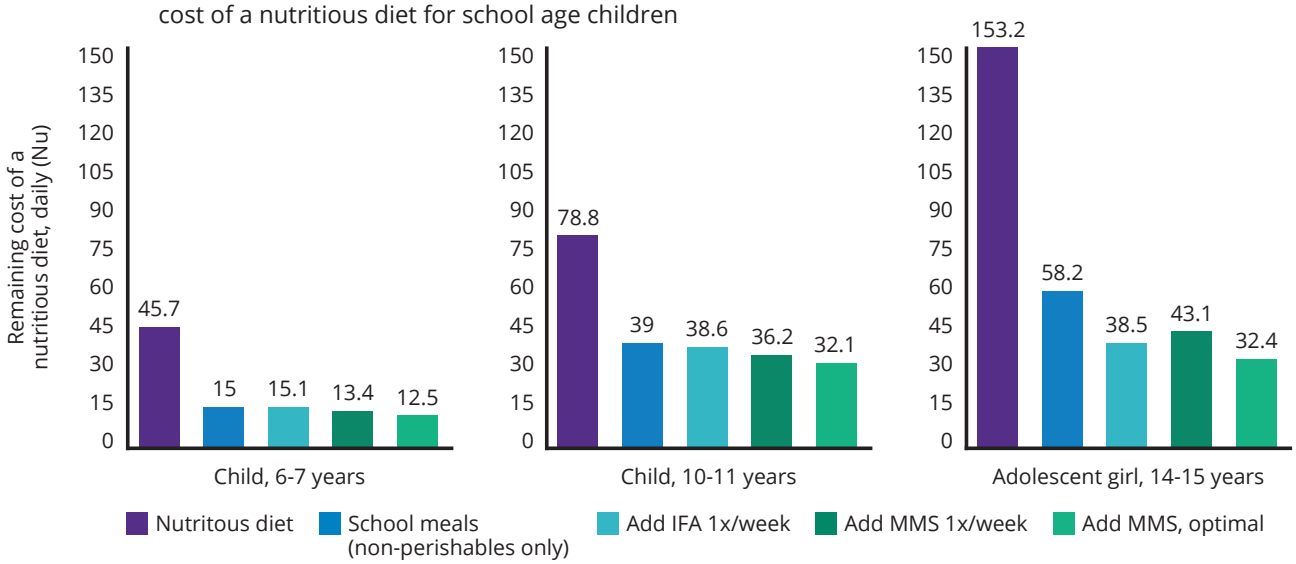
For the FNG models, a moderated portion of rice is therefore used, with the minimum portion equivalent to approximately 55 percent of the daily kilocalorie requirement, consistent with the baseline diet staple adjustment. The other foods in the non-perishable ration are then made available for free but no minimum is specified, while all other local foods are made available at market price. The CotD software selects the allocation of free and market foods that meets nutrient needs at the lowest total cost without exceeding the kilocalorie target.

Fortified rice has been a successful intervention for students in boarding schools. The FNG comparison of school meals with fortified rice and unfortified rice shows that for an adolescent girl, the cost of meeting nutrient needs is 159 percent higher if she is consuming unfortified rice, rather than the fortified rice currently provided (excluding any nutritional supplements).

Figure 8 shows the remaining cost of meeting nutrient needs after provision of the non-perishable ration for each of the three age groups. The resulting cost can be interpreted as the minimum amount necessary to spend on local foods, on top of the non-perishable ration, to meet recommended nutrient intakes for each age group. It would cost an average minimum of: Nu. 105 weekly (457 monthly) for the child aged 6–7 years, Nu. 273 weekly (1188 monthly) for the child aged 10–11 years, and Nu. 407 weekly (1772 monthly) for the adolescent girl. This meets remaining nutrients needs using local foods after the provision of the non-perishable ration (without micronutrient supplementation).

The main nutrient gaps in the non-perishable ration were noted above; the optimal foods selected by the software to meet these nutrient needs (and thus accounting for the cost of the calculated diet) include small fish (canned or dried), beef, fresh milk, guava (whole or juice), spinach, and green chili (foods selected vary by student age and region).

Figure 8: Contribution of the non-perishable ration (including fortified rice) and nutritional supplements to the cost of a nutritious diet for school age children



In addition to the non-perishable ration, the provision of an IFA and MMS were modelled at various frequencies. For the two youngest age groups, weekly MMS results in a greater reduction to the cost of the nutritious diet than weekly IFA. Increasing the frequency of IFA has no additional benefit for these groups (results not shown), while the MMS, if provided more frequently, can reduce the cost of the diet up to 73 and 59 percent for the children aged 6–7 years and 10–11 years respectively if consumed 3–4 times per week. However, if standard MMS is consumed too frequently, upper limits for some nutrients may be approached for young children if supplements are not tailored for this age group.

For the adolescent girl, the IFA, if provided once weekly, has a greater impact than the MMS because of her relatively high iron needs. However, as the frequency of supplementation is increased, the benefit of the MMS becomes greater than the IFA as it meets iron needs and provides other nutrients.

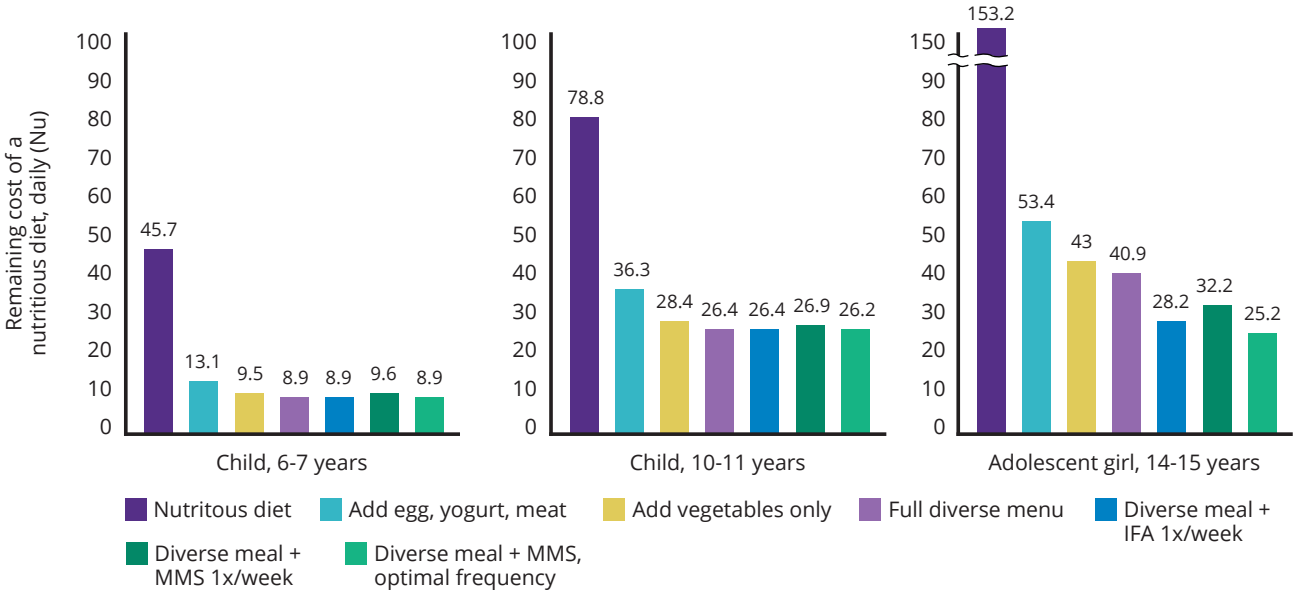
Next, the FNG compares the impact of the cost of the diet of various school meals that contain diverse nutritious foods (Table 3). In addition to the baseline non-perishable foods, this includes a diet with animal source foods (eggs, yogurt and chicken), a diet with vegetables (spinach and carrots), and a diverse menu combining both food groups.

Portion sizes and frequencies used for modelling are drawn from Ministry of Education school feeding guidelines. (18) The results of these menus are shown in Figure 9 with the additional benefit of supplementation with IFA and MMS at various frequencies.

Table 3: Menu scenarios used for modelling school meals in the FNG

	Menu used for modelling	Quantities modelled (per guidelines)
1	Non-perishables only (baseline)	Daily: 400g fortified rice, 60g lentils, 45g oil, 5g milk powder, 5g sugar; Weekly: 39g chickpea, 6g processed cheese
2	Non-perishables plus eggs, yogurt, and meat (chicken)	100g yogurt 1x/week One egg 3x/week 60g meat 2x/week
3	Non-perishables plus vegetables only (spinach and carrots)	300g total vegetables/day
4	Full diverse menu: non-perishables plus eggs, yogurt, meat and vegetables	All of the above

Figure 9: Comparison of improved school meals for school age children
(Note: all school meal scenarios include the non-perishable ration with fortified rice)



The results indicate that a diverse nutritious meal including both vegetables and animal source foods can cover 66–80 percent of the cost of a nutritious diet for the schoolchildren of different ages. Supplementation is an important intervention for bringing nutritious diets within reach. While IFA is an effective supplement for some target groups, acceptance is low as it is poorly tolerated. The high dosage of iron is important for an adolescent girl, but IFA is lacking other essential micronutrients also needed by younger children.

The FNG finds that for younger children (ages 6–7 and 10–11 years), the MMS is more effective than IFA in meeting nutrient needs and reducing the cost of the diet, especially for children not receiving diverse meals. For younger children, MMS should be limited to one to four times per week if supplements are not specifically tailored to the age group, to avoid reaching nutrient upper limits. For an adolescent girl receiving a diverse diet with fortified rice, the IFA is more effective than MMS if taken only once per week; however, if taken daily they are comparable. Due to low acceptance of IFA, MMS can also be explored as an alternative to IFA for adolescent girls in schools. For all student, supplements should be considered as an addition to, not a replacement for, diverse nutritious meals that include fortified rice.

8.
Strengthening food systems can improve food producer and processer incomes while increasing availability of, and access to, nutritious foods for consumers.

- Strengthening the food system by promoting nutrition-sensitive agriculture and diversifying production beyond staples to include more vegetables, fruit and animal source foods, can improve producer incomes while increasing the availability of nutritious foods at the markets.
- Commercial rice fortification should be scaled up; even at a slight price premium it can be a cost-effective way for households to access nutritious diets.

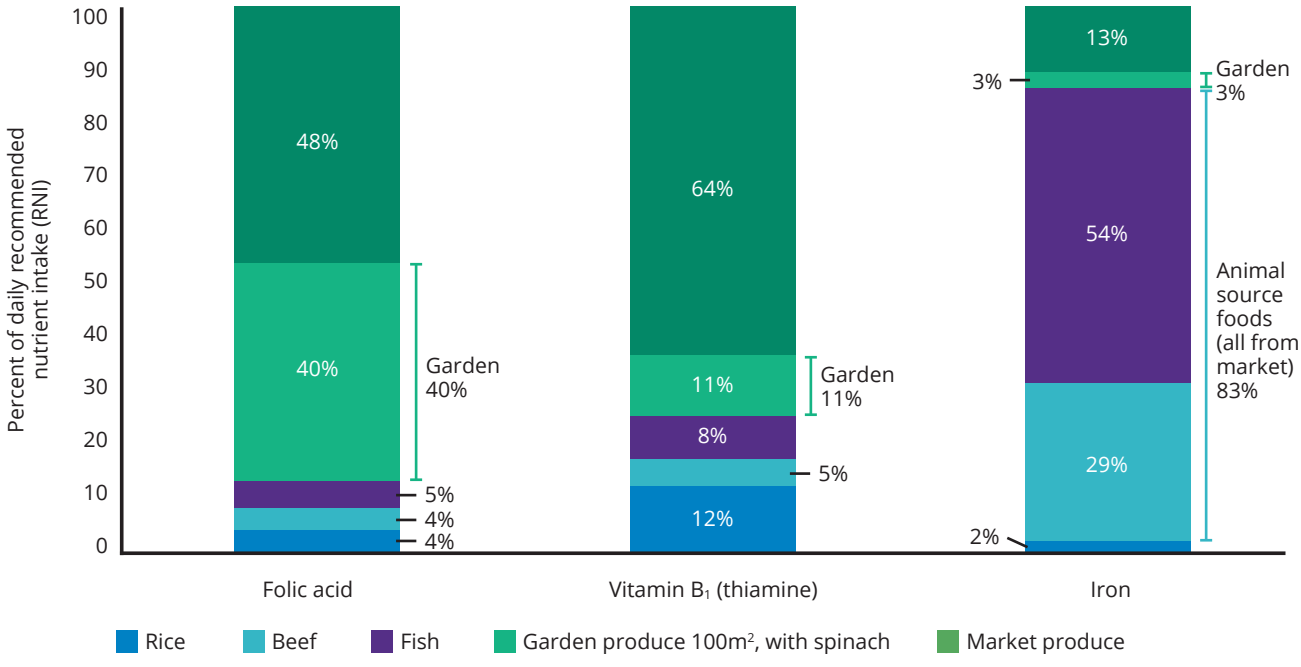
As previously reviewed, agriculture in Bhutan is characterized by low productivity and high inefficiencies, which drive down the availability and drive up the cost of nutritious foods. The FNG identifies and examines potential entry points through which nutrition-sensitive agriculture can contribute to bringing nutritious diets within reach of the most vulnerable.

The agriculture modelling in the FNG simulates small farms of two different sizes: a kitchen garden of 100m^2 oriented toward home production, and a market-oriented smallholder farm of 1.5 hectares (the national average). For each the FNG compares staple-based production (including potato, rice, maize, wheat and lentils) with diverse nutritious production (including rice, lentils, cauliflower and broccoli, plus spinach and chicken eggs). The crops selected are from a longer Ministry of Agriculture and Livestock list called Priority Crops for Food and Nutrition Security (plus the addition of spinach and chicken eggs), with yield figures and post-harvest loss estimates from the ministry and FAO. (15,20) The models are also aligned to support the goals of the Building Resilient Commercial Smallholder Agriculture (BRECSA) project. (21)

The results indicate that while a 100m2 kitchen garden contributes essential nutrients to the household, the overall impact on reducing the cost of the diet is small. A staple-based garden reduces the cost of the household nutritious diet by one percent, while a diverse nutritious garden without chicken eggs reduces it by nearly two percent on average. However, when the production of chicken eggs is added to the diverse nutritious garden, the cost of the diet is reduced by over nine percent on average, underscoring the importance of animal source foods.

One of the reasons for the limited impact of the kitchen garden is that it only makes a small contribution to the limiting nutrients of the adolescent girl. For example, while the kitchen garden (without eggs) contributes 40 percent of the folic acid to the adolescent girl's optimized diet, it contributes only 11 percent of vitamin B_1 (thiamine) and just three percent of the iron she requires. The rest must be obtained locally, with 83 percent of the iron requirements coming from animal source foods from local markets (Figure 10). Supplementation with an IFA can also make an important contribution in this context.

Figure 10: The kitchen garden contributes nutrients for the adolescent girl but the impact is limited due to her high iron needs



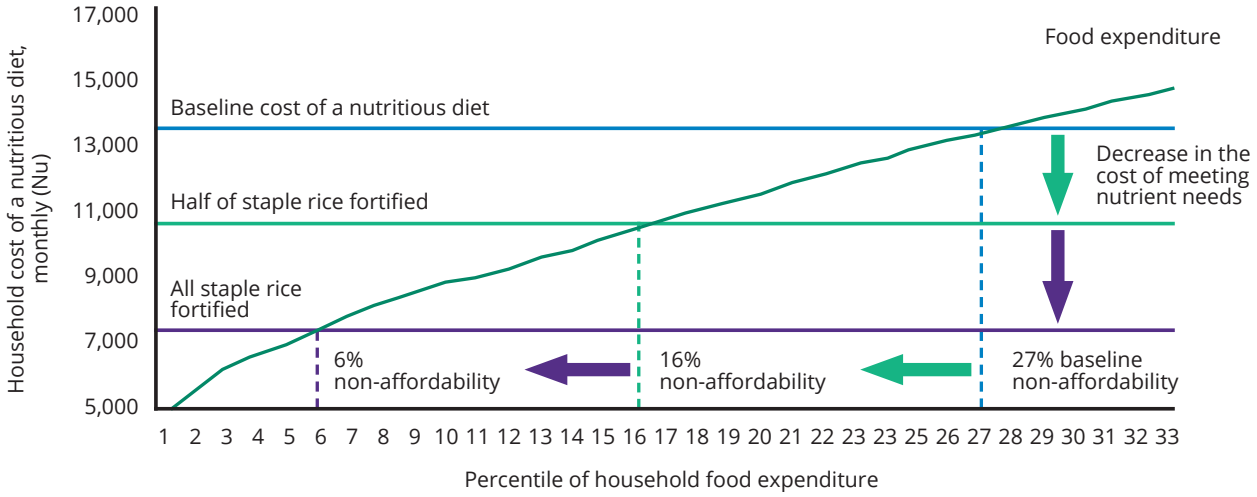
A larger market-oriented smallholder farm of 1.5 hectares can contribute to improved nutrition through two pathways: nutritious production can be consumed by the household and excess production can be sold, with the proceeds spent on nutritious food. As with the smaller kitchen garden, the FNG compared a staple-based farm with one including diverse nutritious crops and production of chicken eggs.

The FNG found that while the staple-based smallholder farm reduced the cost of the diet by 30 percent on average, a diverse nutritious farm including egg production could reduce the household cost of the diet by 78 percent if local production were consumed optimally within the household. Sale of the excess product not consumed could provide enough income to meet remaining nutrient needs, assuming that the cash would be spent optimally. These results underscore that even at a small scale, agriculture can make an important contribution to nutrition if nutritious foods are substituted for staple production and consumed by individuals that need them the most.

The food system can also make an essential contribution to nutrition through scaling up fortified rice nationally. While inclusion of fortified rice in school meals at boarding schools has been a national success, there remains an opportunity to make fortified rice available to all households through commercial markets. Using nutrient specifications from national fortified rice standards, (19) the FNG simulates the potential benefits of replacing unfortified rice with fortified rice in household consumption, at a 10 percent markup to account for costs. Results indicate fortified rice can reduce the cost of the household diet by 20 percent even at the price markup if it replaces just half of household consumption of unfortified rice because of the additional nutrients it provides. If the household consumed only fortified rice, the benefit would be even greater, reducing the cost of a nutritious diet by an average of 46 percent across the three regions of Bhutan.

Even if households did not change their food expenditure patterns, at this lower price nutritious diets would become affordable for many more households. The FNG analysis finds that non-affordability would drop from 27 percent of households to 16 percent if half of household rice consumption were fortified, and to just 6 percent if all of household rice consumption were fortified (Figure 11). Although 100 percent coverage of fortified rice is not a likely scenario in the near future, this analysis demonstrates the great potential of large-scale food fortification to bring nutritious diets within reach in Bhutan.

Figure 11: Commercial scale-up of fortified rice can greatly reduce the cost of meeting nutrient needs and make nutritious diets more affordable for the population



9.

Actions across multiple sectors will be essential to bring healthy, nutritious diets within reach of the most vulnerable.

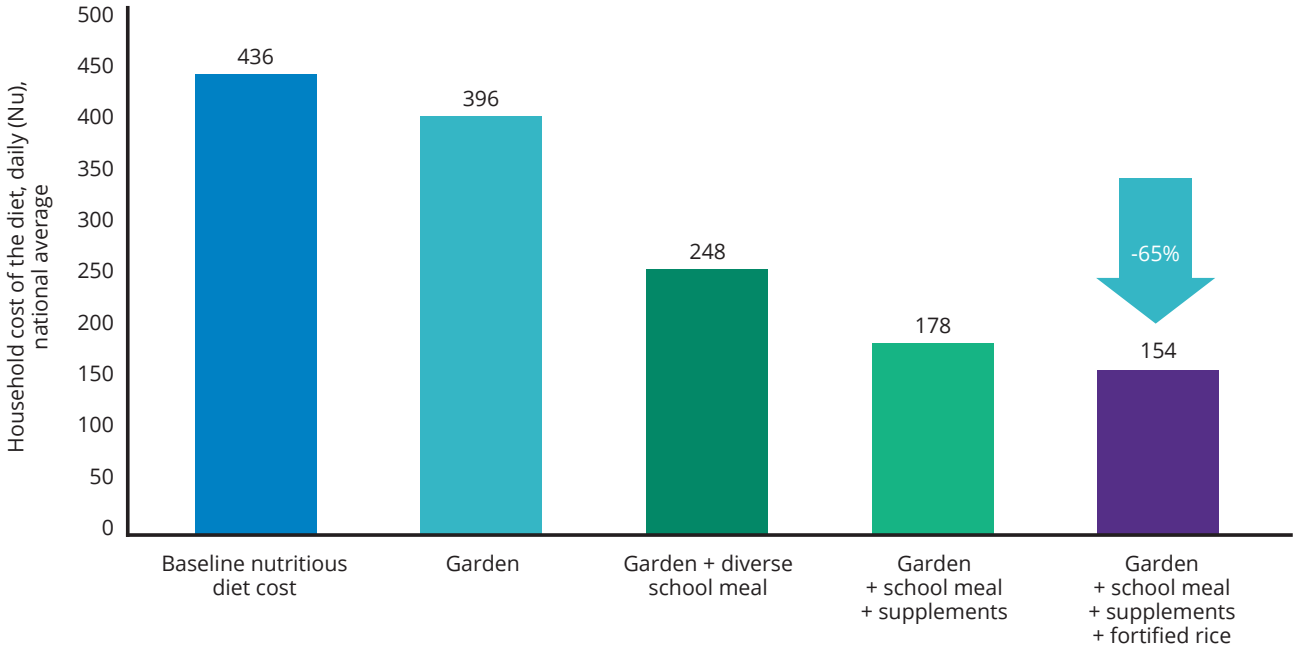
- A combination of nutrition actions across multiple sectors is essential to bring healthy, nutritious diets within reach of the most vulnerable.
- Diversifying the food system, fortification of rice and other staples, targeted supplementation, promotion of optimal infant and young child feeding practices, and healthy school meals should all form part of a package of actions for nutrition.

Good nutrition is everyone's business, and the Fill the Nutrient Gap analysis has shown that actions across food, health and education systems all have a role to play to reduce the cost and bring nutritious diets within reach for the most vulnerable. Thus far, the analysis has primarily shown the impact of individual interventions from specific sectors. However, a package of coordinated

actions across sectors, targeting both the household level and vulnerable individuals, can have a much greater impact than any individual sectoral intervention.

The FNG examines progressively layering the following interventions: optimal consumption that avoids sugary snacks, a nutrition-sensitive kitchen garden, a diverse school meal, micronutrient supplementation to vulnerable groups, and commercial scale-up of fortified rice. Results indicate that a combined package of these interventions can reduce the cost of a nutritious diet by up to 65 percent on average across Bhutan. At this lower cost of the diet, non-affordability would decline from 27 percent at baseline to just one percent of households, indicating the great potential of these multisectoral actions for nutrition.

Figure 12: Combining multiple actions into a package of interventions across sectors can make nutritious diets affordable for nearly everyone



It is important to note that the FNG optimized diet provides an economic indicator, not a realistic diet that is consumed in practice or recommended. This approach allows a level playing field for the comparison of nutrition-specific and nutrition-sensitive interventions across sectors. The optimized diet is not attainable in the real world where many factors –including the food environment, cultural norms, personal preferences, convenience, nutrition knowledge and many more – influence food choices and behaviours.

Social and behaviour change (SBC) is therefore essential to provide people with the knowledge, capacity, opportunity and motivation to select nutrient dense foods and reduce unhealthy foods, thereby optimizing their own diets. SBC should also target actions across the food system: agriculture should be nutrition-sensitive to increase the availability of healthy foods; consumers, including adolescents, must demand and purchase healthy foods while limiting the intake of ultra-processed and sugary snacks; nutritious foods must be distributed to, and consumed by, household members who need them the most; and caregivers must be empowered for optimal maternal, infant and young child nutrition practices.

10.
Timely monitoring of cost and affordability of nutritious diets, coupled with a robust nutrition information system, is essential to support coordinated actions to eliminate malnutrition in Bhutan.

- The ongoing impacts of COVID-19, the global food crisis, and climatic and other shocks, continue to affect the kingdom's food system and national and household economies.
- Timely monitoring of the cost and affordability of nutritious diets and a robust nutrition information system are essential to support coordinated actions to mitigate the impact of shocks and eliminate malnutrition in Bhutan.

While behaviour is an important driver of food choice and consumption, in order to meet nutrient needs households and individuals must have the economic means to purchase healthy foods in the first place. This analysis has estimated the cost of a nutritious diet and has estimated the proportion of the population that can afford it.

Non-affordability of nutritious diets has been recognized as an important indicator for understanding the nutrition situation and is strongly associated with dietary quality, food security and nutrition indicators in Bhutan and elsewhere. (22,23)

Ongoing monitoring of the cost and affordability of nutritious diets is essential for tracking how economic access changes over time, and for understanding how the food system is delivering for nutrition. It is essential for tracking barriers faced by the most vulnerable and for mitigating their nutritional vulnerability to external shocks, such as those seen during the COVID pandemic and the ongoing global food crisis. As this analysis has shown, ongoing monitoring is also invaluable for designing and evaluating the potential of interventions across sectors.

Current information on food price and affordability is essential, especially in the context of today's rapidly changing global food system. While the current FNG analysis estimates the cost of a nutritious diet in September 2021, more recent changes are unknown, but CPI data indicates that overall prices have continued to increase through 2022. (6) An even greater limitation lies in the calculation of the affordability of a nutritious diet. As described, this analysis uses household expenditure data from 2017, and while best efforts are made to adjust the data for inflation, it cannot fully and accurately capture changes to household purchasing power suffered as a result of the pandemic and global food crisis. An update to the estimates using the forthcoming results of the 2022 BLSS, (24) which was unavailable at the time of this analysis, represents an opportunity to improve understanding of Bhutan's nutrition situation.

Indicators of the cost and affordability of nutritious diets as part of a robust nutrition information system, including current data on nutrition outcomes, are essential to support food systems transformation and long-term human capital development in Bhutan.

Stakeholder recommendations

Health System

- Introduce multiple micronutrient supplements for nutritionally vulnerable groups including adolescent girls, nuns and pregnant and lactating women.
- Strengthen infant and young child feeding practices, including promotion of exclusive breastfeeding for children under 6 months and complementary feeding for children 6–23 months using diverse nutritious foods and micronutrient powder to improve dietary quality.
- Identify targeted interventions using alternative modalities to meet remaining nutrient needs for vulnerable women and children during the first 1,000 days of life.
- Enhance social behaviour change (SBC) strategies, including SBC communication and legislative regulations, to 1) improve dietary quality through adequate consumption of nutrient dense foods and reduced intake of ultra-processed foods high in sugar and sodium, particularly among adolescents and young children; and 2) generate awareness of the risk of nutritional deficiencies from practices limiting consumption of animal source foods, especially among adolescent girls.
- Develop national food-based dietary guidelines that address nutritional needs across the life cycle, including for vulnerable individuals.
- Strengthen nutritional surveillance and monitoring systems and technical capacity, including routine monitoring of consumption indicators, anthropometry and biochemical markers among nutritionally vulnerable groups. Update indicators for the cost and affordability of nutritious diets using timely food prices and recent expenditure data to support the National Nutrition Strategy and Action Plan and the 13th Five Year Plan.

Education System

- Utilize schools to establish healthy habits early in life through nutrition education and provision of diverse and healthy school meals.
- Leverage schools as a platform to reduce the consumption of sweetened snacks and beverages and salt through restrictions on the use of sugary and ultra-processed foods within schools and through SBC to discourage their consumption outside of schools.
- Invest in rice fortification infrastructure and capacity to supply all schools with fortified rice, including private schools, day schools currently without meal programmes, and monasteries and nunneries.
- Review adequacy of the stipend provided to schools for local food procurement and revise the basket of centrally procured non-perishable commodities to improve the nutritional quality of school meals. Reallocate resources toward procuring nutritious local foods by reducing the excess portion of staples, tea and sugar in the non-perishable basket.
- Improve local school infrastructure, such as storage and kitchen facilities to ensure food safety of fresh perishable foods.
- Strengthen the Farm to School programme through improved farmer-school linkages and expanding the use of the SMP Plus tool to design local menus linked to local production, and utilize the School Agriculture Programme as a vehicle for hands-on nutrition education.
- Review the efficacy of iron-folic acid supplementation in schools and explore the use of multiple micronutrient supplements to improve impact and compliance.
- Strengthen systematic monitoring of nutrition outcomes in the Education Management Information System to assess school and nutrition programme performance.

Food System

- Leverage the success of the rice fortification programme by 1) reviewing rice fortification standards to maximize the impact of fortification together with complementary targeted interventions; and 2) strengthening the capacity of blending facilities to scale up fortified rice to unreached schools and commercial markets for the general population.
- Promote diversification of agriculture in home gardens and commercial farms to enhance availability of, and access to, locally produced nutrient dense foods, including more nutritious staples, nutrient dense fruit and vegetables and reintroduction of nutrient dense traditional crops.
- Develop value chains, improve infrastructure, and enhance market linkages for nutritious crops to increase farmer and producer incomes while also improving market availability.
- Promote the market-led production of nutritious crops and livestock to improve dietary diversity.
- Strengthen the Agriculture Information Management System to monitor price and availability of nutritious foods weekly, including in rural and urban markets.

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Acronyms

BLSS	Bhutan Living Standard Survey
BRECSA	Building Resilient Commercial Smallholder Agriculture project
CPI	Consumer Price Index
CotD	Cost of the Diet
FCS	Food consumption scores
FNG	Fill the Nutrient Gap
IFA	Iron-folic acid supplement
MDD	Minimum dietary diversity
MMF	Minimum meal frequency
MMS	Multiple micronutrient supplement
NKRA	National Key Result Area
NNSAP	National Nutrition Strategy and Action Plan (2021-2025)
Nu.	Bhutanese ngultrum
SBC	Social and behaviour change
WFP	World Food Programme
WHO	World Health Organization

Contributors

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