More than a meal

How school meals can drive improved nutrition and sustainable food systems

Findings from Fill the Nutrient Gap analysis in Guatemala and Peru

WFP World Food Programme

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Foreword

Every day, millions of children across Latin America and the Caribbean walk into school hungry. For these children school may be the only place where they receive a nutritious meal. For many families, particularly in vulnerable communities, school feeding programs are not only a vital safety net but also a lifeline that protects their children's health, supports their learning, and strengthens social protection systems.

School feeding is much more than a meal. It is one of the most effective interventions to combat hunger and malnutrition, reduce school dropout, and build stronger, more resilient communities. Recent progress in food security and nutrition has only restored levels to those seen before the pandemic. Food insecurity remains high, with 187.6 million people in the region (28.2 percent of the population) experiencing moderate or severe food insecurity, and 58.1 million (8.7 percent) facing severe food insecurity. Simultaneously, the prevalence of overweight and obesity continues to rise across the region. In the region, 8.6 percent of children under the age of five are overweight—the increase outpaces the global rate, especially in South America. These levels increase even further to 30.6 per cent (49 million) for the case of school age children and adolescents (5-19 years), a level that remains high when these populations reach adulthood, nearly doubling the global average. Micronutrient deficiencies, particularly of iron, zinc, and vitamin A, are widespread and largely unresolved, affecting more than half of school-aged children.

These challenges are compounded by the increasing frequency of natural disasters and extreme weather events—floods, droughts, hurricanes—that disrupt local food systems, displace families, and compromise livelihoods. In such contexts, school meals can help ensure continuity, stability, and recovery. When linked to local agriculture and smallholder farmers, school meals programs can also generate local economic

opportunities, strengthen food supply chains, and promote resilience in the face of shocks.

This report, the first of its kind, explores the transformative potential of school feeding through cross-country analyses in Guatemala and Peru. It highlights how well-designed school meal programs can simultaneously address the pressing challenges of affordability, nutrition, and sustainability—especially when rooted in strong institutional frameworks and community engagement.

At a time when countries across the region are navigating economic pressures, food insecurity, and the growing impact of natural disasters, school meals stand out as a powerful and practical solution. They offer a unique opportunity to invest in the well-being of children while strengthening local food systems and community resilience. The World Food Programme and the Inter-American Development Bank are proud to support this important agenda.

We hope this work will inspire policymakers, practitioners, and partners across sectors to act with urgency and ambition. Let us seize this moment to scale up what works and ensure that every child has the nutrition they need to learn, grow, and thrive.

Lola Castro
Regional Director for Latin America
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World Food Programme

Mercedes Mateo-Berganza
Division Chief of Education
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Executive Summary

This report presents the findings from cross-country analyses conducted in **Guatemala** and **Peru** between 2024 and 2025. The primary objective of the exercise is to enhance the current understanding of how school meals can address intersecting challenges of affordability of diets, nutrition, and sustainability. Drawing from data collected utilizing the Fill the Nutrient Gap (FNG) framework, this report examines the potential of school meals to serve as high-impact, cost-effective interventions that meet the immediate nutritional needs of children while promoting resilient and climate-forward food systems.

The FNG is an analytical methodology that integrates a comprehensive secondary literature review together with a with a linear optimization model, employing the WFP *Enhance* software, to model interventions and combination(s) to make health and nutrition available and accessible to the most vulnerable populations.

Five overarching objectives are pursued:

1. To characterize nutritional gaps in population groups of interest.
2. To identify limiting factors for adequate nutrient intake.
3. To understand barriers to nutrient adequate diets for specific groups and areas of interest.
4. To evaluate the impact of diets on the environment.
5. To determine environmental impact mitigation strategies with a food systems approach.

While the FNG analysis provides insights into nutrient gaps and barriers to adequate nutrient intake for different target groups across the life cycle, the focus of this report is solely on the findings and implications of the analysis for school children and adolescents who benefit from school meals programs.

Six key findings are derived from the analysis:

1. **School meals reduce the cost of nutrient adequate diets for households.**

   In Guatemala, diverse meals served in schools can reduce the cost of the diet of a primary school aged child by 62 percent and for a female secondary school student by 55 percent, highlighting the considerable contribution towards meeting children's nutrient needs. In turn, this can reduce the household's burden of meeting costly micronutrient needs.

   In Peru, diverse school meals cover up to 35 percent of the cost of a child's nutrient-adequate diet. Adding fresh produce to meals can reduce household food costs for the child by up to 54 percent.

2. **Meals served at school are more nutritionally impactful than take-home rations.**

   Served meals offer more dietary diversity, include animal source foods, and are tied to clear nutritional targets (e.g., folate, iron, zinc).

   Take-home rations are more limited in diversity, risk being diluted across household members, and lack specific nutritional targets for the intended recipients.

3. **Ultra processed foods account for a significant part of the daily calories consumed by school age children and significantly increase the cost of a nutritious diet.**

   In Guatemala ultra processed foods can account for up to a quarter of the daily calories consumed by school age children and increases the cost of the nutrient adequate diet by close to 20 percent in children and adolescents.

   In Peru, empty calories from ultra-processed foods increase the cost of the nutritional food basket by 7 percent.

4. **Targeted fortification and supplementation can further close nutrient gaps.**

   Guatemala: Incorporating micronutrient powders to school meals or by delivering iron/folic acid alongside school meals could reduce the cost of a nutrient-adequate diet of adolescent girls by up to 85 percent. For school meals, 8-gram sachets of micro-nutrient powders can supplement 20 meals. Furthermore, supplementation interventions ought to be coordinated with the Ministry of Health.

   Peru: Inclusion of fortified rice in all school meals could reduce the cost of a nutrient adequate diet by up to 26 percent more, while also reducing the environmental footprint of meals (less reliance on meat and fish).

5. **The environmental footprint of school meals should be compared to the countries' targets and balanced with health and nutrition goals to inform sustainable programming decisions.**

   Meals served at school in Guatemala result in higher land use and carbon emissions (due to more animal-source foods), though they use less water than take-home rations.

   In Peru, cereals and dairy are major contributors to water use, while meat contributes most to land use and emissions. Fortification strategies – namely rice fortification- can mitigate these impacts.

6. **School meals can strengthen local food systems and enhance climate resilience.**

   Both countries are urged to prioritize local procurement, align meals with seasonal produce, and enhance multisectoral collaboration (e.g., between agriculture and education sectors). Climate variability and related shocks (e.g., droughts, floods) are projected to increase nutrient adequate diet costs by 24 percent–34 percent by 2050 in these countries.

Common themes and lessons that are relevant for the Latin America and the Caribbean region were also identified:

1. **Improving the nutritional content of school meals should be a regional priority.** Meals should align with dietary guidelines, incorporate environmental sustainability, and exclude unhealthy ultra-processed foods and sugary drinks to promote better health and long-term economic productivity.

2. **Food fortification and micronutrient supplementation are essential to combat widespread micronutrient deficiencies**. Amid climate impacts that threaten food quality, their cost-effectiveness and high public health benefits make them vital components of nutrition interventions.

3. **Targeted interventions for adolescent girls are crucial to meeting their unique nutritional demands.** Meeting the increased nutrient requirements to support rapid growth and development of adolescents is costly.

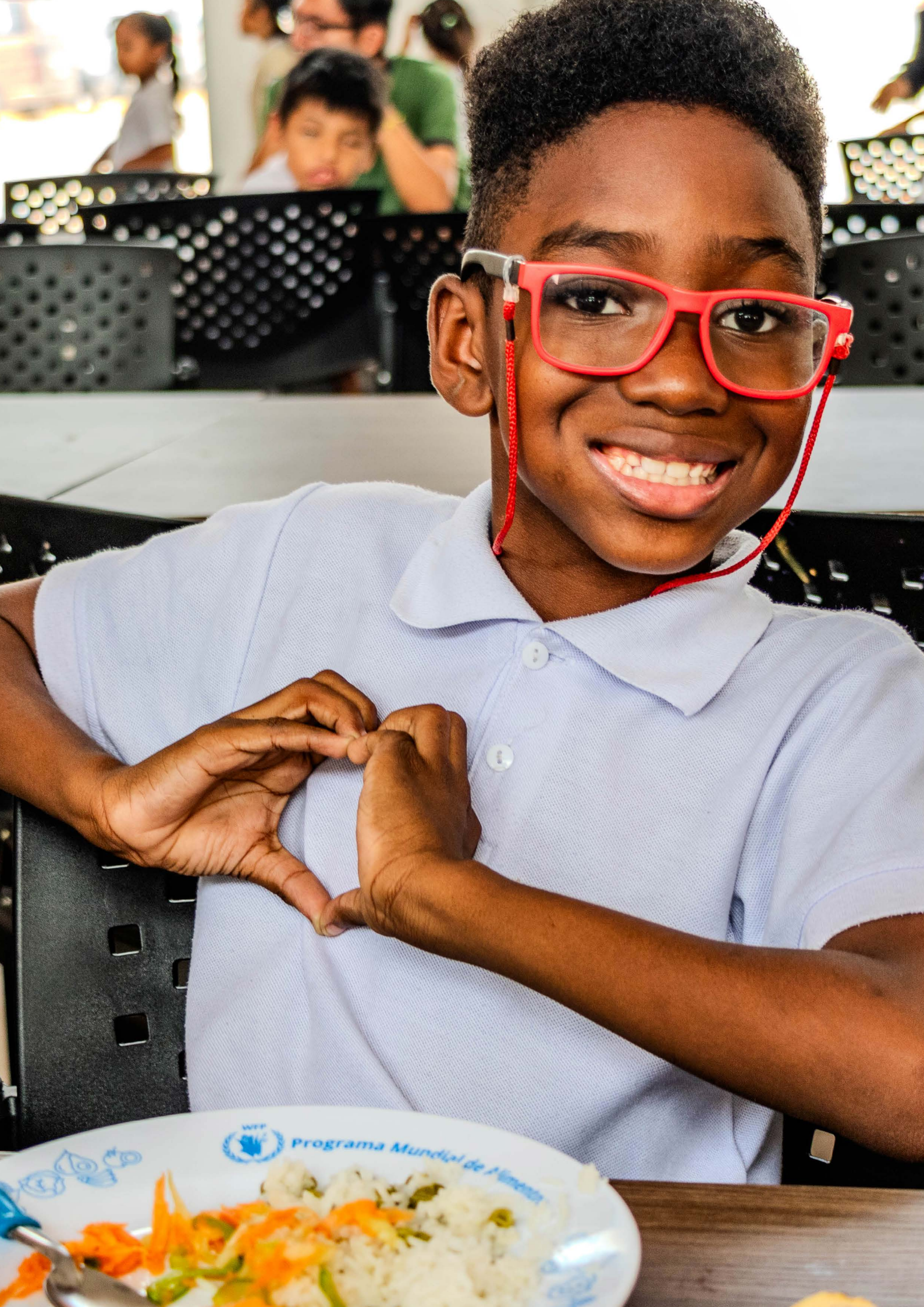
4. **Ultra processed foods are at odds with the health and economic best interests of households.** Policies should foster healthy, affordable, and accessible food environments, regulating obesogenic foods in schools and implementing social behavior change communication to improve dietary quality among children and adolescents.

5. **The environmental impact of school meals warrants further investigation.** Sustainable sourcing, climate-resilient agriculture, and local food systems are necessary to ensure environmental and nutritional sustainability, especially for the nearly 80 million children receiving school meals in Latin America. This report is- to our knowledge - the first attempt to understand this topic.

6. **Engaging parents in the implementation of school meals is a valuable strategy to ensure the effectiveness and cultural relevance of the programs.** However, providing adequate compensation is essential to guarantee quality, continuity, and sustained commitment to the success of the programs.

7. **Robust monitoring and evaluation systems are critical for tracking progress and informing policy.** Tools like the FNG support proactive decision-making but require sustained investment and adaptation to emerging challenges.

8. **Building resilient, equitable food systems demands integrated efforts among governments, communities, NGOs, and stakeholders is critical.** Such collaboration has the potential to secure local sourcing, sustainable practices, and the overall effectiveness of school meal programs.


Programa Mundial de Alimentos

Introduction

Latin America and the Caribbean continues to face pressing food security and nutrition challenges, with recent gains mainly restoring pre-pandemic levels of food insecurity and undernutrition. Although still below the global average, hunger affected 41 million people in the region in 2023—up from 36.3 million in 2019. Mesoamerica (Mexico, Belize, Guatemala, Honduras, El Salvador, Nicaragua, and Costa Rica) and South America (Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Suriname, Uruguay, and Venezuela) together account for over 80 percent of the region's undernourished population, with 10.5 million and 22.8 million affected, respectively (FAO et al., 2025). Food insecurity remains widespread, with 187.6 million people in the region (28.2 percent of the population) experiencing moderate or severe food insecurity, and 58.1 million (8.7 percent) facing severe food insecurity.

The region faces an escalating triple burden of malnutrition. Stunting affects 11.5 percent of children under five— though this is below the global average, it is not declining fast enough to meet the 2030 global SDG target (FAO et al., 2025). Simultaneously, the rates of overweight and obesity are rising rapidly. Adult obesity affects 29.9 percent of the population, nearly double the global average, with Mesoamerica showing the highest prevalence at 34.4 percent (FAO et al., 2025). The prevalence of childhood obesity among children under the age of five in the region (8.6 percent) is also higher than the global prevalence (5.6 percent) (UNICEF, WHO and World Bank, 2023). However, it is most alarming among school-age children, ages five to 19. According to a 2023 regional report by UNICEF, 30.6 percent (or 49 million children) in this age group are affected. South America is the most affected sub-region with 30 million children and adolescents with overweight, followed by Central America, with 16 million, and the Caribbean with 3 million (UNICEF, 2023), Micronutrient deficiencies, particularly of iron, zinc, and vitamin A, are widespread and largely unresolved, affecting more than half of school-aged children (Stevens et al., 2022; Fernández-Gaxiola et al., 2024). These deficiencies are exacerbated by low dietary diversity and the high cost of nutrient-rich foods, with climate impacts—such as reduced crop yields due to elevated CO_2, extreme weather, and ozone exposure—further threatening the availability of micronutrient-dense foods (Semba et al., 2022).

Children experiencing stunting are more likely to face difficulties with concentration, memory, and learning, negatively impacting their school performance. Iron deficiency anemia further exacerbates these challenges, impairing cognitive function and reducing energy levels, which hinders active participation in educational activities. National studies indicate that anemia is linked to lower educational attainment and reduced school performance, largely due to its adverse effects on attention and information retention (Chong et al., 2019; Nakasone et al., 2021). On the other hand, overweight and obesity among children is associated with poorer academic outcomes and increased risk of chronic health issues later in life. The interplay of stunting, anemia, and overweight not only affects children's futures but also has broader implications for societal development, limiting a generation's capacity to contribute effectively to their communities and to the economy.

A major barrier to improving diets in LAC is the cost and affordability of a healthy diet. In 2022, the region had the world's highest cost of a healthy diet, averaging $4.56 PPP[1]/day per

1 Purchasing power parities (PPPs) are primarily used to convert economies' national accounts expenditures on GDP and its components into a common currency. PPPs control for differences in price levels between economies and equalize the purchasing power of the various currencies used across economies, thus enabling cross-country comparisons that reflect only differences in the volume of national economic outputs.

person—well above the global average of $3.96 (FAO et al., 2025). Affordability remains a key barrier, with 182.9 million people (27.7 percent) in the region unable to afford a healthy diet. While this marks a slight improvement from 2021, due to regional economic stabilization, access to nutritious food remains unequal—particularly in the Caribbean and Mesoamerica (FAO et al., 2025). These challenges are shaped by a web of factors: structural inequality, unhealthy food environments, climate variability and climate extremes, economic slowdowns, social norms and lack of comprehensive policies aimed at promoting healthy food systems (FAO, et al., 2024). Global crises such as the pandemic, conflicts, and wars have also led to rising food prices and the unaffordability of nutritious diets (Global Nutrition Report, 2022.). Climate extremes are increasingly impacting the four pillars of food security—availability, access (physical and economic), utilization, and stability—yet their nutritional impacts remain insufficiently explored, particularly in relation to public interventions such as school meals (FAO et al., 2025; Salm et al., 2021; Phalkey et al., 2015; Ruel et al., 2021).

In this context, school meals function as a powerful—and potentially underutilized—tool for achieving multisectoral impact, and to ensure children's right to adequate health and nutrition. Snilstveit et al. (2015) emphasize that when school meals programs are effectively woven into broader social safety nets, they can not only be nutritious, safe, and sustainable, but also bolster child development and enhance educational outcomes. Integrated school meal programs play a crucial role in improving educational performance by promoting better nutrition and health, essential for cognitive development (Irizarry, et al., 2025). Access to balanced meals ensures that students receive vital nutrients, which boosts concentration and cognitive function, ultimately leading to greater engagement in learning activities and improved academic results (Baulch and Ecker, 2018).

Additionally, school meal programs increase attendance and enrollment, particularly among low-income families, by alleviating financial burdens and providing a dependable source of nutrition, thereby fostering more equitable educational opportunities (Alderman et al., 2020). Thus, school meals are essential for cultivating a learning environment that promotes educational success for all students.

When effectively designed and implemented, school meals can enhance dietary diversity, reduce nutrient deficiencies, and lower household food costs for the learner (Drake, et al., 2018)). They also serve as a platform for transforming food systems through local procurement, nutrition education, and resilience to climate-related disruptions (WFP, 2020). Ultimately, school meals can enhance child health and learning outcomes while promoting sustainable food habits and environmentally responsible procurement practices, bridging child nutrition with broader food systems and climate goals. However, despite the rising interest in environmentally friendly school meals, research quantifying their environmental benefits or potential adverse effects, particularly in developing countries, remains limited (Ruel et al., 2021; The Lancet Countdown, 2023).

This report presents findings from cross-country analyses in Guatemala and Peru, examining how school meals can address intersecting challenges of affordability of diets, nutrition, and sustainability. Drawing from the Fill the Nutrient Gap (FNG) framework, it explores the potential of school meals to provide high-impact, cost-effective interventions that meet children's immediate nutritional needs while supporting resilient, climate-forward food systems.

Methodology

This report looks at the findings of the Fill the Nutrient Gap (FNG) analyses conducted in Guatemala and Peru between 2024 and 2025, with a specific focus on their implications for school meals and their environmental footprint. We highlight key findings related to school-age children, drawing on data and insights from the FNG processes in both countries. Additional information about the FNG, including the full country reports for Peru and Guatemala, as well as other countries, can be found at: https://www.wfp.org/publications/fill-nutrient-gap

THE FNG ANALYSIS AND *ENHANCE* SOFTWARE

The Fill the Nutrient Gap (FNG) is an analytical process comprised of a secondary literature review in combination with a linear optimization model (using the WFP Enhance software) that aims to identify barriers to adequate nutrient intake across the life cycle and to model interventions and combination (s) of interventions to make health and nutrition available and accessible to the most vulnerable populations.

Five specific objectives are pursued through the analysis:

- To characterize nutritional gaps in population groups of interest
- To identify limiting factors for adequate nutrient intake
- To understand barriers to nutrient adequate diets for specific groups and areas of interest
- To evaluate the impact of diets on the environment; and
- To determine environmental impact mitigation strategies with a food systems approach.

Box 1. FNG methodology summary.

Fill the Nutrient Gap: Situation assessment for multi-sectoral decision-making on the prevention of malnutrition

Malnutrition has two direct causes: inadequate dietary intake and disease. The FNG analysis examines gaps in dietary intake, particularly among vulnerable populations, to inform how national programs and policies across various systems - food, social protection, education, and health systems - can improve nutrition. It assesses the availability, accessibility, and affordability of nutritious foods to identify barriers to adequate nutrient intake and examines the range of food choices that are available to vulnerable populations as well as the factors that influence their decision-making.

To identify the most effective combination of interventions to improve diets and nutrient intake, the FNG models the impacts of context-appropriate interventions across systems and identifies entry points to refine programs and policies by providing targeted recommendations for decision-makers.

The analysis is comprised of two components:

- A country-specific review of secondary data and information on factors related to dietary intake. This includes malnutrition trends over time, characteristics of the food system[1] and food environment, how these are affected by seasonality, shocks and weather extremes, and population behavior related to food and diet.
- An analysis for multi-sectoral decision-making using Enhance, an open access, [online] analytical software.

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

National stakeholders define the scope and focus of the assessment. They contribute data and sources of information to identify context-specific barriers and entry points and, together with the analytical team, develop a shared understanding of the issues and identify appropriate nutrition-specific and nutrition-sensitive interventions that can be implemented by different sectors using existing delivery platforms, such as social safety nets, food processing and markets, antenatal care and school meals programs.

WFP developed the FNG methodology 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 early 2025, FNG analyses were completed in 46 countries and, at the time of writing in March 2025, were ongoing in 7 countries with more in the pipeline.

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. Maternal and Child Nutrition 2019: DOI: 10.1111/mcn.12793.

Additional information about the FNG for Peru and Guatemala visit: wfp.org/publication/fill-the-nutrient-gap

1 As defined by the Food and Agriculture Organization (FAO).

Box 2. Cost and affordability of diets analysis using *Enhance.*

Enhance is an open-access online analytical platform that uses linear optimization to identify combinations of foods that best meet nutrition, cost and environmental objectives. It allows for analysis of the interplay of cost, affordability, nutritional value, diversity and environmental impact of dietary scenarios. This supports analysis of the extent to which cost, and affordability are a barrier to adequate nutrient intake, including the impact of shocks and climate change, and models how interventions across multiple sectors, such as social protection, health and agriculture, can help mitigate their impact. ***Enhance*** enables the understanding 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 secondary sources, the platform 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 excessive amounts of nutrients. For example, a single food item being a spice, or a condiment cannot contribute to more than 1 percent of the caloric intake of the optimized baskets.

For **Guatemala**, the FNG approach used household food expenditure data from the National Household Income and Expenditure Survey 2022 to derive average dietary patterns. These were used to apply grams-based minimum bounds at food group level to calculate the lowest cost nutritious diet that reflects average dietary preferences, including staple consumption[2]. This diet is referred to as the nutrient-adequate basket or '*nutritious diet*' throughout this summary. It meets requirements for nutrients, including protein, nine vitamins and four minerals, and does not exceed the energy average requirement (+/- 2.5%) and fat recommended intake.

In **Peru**, the FNG approach used national consumption data based on the Peruvian National Household Survey 2023 to derive average dietary patterns. These were used to apply grams-based minimum bounds at food group level to calculate the lowest cost nutrient-adequate basket that reflects average dietary preferences, including staple consumption[2]. This diet is referred to as the nutrient-adequate basket or 'nutritious diet' throughout this summary. It meets requirements for nutrients, including protein, nine vitamins and four minerals, and does not exceed the energy average requirement (EAR) (+/- 2.5%) and fat recommended intake.

Population food 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 can be 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 an optimized selection of nutritious foods. The real cost and non-affordability of a nutritious diet is likely to be higher, because a healthy diet includes foods from several groups and has greater diversity within groups than an optimized set of foods.

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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.

FRAMEWORK AND PROCESS OF THE FNG

The FNG process is led by WFP and carried out at the national level in coordination with stakeholders at the national and sub national level, (e.g. health, agriculture, social protection, education, industry and trade, infrastructure, gender), civil society, donors, UN agencies, private sector and academia. All data and results were validated with national and subnational stakeholders in national workshops. A visual depiction of the process is outlined in Figure 1.

Figure 1. FNG analytical framework.

PROCESS AND SCOPE OF THE FNG ANALYSIS

The FNG analyses in Peru and Guatemala estimated the cost and composition of a number of cost-optimized baskets for the modelled household of five members: a breastfed child (12-23 months); a school aged child (6-7 years); an adolescent girl (14-15 years); a breastfeeding woman; and an adult man, based on WHO/FAO global energy, macro- and micronutrient requirements along the life cycle.

Three types of baskets were modelled using the Enhance software:

1. The **energy-adequate basket** is the combination of foods that at the lowest possible cost meets the household's average caloric requirements only. It mainly consists of basic staple foods and other energy-dense foods.

2. The **nutrient-adequate basket, referred to as a "nutritious diet"** thought this analysis, is the combination of foods that at the lowest possible cost meets the household's energy, macro and micronutrient requirements, adjusted so that approximately 50 percent of energy comes from staple foods for all members of the modelled household except for the child 12-23 months of age, for whom the intake is 30 percent of the energy, under the assumption that they continue to be breastfed. Additionally, the minimum and maximum constraints for each food group were applied to the model based on the distribution of food group consumption in each country. The distributions were derived from national consumption surveys (ref to the FNG analyses or surveys used), using the 5th and 95th percentiles of per capita food group consumption at the sub-national level. The approach allows for consumption patterns to be accounted for in the optimization model.

3. The **nutrient adequate and diverse basket, referred to as the 'healthy' basket**, includes a combination of foods that at the lowest possible cost meet the household's energy, macro and micronutrient requirements, and is diverse as per national food-based dietary guidelines (FBDGs), by aligning the caloric contribution of each food group to the FBDGs of the respective country.

Box 3. FNG/WFP healthy diet basket.

FNG/WFP Healthy diet basket, its composition, and cost and affordability estimations

The healthy diet basket for which cost and affordability have been estimated by the FNG analyses reported in this document meets the FAO/WHO guiding principles for a healthy diet (What are healthy diets? Joint statement by FAO and WHO). Those principles are: nutritional adequacy; balance of energy intake and its sources (protein, fat, carbohydrates); diversity in line with food-based dietary guidelines; and moderate consumption of foods, nutrients, and compounds with detrimental health effects.

Composition:

For the healthy diet baskets defined for the FNG analyses in Guatemala and Peru, these principles have been operationalized through two criteria:

(1) meeting nutrient intake recommendations at a level that meets the needs of 97.5% of the specified target group (equivalent to the RNI), and

(2) adhering to the country's food-based dietary guidelines (FBDGs) which specify the recommended dietary diversity across and within food groups.

These two criteria ensure that the four FAO/WHO guiding principles for a healthy diet are fulfilled.

Setting criteria for both the diversity and the nutrient content of the healthy diet basket, and applying that to different target groups that represent different stages of the lifecycle (5 individuals in total with an average caloric need of ~2100 kcal) and across different geographic areas, provides insights into its cost and the extent to which unaffordability affects whether, where and for whom diets fall short of meeting healthy diet criteria. These insights are critical for the design of interventions that improve access to healthy diets.

For example, this definition enables quantification of the impact of different interventions on the cost and affordability of healthy diets, such as the inclusion of fortified rice, a glass of unsweetened milk, or an extra portion of leafy vegetables in school meals. It also enables the assessment of population level or targeted individual approaches that can impact health and nutrition, such as cash transfers, increased productivity, and diversity of production among smallholder farmers, micronutrient supplementation, or biofortification.

Food price data:

The FNG analyses in Guatemala and Peru used food price data from the countries' most recent Household Consumption and Expenditure Surveys (HCES). Those are derived from household-reported expenditure and quantities of food purchased over the reference period (typically the past 7 days or month, depending on the item). Data were available for 250 food items across food groups in Guatemala and 236 in Peru (excluding ultra-processed foods), and are disaggregated by geographic area.

Affordability estimation:

To determine the proportion of households that cannot afford the lowest cost of a healthy diet basket, food expenditure reported by households in the HCES surveys was used. For this estimation, the reported household food expenditure was converted to a per capita value and compared to the per capita cost of the basket based on the modelled household of five people.

Notes:

For the cost and affordability of a healthy diet (CoAHD) indicators that are reported annually in the SOFI report (The State of Food Security and Nutrition in the World 2024 | Agrifood Economics | FAO) a different methodology is used in terms of diet composition and sources of data on food prices and food expenditure. For composition it represents the lowest cost of a global 'Healthy Diet Basket standard' that is based on the average food group proportions and recommendations across ten quantified FBDGs from different countries. It has a caloric content of 2330 kcal/d spread across six food groups and 1-3 foods per food group and selects the cheapest source(s) of calories for each of these food groups (Methods_Brief_FAOSTAT_CoAHD_indicators.pdf). The indicators are reported at a national level, uses food prices from the International Comparison Program (International Comparison Program -ICP) that are updated every couple of years (most recently in 2021), and for the affordability estimate, country income distribution data are used after subtracting a fixed allocation for non-food that is dependent on the country income group.

The cost and affordability of a healthy diet indicators reported in the SOFI report differ from the estimate that is reported in the FNG analyses for several reasons: (1) the estimates are based on different time periods and use distinct food price data sources; (2) they use either food expenditure (FNG) or income data after subtracting a fixed allocation for non-food (SOFI); (3) they are estimated based on national price and income data (SOFI) or represent a weighted average of sub-national cost and affordability data (FNG); (4) while both diets meet diversity recommendations, the healthy diet basket used in the FNG analyses also meets specific nutrient requirements for selected target groups.

While these differences are important to acknowledge, they should not be over-emphasized. Each indicator serves a specific purpose. The SOFI indicators of cost and affordability of a healthy diet are very useful metrics for comparing countries and tracking changes amongst them over time, as the same methodology and data are applied across countries. The FNG cost and affordability of a healthy diet basket that meets both nutrient intake and diversity requirements, which includes different target groups and is calculated sub-nationally, is very useful to identify ways to integrate nutrition interventions across sectors to improve affordability and access to healthy diets that meet the FAO/WHO guiding principles, and also adhere to national food-based dietary guidelines[1].

1 In absence of national food based dietary guidelines, the approach utilizes the World Bank/FAO HDB reference basket as a source of dietary energy to allocate across food groups.

Some gaps and considerations about the analysis when interpreting the data should be noted. The analysis estimates the cost and affordability of the three baskets that meet age- and sex-specific nutrient requirements across the life cycle. This includes sufficient energy (in kilocalories), balanced macronutrients (proteins, total fat content), and bioavailable micronutrients (such as iron, zinc, vitamin A, calcium, and folate) necessary for adequate growth, cognitive development, immune resilience, and overall metabolic function. The FNG approach models these across life stages—including early childhood, middle childhood, adolescence, pregnancy and lactation, and adulthood—highlighting nutrient gaps driven by constraints related to local food systems, market prices, and household purchasing power.

The estimates are provided as economic indicators and should not be interpreted as dietary recommendations of actual consumption patterns. While the analysis considers, to some extent, consumption patterns, it does not consider cultural preferences and practices (i.e. Indigenous Peoples' food systems) and is based on healthy individuals with normal nutrient absorption. It does not consider interactions between micronutrients that may enhance or inhibit absorption. It also does not calculate the actual nutrient intake of the population.

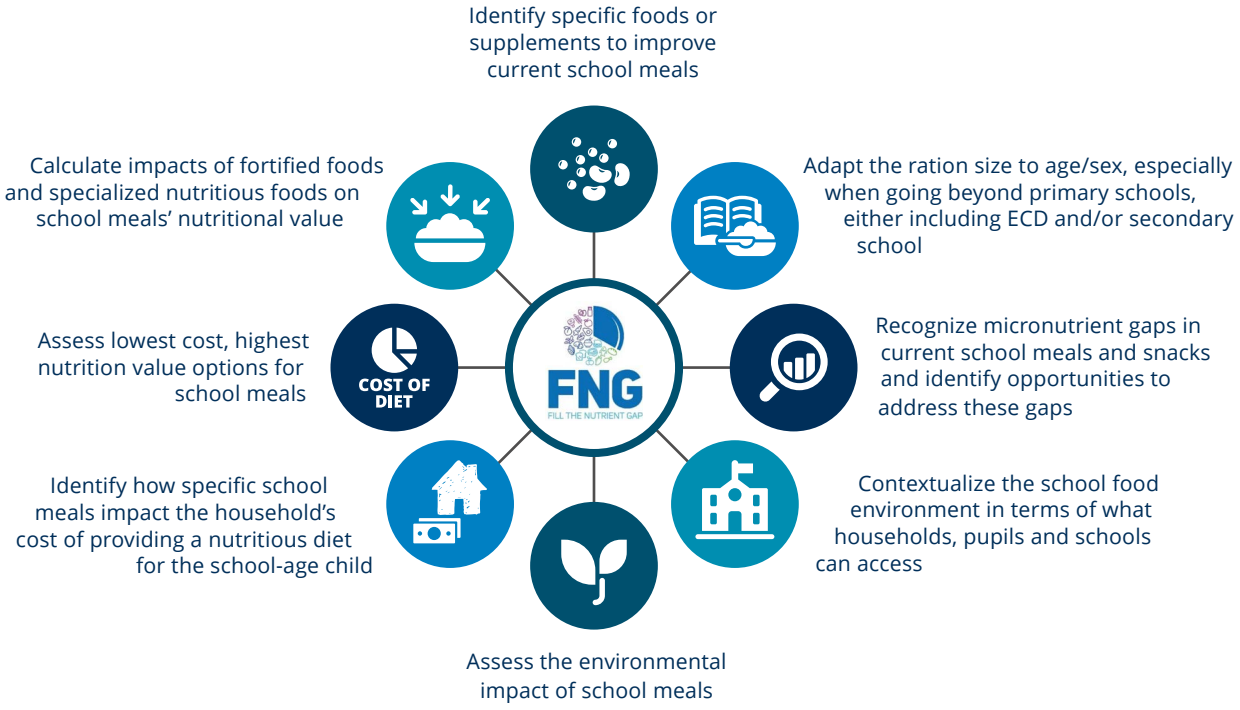
While the FNG analysis considers the market cost of a nutrient-adequate diet for the defined model household, it does not calculate the program implementation costs incurred. The environmental estimations are carried out using

data compiled by Poore and Nemecek (2018). These estimates reflect environmental impacts of food production at the global level; therefore, the estimates may not accurately represent local production practices.

While the FNG analysis identifies nutrient gaps and barriers to adequate nutrient intake for different target groups across the life cycle, the focus of this report is solely on the findings and implications of the analysis for school children and adolescents who receive school meals. The FNG analysis uses the *Enhance* software to explore specific questions related to how nutrition interventions, including school meals, could impact household or individual diet costs and nutrient intake. Figure 2 describes the FNG approach to modelling school-based interventions, and the considerations during the iterative process of the multistakeholder engagement that is part of every FNG assessment.

This report summarizes and compares the results of the **FNG analyses in Guatemala and Peru**. **Section 1** and **Section 2** are devoted to country specific findings related to school meals interventions. **Section 3** analyses the joint findings and identifies patterns, potential regional implications for school meals, and offers recommendations. We consider some environmental effects, particularly in terms of greenhouse gas (-GHG) emissions, land use and freshwater use, in each section of the analysis. To our knowledge, this study represents the first analysis in the region to specifically examine the environmental impacts of – at least partially – closing the nutrient gap with school meals. We trust the findings and recommendations herein will provide insights for national and regional policymakers and program managers to ensure more nutritious and environmentally sustainable school meals for school going children— their families and wider community through secondary impact— in Guatemala, Peru, and beyond.

Figure 2. The FNG approach to modelling school-based interventions.



Source: Adapted from WFP. (2021). Fill the Nutrient Gap (FNG) Analysis: Maximizing the Contribution of School Meals to Healthy Diets for Improved Human Capital.

Section 1. Guatemala

CONTEXT

Guatemala is currently facing a complex nutritional crisis. It holds the highest prevalence of childhood stunting (49,8%) in Latin America (one in two children) disproportionately affecting rural and Indigenous communities (UNICEF, et al. 2023).

Overweight and obesity among school-aged children are also pressing concerns, affecting one in three children with notable gender disparities (27% of boys and 31% of girls). Micronutrient deficiencies, particularly iron deficiency anemia, are widespread; the National Maternal and Child Health Survey (ENSMI) indicates that over 50% of children under five and more than one-third of women of childbearing age are affected by this condition (INE and MSPAS, 2019).

The coexistence of stunting, overweight and obesity, and micronutrient deficiencies characterizes the triple burden of malnutrition confronting Guatemala and many countries in the region.

The economic losses attributed to malnutrition in Guatemala are the highest in the region (World Bank, 2021). This burden has considerable economic implications, amounting to roughly USD 12 billion per year, equivalent to 16.3% of the gross domestic product. The report "The Cost of the Double Burden of Malnutrition: Economic and Social Impact in Guatemala (2020)", which cites data from 2018, corroborates these findings and highlights the lack of progress observed in recent years. The report revealed that the health costs associated with undernutrition and related diseases exceeded USD 365 million, accounting for approximately 45% of the total 2018 budget of the Ministry of Public Health. Moreover, the estimated health costs linked to overweight, obesity, and related diseases—factoring in productivity losses, educational attainment declines, and incremental public health expenditures—neared USD 3.5 billion at the time, equating to four times the total 2018 budget of the Ministry of Public Health. Paradoxically, while evidence indicates that social assistance programs are crucial for ensuring physical and economic access to food and essential services, Guatemala invests the least in social programs in Latin America (UNDP, 2023).

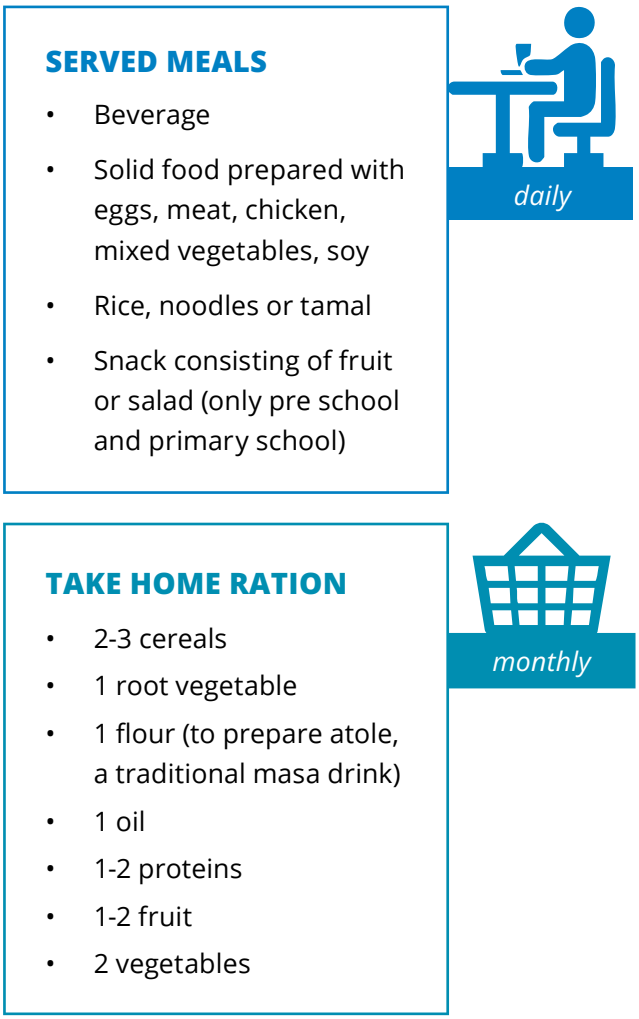
School meals program

Guatemala's school meals program (*Programa de Alimentación Escolar - PAE*) has integrated nutrition based on renewed regulation since 2017. The program, which is supported by a legal framework and executed by the Ministry of Education, reached over 3 million children aged 6 months to 18 years of age in 2024.

Guatemala's school meals program aims to enhance children's nutrition and health by providing adequate, nutritious, safe, and culturally relevant meals through two delivery modalities: approximately **2.4 million children receive a monthly take home ration**, while another **700 thousand are served a daily meal at school**. According to UNESCO (2024), the total school age population in Guatemala amounts to 7,278,035. The monthly take home ration delivered, which covers the needs of the child for 20 days on average, consists of cereals and root vegetables, flour (to prepare *atole*, a traditional corn flour drink), oil, legumes, eggs and fruits and vegetables. Daily meals served at school include a beverage (fruit juice, *atole*), an animal source of protein (meat or eggs), cereals, legumes, and vegetables. Although there is wide variability across regions, some commonly used vegetables include *güisquil*, tomato, carrot, onion, and beans, along with corn tortillas. School meals are habitually prepared with meat, chicken or eggs and try to be culturally sensitive, as it favors consumption and acceptability by students contributing to the sustainability of the program. Tamales are also consumed, made with corn flour, chicken or meat, and egg.

The program allocates a daily budget of Q4 (USD 0.50) for pre-primary children aged four to six and secondary school students aged 13 to 18. For children in preschool (six months to four years) and primary school (seven to twelve years), the budget is set at Q6 (USD 0.75). Implementation is conducted through parents' associations,

Figure 3. School Meals delivery modalities in Guatemala.



which oversee procurement, quality control, storage, and distribution of meals or rations but do not receive financial compensation for their efforts. All children aged six months to four years receive take-home rations, while for other age groups, the parents' association determines the distribution modality utilized. The program mandates that at least 70% of total financial resources be allocated for local procurement from family farms, underscoring its commitment to strengthening local economies. Funding for food purchases is entirely provided by the Government of Guatemala and executed through the Ministry of Education. This funding comes from an allocation of 0.8% of the revenues collected from the Value Added Tax for Peace (VAT-Peace), amounting to a total investment of USD 348 million for 2024.

Process of the FNG analysis in Guatemala

The FNG Analysis was conducted in Guatemala between January 2024 and March 2025. The process was conducted by WFP, under the leadership of the Secretariat of Food and Nutritional Security of the President of the Republic (SESAN), and the collaboration of the Ministry of Public Health (MSPAS), the Ministry of Social Development (MIDES), the Ministry of Agriculture (MAGA), and the Ministry of Education (MINEDUC).

Data sources for this analysis included the 2022 Guatemalan National Expenditure Household Survey (Encuesta Nacional de Ingresos y Gastos de los Hogares, ENIGH) which includes a food consumption and expenditure module that focuses on the relationship of products obtained, consumed, purchased or given away including 200 items, and which provides subnational disaggregation. The Institute of Nutrition of Central America and Panama´s (INCAP) food composition table (INCAP, 2018) was also considered. Data sources and other details pertaining to country specific data adjustments for the analysis can be consulted in the national FNG report.

As already noted in the methodology section, the planning, secondary data collection and baseline, intervention modelling, validation of results and nationally relevant recommendations are developed in close collaboration with national authorities and key stakeholders. See Annex 1 for a detailed list of participating entities.

Key findings of the FNG in Guatemala

Key findings are divided into 3 categories:

- Cost of basket for households
- School meals
- School meals program impact on carbon emission, land and water use

COST OF BASKET FOR HOUSEHOLDS

A nutritious food basket is out of reach for most Guatemalan homes. The lack of affordability of a healthy diet is one of the most pressing findings of the analysis.

While 95 percent of the population can afford a minimum expenditure diet that would satisfy the energy requirements of individuals (Figure 4), the cost of a nutrient adequate diet – one that meets macro and micronutrients requirements at the lowest cost- is out of reach for 40 percent of the population (Figure 5). Access to a healthy basket- a nutrient adequate and diverse one that would meet the national dietary guidelines- is out of reach for close to 80 percent of households (Figure 6), as per the FNG methodology. Large geographic variability shows dramatic inequality across departments, where the northern and northeastern regions have the largest percentages of unaffordability.

The monthly cost of a healthy food basket that meets the dietary guidelines and nutrient needs is twice as expensive as the cost of a nutrient adequate diet. Furthermore, even if it were economically feasible for families to purchase a healthy basket that meets the dietary guidelines they could not; the national imports and production of greens, legumes and dairy in the market would be insufficient to meet the demand.

Food supply is key to understanding access to a nutritious diet. The current food supply (production and imports) in Guatemala reflects its consumption practices; supply exceeds energy requirements, with 3,268 kcal available per capita per day, and the proportion of dietary energy from staple foods, mostly corn, is 44 percent (Instituto Nacional de Estadistica, 2023; GAIN, 2024). Protein supply in Guatemala is approximately 81.7 grams/person/day, which is sufficient to meet the recommended protein intake for healthy adults (50-60 grams/person/day), but it is worth noting that 43 percent of this available protein is of animal origin and that the availability of legumes per capita per day is considered low (Instituto Nacional de Estadistica, 2023; GAIN, 2024). Legumes are imported in a significant proportion of 63 percent, meaning they are not produced in sufficient quantities to meet the country's demand (Instituto Nacional de Estadistica, 2023).

If we consider the potential food demand necessary to meet the national food based dietary guidelines, the supply of legumes, dairy products, and vegetables would be inadequate. Comparing supply based on food balance sheets and food-based dietary guidelines quantities indicates that the current supply of legumes, dairy products, and vegetables in Guatemala meet only 32 percent, 76 percent, and 41 percent, respectively, of the recommended daily intake (Gobierno de Guatemala, 2016). In contrast, the daily available sugar per capita is more than 100 g, or more than 400 kcal, which exceeds the WHO recommendation of less than 10 percent of calories from sugar (WHO, 2015). Aiming to reach for a nutrient adequate diet, albeit not in line with dietary guidelines, is the most cost effective.

Table 1. Summary of estimated national average cost for each modelled basket for the modeled household.

Type of basket	Estimated cost (Q)	Estimated cost (USD)	Unaffordability in relation to household income
Energy adequate basket	Q 692 [Q 489 - Q 929]	USD 90 [USD 64 – 121]	5%
Nutrient adequate basket	Q 1531 [Q 1146 – Q 2305]	USD 199 [149- 299]	37%
Nutrient adequate and diverse basket	Q 2856 [Q 2434 – Q 4029]	USD 371 [USD 316 – 523]	77%

*Definitions of the types of baskets can be found in the methodology section of this document.

Figure 4. Mapping of the non- affordability of the energy adequate basket.

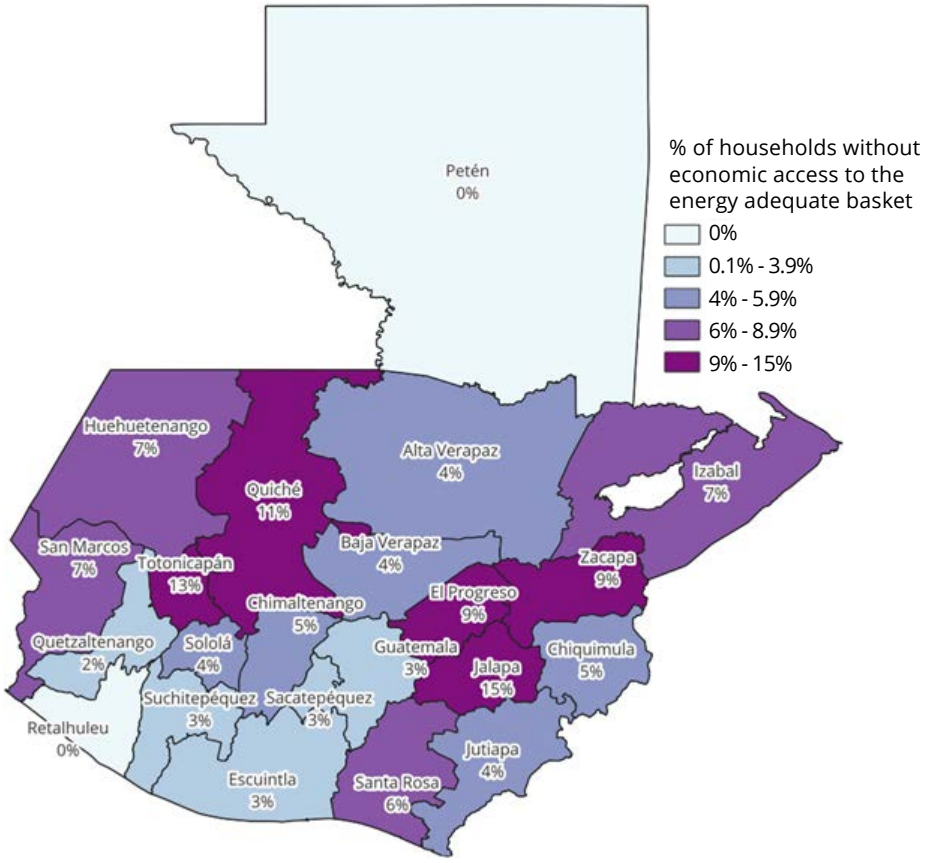


Figure 5. Mapping of the non-affordability of the nutrient-adequate basket.

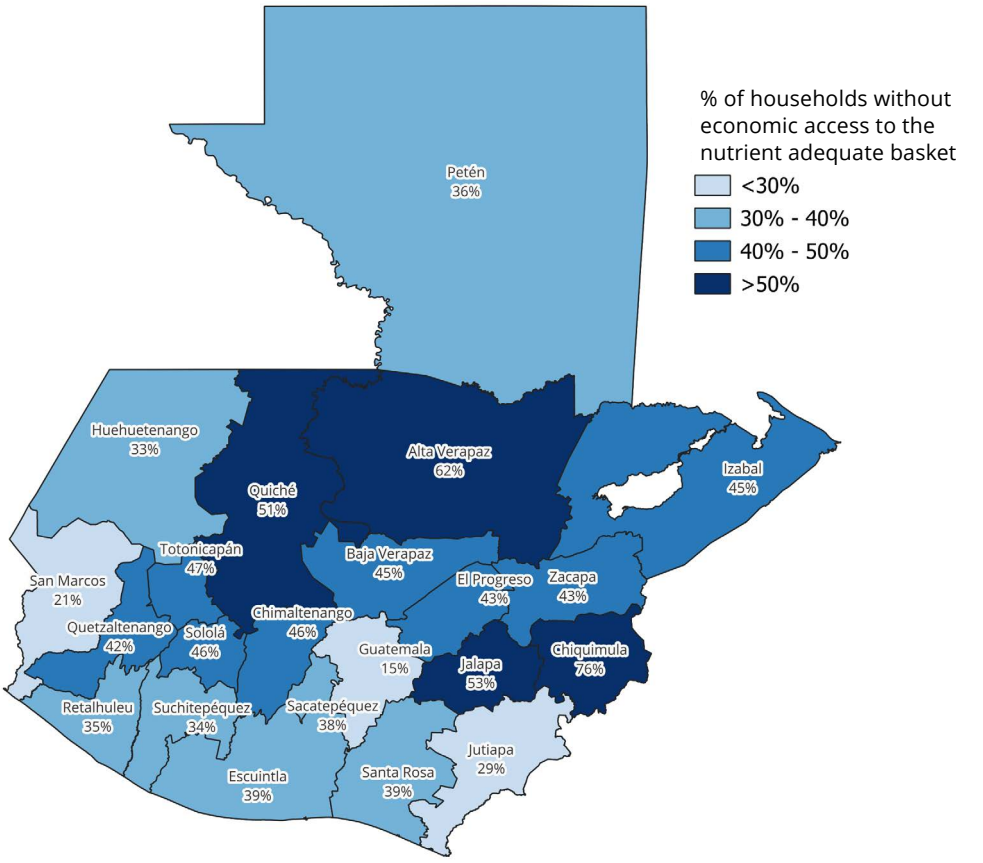
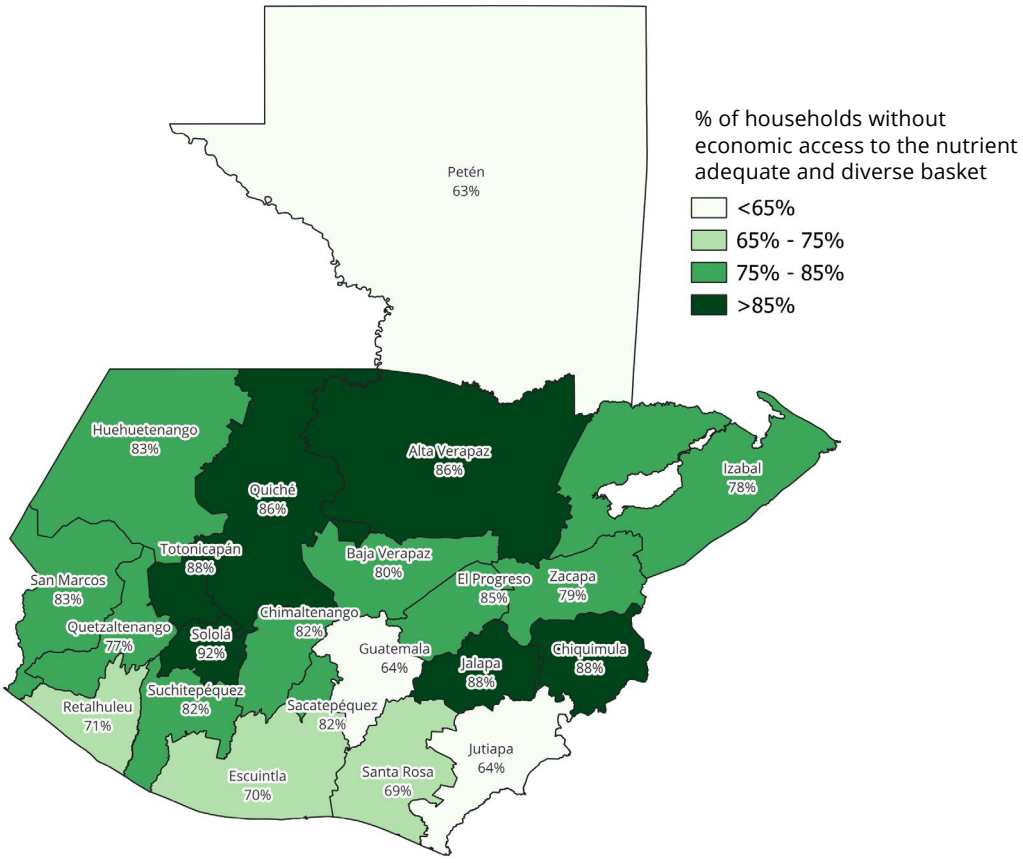


Figure 6. Mapping of the non-affordability of the nutrient adequate and diverse basket.

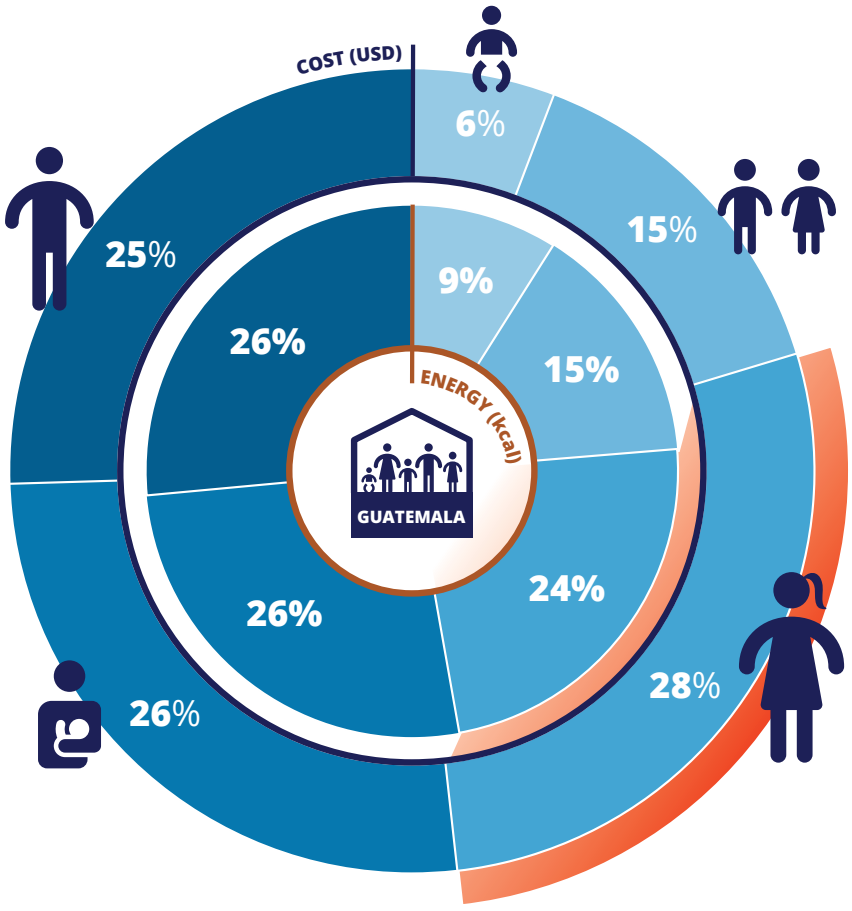


Adolescent girls have the highest nutritional needs, making them the most significant cost driver in a modelled household's diet cost and putting them at a higher risk of deficiency.

While men and breastfeeding women require more kilocalories and nutrients, adolescent girls need greater nutritional density, accounting for 28% of the total dietary cost for the household due to their demanding growth and biological changes (Figure 7).

Calcium, iron, and zinc are the primary cost drivers of a nutrient-dense diet in Guatemala, and these micronutrients are essential for the healthy growth and development of adolescent girls. Unfortunately, the analysis reveals that calcium and iron—found in animal-source foods and fortified cereals—are largely inaccessible to adolescent girls in most departments of Guatemala. The deficiency of these nutrients not only affects the adolescent girl's development but also has implications for the health of her future children.

Figure 7. Cost distribution per person/day of a nutrient-adequate basket in Guatemala.



SCHOOL MEALS

Hot school meals, prepared and served in the school, make the highest nutritional contribution; they also make the largest financial one.

The two school meals modalities in Guatemala, take home rations and served meals, are very different by design. In terms of nutritional contribution, meals served at schools include more meat and fresh produce, therefore resulting in higher dietary diversity when compared to take-home rations.

Served meals were also found to have a higher micronutrient density at the pre-primary and primary levels. Take home rations are characterized by a high content of cereals and tubers. In addition to providing less dietary diversity and possibly lower protein and micronutrient density, intrafamilial dilution of the rations or alternative use of the resource is always a risk that can influence the nutritional contribution of the resource to the school attending child.

Unlike with take home rations, there are established nutritional targets to be met by the served meals modality. Served meals are expected to meet folate (30 percent) and iron and zinc requirements (20 percent respectively) for pre- primary and primary aged children. The targets are lower for secondary school age children, establishing that 20 percent of the folate daily requirement and 15 percent of both iron and zinc requirements are met. When analyzed, the modelled meals met or exceeded the targets established for the younger children but fell short of meeting some of the ones established for older ones (i.e. iron), namely adolescent girls. Since there are no targets for the monthly take home rations, which are less diverse and with a large proportion of energy coming from staples, it is safe to assume that rations make an important energy contribution but fall short nutritionally.

Even under the assumption that school meals are served during the 180-day school year, both the monthly take home ration and the daily meal served at school make an important contribution to the cost of the nutrient adequate basket for children and adolescents. Served meals can cover up to 62 percent of the nutrient adequate basket for children in pre-primary and primary school and 55 percent of those in secondary school, despite the higher nutritional requirements of the latter. In turn, take-home rations, not considering intra-household sharing, would reduce the cost of the diet for younger children by 57 percent and for older ones by 39 percent. However, considering a higher nutritional density and larger contribution to reducing the cost of the diet per child, the meals served in school prove far superior.

Micronutrient supplementation of served meals would significantly contribute to meet the micronutrient needs of children and adolescents; they could also dramatically reduce the cost of a nutrient adequate diet for them.

At the pre-primary level, the addition of micronutrient powders to school meals would ensure the nutrition targets established by the program for folate, iron and zinc are met, as well as for the other nine micronutrients for which there is not target but also modelled, and in most cases meet the daily requirement.

The meal, enhanced with micronutrient powders, would also reduce the cost of the nutrient adequate diet of preprimary school children by up to 97 percent. Iron supplementation provided along with served meals for primary school children would secure meeting the nutritional targets set by the program and reduce the cost of the nutrient adequate diet to the household by 94 percent. Since the cost of the nutrient adequate basket is higher for the adolescent girl due to higher micronutrient demands, providing iron and folic acid supplements along with the meals served would meet the nutritional targets of the program while reducing the cost of the nutrient adequate basket up to 85 percent.

The reason that the school meals, including the MNP or supplements, can cover such a high proportion of the cost of the nutrient-adequate diet for these children, is that the planned meals provide much more than a third or half of their energy and macronutrient requirements as well. In other words, the planned meals are larger than required, and the meals consumed may be smaller.

Closing the micronutrient gap does not, however, mean that the overall diet is accounted for, and families should disregard nutritional density at home. Other necessary components to the diet, including healthy sources of the remaining energy to be met, fiber and antioxidants – among other components of a healthy diet— should not be overlooked.

Table 2. Summary of percentage of cost reduction from school meals per child/adolescent for families.

	Type of basket	Meal % energy covered	Meal + supplementation % covered
Take home ration	**Preprimary and primary**	57%*	n.a
	Secondary	39%	n.a
Meal served in school	**Preprimary**	62%	97%
	Primary		94%
	Secondary	55%	85%**

*This percentage assumes the ration is not shared with other household members.
**This percentage reflects the % covered for an adolescent girl 14-15 years of age

Ultra processed foods are a competing factor to achieve a nutrient adequate and affordable diet for children and adolescents.

Despite of the efforts of the PAE to encourage better nutrition through better eating habits, the school food environment in Guatemala is highly obesogenic characterized by the high availability, access and promotion of ultra processed foods and low availability and access of healthy diets (INCAP, 2020).

When analyzing the consumption patterns of school age children 6-14 years of age, it was found that almost 50 percent of children eat some type of ultra processed salty and fried snack and close to 80 percent consume a sugary drink daily.

At present, it is estimated that ultra processed foods can account for up to a quarter of the daily calories consumed by school age children and increases the cost of the nutrient adequate diet by close to 200 percent in both children and adolescents. The dramatic increase in cost pertains to the high calorie, low nutrient density ratio of ultra processed foods that are available and thus would demand for very nutrient dense foods to be consumed alongside the ultra-processed foods to meet the daily nutritional requirements without exceeding the daily energy requirements. This, in turn, would increase the cost of a menu in a school feeding program given the nutrient density required in the context of a highly obesogenic school environment.

SCHOOL MEALS PROGRAM IMPACT ON CARBON EMISSION, LAND AND WATER USE

Meals served in schools are nutritionally better for children but could have higher environmental demands.[2]

Although Guatemala contributes very little to global GHG emissions – 0.08 percent according to World in Data- is important to safeguard sustainable use of resources to ensure access to healthy diets in the future (Climate Watch, 2024). Water is increasingly scarce in Guatemala. Food availability in Guatemala is highly dependent on rainfed production, contributing to the high degree of vulnerability to climate related shocks and extreme weather events such as recurring draughts, excessive rainfall and floods. The IMPACT[3] economic model, which considers factors such as food production, consumption, and trade, was used to project the effects of climate extremes on food prices through 2050 in Guatemala. The results showed a 34 percent increase in the cost of the nutrient adequate basket in a "business as usual" scenario, highlighting the importance of mitigation and adaptation strategies for improved nutrition.

As already stated, meals served in school – when compared to rations- are more nutritious and have a higher contribution to reducing the cost of the nutrient adequate basket for households. The average environmental demands of school meals for little over 3 million Guatemalan children was calculated using the Enhance software together with data from Poore and Nemecek (2018). Some limitations should be considered when interpreting these results; they are derived from global averages of the environmental impact of food. The analysis suggests that while meals served in school have a lower water footprint than take home rations, land use and MtCO2e would both increase by over 50 percent if only served meals were provided (Figure 8). The increase of the environmental impact related to land use and CO2e emissions of served meals at schools is primarily driven by the production of a more diverse basket, especially if animal protein is considered, to achieve a more diverse diet when compared with the take home rations. These rations are less diverse and have a higher content of cereals and nonperishable products. In turn, served meals offer more animal sourced foods, dairy and eggs explaining higher GHG emissions and land use.

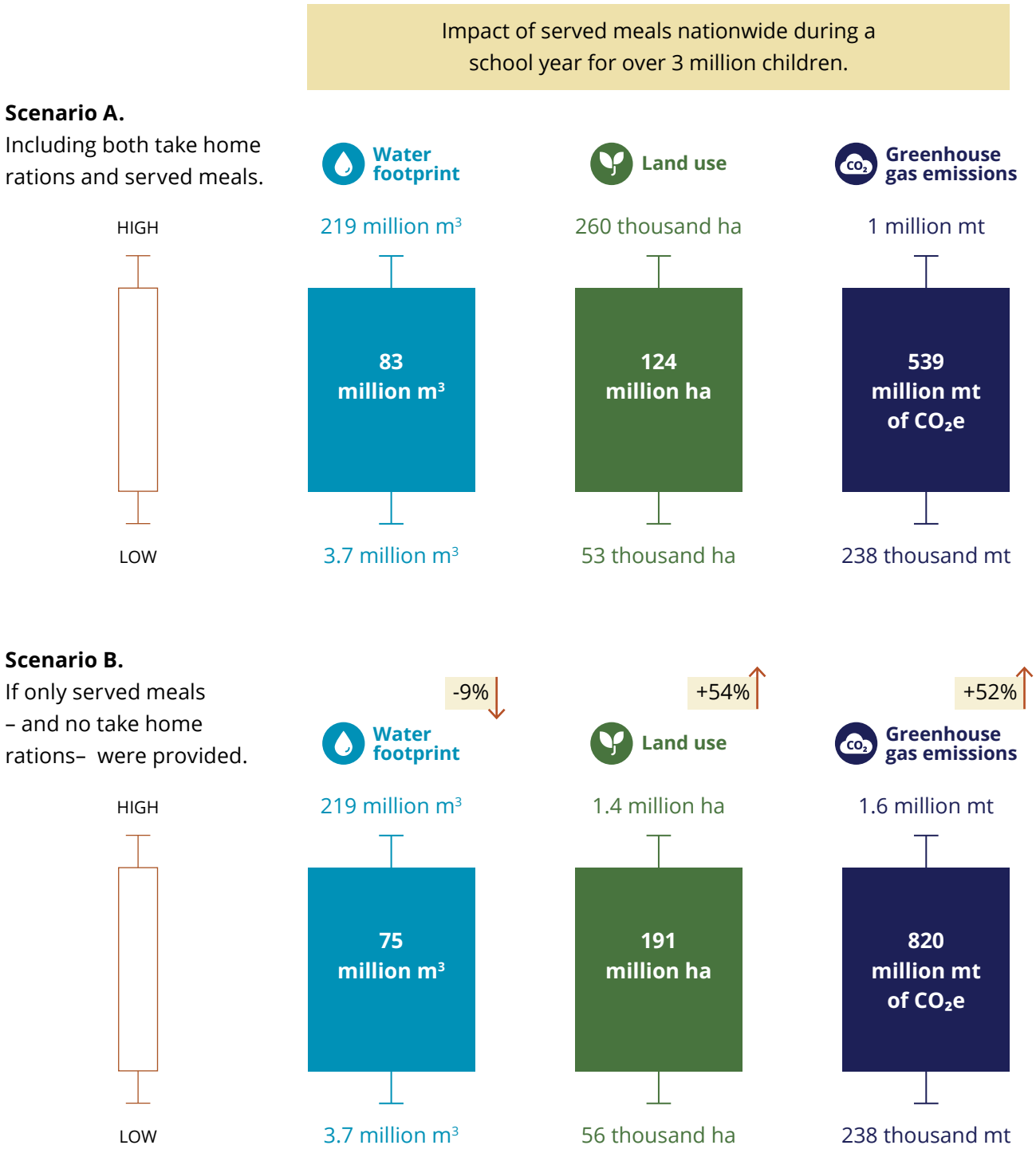
Weather extremes could lead to a dramatic increase in food prices.

According to the findings of the analysis, the cost of a nutrient-adequate food basket could rise by up to 34% due to climate variability. The modeled monthly cost of a nutrient-adequate household of five is projected to increase from Q1,531 (USD 198) in 2023 to Q2,044 (USD 265) in 2050, at present value, largely due to depleted micronutrients in land and food (Zhu et al. 2018). The literature suggests that, in parallel, climate shocks may reduce protein, micronutrient, and vitamin content in foods, potentially resulting in additional cost implications for consumers, which could also hinder progress toward reducing global nutrient deficiencies (Zhu et al., 2018; Beach et al., 2020). This finding underscores the critical role of school meals as a social protection mechanism for the Guatemalan population. It is essential to ensure access to nutritious diets while preventing increases in the cost of healthy foods by implementing sustainable practices that promote inter-sectoral collaboration between agriculture and social protection.

2 These estimates are based on the number of meals served according to school feeding menus for approximately 3.1 million children in a school year. The environmental impact estimation is based on the global average values published by Poor and Nemecek (2018) and used in Enhance. The values in the box represent the yearly total environmental impact for the school meals program in terms of freshwater use, land use, and greenhouse gas emissions. The values below and above the box represent a low-impact and a high-impact range, i.e. if more sustainable or less sustainable food production practices were to be adopted and are based on the 10th and 90th percentiles published by the same authors.

3 The International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT), which links economic, water and crop models.

Figure 8. Estimation of the total current environmental footprint of school meal by scenarios.



Calculated using Enhance with data from Poore and Nemecek (2018) and school food menus.
Rations represent 85% of the distribution modality. Excludes the pre-primary level.

Implications of the FNG findings for school meals programming

Key finding from the FNG analysis in Guatemala suggest that the national school meals program has the potential to be economically impactful, nutritionally richer and environmentally conscious. The triple burden of malnutrition, alongside the challenges of high rates of rural poverty, pose important challenges to the wellbeing of the population at large. While, relative to other countries in the region, social investment in Guatemala is low the evidence gathered shows school meals program offers a platform that – if properly implemented- could significantly contribute to reducing the cost of meeting a nutrient adequate basket for the child, while ensuring that children receive a suitable – nutritious, safe affordable and sustainable- meal to counter malnutrition and improve learning outcomes, upholding their right to adequate health and nutrition.

At present 40 percent of Guatemalan families can't afford a nutrient adequate diet; the cost reduction of up to 62 percent per child contributed by school meals – without considering additional complementary interventions such as fortification- is substantive. Meeting that contribution will require numerous revisions to the program as currently implemented.

RATIONS VS. SERVED MEALS

At present, most meals are not served at school; they are sent home in the form of rations. The analysis indicates that meals served at school have a higher nutritional value; this modality contributes to greater dietary quality and diversity, namely because of the animal sourced products offered, which guarantee the intake of essential micronutrients such as iron, zinc, and folate, and provides a greater contribution to reducing the cost of the nutritional basket.

Moreover, take home rations are habitually shared at home. While sharing the ration can still make a nutritional contribution to the household, it challenges the objective of the program, which is to guarantee that the targeted child meets his or her dietary needs for proper nutrition, health and development. However, scarcely 25 percent of the meals provided by the program are served in schools.

Because parents' associations decide the modality that is offered, working to understand their needs and motivations is critical. At present, parents- who bear the load of operating the school meals program receive no compensation for their efforts. Like in other countries, women predominantly embody the – unpaid— labor force around school meal programs in Guatemala (Global Child Nutrition Foundation, 2024). Therefore, it is not surprising that rations which are less labor intensive are favored over daily cooked meals when given the option.

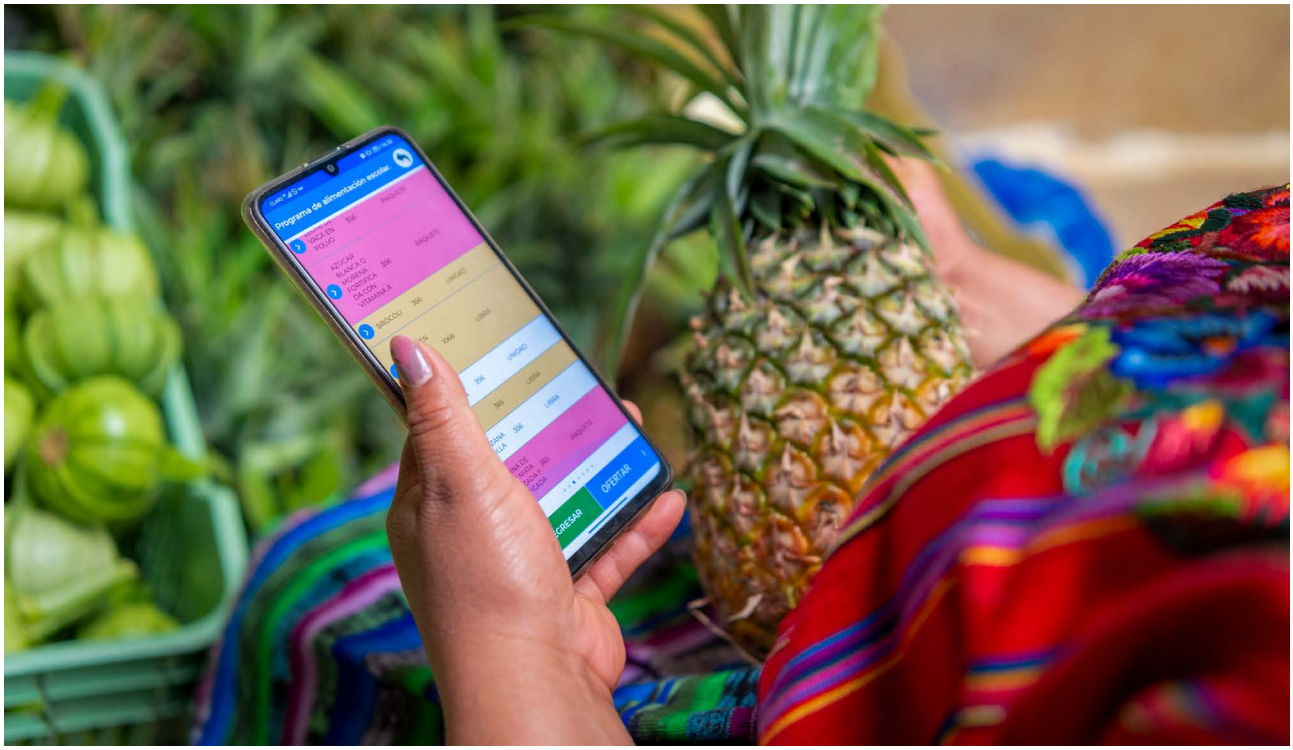
To successfully scale up served meals and meet nutritional goals, financial incentives for parents involved in the program are essential. Evidence from various countries shows that school meal programs can create significant employment opportunities for cooks, food handlers, and monitors. These financial incentives encourage parents to actively sustain the program, fostering a sense of ownership and responsibility for its success. Additionally, investing in gender equality and women's empowerment remains urgent and offers potential for economic growth, food and nutrition security, and improved livelihoods, especially in rural areas where most Guatemalans reside.

The program should also incorporate strategies to ensure higher dietary diversity and to promote adequate nutrition practices, which are critical for meeting children's nutritional needs. Improving access to insurance mechanisms as well as financial products can reduce risk and provide rural farmers with the working capital necessary for diverse crop production. Enhanced working capital and insurance allow farmers to expand operations, increase food variety, and boost productivity.

Moreover, developing infrastructure—such as transportation, storage facilities or irrigation, to mention a few—is crucial for the effective distribution of fresh, nutritionally dense foods to schools, minimizing food loss and maximizing availability. Fostering smallholder farmer associations through cooperatives can further empower farmers, offering collective bargaining power, market access, and shared resources.

By collaborating, smallholder farmers ensure a consistent supply of affordable, diverse foods for school meal programs. The financial implications of the latter must not be overlooked. Social and behavior change communication, alongside training on nutrition, could contribute to increased crop diversification.

Implementing these strategies could enhance dietary diversity for children while positively impacting the local economy by supporting rural agriculture. This comprehensive approach aligns with the goals of improving health and nutritional outcomes and promoting sustainable agricultural practices and economic growth in the community (World Bank, n.d.).



Under the premise that served meals should be promoted, the following recommendations ensue:

- **Utilize FNG analysis to enhance nutritional guidelines:** Leverage the findings from the FNG analysis to revise and strengthen the nutritional guidelines of the existing school meals program to improve their affordability. This should include the development of diversified school meal menus that prioritize fresh or minimally processed nutrient-rich foods, incorporating a variety of fruits, vegetables, whole grains, and animal-sourced products. The goal is to ensure that all meals provided not only meet the basic dietary requirements but also promote optimal dietary diversity, enhancing children's overall health and development. Additionally, it would be beneficial to update the Guatemalan Food-Based Dietary Guidelines to consider more affordable and environmentally sustainable food options.

  In addition to – as noted above- improving the nutritional value of school meals and reducing the overall cost of the nutrient adequate basket for families, school meals can indirectly contribute to environmental sustainability by supporting healthier diets and potentially reducing reliance on certain food production methods. Environmental and nutritional objectives can be at odds. For instance, the EAT-Lancet Commission developed a set of dietary guidelines aimed at feeding a growing global population a healthy diet within sustainable environmental limits (Willett et al., 2019).

  The global recommendations emphasize a reduction in red meat and sugar and advocate in favor of a mostly plant-based diet. While environmentally sound, policies encouraging shifts towards more plant-based diets can lead to shortfalls in micronutrients typically present in animal products (B-vitamins, vitamin D, calcium, iodine, iron, selenium, zinc, and long-chain omega-3 fatty acids) , and in countries that currently have a low intake of these nutrient-dense but high environmental impact animal source foods a moderate increase may be required to meet health and nutrition goals, especially among target groups with relatively high needs, such a young children and adolescents. The potential of food fortification as an enabler of more environmentally sustainable, nutritionally adequate and lower cost diets should also be taken into consideration (Grasso et al., 2023).

- **Increase daily allocations for secondary school meals:** Recognizing the heightened nutritional needs of adolescents, particularly adolescent girls, it is essential to increase the daily micronutrient content of school meals in secondary schools. This increase should reflect the specific dietary requirements of this age group, ensuring that meals, in combination with micronutrient supplementation, provide sufficient energy and a balanced contribution of macro-nutrients and are rich in essential micronutrients such as iron and folate.

- **Introduce comprehensive micronutrient supplementation:** Implement a systematic approach to micronutrient supplementation alongside school meal programs to address deficiencies for children aged 6 months to 18 years, which is the population targeted by the school meals program. This initiative should provide micronutrient powders for children under 5, iron or multi-micronutrient supplements for children aged 5 to 12 years of age, and iron and folic acid supplementation specifically for adolescent girls in schools. This could also be realized through fortified foods. By bridging the identified micronutrient gaps, this program will not only enhance dietary quality but also contribute to reduced household costs for nutrient-adequate diets, ultimately improving the health outcomes of children and adolescents served by the program.

- **Provide financial compensation to parents in charge of the school meals program:** Acknowledging that women often bear the burden of unpaid labor in these programs, offering monetary incentives will not only empower them but will also encourage increased participation and commitment to the school meals program. By compensating parents for their efforts, communities will be motivated to prioritize the provision of served meals over take-home rations, ultimately enhancing the nutritional quality of the meals delivered to students and fostering a sense of ownership and responsibility towards the program. This approach will help ensure that the program is sustainable, effective, and beneficial for both students and their families.

- **Incorporate strategies to enhance dietary diversity in served meals:** Improving access to financial products for rural farmers, developing essential infrastructure for food distribution, and fostering smallholder farmer cooperatives will empower local agricultural communities. By facilitating better financing options, farmers can expand their operations and increase the variety of foods available. Enhanced infrastructure will ensure that fresh, nutritionally dense foods are effectively distributed to schools, minimizing food loss and maximizing availability.

- **Promote and implement comprehensive public policies aimed at creating healthy food environments for children that regulate the promotion, access and availability of processed foods and promote the availability and access to healthy diets**. The high availability, access and promotion of ultra processed foods are major challenges to ensure healthy food environments in and out of schools for children. Regulating this environment through proper policy instruments that are fully implemented and regulated is necessary.

SCHOOL MEALS AND THE ENVIRONMENT

Balancing nutritional needs with environmental sustainability is crucial for supporting a healthy population while preserving the planet. Although Guatemala's overall carbon emissions are low compared to larger industrialized nations, deforestation and changes in land use significantly contribute to greenhouse gas emissions, and future water scarcity is a concern. Furthermore, Guatemala is particularly vulnerable to the impacts of extreme weather, including an increase in the frequency and severity of hurricanes and droughts. These climatic events exacerbate the existing challenges faced by the population, largely stemming from extreme poverty, and underscore the urgent need for enhanced adaptation and resilience strategies.

In all contexts, school meals should aim to be sustainable and not contribute to environmental distress. According to the School Meals Coalition (SMC), school meals represent a unique opportunity for food system transformation.

A white paper on Planet-Friendly School Meals – defined as programs delivering equitable and healthy foods for children, produced in ways that do not pollute or overexploit natural resources and protect biodiversity— argues that school meals can effectively address challenges such as malnutrition, environmental degradation and weather extremes, and economic inequality, by engaging schoolchildren and adolescents as agents of change and through the power of food procurement for school meals (Pastorino et al., 2024). School meals procurement can create demand for planet-friendly food production practices and support local agriculture. Healthy and sustainable food habits promoted in schools will also influence children's families and communities into the future.

Environmentally sustainable policies can yield long-term benefits when adequately supported. However, they are not always economically viable, particularly in Latin America and the Caribbean, where the feasibility of sustainable practices can vary depending on local markets, incentives, and existing political and economic trade-offs. Importantly, while increased production of more diverse food baskets is crucial for meeting nutritional needs, it can also lead to detrimental effects on land use and greenhouse gas emissions. This trade-off highlights the need to balance productivity gains with sustainable environmental practices to ensure that efforts to enhance food diversity do not exacerbate ecological issues.

To ensure that the national government can develop policies that directly impact schools while also indirectly influencing food procurement for school meals and broader food systems, the following recommendations are proposed:

- **Enhance collaboration between ministries:** To strengthen the school meals program, it is essential to foster closer collaboration between the Ministry of Education and the Ministry of Agriculture, Livestock, and Food. This partnership should focus on fostering sustainable food systems through direct purchases from local farmers. Efforts must prioritize seasonal food production and incorporate low-cost native foods that are rich in vital nutrients identified as limitations in the FNG analysis, such as vitamin C, iron, calcium, and protein. Furthermore, implementing training and providing resources for farmers will help align their production with the nutritional needs of school meal programs. Improvements of agricultural productivity through optimized value chain practices is crucial. This is especially key for foods from animal sources, as they are major contributors to emissions from the agricultural sector. It is recommended to enhance capacities to enable more efficient livestock farming; increased carbon capture through optimized management of land use; improved manure management; and decreased dependence on fossil-fuel inputs (Friel, et al., 2009).

  Moreover, interventions that promote safe food handling practices, minimize loss at the production level and waste at the school and households, which in turn is known to significantly reduce emissions and improve the overall sustainability of food systems. By developing smallholder farmer-friendly incentives, and investing in fostering infrastructure, we can improve trade opportunities and ensure that local farmers benefit economically, which in turn supports the sustainability of school meal programs. This approach aligns with recommendations from the World Bank, emphasizing the importance of strengthening local supply chains and integrating environmental considerations into agricultural practices (World Bank, 2020).

- **Comprehensive food and nutrition education and social and behavior change communicatios (SBCC):** Implement a robust food and nutrition education program aimed at the entire educational community, including parents, students, teaching staff, and other stakeholders. SBCC strategies should emphasize community engagement and participation, as these are key to improving knowledge, attitudes, and practices related to healthier dietary behaviors. This initiative should raise awareness about the negative health and environmental impacts of ultra-processed foods, and encourage the consumption of locally sourced, minimally processed foods. By fostering a culture of healthy eating, the program can drive social behavioral change, reduce reliance on nutrient-poor products, increase demand of locally available more diverse and nutritionally dense foods and ultimately decrease overall dietary costs for families.

- **Robust monitoring and evaluation framework:** Establish a comprehensive monitoring and evaluation framework that incorporates a clear theory of change to guide the school meals program implementation. This framework should outline the program's design, define measurable objectives, identify potential implementation challenges, and establish process indicators to assess progress. Additionally, evaluate the program's impact on student health and nutrition outcomes, food security, and environmental sustainability in alignment with the objectives of national regulation. Regular assessments should be conducted to refine strategies, ensuring ongoing improvement and alignment with best practices in sustainability and nutrition.

Conclusion

The findings of the FNG analysis in Guatemala underscore the urgent need to transform the national school meals program into a more effective, sustainable, and equitable initiative. By prioritizing served meals over take-home rations, enhancing nutritional guidelines, and introducing a compensation system for parents, the program can significantly improve the dietary quality and overall well-being of children and adolescents.

A shift towards served meals must also emphasize environmental responsibility; if rations are foregone, the program will have the challenge to design sourcing and preparation of meals to minimize the programs environmental impact, particularly for land use and GHG emissions. This involves adopting practices such as local procurement, seasonal produce usage, reducing waste and integrating environmentally sustainable practices. By fostering collaboration among key ministries and stakeholders and prioritizing sustainable food sourcing, Guatemala can transform its school meals program into a catalyst for positive change. This transformation will support a healthier population, enhance food security, and contribute to the sustainability of local food systems, ultimately paving the way for a brighter future for children and their families while safeguarding the environment for generations to come.

Section 2. Peru

CONTEXT

Poverty remains a significant development challenge in Peru, evident in stark disparities between urban and rural areas that disproportionately affect Indigenous populations. When compared, the occurrence of extreme poverty in urban areas is 2,1 percent, whereas extreme poverty is dramatically higher in rural areas (12.1%) (INEI, 2022).

The country's nutrition landscape reflects a triple burden of malnutrition, where various forms of deficits coexist. Over 50% of the Peruvian population is moderately or severely food insecure (FAO, 2024). National data from 2021 shows that 11.5 percent, or 1 in 10 children under 5 suffers from stunting, while 1 in 2 women of reproductive age (15 to 49 years) and 1 in 2 children (6 to 35 months) experience iron deficiency anemia. However, the data at the subnational level shows dramatic disparities by socioeconomic level. Areas with the highest levels of poverty such as Cajamarca, Loreto and Huancavelica have the highest levels of stunting at over 20 percent; Lima, and other large metropolitan areas show a prevalence below 5 percent (INEI, 2022).

The same is true for anemia in children five years of age and under, which is more prevalent among children in the poorest departments, notably Puno, Ucayali and Huancavelica – close or over 50 percent- and lowest in Tacna, Lima and other urban areas, below 25 percent (INEI, 2022). Overweight and obesity, another pressing nutrition challenge, is particularly pressing among children 6-13 years of age, at 38.4 percent (UNICEF, 2023). In the case of overweight and obesity, the prevalence is higher among those in urban areas, at close to 45 percent, but dramatically lower in rural areas where the prevalence is closer to 15 percent. Insufficient zinc and vitamin A intake for a substantial segment of the population is also widely recognized.

As in the case of Guatemala, for Peru malnutrition has severe health and economic implications. The ongoing rates of malnutrition bear significant economic costs for the Peruvian state, with estimated losses accounting for 4.6% (USD 10.5 billion) of the gross domestic product (GDP). This economic burden stems from various nutritional issues within the triple burden of malnutrition, significantly impacting the well-being and productivity of Peruvians. A 2022 WFP report, based on 2019 data, corroborates these findings. Titled "The Cost of the Double Burden of Malnutrition: Economic and Social Impact in Peru (2022)", the report revealed that health costs related to undernutrition and associated diseases approached USD 100 million (WFP, et al., 2022). Alarmingly, it links 26% of grade retention and productivity losses due to malnutrition to an astounding USD 6 billion, equivalent to 2.8% of Peru's GDP.

Additionally, the burden of overweight and obesity has further strained the public health system, costing over USD 2.5 billion in 2019 alone amounting to 45% of all public health expenditures and diverting crucial resources from other health priorities.

School meals program

Until December 2024, the National School Meals Program *Qali Warma* (PNAEQW), implemented by the Ministry of Development and Social Inclusion (MIDIS), provided daily meal services during the school calendar for girls and boys in public educational institutions at the initial, primary, and secondary levels. The program reached approximately 4 million children in 2024. According to UNESCO (2024), the total school age population in Peru amounts to 10,049,530.

The program aimed to achieve three specific objectives: to ensure a daily food service for school-age children, to improve school attendance and academic performance, and to enhance the dietary habits of children and adolescents.

Additionally, the PNAEQW promoted community participation and co-responsibility through a community-based co-management model. Its target population included children aged 3 years and above receiving primary public education nationwide, as well as Indigenous students in the Peruvian Amazon attending public secondary schools.

During the COVID-19 pandemic, the program was temporarily expanded to provide food assistance to other vulnerable populations, including individuals living in poverty, women and their families, older adults, people with disabilities, Indigenous communities, and residents of penitentiary establishments and juvenile centers. The primary focus remained on serving primary school children.

A comprehensive evaluation of the PNAEQW initiated in 2023 identified numerous opportunities for improvement. As this report was prepared, a new National Community School Meals Program was announced, however, the program (*Wasi Mikuna*) was ended in April 2025. The analysis and recommendations presented here are based on the evaluation of the Qali Warma School Meals Program and can offer valuable insights for the development and implementation of the future school meals program.

Process of the FNG analysis in Peru

The FNG analysis in Peru was conducted between January 2024 and March 2025, led through the coordinated efforts of the Ministry of Development and Social Inclusion, the Ministry of Agriculture, the Ministry of Environment, the Ministry of Health, and the National Institute of Statistics. Data from the annual Peruvian National Household Survey (*"Encuesta Nacional de los Hogares- ENAHO"*) spanning 2016 to 2023 were used for the FNG analysis. Data sources and other details pertaining to country specific data adjustments for the analysis can be consulted in the national FNG report.

As previously noted, the planning, secondary data collection, baseline assessment, intervention modelling, and validation of results were carried out in close collaboration with national authorities and key stakeholders. A comprehensive list of participating organizations can be found in Annex 1.

Key findings of the FNG in Peru

Key findings are divided into 3 categories:

- Cost of basket for households
- School meals
- School meals program impact on carbon emission, land and water use

COST OF BASKET FOR HOUSEHOLDS

Nutrient adequate diets are not affordable to a considerable segment of the Peruvian population.

A nutrient adequate basket — one that meets macro and micronutrient requirements— is out of reach for almost 20 percent of Peruvian homes. A nutrient adequate basket that meets the national dietary guidelines is out of reach for 29 percent homes: the cost namely driven up by the price of eggs and legumes as seasonality was not found to have an impact on the price of staple products in most regions (Figure 9 and Figure 10). The average cost of the diet per person per month is S/. 166[4] (USD 44).

In Peru, where the average national salary is S/.1,674 (USD 446), the cost of a nutrient-adequate food basket for a household of five consumes nearly half (49.5 percent) of the average minimum household income that, while affordable, can strain household budgets.

The analysis further reveals a concerning trend: the percentage of households unable to afford a nutrient-adequate basket has dramatically increased from 11 percent in 2016 to 17 percent in 2023, highlighting a growing affordability crisis. Most strikingly, this inability to afford a nutrient adequate basket disproportionately affects rural areas, with 31 percent and 24 percent of households in the rural jungle and rural highlands, respectively, unable to access a nutrient-adequate basket.

4 S/. 3.66 = USD 1 (March 2025).

Figure 9. Mapped depiction of households without economic access to a nutrient adequate basket.

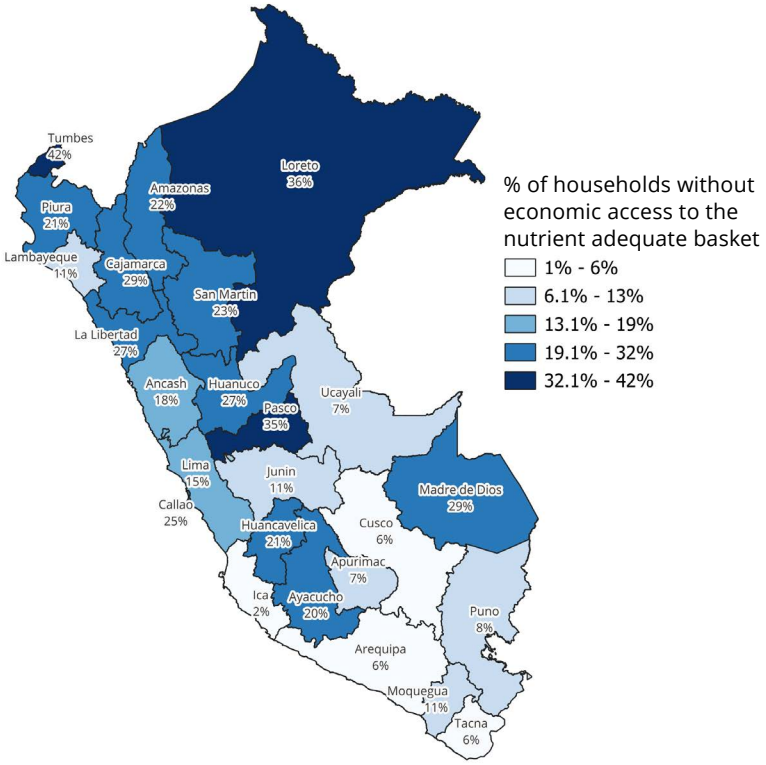
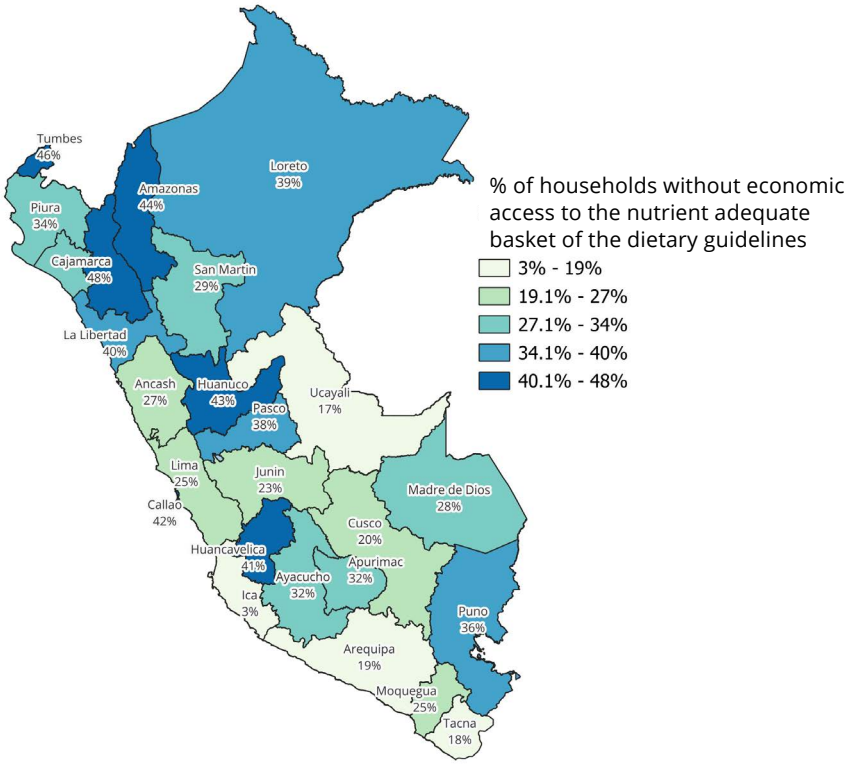


Figure 10. Mapped depiction of households without economic access to a nutrient adequate basket that meets the national dietary guidelines.



Peru faces a dual challenge with regards to availability and consumption patterns: inadequate fruit and vegetable consumption coupled with high intake of ultra-processed foods. Fruit and vegetable consumption is both low and unequal across economic strata, with only 10 percent of the population meeting daily recommendations, and just 5 percent among the poorest. This translates to an average daily intake of only one serving of vegetables and two servings of fruit, falling far short of the recommended 400 grams. This deficiency raises significant public health concerns, particularly for low-income communities, where limited access to fresh produce exacerbates micronutrient deficiencies. The lack of fruit and vegetables directly contributes to inadequate intake of essential vitamins and minerals, further compromising the nutritional status of vulnerable populations. Compounding this issue, the insufficient consumption of fruits and vegetables drives up the cost of a nutrient-adequate food basket by 7%; by not consuming fruit and vegetables, the cost increases to compensate for their micronutrient contribution.

Simultaneously, access, availability and consumption of ultra-processed food is notable, with two-thirds of Peruvians consuming these items weekly, contributing 10 percent of their energy intake. Wealthier segments of the population consume four times more ultra-processed foods, exacerbating health risks. Moreover, incorporating these nutrient-poor, energy-dense foods into the diet increases the cost of a nutrient adequate basket by another 7 percent, further undermining affordability. This concerning trend, particularly pronounced post-COVID, highlights the urgent need to address both the lack of access to nutrient adequate fresh and minimally processed foods and the overconsumption of ultra-processed products.

Table 3. Summary of estimated household cost for each modelled basket*.

Type of basket	Estimated cost (PEN)	Estimated cost (USD)	Unaffordability in relation to household income
Energy adequate basket	PEN 257 [PEN 203- 348]	USD 72 [USD 57-97]	1%
Nutrient adequate basket	PEN 818 [PEN 504 - 1197]	USD 224 [USD138 – 328]	17%
Nutrient adequate and diverse basket	PEN 963 [PEN 867- 1146]	USD 269 [242-321]	29%

*Definitions of the types of baskets can be found at the end of this document.

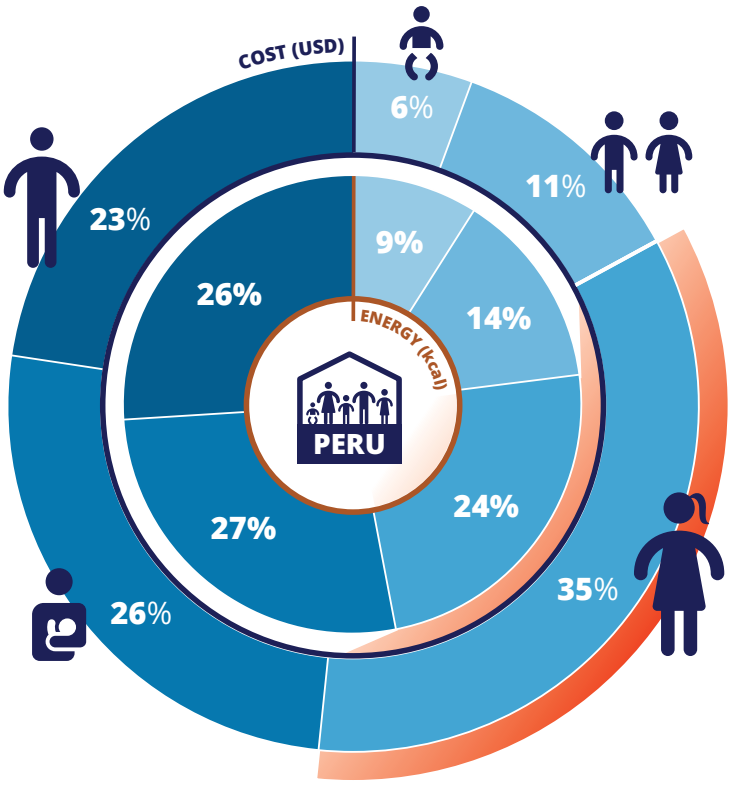
Meeting the nutritional needs of the adolescent girl is the most expensive component of a household's nutrient adequate basket.

While adolescent girls account for 24 percent of the household's energy intake, their diet comprises 35 percent of the total cost. This higher cost stems from their need for nutrient-rich foods to support their unique developmental requirements. Calcium, iron, and zinc were identified as key limiting micronutrients in Peru as they are the costliest in a nutrient-adequate diet. These micronutrients are precisely those that adolescent girls require for adequate growth and development. This is largely because these essential nutrients are commonly found in more expensive animal-source foods.

The nutritional status of adolescent girls profoundly influences their well-being and future opportunities. Malnutrition, including micronutrient deficiencies and anemia, exacerbates gender inequalities by reducing their learning potential. When girls face these nutritional challenges, they are more likely to experience diminished educational opportunities, which impact their social and economic prospects and perpetuate health disparities (UNICEF, n.d.). Poor nutrition during adolescence hampers cognitive development and academic achievement while also weakening their immune system, increasing vulnerability to infections. This decline in health can have lasting effects, limiting girls' ability to fully participate in community life, pursue economic opportunities, and lead healthy, productive lives.

Moreover, if the girl were to become pregnant, inadequate nutrition during this critical period would not only elevate the risk of low birth weight and premature birth—factors that perpetuate a cycle of malnutrition in all its forms across generations—but also further weaken her immunity to infections and increase the likelihood of life-threatening complications during pregnancy and childbirth.

Figure 11. Average per person and individual daily cost of the nutrient-adequate basket in Peru.



SCHOOL MEALS

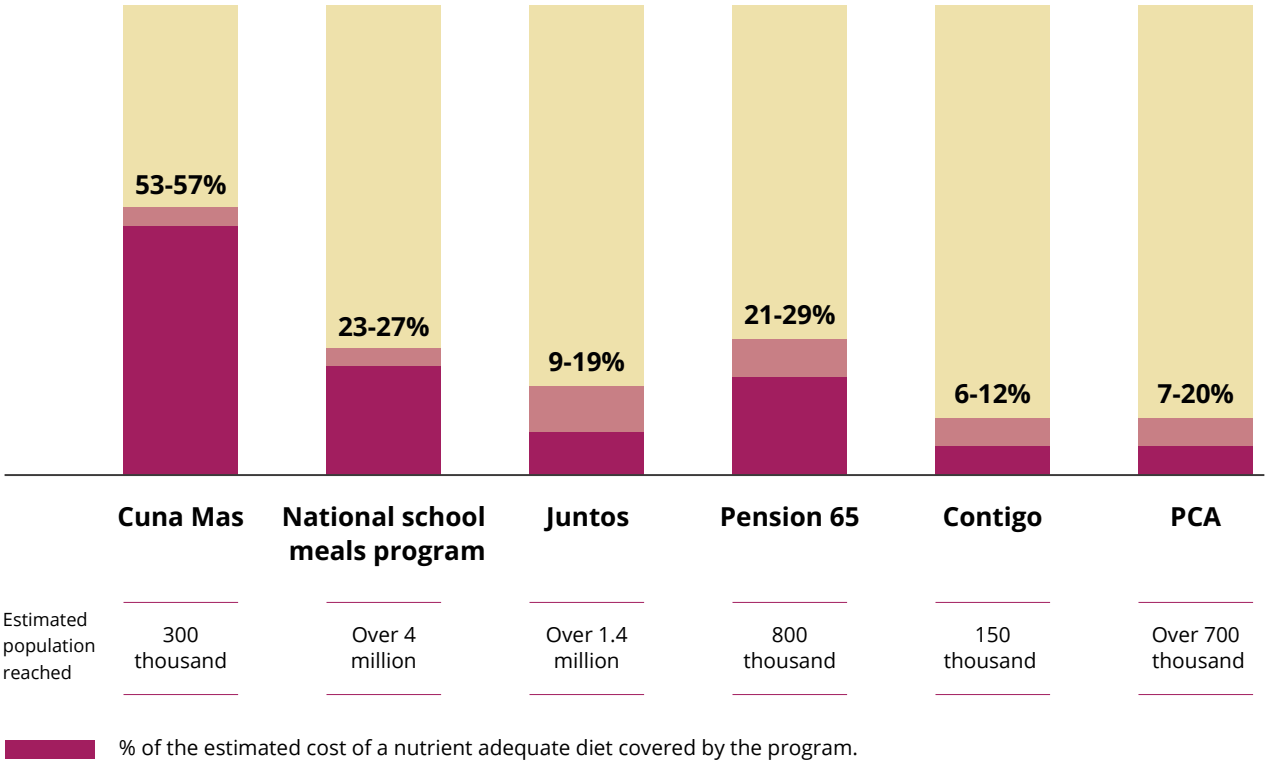
Social protection programs, including school meals, are vital for reducing economic barriers and ensuring access to nutrient adequate diets for vulnerable populations.

Peru has implemented a comprehensive suite of social protection programs designed to improve access to nutritious diets for vulnerable populations throughout their lives.

These initiatives include the *Food Supplementation Program (PCA)*, providing targeted rations to individuals living in poverty; *Cuna Mas*, offering nutritious meals and early childhood development support for children aged 1 to 3; *Juntos*, a conditional cash transfer program integrating nutrition-sensitive interventions; *Pensión 65*, providing a basic retirement income for impoverished seniors; *Contigo*, delivering direct cash transfers to individuals with severe disabilities; and the *School Meals Program*, offering nutritious meals to children aged 3 to 15.

As illustrated in Figure 12, these programs all contribute significantly to offsetting the cost of a nutrient-adequate food basket. While Cuna Mas provides the most substantial financial contribution per beneficiary, the School Meals Program has the widest coverage nationwide, reaching the largest number of individuals and thus making the greatest overall contribution to improved economic access to a nutritious diet.

Figure 12. Average per person and individual daily cost of the nutrient-adequate basket in Peru.



At present, school meals cover over 30 percent of the cost of a nutrient adequate basket for children (3 to 15 years of age).

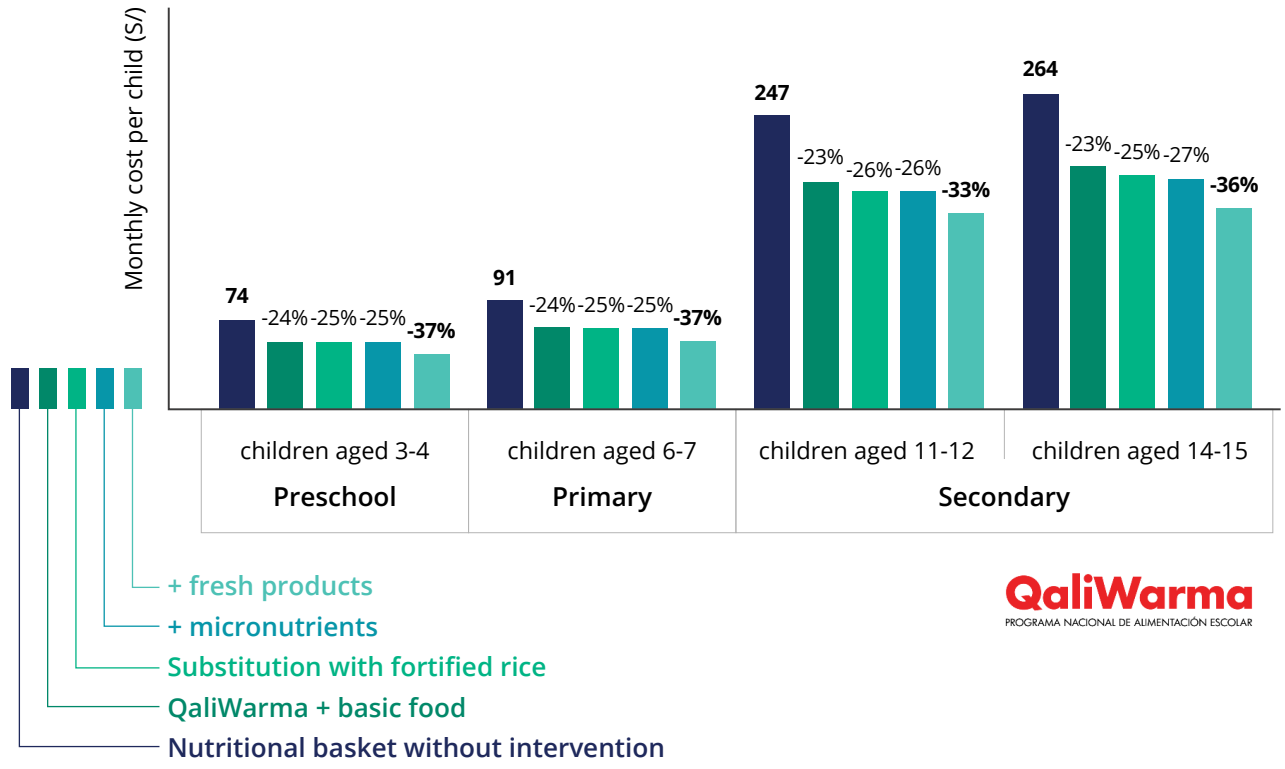
Analysis of the current school meals program in Peru reveals that, as it stands, it can cover up to 35 percent of the cost of a child's diet (ages 3 to 15). To assess the program's potential economic contribution to households, three types of school lunch menus were modelled, focusing on children in the poorest quintiles who receive daily breakfast and lunch: 1) the regular menu, 2) a menu incorporating fortified rice, and 3) a menu incorporating fortification and fresh produce.

Given that rice is a staple food in Peru, with an average per capita consumption of 148 grams per day, the Peruvian government mandated nationwide rice fortification[5] in 2019 as a key strategy to prevent and combat anemia.

This initiative, supported by WFP and other development partners, has been progressively expanded to schools nationwide, though universal distribution to the school meals program has not yet been achieved.

The analysis reveals that adding fresh products to school meals offers a far greater potential – more so than fortification—for reducing the economic burden, lowering the cost of the child´s nutritious diet by over 50 percent across all age groups. This analysis specifically considered incorporating a variety of fresh products into the daily school menu, including bananas, sweet potatoes, milk, celery, carrots, and spring onions. Furthermore, including these foods in the school meals program not only significantly reduces costs but also brings children and adolescents closer to meeting the dietary recommendations outlined in the nutrient-adequate food basket, promoting healthier eating habits and potentially better nutritional outcomes.

Figure 13. Nutrient contribution of the different potential interventions alongside school meals.



*Calculated using Enhance with data from ENAHO 2023. It considers that school meals are provided only during the 180-day school year.

5 Fortificant mix must include vitamin A, b vitamins, vitamin D, E, iron and zinc.

Incorporating more fruits and vegetables into school meals results in significant cost savings for families by providing more balanced and nutrient-rich options.

The analysis shows that integrating fresh produce into school meal programs can cover up to 54 percent of the cost of a nutrient-adequate basket for children across all age groups. This signifies an additional 24% compared to the basket without fresh produce. The analysis compared the monthly cost per child for basic food, fortified rice, micronutrients, and fresh products. By adding fresh items, the economic and nutritional value of meals is greatly enhanced.

This approach not only supports the health and development of children but also alleviates financial demands on families by reducing the overall expense related to meeting nutritional needs. Additionally, emphasizing fresh produce in school meals could promote domestic demand of local agriculture thereby supporting farmers and contributing to a more resilient food system.

SCHOOL MEALS PROGRAM IMPACT ON CARBON EMISSION, LAND AND WATER USE

School meals that meet the dietary guidelines improve diets and have a lower impact on the environment.

These results should be analyzed recognizing that Peru, like Guatemala is a very small contributor to global GHG at 0.38 percent per year according to Andrew and Peters (Andrew and Peters, 2024).

In 2020, Peru established an ambitious updated National Determined Contribution, increasing its adaptation and mitigation goals from 30% to 40% against the Business-as-Usual scenario in 2030. Moreover, in 2021 the Peruvian government developed a Roadmap to achieve sustainable food systems[6]. The document outlines Peru's strategy to achieve a sustainable food system in alignment with the UN's Sustainable Development Goals. It acknowledges the interconnectedness of food production, processing, distribution, consumption, and waste management, emphasizing the need for systems that are productive, equitable, resilient, regenerative, and promote nutritious diets. The roadmap identifies key challenges including malnutrition, poverty, weather extremes' impacts, and unsustainable resource use.

To address these challenges, the roadmap proposes actions across five key areas: ensuring access to nutritious foods, adopting sustainable consumption patterns, promoting sustainable production, fostering equitable livelihoods, and building resilience to vulnerabilities and shocks.

The document emphasizes inter-ministerial coordination, local participation, and the use of existing policy instruments to achieve its vision of a food system that ensures nutritious diets, protects ecosystems, and promotes equitable benefits for all Peruvians by 2030. Findings of analyses like the FNG ground priorities as outlined in the Roadmap for Sustainable Food Systems into policy instruments such as school meals programs.

The FNG analysis found that meeting the dietary guidelines would allow for improved diets and a smaller water footprint. The current environmental impact of school meals is presented in Figure 14. At present production to source school meals demands only 14 percent of the freshwater available for agriculture and 16 percent of the total arable land.

The school meals-specific analysis revealed the following key findings:

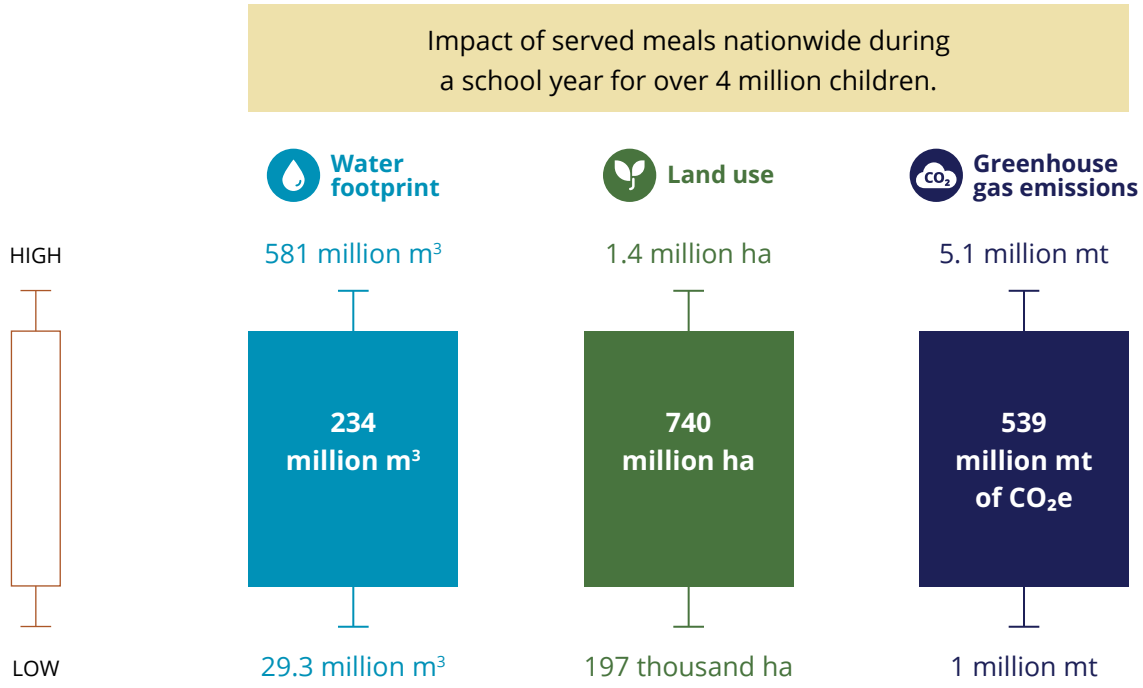
- Cereals, especially rice, and dairy products, contribute most significantly to the water footprint of the program.
- Within the animal-source food group, fish and meat have the largest water footprint.
- Cattle and other meat sources are the primary drivers of land use.
- The meat food group contributes the most to greenhouse gas emissions.
- Including fruits and vegetables to the school meals program would both, help meet the dietary guidelines and reduce the water use of the program.

In this context rice fortification, if properly scaled up to reach universal coverage, could constitute an important mitigation strategy for improving nutrition and reducing environmental impact. According to the model, rice fortification has the potential to decrease greenhouse gas emissions by 13 percent and reduce the freshwater footprint by 1 percent in the least-cost nutrient-adequate food basket. This reduction is made possible by the contribution of essential micronutrients, which would allow for lower consumption of meat and fish while still meeting micronutrient targets.

6 https://summitdialogues.org/wp-content/uploads/2021/09/Hoja-de-Ruta-SAS-Peru-v1-MIDAGRI.pdf

Additionally, other fortification strategies, such as biofortification of purple Peruvian potatoes with iron and zinc, and purple corn with zinc and vitamin A, have been explored and could have a significant impact, but, to date, they have not been scaled up. Yet, even if adequate and comprehensive fortification strategies are in place, the provision of a diversified basket should continue to be prioritized. Additionally, a shift from the production and consumption of livestock products of ruminant origin (beef, milk) to those of monogastric origin (pork, chicken, eggs) could be evaluated as a measure to reduce greenhouse-gas emissions without compromising the nutritional requirements of those most in need.

Figure 14. Estimation of the total current environmental footprint of school meals.



Calculated using Enhance with data from Poore and Nemecek (2018) and school food menus, total commodities and servings for all three levels.

Improving the micronutrient content of school meals through supplementation and fortification strategies is essential for meeting the nutritional needs of children and adolescents, and it can also serve as a strategy for sustainable food systems transformation.

The analysis indicates that while rice fortification does not significantly reduce costs for a school age child (only by 2 to 5 percent), it enhances nutritional density in what is otherwise a starchy food with limited nutritional value. Importantly, the analysis revealed that rice fortification can lower the water and carbon footprint of school meals by reducing the consumption of meat and fish in daily menus. As noted earlier, livestock and other meat sources are the largest contributors to land use and greenhouse gas emissions.

By ensuring adequate micronutrient intake through fortification, the program can decrease reliance on resource-intensive animal products, contributing to a more sustainable and climate-friendly food system. Additionally, fortification addresses the declining micronutrient content of certain foods, a consequence of weather extremes and climate change that impact crop quality and nutrient availability.

Changes in climatic patterns could lead to a dramatic increase in food prices.

The analysis projects that change in climatic patterns could drive up the cost of a nutrient adequate basket by as much as 24 percent in the future. This translates to a substantial increase in the modeled monthly cost of a nutrient-adequate diet for the five-person household, rising from S/.166 (USD 44) per person in 2023 to S/. 206 (USD 55) by 2050, at present value. This can be partially due to the now more frequent extreme weather events associated to El Niño that have caused significant agricultural losses and could affect availability. Moreover, existing research suggests that climate shocks can also diminish the protein, micronutrient, and vitamin content of foods, potentially exacerbating nutritional deficiencies and further increasing costs for consumers.

Beyond enhancing the nutritional value of school meals and reducing the overall cost of a nutrient-adequate diet, these programs can indirectly support environmental sustainability by promoting healthier dietary choices and potentially lessening dependence on certain resource-intensive food production methods. However, it's important to acknowledge that environmental and nutritional goals may involve trade-offs that require careful consideration and informed decision-making. For example, the EAT-Lancet Commission's dietary guidelines, designed to feed a growing population healthily within environmental limits, advocate for overall reduced red meat and sugar consumption and a greater emphasis on plant-based diets. While environmentally sound, policies encouraging shifts towards more plant-based diets can lead to shortfalls micronutrients typically present in animal products (B-vitamins, vitamin D, calcium, iodine, iron, selenium, zinc, and long-chain omega-3 fatty acids) for some age groups of the population, and in countries that currently have a low intake of these nutrient-dense but high environmental impact animal source foods a moderate increase may be required to meet health and nutrition goals, especially among target groups with relatively high needs, such a young children and adolescents. The potential of food fortification as an enabler of more environmentally sustainable, nutritionally adequate and lower cost diets should also be taken into consideration (Grasso et al., 2023).

Implications of the FNG findings for school meals programming

Peru's school meal program stands at a critical juncture, poised for significant strengthening to address pressing nutritional and environmental challenges. As this report was being finalized, a new school meals program is under development.

While school meals currently cover a notable portion (35 percent) of the cost of a child's nutrient-adequate diet, the analysis reveals substantial opportunities for greater impact. Incorporating fortified rice offers a modest increase in the program's contribution, but the addition of fresh produce promises a far more significant reduction in children´s diet cost to the household, potentially exceeding 50 percent.

Furthermore, the analysis underscores the environmental footprint of current food choices, with cereals and dairy contributing substantially to water usage, meat driving land use, and animal products generating the most greenhouse gas emissions. Rice fortification- a nutrition forward strategy that has been promoted in the country for close to a decade- can help mitigate both micronutrient deficiencies and the environmental impact of school meals by reducing reliance on resource-intensive animal products. However, weather extremes pose a significant threat to food affordability, potentially increasing the cost of a nutrient adequate diet by as much as 24 percent, urgently calling for proactive and sustainable solutions.

Based on the above, the following recommendations ensue to enhance the nutritional and economic contributions of the new school meals program:

- **Optimize menus to meet specific developmental needs:** Analyze the feasibility of implementing diverse ration delivery modalities within the school meals program to better meet the needs of different communities and age groups. Most notably, feeding an adolescent is costly; emphasis needs to be placed on school interventions targeting the adolescent girl.

- **Prioritize fresh, locally sourced foods:** Evaluate and progressively incorporate fresh fruit and vegetables sourced from family farms into the program's rations to align with CENAN's nutritional guidelines. Food safety interventions to guarantee the supply of healthy food, including good agricultural practices and promoting integrated pest management, should also be promoted. Furthermore, increased attention and investment should be directed toward communication campaigns that promote fruit and vegetable consumption, leveraging the country's production capacity while remaining cognizant of seasonal availability.

- **Guarantee universal rice fortification as part of the school meals program:** Fortified rice has demonstrated the potential to meet nutritional gaps while potentially reducing environmental demands generated by school meals. While introduced in the country over 6 years ago, its distribution is not yet universal. All children should consume fortified rice and its scale up should be a priority moving forward.

- **Strengthen quality control and nutritional monitoring:** While the FNG analysis provides a valuable snapshot of the school meals program at a specific point in time, improved monitoring and evaluation systems will enable ongoing assessment of the program's effectiveness moving forward. By focusing on the most relevant and useful findings from the analysis, the program should strive to understand and meet the evolving nutritional needs of children, accounting for the heterogeneity of impact among different gender and age populations. This process can also provide continuous insights into the program's overall financial contribution to families.

Extreme weather events associated to El Niño in Peru, are likely to escalate in frequency and intensity, having a dramatic impact on agricultural production, and therefore in the national food systems, household finances and nutritional wellbeing. In this context the following recommendations ensue to promote environmental Sustainability and Climate Resilience through school meals:

- **Promote sustainable diets through school meals:** Develop and implement nutrition education programs that encourage healthier, more sustainable dietary choices, emphasizing plant-based options and reducing consumption of ultra-processed foods. Integrate climate resilience considerations into school meal planning, including diversifying food sources, promoting drought-resistant crops, and implementing water-efficient irrigation practices.

- **Support local sustainable and climate resilient food systems:** Strengthen linkages between the school meals program and local smallholder farmers. Simultaneously, promote the transition to sustainable agricultural practices in arid and semi-arid zones, focusing on both rice production and export crops, ensuring production aligns with local environmental conditions and supports long-term food systems resilience. Doing so, will require adaptation of current agricultural practices to offer options that are nutritionally adequate and resilient to climate variability and more frequent extreme weather events.

- **Foster multi-sectoral collaboration:** Enhance multi-sectoral collaboration between MIDAGRI, MINAM and MIDIS to identify areas for collaboration and promote integrated strategies for sustainable food systems.

Section 3.
Common themes and implication for the region

While specific to their respective contexts, the Fill the Nutrient Gap (FNG) analyses conducted in Guatemala and Peru offer valuable insights into the broader challenges and opportunities facing Latin America's food systems.

By examining the potential of school meal programs to address pressing issues such as malnutrition, rising diet costs, increased availability, access and promotion of ultra processed foods and environmental sustainability, we can identify key lessons and recommendations that hold relevance for the region. These findings should prompt reflection among stakeholders in school meal programs across Latin America, guiding efforts to enhance their ongoing efforts.

In **Guatemala**, shifting from take-home rations to prepared nutritious and safe meals served in schools, coupled with an age-appropriate comprehensive supplementation strategy, could fulfill most children's nutritional needs and alleviate financial strain on families, leading to improved overall well-being. In **Peru**, incorporating fresh fruits and vegetables can dramatically enhance the nutritional composition of school meals while simultaneously benefiting the environment. These findings underscore the immense potential of school meal programs to address malnutrition and promote sustainable food systems. Realizing this potential, however, demands sustained political commitment and significant programmatic adjustments to ensure these programs are effectively implemented and meet their objectives.

Beyond reflecting on the findings of these recent FNG exercises, the following key takeaways should be carefully considered.

- **The nutritional quality of school meals matters.** Improving the nutritional content of school meals should be a priority across the region. School meals should be aligned with dietary guidelines, and countries should update these guidelines to consider environmental sustainability issues. Nutritionally dense meals not only contribute to alleviating the financial cost of the child to the household but signify that – especially – the most vulnerable will have a diet that is conducive to better health, nutrition, economic achievement and productivity later in life. It is also important that school meals be free of sugary drinks and ultra-processed foods given the overwhelming evidence of their negative effects on human health.

- **Food fortification and micronutrient supplementation are not merely desirable; they are essential interventions.** In a region where micronutrient deficiencies are prevalent and anemia impairs the growth and development of millions of children, implementing these strategies alongside school meal programs is a critical imperative. In the context of increasing weather extremes — where the nutritional value of harvested foods and production is projected to decline—the widespread adoption of fortification becomes even more crucial to ensure adequate nutrient intake. Investing in food fortification and micronutrient supplementation represents a strategically sound approach to addressing these deficiencies, particularly among vulnerable populations such as children and pregnant women.

  Both interventions have demonstrated significant cost-effectiveness in improving public health outcomes and provide a high return on investment. Numerous studies indicate that for every dollar invested in micronutrient supplementation, substantial benefits can be realized in terms of health outcomes and economic productivity. The World Bank emphasizes that addressing micronutrient deficiencies through targeted interventions can lead to reduced healthcare costs, increased productivity, and an enhanced quality of life (World Bank, 2016). Moreover, when these interventions are aligned with supportive policy frameworks, they can achieve sustainable results and drive significant public health advancements (Global Alliance for Improved Nutrition, 2015).

- **Meeting the needs of the adolescent girl is crucial.** There is a pressing need for targeted interventions to ensure they have access to affordable, nutrient-rich foods that support their unique developmental requirements. During puberty, adolescents generally have high nutritional needs due to rapid growth; however, biological changes like menarche create specific requirements for girls, particularly an increased need for iron to compensate for losses during menstruation. The finding that adolescents represent the highest cost to families is not limited to Guatemala or Peru. Bose et al. (2020) documented similar challenges in El Salvador, Ghana, Madagascar, and Laos PDR, highlighting significant financial constraints in meeting the nutritional intake recommendations for adolescent girls and lactating women.

- **Ultra processed foods are at odds with the health and economic best interests of households.** As evidenced for both countries in the analysis, energy-dense foods increase the cost of a nutrient adequate basket but households while harming nutritional well-being. Comprehensive policies to ensure healthy food systems that support nutritious food environments, and which address multiple factors including availability, affordability and access of nutritious foods by the most vulnerable, are urgently needed. These should regulate obesogenic/ unhealthy food environments in schools– a pressing challenge affecting school aged children and adolescents' malnutrition- and a pivotal action to improving diets. Social and behavior change communication strategies to disseminate the information at large should be implemented alongside.

- **While this report only considers a fraction of school meals´ potential environmental impacts, the need to further examine them is evident.** Close to 80 million children in Latin America and the Caribbean receive some form of school meal daily, and the way these meals are sourced, prepared, managed, and distributed has significant environmental implications. Of the estimated 408 million children receiving school meals globally, 16% are in Latin America (WFP, 2022).

  To enhance the effectiveness and sustainability of school meal programs in Latin America, it is essential to promote nutrient-rich diets and engage in local, sustainable sourcing that respects seasonal availability. This approach should also emphasize climate-resilient agricultural practices to adapt to climate variability, while also providing stakeholders with policy tools and programs that support climate-resilient smallholder agriculture. These tools can include improved access to financial products to reduce risk and increase working capital, enhanced infrastructure, and inclusive technology transfers that account for changing climatic patterns—such as high-precision irrigation and drought-resistant crop varieties. Initiatives that encourage the formation of smallholder farmer associations through cooperatives can further enable additional supply and improve the availability and affordability of fresh, nutritionally dense foods.

  Additionally, these tools should include incentives that stimulate increased demand for more diverse foods, allowing the private sector to respond effectively. By involving local communities and prioritizing sustainable practices, we can ensure that school meals are not only nutrient adequate and culturally relevant but also contribute positively to environmental sustainability.

- **Unpaid labor in school meal programs is common across the Latin American region.** Engaging parents, who are deeply committed to their children's well-being, along with local communities, is a valuable strategy to ensure the effectiveness and cultural relevance of these programs. However, providing adequate compensation is essential to guarantee quality, continuity, and sustained commitment to the success of the programs.

- **Monitoring and evaluation are essential, not optional.** Robust systems are needed to track progress, as well as shifts in vulnerability, and inform policy decisions timely and effectively. The FNG is a powerful tool that provides prospective analysis, which aids in shaping future decisions. However, implementing these systems requires a significant investment of time and resources from countries. While they facilitate reflection and analysis, continuous improvement demands ongoing follow-up and awareness of both successes and failures within a program. These evaluation efforts do not replace the need for adaptable monitoring systems that can evolve to address emerging challenges, such as environmental concerns in school meals.

- **The need for integrated, multi-sectoral approaches that prioritize both children´s rights, human health and environmental stewardship to build more resilient and equitable food systems across Latin America has never been more critical.** To achieve this, enhancing collaboration among government ministries, local communities, NGOs, and other stakeholders is essential for effectively addressing the complex challenges faced by school meal programs.

By fostering partnerships across sectors, we can leverage diverse resources, knowledge, and expertise, ensuring that school meal initiatives not only provide nutrient adequate food but also consider cultural relevance and environmental sustainability. Collaborative efforts will empower communities, promote local sourcing, and encourage sustainable practices, ultimately leading to more effective and adaptive school meal programs that meet the needs of children and support overall health and wellbeing in the region.

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Annexes

Annex 1. List of participating institutions in the FNG national data collection and validation process in Guatemala.

Category	Institution	Official acronym (in Spanish)
GOVERNMENT MINISTRIES	Ministry of agriculture, Livestock and Food	Ministerio de Agricultura Ganadería y Alimentación (MAGA)
	Vice ministry of Food and Nutritional Security	Viceministerio de Seguridad Alimentaria y Nutricional (VISAN)
	Directorate of Food and Nutritional Assistance	Dirección de Asistencia Alimentaria y Nutricional (DAAN)
	Ministry of Public Health and Social Assistance of Guatemala	Ministerio de Salud Pública y Asistencia Social de Guatemala (MSPAS)
	Food and Nutrition Security Program	Programa de Seguridad Alimentaria Nutricional (PROSAN)
	Ministry of Social Development of Guatemala	Ministerio de Desarrollo Social de Guatemala (MIDES)
	Ministry of Environment and Natural Resources of Guatemala	Ministerio de Ambiente y Recursos Naturales de Guatemala (MARN)
	National Institute of Statistics	Instituto Nacional de Estadística
	Secretariat of Food and Nutritional Security (SESAN)	Secretaria de Seguridad Alimentaria y Nutricional (SESAN)
	Vice Ministry of Food and Nutritional Security	
	Ministry of Education	Ministerio de Educación
ACADEMIA	Nutrition Institute of Central America and Panama (INCAP)	Instituto de Nutrición de Centro América y Panamá (INCAP)
UN SYSTEM	World Food Programme (WFP)	Programa Mundial de Alimentos (WFP)
	Food and Agriculture Organization (FAO)	Organización de las Naciones Unidas para la Alimentación y la Agricultura (FAO)

Annex 2. List of participating institutions in the FNG national data collection and validation process in Peru.

Category	Institution	Official acronym (in Spanish)
GOVERNMENT MINISTRIES	Ministry of Health	Ministerio de Salud (MINSA)
	National Institute of Health/ National Center for Food, Nutrition and Healthy Living	Instituto Nacional de Salud/ Centro Nacional de Alimentación, Nutrición y Vida Saludable.
	Ministry of Development and Social Inclusion	Ministerio de Desarrollo e Inclusión Social (MIDIS)
	National Solidarity Assistance Program Pension 65	Programa Nacional de Asistencia Solidaria Pensión 65
	National Program for the Delivery of Non-Contributory Pensions to People with Severe Disabilities Living in Poverty - CONTIGO	Programa Nacional de entrega de la pensión no contributiva a personas con discapacidad severa en situación de pobreza-CONTIGO
	DPSC	DPSC
	National School Meals Program Qali Warma	Programa Nacional de Alimentación Escolar Qali Warma (PNAEQW)
	National Program CUNAMAS	Programa Nacional CUNA MAS
	DDPS	DDPS
	General Directorate of Monitoring and Evaluation	Dirección General de Seguimiento y Evaluación (DGSE)
	Ministry of Agrarian Development and Irrigation	Ministerio de Desarrollo Agrario y Riego (MIDAGRI)
	Ministry of Environment	Ministerio del Ambiente (MINAM)
ACADEMIA	Nutritional Research Institute	Instituto de Investigación Nutricional (IIN)
CIVIL SOCIETY	Roundtable for the fight against poverty	Mesa de concertación para la lucha contra la pobreza (MCLCP)
UN SYSTEM	United Nations Children Emergency Fund (UNICEF)	Fondo de las Naciones Unidas para la Infancia (UNICEF)
	World Food Programme (WFP)	Programa Mundial de Alimentos (WFP)

Definitions

Environmental footprint: A measure of the environmental impact of human activities, expressed in terms of the natural resources used, such as land and water, and the emissions generated, including greenhouse gases.

Energy adequate food basket: Optimized food combination that meets only energy (kcal) requirements, (as per the FNG methodology).

Essential micronutrient: refers to any micronutrient (vitamin or mineral), which is needed for normal growth, development, and function by the body in small amounts throught the human life cycle.

Fortification: the practice of deliberately increasing the content of essential micronutrient(s), i.e., vitamins and minerals, in a food, to improve the nutritional quality of the food supply and provide a public health benefit with minimal risk to health. The essential micronutrients are added to make the food more nutritious post harvesting.

Fortified rice: rice fortified with fortificant mix by dusting, or non-fortified rice combined with the fortified kernels in a 0.5%-2% ration. Typically, fortified kernels are blended with non-fortified rice in 1:100(1%) ratio.

Greenhouse gas emissions: Measures global warming potential and is expressed in mass of carbon dioxide equivalent (kg CO2 eq).

Land use: estimates the areas occupied by good production and is expressed in units of area (square meters (m2)).

Micronutrient deficiencies: a form of malnutrition caused by an insufficient intake of vitamins and minerals (also known as micronutrients), which are essential for human health, growth, development and function; also referred to as micronutrient malnutrition or hidden hunger.

Micronutrient powders: single-dose packets or multiple-dose packets of dry powder containing lipid encapsulated iron and other micronutrients for delivering iron and other micronutrients with food.

Nutrient adequate basket: Optimized food combination that meets energy, fat, protein and micronutrient requirements, including staple adjustment to reflect staple preference (as per the FNG methodology).

Nutrient adequate and diverse basket (also referred to as a healthy basket): Optimized food combination that meets energy, fat, protein and micronutrient requirements and includes diverse foods groups in line with national food based dietary guidelines (as per the FNG methodology).

Safety nets: are one component of social protection systems. They are formal or informal non-contributory transfer programs designed to provide predictable support to people who are vulnerable to or living in poverty or who are facing malnutrition or other forms of deprivation. The terms “safety nets”, “social transfers” and “social assistance” all refer to non-contributory transfers.

Served [school] meals: hot meals prepared and served in schools for children.

Social Protection: refers to a broad set of arrangements and instruments designed to protect members of society from shocks and stresses over the lifecycle. It includes social assistance for the poor, contributory insurance for the vulnerable, labor market regulations, and social justice for the marginalized. At a minimum, social protection systems include safety nets, labor market policies, insurance options, and basic social services. Overall, the components of social protection are often underpinned by rights and legislation, such as minimum wage.

Stunting: refers to a child who is too short for his or her age and is the result of chronic or recurrent malnutrition.

Take home ration: food basket to be taken home and consumed by individuals, typically to supplement existing diets or to address specific nutritional needs.

Triple burden of malnutrition: the simultaneous existence of undernutrition (stunting, wasting, and underweight), overnutrition (overweight and obesity), and micronutrient deficiencies (hidden hunger) within the same population or even within the same household.

Water use: estimates the use of a valuable natural resource and is expressed in volume (liters)

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