# Nutrition-sensitive Food Systems: Brief Perspectives

*Lalita Bhattacharjee[1*], Richemont Seki[2], Md. Musharraf Ashraf [3], Kraisid Tontisirin[4]*

[1]Food and Agriculture Organization of the United Nations (FAO), [2]International Fund for Agricultural Development (IFAD), [3]BRAC James P Grant School of Public Health, BRAC University, Mohakhali, Dhaka 1213, [4]Institute of Nutrition, Mahidol University (INMU) & Faculty of Medicine Ramathibodi Hospital, Member of the Senate, Government of Thailand.

## Summary

Food systems – covering the 'production to the plate' chain – comprise food production, processing, marketing, utilization, and consumption. It facilitates peoples' access to nutritious food in an adequate amount and variety necessary for maintaining a healthy life, irrespective of age, gender, culture, and social stratum. Food systems also address people's access to information to facilitate their informed choice of food. To this end, food system elements and nutrition have linkages that offer opportunities for policy priorities, programs, and strategies. The trends in hunger and food insecurity, dietary consumption, and malnutrition appear to vary across the globe amidst the recurrent effects of global warming and socio-political crises which pose challenges for many developing countries to achieve the SDG 2.1 target. There is a need for strengthening the linkages between sustainable healthy diets for nutrition and between food systems and nutrition along with addressing the alterations in food systems amidst urbanization and diet changes. Policy actions should leverage nutrition-sensitive agriculture and food systems with prospects for women, small holder farmers, and communities to improve diets and nutrition.

***Keywords:*** Food systems, Healthy diets, Nutrition-sensitive agriculture, Malnutrition

## Nutrition-sensitive food systems concept

Healthy food is essential for a healthy and productive life. Good health originates with food that is safe and sufficiently diverse to provide an adequate amount of essential nutrients to each member of a family. Apart from providing essential nutrients, a healthy diet offers health benefits, helps prevent chronic diseases, and promotes nutritional wellbeing. Good food comes from agriculture, starting with appropriate selections of crops, as well as the sequence of crops cultivated in a particular field. Techniques used for the overall management of the agricultural processes including, product handling, preservation, safe storage, marketing, application of food standards, and correct food preparation are also important for the availability of good food. Food systems – covering the 'production to plate' chain – comprise food production, processing, marketing utilization, and consumption domains. It facilitates people's access to safe and nutritious foods as well as the knowledge and information needed to make healthy choices of food.

In the last decade, there has been a growing consensus among policymakers and practitioners on the importance of food systems in alleviating global hunger and malnutrition. To this end, food systems offer an entry point for contributions of agriculture, health, and nutrition in identifying policy priorities, programs, and strategies. Designing nutrition sensitive food systems can contribute to healthier foods and ensure better nutrition for the populace. This needs an understanding of the different components of the food system encompassing food production to consumption and necessitates designing, planning, and executing policies and program options to remodel the food systems to sustainably produce and stimulate demand for safe and diversified diets.

This article provides a brief analysis of (a) the trends in hunger, food insecurity, dietary consumption, and malnutrition, overall (b) the linkages between healthy and sustainable diets for nutrition (c) the linkage between food systems and nutrition, (d) the changes in food systems with urbanization and diet changes, (e) the policy options for nutrition-sensitive agriculture and food systems with an emphasis on women, small scale farmers and communities.

### Trends in hunger, food insecurity, dietary consumption, and malnutrition

Changes have occurred in the last two decades on the nutritional status of populations in developing Asian countries and they have influenced

**Corresponding author, Email: Lalita.bhattacharjee@fao.org*

the policies and programs in designing and implementing the food systems.

***Global trends in hunger and food insecurity***

To monitor progress on food security and reduction of hunger as stipulated in the Sustainable Development Goals (SDGs), the prevalence of undernourishment (PoU) is used as one of the major indicators. According to FAO (FAO, 2008), undernourishment, a measure of dietary energy inadequacy, is different from undernutrition and refers to the fraction of the populace whose energy intake is below a pre-established level. This pre-determined level, expressed in terms of the number of kilocalories essential for carrying out sedentary or light activities, is country-specific and varies depending on the age and gender structure of the populace. According to the State of Food Security and Nutrition in the World 2019 (FAO, IFAD, UNICEF, WFP & WHO, 2019), while the global prevalence of undernourished population remains almost stable in recent years, the condition is disquieting in Africa, where there is an increase in PoU. This is marked in West Africa, which has the highest increase in rate (Table 1). The recurrent effects of climate change and recent socio-political crises have contributed to the deterioration of the situation. Considering the current trends, it would be difficult for many developing countries to realize the SDG 2.1 goal which implies ending global hunger by the year 2030 through ensuring safe and nutritious food in an adequate amount for all people irrespective of their economic conditions.

## Trends in dietary consumption

In Asia, energy-dense foods traditionally represent a large proportion of the diets, with cereals, roots, and tubers providing the largest share of the energy intake. However, there have been efforts to increase the consumption of nutrient-dense foods that are rich in nutrients but low in calories, in contrast to energy-dense foods which are high in calories and notably low in nutrients. Nutrient-dense foods provide essential micronutrients and good quality proteins that contribute to the proper functioning of the human body and optimum health. In many countries, in the absence of data on dietary energy intake (DEI) from food consumption surveys, dietary energy supply (DES) is used as a proxy indicator to assess dietary supplies for consumption and diversity.

**Table 1.** Trends in frequency of undernourishment** in the World, in Africa and Asia (FAO, IFAD, UNICEF, WFP and WHO, 2019)

| | Frequency of undernourishment (%) | | | | | |
|---|---|---|---|---|---|---|
| | 2005 | 2010 | 2015 | 2016 | 2017 | 2018* |
| **WORLD** | **14.5** | **11.8** | **10.6** | **10.7** | **10.8** | **10.8** |
| **AFRICA** | **21.2** | **19.1** | **18.3** | **19.2** | **19.8** | **19.9** |
| Northern Africa | 6.2 | 5.0 | 6.9 | 7.0 | 7.0 | 7.1 |
| Sub-Saharan Africa | 24.3 | 21.7 | 20.9 | 22.0 | 22.7 | 22.8 |
| Eastern Africa | 34.3 | 31.2 | 29.9 | 31.0 | 30.8 | 30.8 |
| Middle Africa | 32.4 | 27.8 | 24.7 | 25.9 | 26.4 | 26.5 |
| Southern Africa | 6.5 | 7.1 | 7.8 | 8.5 | 8.3 | 8.0 |
| Western Africa | 12.3 | 10.4 | 11.4 | 12.4 | 14.4 | 14.7 |
| **ASIA** | **17.4** | **13.6** | **11.7** | **11.5** | **11.4** | **11.3** |
| Central Asia | 11.1 | 7.3 | 5.5 | 5.5 | 5.7 | 5.7 |
| Eastern Asia | 14.1 | 11.2 | 8.4 | 8.4 | 8.4 | 8.3 |
| South-eastern Asia | 18.5 | 12.7 | 9.8 | 9.6 | 9.4 | 9.2 |
| Southern Asia | 21.5 | 17.2 | 15.7 | 15.1 | 14.8 | 14.7 |
| Western Asia | 9.4 | 8.6 | 11.2 | 11.6 | 12.2 | 12.4 |
| Western Asia and Northern Africa | 8.0 | 7.1 | 9.2 | 9.5 | 9.8 | 9.9 |

* Projected values from FAO

** A measure of dietary energy inadequacy

Data from Asian developing countries shows that the contribution of cereals, roots, and tubers to DES has reduced gradually. Concurrently, intake of foods that are rich in nutrients, such as vegetables, pulses, meat, and fish have been favoured (Table 2) by an improvement of purchasing power and increasing demand for more diversified foods. However, the increase is very slow, especially for animal proteins, pulses, fruits, and vegetables, and denotes that the dietary diversification is still low. The analysis of the consumption trends also reveals a worrying increase in the consumption of fats and sugar, correlated to a more sedentary lifestyle, and which could be responsible for overweight and obesity, key causal factors of diet-associated non-communicable diseases which are on the rise. A similar situation is observed in milk consumption (Table 3). Improvement in living conditions and urbanization are key drivers of this increase.

**Table 2.** Trends in share (%) of dietary energy supply from main foods in Asia (in 1992, 2012, and 2014) (FAO, 2014)

| Food commodity | Year | | |
|---|---|---|---|
| | 1992 | 2002 | 2014 |
| Cereals excluding beer | 62.7 | 57.5 | 52.7 |
| Starchy roots (%) | 4.1 | 4.0 | 3.6 |
| Sugars and sweeteners (%) | 6.0 | 6.1 | 5.9 |
| Pulses (%) | 2.3 | 2.0 | 2.2 |
| Treenuts (%) | 0.2 | 0.3 | 0.5 |
| Oilcrops (%) | 2.0 | 2.2 | 2.2 |
| Vegetables (%) | 2.2 | 3.4 | 4.1 |
| Fruit – excluding wine (%) | 1.7 | 2.3 | 2.9 |
| Alcoholic beverages (%) | 1.3 | 1.3 | 1.6 |
| Stimulants (%) | 0.0 | 0.1 | 0.1 |
| Meat and offal's (%) | 5.3 | 6.8 | 7.9 |
| Vegetable oils and animal fats (%) | 7.7 | 8.6 | 9.7 |
| Fish, sea food and aquatic products (%) | 0.8 | 1.1 | 1.3 |
| Milk excluding butter (%) | 2.4 | 2.6 | 3.3 |
| Egg (%) | 0.7 | 1.2 | 1.3 |

**Table 3.** Past and projected meat and milk consumption (Bruinsma et al., 2003)

| Region | Meat (kg/year) | | | Milk (kg/year) | | |
|---|---|---|---|---|---|---|
| | 1964-1966 | 1997-1999 | 2030 | 1964-1966 | 1997-1999 | 2030 |
| World | 24.2 | 36.4 | 45.3 | 73.9 | 78.1 | 89.5 |
| Developing countries | 10.2 | 25.5 | 36.7 | 28.0 | 44.6 | 65.8 |
| East Asia | 8.7 | 37.7 | 58.5 | 3.6 | 10.0 | 17.8 |
| South Asia | 3.9 | 5.3 | 11.7 | 37.0 | 67.5 | 106.9 |
| Industrialized countries | 61.5 | 88.2 | 100.1 | 185.5 | 212.2 | 221.0 |
| Transition countries | 42.5 | 46.2 | 60.7 | 156.6 | 159.1 | 178.7 |

Developing Asian countries are having improved access to electricity and cold chain infrastructure, thus increasing the trade of animal foods, which are perishable. The rise of the middle class has generated demand for animal foods, which are considered tastier but less affordable to the poor. However, increased consumption of animal-source foods does not contribute to sustainable food systems and diets.

Box 1 below presents case studies highlighting the trends in the consumption of key foods in India and Bangladesh. It shows that some progress is made in the intake of foods rich in micronutrients such as fruits, while on the contrary, an increase is also observed in the consumption of foods rich in calories such as fat, which is linked to the rise of overweight and obesity that is being observed.

**Box 1 | Case-studies: Consumption trends in India and Bangladesh**

Protein and fat consumption beyond recommendation in India. Although protein consumption has gone down from 1983 to 2011-12 in both rural and urban regions respectively from 63.5 g/capita/day to 55.7 g and 58.1 g to 55.7 g, per capita, intake still remains above the daily minimum required amount according to the recommended dietary allowance (RDA) level. Fat consumption is increasing since 1983 at a faster rate in rural areas (34.8%) compared to urban areas (29.3%). Over the period 1983 to 2011-12, fat consumption in rural region has increased from 27.1 g/capita/day to 41.6 g/capita/day. In the same period, in urban areas, fat consumption has increased from 37.1g/capita/day to 52.5 g/capita/day. This is a concern, as these amounts consumed are much higher than the RDA level suggested. For rural India, the RDA estimates for protein and fat are 48g/capita/day and 28g/capita/day respectivelly. For urban areas, the estimates are 50g/capita/day and 26g/capita/day of protein and fat respectively. Such a trend in dietary intake is related to the high occurrence of overweight, obesity, and non-communicable diseases (NCDs) that is currently observed in India. With the economic improvement, the decrease in cereal intake has been substituted by excess consumption of protein and fats.

Decrease of cereal consumption in Bangladesh: Rice is the major cereal consumed in Bangladesh. National rice consumption significantly dropped from 464.3g/capita/day in 1995-96 to 367.19 in 2016 (Household Income and Expenditure Surveys 1995-96 and 2016) [BBS, 1998; BBS, 2019]. Available data suggests an important reduction in the daily per capita consumption of cereals which contributed to 70% of total dietary energy intake in 2010 to between 64% - 66% in 2016 (Second Country Investment Plan (CIP2) Monitoring Report 2019) (FPMU, Ministry of Food, Bangladesh, 2019). This trend indicates that Bangladesh is on track towards achieving the expected target of 60% of the total cereal dietary energy intake by 2020, as set in the national food and nutrition security policies and actions plans. In the last decade, an emphasis has been put on the nutrition sensitization of policymakers and nutrition education of the populations on healthy diets for improved nutrition, contributing to achieving the observed positive trend (Food and Nutrition Security Analysis, India, 2019; Ministry of Statistics and Programme Implementation & WFP, 2019).

### *Malnutrition trends: Global and regional scenarios*

Malnutrition, in all its forms, negatively affects people's life. It imposes high economic and social costs. Globally, about 24% of children under five years of age are stunted. Malnutrition is a multifaceted, complex problem that necessitates a concerted multi-sectoral approach to address. The role of food and agriculture is critical in resolving the malnutrition issue (FAO, 2013).

While undernutrition has reduced in many developing countries, the situation remains unacceptable, especially in southern and south-Eastern Asia, where malnutrition rates are the highest (above the global level) and represent a public health issue.

In the south and south-Eastern Asia, child stunting was 32.7% and 25% respectively in 2018 against 40% and 30.6% in 2012 (Table 4). A similar trend is observed for child wasting or acute malnutrition (SDG indicator 2.2.2) (Table 5).

**Table 4.** Comparison between global and regional trends of stunting prevalence in Asia (UNICEF, 2013) (UNICEF-WHO-The World Bank Group, 2019)

| Stunting prevalence in children under five years (%) | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|
| Global | 26.2 | 25.6 | 25 | 24.4 | 23.9 | 23.3 | 22.8 | 22.4 | 21.9 |
| Southern Asia | 40.0 | 39.1 | 38.1 | 37.2 | 36.3 | 35.4 | 34.5 | 33.6 | 32.7 |
| South-eastern Asia | 30.6 | 29.9 | 29.1 | 28.4 | 27.7 | 27.0 | 26.4 | 25.7 | 25.0 |

**Table 5.** Comparison between global and regional trends of wasting prevalence (UNICEF, 2013; UNICEF-WHO-The World Bank Group, 2019)

| Wasting prevalence in children under five years (%) | 2011 | 2018 |
|---|---|---|
| Global | 8.0 | 7.3 |
| South-Central Asia | 14.8 | 14.6 |
| South-eastern Asia | 9.7 | 8.7 |

Malnutrition is a multidimensional problem; it can manifest itself either as undernutrition, micronutrient deficiency, or overnutrition. Notably, many developing countries, particularly in Asia, are experiencing coexistence of all three forms of malnutrition within the country, community, or even within the same household (Figure 1). This poses challenges to the socio-economic development of countries and requires urgent actions to address the situation.

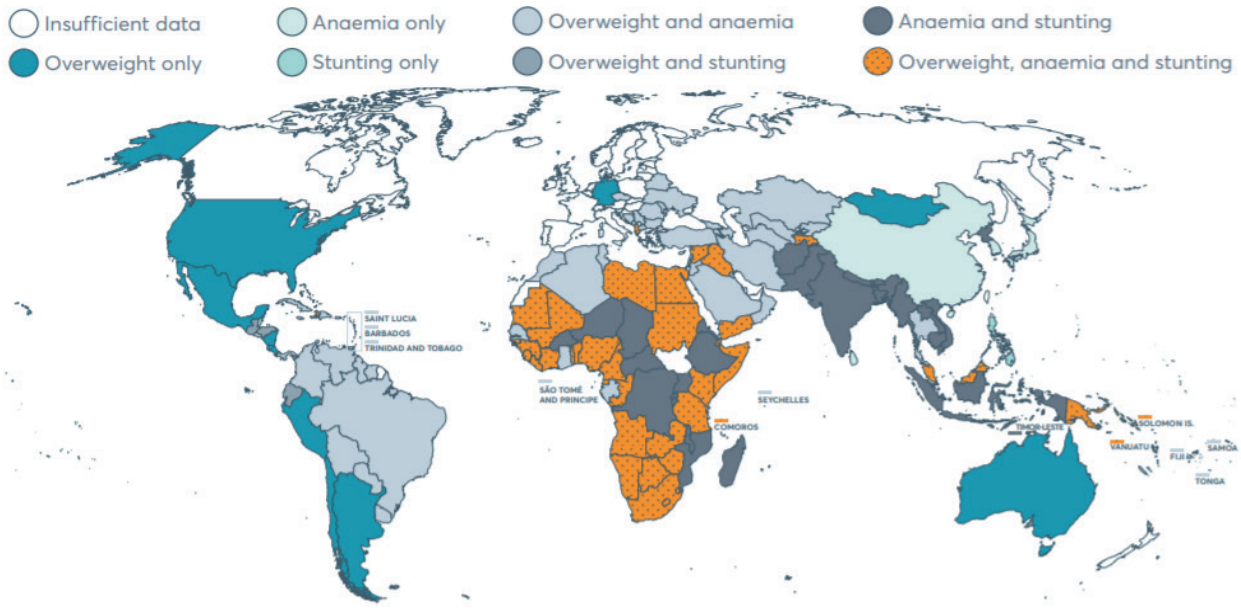


**Figure 1.** Coexistence of multiple forms of malnutrition in countries (Ng et al., 2014).

## Healthy and sustainable diets for achieving nutrition outcomes

Healthy and sustainable diets comprise mainly of verities of plant-based foods, contain a high level of unsaturated fats, while low in saturated fats, refined grains, and foods from animal sources. They should also be low in salt content, added sugar as well as ultra-processed foods (The EAT-Lancet Commission on Food Planet Health, 2019). On the basis of a comprehensive literature review, dietary practices, and health goals, the EAT-Lancet Commission has developed scientific targets for healthy diets (Table 6).

With evidence linking diets with health and environmental sustainability, there is a need for dietary guidelines and nutrition-related targets to guide agriculture, food, and health sectors in policies, programs, and strategies to deliver desirable dietary choices and sensitize the population to make wise food choices and consume healthy diets.

While most countries have national dietary guidelines and food guides that are used in nutrition education and as a tool for policymakers and nutrition and health practitioners, the dietary guidelines need to be considered as a policy tool in agriculture and food planning (FAO, n.d.). The proposed EAT-Lancet Commission guideline below can also be considered for adapting the scientific targets to harmonize with national food production and consumption strategies.

**Table 6.** Scientific targets for global healthy diet, with probable ranges for an intake of 2500 kcal/day

| **Food group** | | **Macronutrient intake grams per day (possible range)** | **Calorie intake kcal per day** |
|---|---|---|---|
| *Whole grains:* Rice, wheat, corn, millets, and others | | 232 | 811 |
| *Tubers or starchy vegetables:* Potatoes and cassava | | 50 (0-100) | 39 |
| *Vegetables:* All vegetables | | 300 (200-600) | 78 |
| *Fruits:* All Fruits | | 200 (100-300) | 126 |
| Dairy foods: Whole milk or equivalents | | 250 (0-500) | 153 |
| *Protein sources:* | Beef, lamb, and pork | 14 (0-28) | 30 |
| | Chicken and poultry | 29 (0-58) | 62 |
| | Egg | 13 (0-25) | 19 |
| | Fish | 28 (0-100) | 40 |
| | Legumes | 75 (0-100) | 284 |
| | Nuts | 50 (0-75) | 291 |
| *Added fats:* | Unsaturated | 40 (20-80) | 354 |
| | Saturated | 11.8 (0-11.8) | 96 |
| *Added sugars:* All sugars | | 31 (0-31) | 120 |

**Source:** Wilett et al. (2019)

## Linkage between food systems and nutrition

Food systems can improve nutrition in many ways. For instance, they can influence the type and quality of food produced, processed, and commercialized; at the same time contribute to women's empowerment and adequate management of natural resources (FAO, 2017). Therefore, it is fundamental to understand those pathways and the challenges in consolidating the relationships between food systems and nutrition.

The UNICEF Conceptual Framework for Malnutrition (UNICEF, 2013) categorizes the major causes of malnutrition as immediate, underlying, and basic. Insufficient intake of healthy food leading to poor health is considered as the immediate cause of malnutrition. Underlying causes of malnutrition include food insecurity at the household level, lack of caring capacity and health services, and environmental impact. Basic causes of malnutrition, on the other hand, are related to the shortage of human and financial resources, and access to services. Sociocultural, economic, and political circumstances are also considered as basic causes of malnutrition. Immediate causes of malnutrition can be mitigated by interventions specifically addressing the immediate nutritional need of the population, *such as* consumption of a sufficient amount of healthy food, adequate feeding and caregiving, nutrition-sensitive parenting, and reducing the instance of infectious diseases. On the other hand, *nutrition-sensitive interventions* such as setting up nutrition goals and multispectral action plans (agriculture and food security; social safety nets; early child development; maternal mental health; women's empowerment; child protection; schooling; water, sanitation, and hygiene; health and family planning services) can be the key to mitigating the underlying or basic causes of malnutrition. Nutrition-sensitive initiatives can potentially assist in the implementation of nutrition-specific interventions by enhancing their coverage and efficiency (Ruel & Alderman, 2013).

### *Agriculture sector and food systems approach: important for food security and nutrition*

In the past, agriculture sector priorities did not include nutrition. It is now recognized that agriculture plays a crucial role in determining the type and quality of diets, therefore contributing to nutrition outcomes. Firstly, the sector is responsible for food production, thus influencing food availability. For example, a country's agricultural policy priority to produce more staple foods such as cereals or cash crops for export will determine the availability of nutrient-dense foods for its population. Secondly, agriculture employees constitute much of the active population in developing countries, therefore creating incomes that support families to have better food accessibility and access to nutrition-related social services (education, health, safe water, sanitation, and hygiene). Thirdly, the sector is also in a position to contribute to addressing gender inequality and empowering women through adapted interventions considering their role in agriculture value chain development and the challenges they face. There is a positive association between women's empowerment and household food security and nutrition. Furthermore, agriculture helps mitigate the adverse impact of climate change on sustainable food availability and nutrition through climate-smart practices. Agriculture influences diets and nutrition in multiple ways. Understanding how they are interrelated is key to designing agriculture policies and programs that will have a better effect on the nutritional status.

A food systems approach encompasses agriculture and goes beyond it. As defined by the UN High-Level Task Force of Global Food and Nutrition and also highlighted in the exemplary Second Country Investment Plan on Nutrition Sensitive Food Systems (2016 -2020) by the Government of Bangladesh, it is a system "that embraces all elements (environment, people, inputs, processes, infrastructure, institutions, markets, and trade) and activities that relate to the production, processing, distribution and marketing, preparation and consumption of food and the outputs of these activities, including socio-economic and environmental outcomes" (High Level Panel of Experts (HLPE), 2014).

### *Food systems approach: understanding the complexities*

The food systems approach for food security and nutrition acknowledges the extensive commonalities and inter-linkages between various components of the food system (production and processing of food, commercialization, information and nutrition knowledge available to consumers and their preferences, food safety and quality, food waste management, management of natural resources, etc.) (Figure 2.) For instance, the food consumption pattern of a household can be determined by its understanding of nutrition, choice of food, and cultural norms. The food consumption pattern is also significantly influenced by the price of food and advertisements by the producers.

Food availability and quality can also be influenced by natural factors such as soil fertility and quality and availability of natural resources.

The concept of a food system goes beyond the conventional practice involving a producer-to-processor-to-trader-to-consumer approach. This linear value chain is based on market experience without anticipating or planning to address consumption changes. The food system approach places the consumer at the centre of the prioritization process. In the traditional approach, it was expected that improving food availability will automatically translate into improved nutrition at an individual level, which is not necessarily true. A food system approach recognizes the necessity to also support vulnerable socioeconomic groups to understand the significance of healthy diets and access food in quantity and quality, including through the implementation of safety nets.

The food system is thus a very complex entity that involves multiple interactions between human and natural elements. This is highlighted in the Bangladesh Second Country Investment Plan (CIP2) and Figure 3 below (FPMU, Ministry of Food, Bangldesh, 2019) which depicts the interlinkages between key elements of the food systems. At the population level, there are consumers (which include food producers, women, children, and the elderly) whose interests and food demand can influence food production patterns. These people are also influenced by the available infrastructure and services to ensure food sustainability, availability, and quality; including the way food waste and losses (FWL) are managed across the food value chain. The food system, therefore, needs to be supported by a conducive policy and institutional framework.

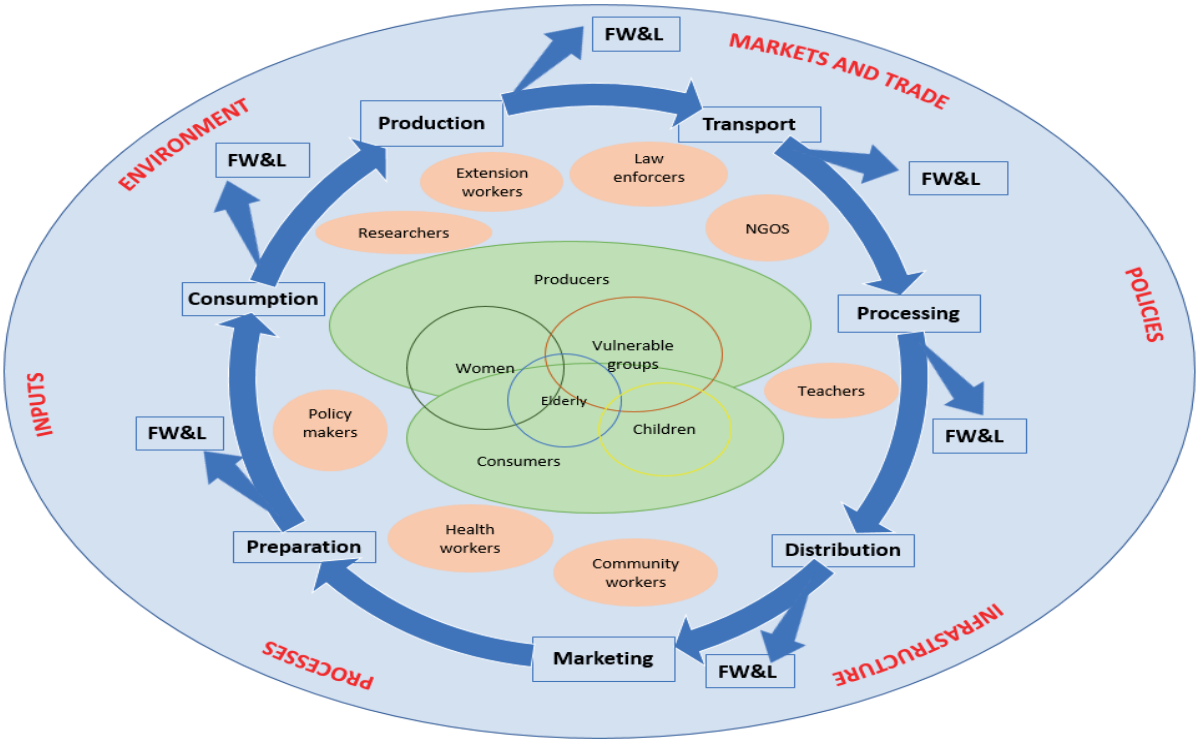


**Figure 2.** Capturing the complexities of food systems (FPMU, Ministry of Food, Bangldesh, 2019)

## Changes in food systems

Food systems today are rapidly changing with a wider range of foods emerging because of transformation, product development, and processing in the market. Many of these changes are closely associated with urbanization, increasing incomes, better purchasing power, import and export of food, greater consumer awareness, and income-generating opportunities.

The supply of food is not simply an issue of meeting demand, because it recognizes that there is a complex range of factors that influence our access to food. These include policies, legislation and regulations, infrastructure, governance, the environment, and the overall awareness of the consumer and society. Intervening to ensure access to affordable and nutritious food requires taking these factors into account, working with multiple stakeholders, promoting nutrition-sensitive policies, and possessing a better knowledge of the complexity of environments, both rural and urban, that impact food systems and nutrition.

### *Urbanization and diet changes*

The *2018 Revision of World Urbanization Prospects* (United Nations, 2019) produced by the Population Division of the UN Department of Economic and Social Affairs (UN DESA) anticipated a highly concentrated urban population in just a few countries. It is projected that by 2050, India, China, and Nigeria will respectively have 416 million, 255 million, and 189 million people living in urban areas. Together, these three countries will account for about one-third of the global urban population growth between 2018 and 2050.

According to the same report, the global urban population in 2018 was 4.2 billion as opposed to a mere 751 million in 1950. Despite a low level of urbanization, 54% of the global urban population live in Asia, while Europe and Africa are jointly holding the second position with 13% each. Asia is presently experiencing approximately 50% urbanization level.

Urbanization alters the environment in which people live leading to marked changes in lifestyle including dietary patterns. Asia Pacific region has been experiencing drastic changes in dietary patterns since the last decades (Pingali, 2007), mostly due to women empowerment and inclusion of a large proportion of women in the workforce. Consumption of processed and ready-to-eat food has increased dramatically as more and more women spend less time on food preparation. Smaller urban families also tend to eat out more often. Improved economic conditions, altered socio-culture environment, infrastructural development, and increased resource availability also provide greater access to “western foods” such as fast foods and ready-to-eat ultra-processed foods and impact tastes and preferences of the urban population (Mendez et al., 2005). This is particularly marked among youth. Ready-to-eat-ultra-processed foods and drinks readily available at the supermarkets and fast-food outlets are gradually replacing the low fat, high fibre foods among the urban dwellers. Containing high levels of salt, sugar, and fats, these products are associated with enhanced risks of non-communicable diseases. While levels of malnutrition are declining across developing regions, rates of obesity and overweight are increasing alongside, especially in young children, resulting in a complex situation, and raising challenging questions for nutrition policy planners.

Various surveys show that overnutrition in childhood is rapidly increasing in Asia. In Taiwan, for instance, an estimated 25% of children are overweight. Generally, childhood obesity is more common in urban areas than in rural areas. The problem is more severe in economically developed countries like Japan, Malaysia, and the Republic of Korea. Childhood obesity has also been identified as a serious public health concern in countries like Indonesia, which is just experiencing economic transition. A study conducted in Indonesia highlighted that overweight and obesity is increasing among school children, especially rich families, but remain a concern for the middle-level class (Syahrul et al., 2016).

Agriculture and food systems can significantly contribute to addressing the rising incidence of nutrition-related health problems such as overweight, obesity, and non-communicable diseases by ensuring access to an adequate amount of safe and healthy food and health services for local, national, and international consumers.

Box 2 below presents an example of emerging agriculture and food system policies in Thailand to address the shifts occurring in dietary practices with changes in socio-economic situation and urbanization.

## Box 2 | Thailand's case study

Thailand presents an amazing success story of implementation of agriculture and food systems in addressing malnutrition at the macro and micro-levels nationally and at the community, household, and individual level. Agriculture and food sectors have contributed their best to warrant ample supplies of high quality and safe foods for the local populace as well as for the trade. Actions taken at the National as well as local levels has increased food accessibility, consumption, and utilization, particularly among susceptible population in under developed rural areas that have been previously disposed to malnutrition. The multi-sectorial approach involving agriculture and health sectors, local administration and communities under the national poverty alleviation plan have successfully reduced maternal and child malnutrition.

Expeditious progress in the agro-industry and food systems during the last three decades has enabled Thai people to access greater food diversity and increased animal protein, sugary and fatty foods. Energy intake has been declining gradually, but the consumption of protein and fat has been increasing. While a drop in the consumption of carbohydrates from rice, tubers, pulses and dried nuts is evident, increase in consumption of sugar is recorded. The present energy contributions from carbohydrates, protein and fat are estimated to be 55%, 16% and 28% respectively. However, the daily intake of fruit and vegetables is still rather low, which can lead to inadequate consumption of dietary fibre and micronutrients, thus heightening the risks of non- communicable diseases (NCDs) and cancers. It has also been noted that sodium intake among the Thai people is over twice the limit for healthy consumption, whereas intake of potassium is only 50% of the daily recommended amount. The low consumption of potassium is partly due to low fruit and vegetable intake. Milk consumption among the Thai population is also low, which affects calcium and riboflavin intake. However, national initiatives are being actively promoted to improve milk-consumption practices and instil values towards milk consumption at pre-school, family, and individual levels.

During the past 20 years, Thai population have shifted from procuring foods at retail fresh food markets to purchasing foods at air-conditioned convenience stores, supermarkets, or modern shopping mall. Fast food, frozen food, processed food, and imported food products have become more available at these modern outlets. Aggressive marketing strategies and changes in dietary habits have led urban dwellers to invest less time in food preparation at home, and increased dependence on fast, ready-to-eat processed foods. Moreover, eating fast foods at renowned foreign franchises, particularly those located in modern shopping malls, is being considered by the Thai youths as symbol of social status. While such foods are easily available and maintain certain level of quality and safety, they are altering local food habits and lessening the roles of the local, traditional food system and its providers due to the diminished popularity of local foods compared to processed ready-to-eat foods. Consequently, diets are becoming less diverse and mostly lack local, highly nutritious ingredients. Commercial media advertisements promoting fast foods and modern food services have accelerated this trend (Compact 2025 Report 2017).

***Evidence based policy options: crucial for improving agriculture and food systems role in enhancing nutrition outcomes***

It is critical that agriculture and food systems support better nutrition outcomes. However, improving their contribution implies that policymakers and program implementers are provided with options that are based on evidence. The following options merit consideration:

- Strengthening of information and knowledge management system for food and nutrition security: Providing quality and timely information to users is fundamental to orient decisions and ensure prioritization is made based on evidence. To this end, the association between food security and nutrition information system needs to be recognized and strengthened by the policymakers and programme implementers. Food and nutrition data gaps are identified as one of the major challenges in improving the contribution of agriculture and food systems to nutrition. It is imperative to generate information on the food production and nutrient or micronutrient supply targets and compare them to the national dietary recommendations, to identify production and consumption gaps. Providing market information

to beneficiaries (food producers, traders, and consumers) is also important. Initiatives are being undertaken in developing countries to improve the food and nutrition security information systems (CELAC, n.d.).

One of them is The National Information Platforms for Nutrition (NIPN) programme initiated by the European Commission (EC) to address malnutrition in the developing countries experiencing malnutrition, intending to contribute to the global mitigation in the occurrence of stunting in agreement with the goal set for 2025 by the World Health Assembly and in support of the commitments of the EU Nutrition Action Plan. Bangladesh is one of the countries that are implementing the NIPN initiative.

- Prioritizing key interventions for each element of the food systems: Improving the contribution of food systems to nutrition implies that each aspect of the food system, from the production of the consumption, is assessed to identify challenges and opportunities, and key interventions for nutrition mainstreaming. Due considerations should be given to cross-cutting topics such as gender, environment, and community participation. Special attention should be put on improving small farmers' performance and nutrition knowledge and practices. Capacity strengthening interventions in countries need strong institutions with skilled human resources in quantity and leadership to support their efforts to improve nutrition.
- Support sub-national policy and programming processes: Often, the identification of priorities happens at the central level, with the sub-national level insufficiently involved. While ensuring central level work, it is also important to support sub-national public institutions to identify their needs and participate in planning and programming processes. For example, the Government of India, under the Bhartiya Poshan Krishi Kosh (BPKK) is developing a food atlas across 127 agro-climatic zones (Minister of Women and Child Development, India 2019). The data will be used to create a sustainable nutrition programme with inputs for influencing the production of suitable food items and their consumption to tackle the challenge of malnutrition.
- Strengthening multi-sectorial coordination: Nutrition is a multi-sectorial domain that needs a concerted commitment of all key sectors and stakeholders. Efforts must be made to establish neutral multi-sectorial coordination bodies in which the roles and responsibilities of each actor are clearly defined and to support these bodies to develop and use coordination tools such as standard operating procedures (SOPs). The coordination should be strengthened at central and at sub-national levels. Various examples exist at the country level in terms of multi-sectoral coordination. In Bangladesh, the Bangladesh National Nutrition Council (BNNC) has been created to coordinate the implementation of nutrition-related interventions in the country. This important instance is placed at the highest political level, as it is chaired by the Honourable Prime Minister. Under the BNNC, sub-national level coordination platforms have been created, namely the District Nutrition Coordination Committees and the Upazila Nutrition Coordination Committees. The main challenges faced by the BNNC are to strengthen its institutional, human, and operational capabilities to fulfil its duties.

***Improving community-based food and nutrition security programming:*** Communities are best poised to understand and identify the food security and nutrition-related challenges they face and the nature and scope of intervention required for addressing such challenges. Thailand represents an example of community-based interventions that successfully enhanced food and nutrition security as well as socio-economic development (Tontisirin & Bhattacharjee, 2008). Community-based approaches also require relatively small financial involvement on the government's part, mostly in the form of staff salaries. Empowering and mobilizing community volunteers, providing adequate training on nutrition and food security, dividing responsibilities between national and regional levels for implementing multi-sectoral initiatives are some of the key factors to Thailand's success in addressing malnutrition through community-based approaches. Thailand's success also underlines the importance of political will to empower the community leaders to address community-level problems such as malnutrition and food security.

Box 3 presents an example of the evolvement of the food and nutrition security policy framework in Bangladesh which has taken into consideration the nutrition priorities.

***Recognizing the central role of women in the food system value chain and ensuring required support***

It is important that gender qualities and social desegregation of population groups are recognized and included either as the ways to achieve food and nutrition security or as the consequence of improved food security and nutrition. This will necessitate faster and united actions from various stakeholders in supporting the pro-poor and comprehensive route to create a world free from poverty, discrimination, starvation, food insecurity, and malnutrition.

Women play an indispensable part in the food system value chain. On average, 43% of the agricultural workforce is composed of women in developing countries. For example, women represent 50% of the labour force in Eastern Asia and sub-Saharan Africa (FAO, 2011) and the number is gradually increasing. Involved as voluntary workforces or paid labour in agriculture as well as in trading and marketing of food, cooking, and feeding the family, women often have opinions on the selection of crops and varieties to grow. As the primary caregiver in most households, they also decide what to eat.

Women farmers must be given not only sufficient access to assets such as land and training inputs but are also supported in having access to women-friendly markets. Moreover, women are primarily responsible for managing household food preparation and consumption. Women are therefore perfect targets for nutrition programmes for the entire food system, including the provision of adequate, diversified, and appropriate quantity and quality of food, particularly to young children in their growing years. Moreover, women, as the bearers of children, need to take care of their own nutritional status and being a position to be healthy and active members of the society as well as be well-nourished during the reproductive phases of pregnancy and nursing for ensuring optimum brain development and health of the growing foetus in the womb and for ensuring optimum breastfeeding.

**Box 3 | Policy options for nutrition-sensitive food systems and healthier diets: the case of bangladesh**

The food and nutrition security policy framework in Bangladesh has positively evolved from production-driven to more nutrition-oriented priorities [Osmani, 2016]. This is a result of continuous advocacy, high-level political commitment and multi sectorial policy monitoring. There has been a consensus among policy makers on the necessity to ensure better nutrition outcomes while the country is securing its food security. Although agricultural production has considerably improved leading to better food security, the translation into diet improvement and reduction of malnutrition has remained low. In 2019, Bangladesh has launched its Second Country Investment Plan: Nutrition-Sensitive Food Systems (CIP2, 2016-2020).

This is the first national policy outcome which highlights the importance of food systems for nutrition and uses a production to consumption approach. The process was piloted by the Ministry of Food and technically supported by FAO. CIP2 has prioritized key evidence-based interventions across several sectors from the food production to consumption that could lead to a greater impact on nutrition. CIP2 has 5 outcomes, presented below, which represent expected results for each critical aspect of the food system (production, post-harvest management and value addition, dietary diversification through improved consumption, social safety nets for vulnerable populations and enabling environment).

I. “Diversified and sustainable agriculture, fisheries, and livestock for healthy diets
II. Proficient and nutrition-sensitive post-harvest processing of the products and value addition
III. Enhanced food variety, intake, and utilization
IV. Improved access to social safety nets and better resilience
V. Strengthening facilitating environment and integrating multi-sectoral initiative to attain food and nutrition security.”

Women who are often not easily reached by other systems are reached by food systems programmes that impart nutrition messaging through agricultural extension services. These women are noted to effectively use the knowledge received for the improvement of the diets of their households and children (HLPE, 2017).

One particular challenge for women farmers is balancing their role as farmers and as the caregiver to the family, particularly as a mother to growing children. More time spent in the agricultural workforce will result in less time spent in taking care of children, which may deleteriously affect children's nutritional status (Jain & Zeller, 2015). It is crucial that food systems address this gap and actively contribute to the empowerment of women so that they can achieve their optimum potential.

***Smallholder farmers: role for improved agriculture and food systems***

A sustainable value chain that supports smallholders can help them continue to farm profitably and responsibly. One of the ways agriculture can contribute to food sustainability and nutrition is by inspiring local production of nutrient-dense foods with the small farmers playing a major role in food production and processing. In India, the National Rural Livelihood Mission (NRLM) Programme through the network of self-help groups (SHGs) of women is reaching and empowering almost 3 million women who are often the most disadvantaged women and unreached women. A special NRLM activity, Mahila Kisan Sashaktikaran Pariyojana (MKSP) focuses on nutrition-sensitive agriculture, horticulture, and livestock interventions for women with small landholdings to improve access to diversified food and provides a platform for nutrition education and other health-nutrition-sanitation services (CARE India Solutions for Sustainable Development, 2016).

With the right equipment and appropriate technologies, smallholder farmers can play a vital role in reducing post-harvest losses of nutrient-dense foods, thereby ensuring higher agricultural revenue and nutrition as well as the quality and quantity of the food supply. Post-harvest activities like proper storage, profitable home-based processing and food preparation can facilitate access to nutrients by enhancing the consumption of nutrient-rich foods, and increasing the nutrient density of foods consumed by households, mothers, and children, as well as conserving nutrient losses through the correct processing of foods locally available.

Ultimately, strengthening food systems and promotion of appropriate diets need to be integrated into poverty reduction efforts and be environmentally sustainable as well as to contribute to mitigating the impact of climate change. Sustainability is of concern not only regarding agricultural practices but also in the context of consumption patterns that need to be promoted through the integration of a nutrition orientation across the food chain. The sustainability of agriculture initiatives needs to be also understood from the perspective of the ability to sustain the effects for long-term nutrition and health impacts.

## Conclusion and recommendations

There is a need to reaffirm global commitments of working together to overcome the challenges facing the world from starvation, food insecurity, and malnutrition. While there was a drop in hunger globally for over a decade, there is now a recent rise. Worldwide, over 820 million people still lack access to an adequate amount of healthy food, accentuating the mammoth challenge of attaining the SDG goal of Zero Hunger by 2030.

Amidst this context, climate change and growing climate unpredictability as well as factors like global warming are disrupting agricultural output, food security, and natural resources. Due to changes in the food system and available opportunities, restructuring of the rural communities is evident, leading to a drop in the number of farmers and major alteration in the food production, distribution, and consumption pattern and practices. All these have created new challenges for food and nutrition security. Diminished availability of safe and nutritious foods has put people at heightened risk of malnutrition and poor health.

Alongside, developing countries are witnessing transformations in economic structures, including agriculture and food systems with more varied and high-value production leading to vibrant local demand. Interlinked challenges require to be addressed, such as improving nutrition across the life cycle, food safety, and enhancing demand for healthy diets, preservation of biodiversity for sustainable diets, mitigating ill effects of urbanization, promoting responsible engagement of the private sector, and increasing nutrition-sensitive investments in food systems. Following are the broad recommendations:

- Analyse agriculture development trends for their implications on diets and nutrition.

- Monitor the implementation of multi-sectorial policies and investments to assess the impact of agriculture and food systems on nutrition.
- Promote the use of dietary guidelines as guidance tools for agriculture, food, and health planning and as nutrition education tools.
- Provide sustainable support for linking food systems with diets, nutrition, and health outcomes
- Implement community-based approaches linked with government service delivery structures while strengthening the interface between the national and local levels.

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