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MULTI-SECTORAL NUTRITION TECHNICAL GUIDANCE BRIEF

Working within the Food System: Agriculture-to-Nutrition Pathways for Achieving Improved Diets and Nutrition



Credit: Morgana Wingard, ONE

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This brief is part of a series of technical briefs that provide guidance for developing and implementing multi-sectoral nutrition programming in support of the [U.S. Government Global Food Security Strategy](#) and the U.S. Agency for International Development's (USAID's) related plan under the strategy. It is designed to be used by agriculture and nutrition staff, both within and outside USAID, to apply technical guidance to practice.

The brief provides guidance on how to take evidence-based actions that consider the Agriculture-to-Nutrition Pathways when designing and implementing approaches to improve diets through food systems programming. It reinforces the importance of working across the food system and prioritizing pathway(s) that lower barriers to improved nutrition and support practices most likely to strengthen diets and nutrition.

AGRICULTURE-TO-NUTRITION PATHWAYS AND THE FOOD SYSTEM

Agriculture is the main livelihood and often the main source of food for rural households globally (Kissoly et al. 2020). Estimates indicate that 60 percent of total employment in low-income countries is in agriculture (World Bank n.d.). While associated with greater reductions in child stunting than nonagricultural growth (Mary and Shaw 2020), agricultural growth and the resulting income alone have not directly resulted in improved nutritional status of vulnerable individuals within producer households or the general population (Ruel et al. 2018).

Agricultural research and interventions to improve nutrition have often focused on how a household's involvement in food production influences its members' nutrition through the Agriculture-to-Nutrition Pathways (figure 1) of women's empowerment, production, and income. However, assessment of how directly working through the pathways impacts individual nutritional outcomes has yielded minimal evidence

BOX 1. KEY MESSAGES

The Agriculture-to-Nutrition Pathways help practitioners to—

- Design agriculture interventions to intentionally improve diet and nutrition outcomes.
- Understand the ways in which women's empowerment is central to achieving nutrition outcomes.
- Analyze how elements of the food system can influence and strengthen household-level investments intended to impact diet and nutrition outcomes.
- Prioritize interventions across food systems to strengthen household-level impacts.

(Cliffer 2019). This gap in demonstrating impact is due in part to the many confounding factors that influence nutrition outcomes related to women's empowerment, production, and income, such as types of foods produced, access to markets, inclusion of nutrition-related social and behavior change (SBC), and societal gender norms (Ruel et al. 2018). Additional factors include age, gender, disease status, and socioeconomic status.

Improvements in agricultural production have great potential to reduce malnutrition. Agriculture is closely linked to the immediate causes of undernutrition such as diet, feeding practices, and health as well as underlying determinants like income; food security; education; access to water, sanitation, and hygiene and health services; and gender equality. Evidence shows that if agricultural interventions include or link with other sectors, such as health, water, economic growth, gender and inclusion, and social protection, they are more likely to improve nutrition outcomes (Gillespie and van den Bold 2017).

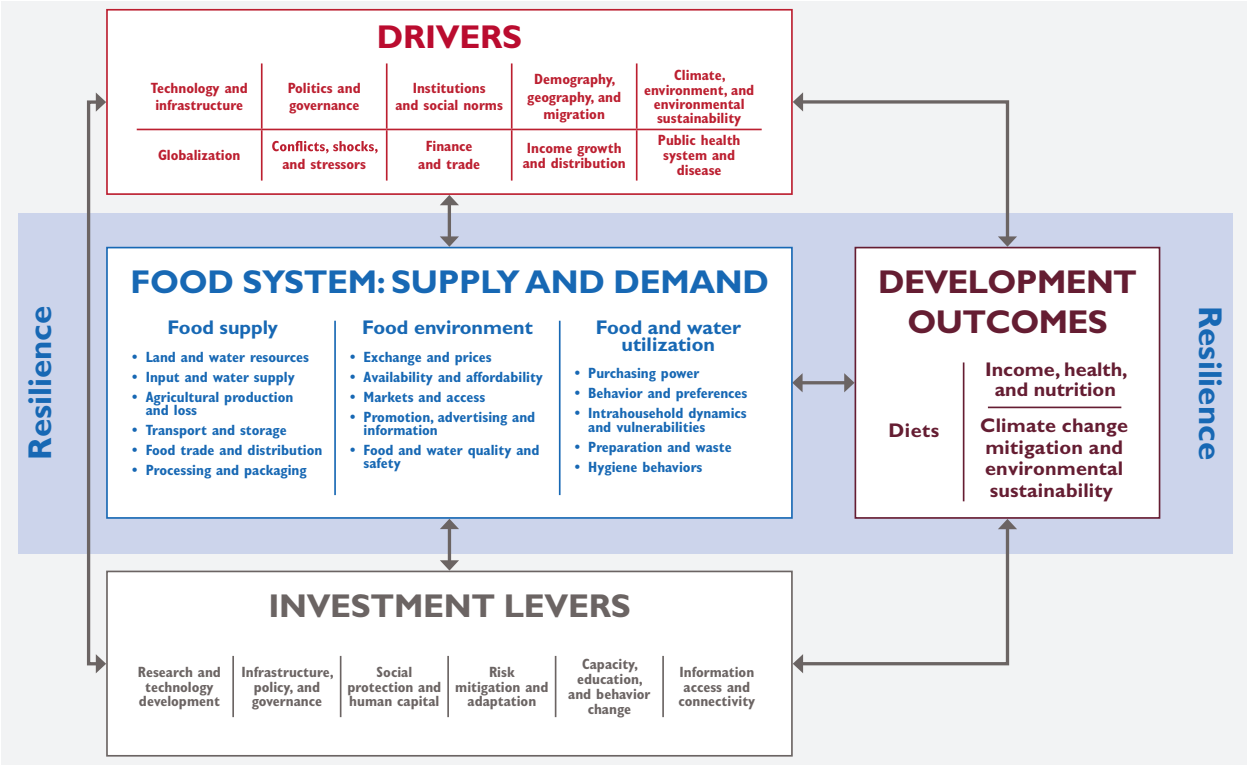
While the Agriculture-to-Nutrition Pathways focus on individual households and their members, the food system encompasses the entirety

of the production-to-consumption journey. The U.S. Government Global Food Security Strategy defines food systems as the “interrelated components of people, behaviors, relationships, and material goods that interact in the production, processing, packaging, transporting, trade, marketing, consumption, and use of food, feed, and fiber through aquaculture, farming, wild fisheries, forestry, and pastoralism” (USAID 2021a). All of these elements affect consumer behavior, diets, and ultimately nutrition outcomes. The pathways are an important part of the food system because they demonstrate how household-level actions affect individual diets and nutrition outcomes. Effective programs need not interact with all of the pathways or food system elements. Instead, practitioners should prioritize opportunities for improving diets and nutrition based on program context and objectives.

BOX 2. COMPONENTS OF THE FOOD SYSTEM

As depicted in the USAID Bureau for Resilience and Food Security (RFS) Food Systems Conceptual Framework (figure 1), a **food system** consists of activities in food supply, food environment, and food and water utilization. These activities influence and are influenced by drivers and link to resilience and development outcomes. **Investment levers** are actions that can strengthen the food system and lead to sustainable development outcomes (USAID 2021a).

Figure 1. RFS Food Systems Conceptual Framework



Source: USAID 2021a.

WHAT ARE THE AGRICULTURE-TO-NUTRITION PATHWAYS?

Agriculture and nutrition have multiple linkages. The Agriculture-to-Nutrition Pathways diagram (figure 2) illustrates three interconnected household-level pathways for impacting diet and nutrition outcomes:

- **Women’s empowerment**, which affects women’s income and their ability to make decisions about its use, caring capacity and practices, and energy expenditure
- **Food production**, which affects food availability and prices for household consumption
- **Agricultural income** for expenditure on food and non-food items.

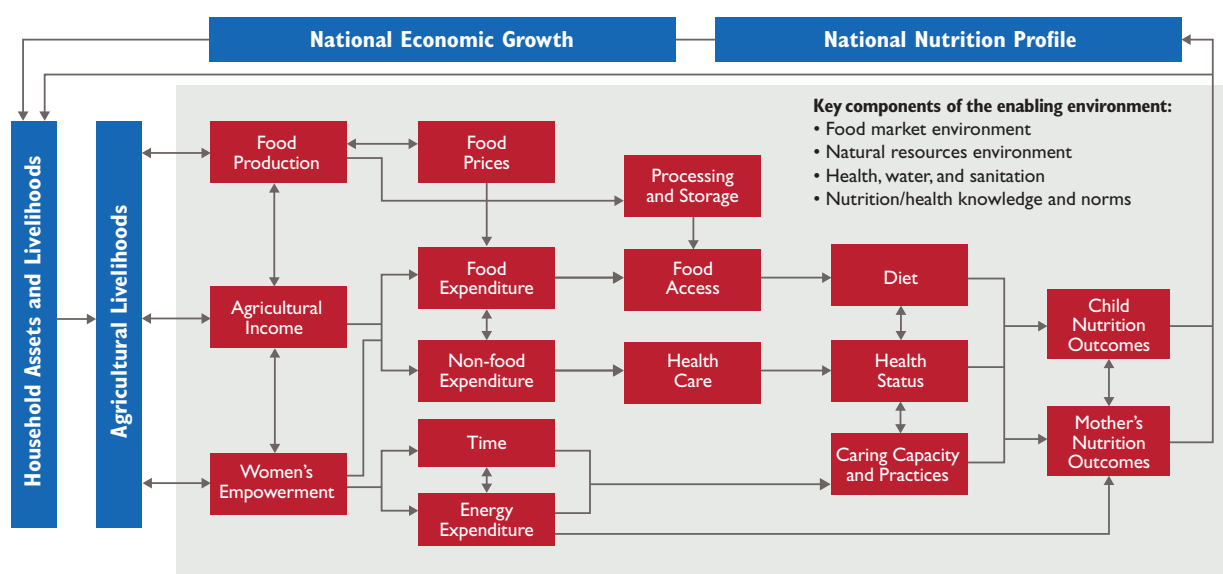
The enabling environment for nutrition comprises the food market; natural resources; health, water, and sanitation environments; and nutrition and

health knowledge and norms. Nutrition outcomes ultimately affect national economic growth and household assets and livelihoods, including those contributing to both agricultural and non-agricultural sources of income. This section walks through the pathways and describes how each leads to better diet and nutrition outcomes.

BOX 3. WOMEN’S EMPOWERMENT

While the diagram depicts the women’s empowerment pathway at the bottom, this pathway is critical for ensuring gender equality across all pathways and throughout the food system. It intersects with and influences the food production and agricultural income pathways toward positive diet and nutrition outcomes.

Figure 2. Agriculture-to-Nutrition Pathways



Adapted for Feed the Future from Gillespie et al. 2012 and Headey et al. 2011.

Women's Empowerment Pathway

The pathway from women's empowerment to improved nutrition can occur through use of income for food and non-food expenditures, time use and care, and energy expenditure. [The Working within the Food System: Gender Considerations for Achieving Improved Diets Technical Guidance Brief](#) describes evidence and potential actions for considering and addressing gender and women's empowerment for improved diets.

Women's control of household income enables expenditures on food and health care, which can affect diet, nutrition, and health status. Research shows that in many places around the world, when women control income, they more frequently use it for family food and health care, particularly for children (Santoso et al. 2019). Training both female and male farmers in farm management and business skills can optimize the income earned with the available time, labor, assets, and capital (Herforth and Harris 2014).

Women are typically responsible for a wide range of household and agricultural tasks. Agricultural interventions can affect women's time and labor burden across these tasks, their health and energy expenditure and, in turn, their capacity to feed and care for infants, young children, and themselves (Malapit 2019; Njuki et al. 2021). Consider these factors when designing programs for im-

proving household nutrition through agriculture. For example, when designing and monitoring agriculture programs for the production of nutritious foods with high market value to increase women's income, consider the impacts and potential trade-offs related to women's time and labor (Herforth and Harris 2014). One way to reduce women's workloads is to promote labor-saving technologies and practices—higher-yield or pest-resistant crops, use of draft animals, no-tillage agriculture methods, small pounding and de-husking machines, and water-source construction and rehabilitation (FAO 2017a). Increasing women's access to financial services, information, and markets can also help them gain control over resources and income (FAO 2017a).

Food Production Pathway

Household food production is important to the diets and nutrition of producer families, as food that they produce is either consumed or sold in markets for income used to purchase additional food. In general, it is not the primary objective of an agricultural livelihood to produce all the food a family needs, and many households involved in agriculture are net purchasers of food (FAO 2017b). Diet and nutrition in food-producing households are determined by a combination of factors, including consuming their own production, using income from selling household production, availability of other foods in markets, and food prices for both selling and purchasing food. Production affects the type, quantity, quality, and seasonality of food available in the household. Additionally, production influences the availability, affordability, and prices of diverse food in local markets (Herforth and Harris 2014).

Many factors—including market prices, costs, and risks associated with each product; land assets; and family needs and preferences—affect farmers' decisions about crop and livestock production. If preferred foods or food varieties are inconsistently available, affordable, or accessible in markets, raising or growing them on the farm may be an

BOX 4. PATHWAYS BACKGROUND

The Agriculture-to-Nutrition Pathways described in this brief were developed by the Strengthening Partnerships, Results, and Innovations in Nutrition Globally ([SPRING project](#)) in 2014 as an adaptation of a framework introduced by the International Food Policy Research Institute (IFPRI) in 2012, based on its research in India (Gillespie et al. 2012).

BOX 5. RURAL HOUSEHOLDS AND PROCESSED FOODS

Highly perishable foods, such as animal-sourced foods, fruits, and vegetables, while generally (seasonally) available in rural markets, are often inaccessible to low-income households due to high cost. Most raw foods require some kind of processing, either at the household or commercial level. Food processing improves shelf life, retains nutrients, decreases cost, and increases year-round availability. Food fortification is a type of food processing to address micronutrient deficiencies, thereby improving the quality of diets and nutritional status.

Some processed foods, however, are ultra-processed, which decreases nutrient content and adds substantial additives including sugar, salt and fat. Additionally, processing can lead to foodborne illness if food safety standards are not met.

Processed foods are an important part of diets globally, including in rural households. When food processing is developed with consumer preferences in mind and according to hygiene and sanitation standards, it can make nutritious foods more desirable, convenient, affordable, and safe. In this way, food processing can improve food systems outcomes, primarily diets and nutrition (USAID Advancing Nutrition 2022).

efficient way to obtain them. Nutrition knowledge is essential for informing the range of decisions that farmers make about what they grow to consume and sell, and what they decide to purchase with their income. Processing and storage affect the perishability, safety, availability, quality, and nutrient content of foods as detailed in text box 5 (Herforth and Harris 2014). Additionally, societal gender norms influence who in the household produces which products; has access to resources; can make decisions over what is produced, consumed or sold; and how production labor and inputs are allocated (Malapit 2019).

Agricultural Income Pathway

Many rural households rely on agriculture as their primary source of income, which can be used for immediate or future needs, including food and non-food purchases that support safe and nutritious diets. However, even if a producer household is able to increase their income from agriculture, this income does not necessarily lead to improved nutrition. Factors such as the stability of the household income, intra-household

income distribution, food availability and prices in the market, and household preferences influence spending decisions (FAO 2017b). Additionally, women's control over income can also influence dietary quality. Evidence indicates that income under women's control is more likely to be directed to food purchases, whereas male control of production revenue has been negatively associated with dietary quality (Madzorera et al. 2021).

This income pathway assumes that nutritious, diverse foods are available and affordable in local markets. Inputs and services for production, harvest, processing, transportation, and storage of diverse foods must also be available so that local production can meet demand. Market and transportation systems must enable year-round supplies based on consumer preferences and purchasing power. When these criteria are not met, diet and nutrition outcomes suffer. Nutrition knowledge, market prices and practices, and a household's need to balance long-term investments and immediate purchases influence market supply and demand. The effect of income on nutrition is neither direct nor predictable. Availability

ty, affordability, convenience, and decision-making power determine what foods households are able to purchase (Herforth and Harris 2014).

Enabling Environment

The enabling environment at the community, regional, national, and global levels influences the pathways between agriculture and nutrition. In figure 2, the enabling environment includes the food market environment;¹ natural resource environment; health, water, and sanitation environment; and nutrition/health knowledge and norms. These components represent links to the broader food system.

The **food environment** affects the kinds of foods available and likely for households to purchase. For example, farm households are inclined to produce certain crops as a response to price signals and market incentives. Government policies and private sector actions also affect the availability and affordability of food in the market (HLPE 2017; Downs et al. 2020). Trade policies can increase the availability of imported food and beverages in local markets, and favorable tax policies may increase household access to nutrient-dense food products. Additionally, food labeling and marketing influence food purchase decisions and consumption habits (HLPE 2017; Downs et al. 2020).

The **natural resources environment**, including water, soil, climate, and biodiversity, affects agricultural production potential and, therefore, strategies for managing income generation and food availability. Access to potable water is essential for drinking, food preparation, and hygiene and sanitation. Soil health directly affects the quality and yield of crops, including plant nutrient content levels; maintaining fertility is a primary consideration in farming for food and income (FAO 2015).

1. The 2014 Agriculture-to-Nutrition Pathways document uses the phrase “food market environment.” In this brief, to be consistent with the RFS Food Systems Conceptual Framework, “food environment” will be used going forward.

Changing climatic conditions, including unpredictable rains, floods, droughts, and rising temperatures, affect production cycles, causing yields to decline and decreasing food availability and income for producer households.

Agricultural practices interact with the **health, water, and sanitation environment**, which affects nutritional status. Some agricultural practices may contaminate water available for household use. Poor water management contributes to waterborne diseases, and exposure to zoonotic disease and agro-chemicals pose risks to human health (Hawkes and Ruel 2006). Additionally, family and community **nutrition and health knowledge and norms** affect decisions about agricultural production, as well as food purchase, preparation, and consumption (Herforth and Harris 2014).

HOW LESSONS FROM THE PATHWAYS INFORMED FOOD SYSTEMS APPROACHES TO IMPROVING DIETS

Diet and nutrition are complex and affected not only by what individuals consume but also their environment, including home, work, social norms, policies, and markets. Improving diet and nutrition outcomes requires actions within and outside the household, indicating the need for a systems approach (Meadows 2008). Working within the food system to improve diets requires consideration of the entire journey from food supply to consumption. This includes understanding the interplay between system components, relationships, and outcomes to identify which interactions are critical for success and minimize unintended consequences. While some research indicates that agricultural interventions can broadly affect health and nutrition, reviews have found little evidence of the impact on specific nutrition outcomes, including stunting, wasting, or micronutrient status (Gillespie and van den Bold 2017; Gillespie et al. 2019; Ruel et al. 2018). Factors such as poor sanitation, inadequate health services, weak markets,

and political instability can negatively affect the potential for agriculture to improve nutrition outcomes. Understanding and analyzing these key system influences will help identify promising entry points for using the pathways to improve nutrition (Gillespie et al. 2019).

For example, poultry programs typically focus on female smallholder farmers with the goal of improved nutrition and possible income generation from consumption and sale, respectively. However, these “poultry-for-nutrition” interventions seldom establish market linkages. A four-country study of a poultry development project showed that participants rarely sold chickens and even less frequently, eggs, even when production levels were great enough to do so (Nordhagen et al. 2018). While strengthening market linkages are likely important for long-term sustainability and greater impact, it was unclear whether demand for eggs or meat in the rural areas was sufficient to support widespread marketing.

Assessment of potential impacts of the food system on the project, from accessibility to market information to physical and institutional infrastructure, could have helped practitioners understand poultry meat and egg markets in low-resource areas and identify opportunities to help small-scale producers market their products. The study concluded that family poultry systems are part of the wider food system in which households participate as both producers and consumers (Nordhagen et al. 2018).

Mycotoxin contamination of common foods, such as cereals, nuts, and spices, provides another example of the need to look at the food system when investing in interventions along the food production pathway. Evidence increasingly links exposure to mycotoxins to poor nutrition outcomes, particularly limited growth in children (Andrews-Trevino et al. 2022; Cliffer et al. 2019). Producer-focused investments along the production pathway, such as improved seeds and post-harvest

handling and processing practices, cannot be relied upon solely to scale or sustain the prevention of contamination. A systems approach requires consideration of investments at various entry points in the food system (Webb et al. 2021).

Depending on the context and objective, investments to prevent mycotoxin contamination could be made in the areas of research and technology development; infrastructure, policy, and governance; social protection and human capital; capacity, education, and behavior change; and information access and connectivity (USAID 2021a). Even if a producer household follows proper pre-harvest and drying techniques, prevention of mycotoxin consumption also depends on safe storage practices at the household- and market-levels, including access to appropriate technologies, local surveillance and regulation of mycotoxin levels in the food supply, and education on the dangers of contamination.

Engaging with the Agriculture-to-Nutrition Pathways requires understanding the context and complexities of the larger food system. Considering the components of the RFS Food Systems Conceptual Framework can support the design, implementation, and evaluation of activities that focus on diet and nutrition outcomes (figure 1). The framework illustrates how key elements of USAID’s work come together as part of the food system; specifically, agriculture-led economic growth, water, nutrition, and resilience (USAID 2021a).

THE PATHWAYS WITHIN THE FOOD SYSTEM

The Agriculture-to-Nutrition Pathways focus on actions taken at a household level to improve nutrition outcomes. Using examples, this section describes how household-level pathway elements relate to the RFS Food Systems Conceptual Framework (figure 1), and how the steps along the pathways connect to each component of the framework.

BOX 6. FOOD SUPPLY: PRODUCING NUTRITIOUS FOODS AT THE HOUSEHOLD LEVEL

Producer households need access to improved agricultural inputs, technologies, knowledge, and skills to safely and efficiently produce nutrient-rich foods. Households can then maximize production for home consumption and market sales. Support for production could include:

- Household actions: Provide training and vouchers for producers to gain access to skills and inputs.
- System actions: Improve safe supply of inputs by assisting input suppliers to access finance that allows them to reduce transportation and storage constraints.

Food Supply

The food supply encompasses how food moves from production to consumption, including storage, distribution, processing, and packaging. Decisions made along the supply chain can influence the types of available and accessible food, and the way they are produced and consumed.

Food supply as represented in the RFS Conceptual Framework may have common elements of the pathways, including **food production, processing, and storage, and women's empowerment and energy expenditure**. These correspond with the subcomponents of the food supply—**land and water resources, inputs and water supply, agriculture production and loss, transport and storage, food trade and distribution, and processing and packaging**—and reflect how gender is a cross-cutting theme of the food system. Activities focusing on smallholder food production to improve household diets and nutrition can facilitate success by

considering the influence of food supply and its corresponding components.

Food Environment

The food environment is where consumers directly procure food. Its dimensions include **affordability and availability, exchange and prices, marketing activities and access, promotion and advertising, and food and water safety**. Food environments influence what households purchase and consume, making them critical for activities to promote safe and nutritious diets (USAID 2021a). Different types of food environments include natural (wild and cultivated) and built (informal and formal markets) (Downs et al. 2020). Though markets play an important role in consumers' food choices, they may be one of multiple food procurement channels, particularly in rural low- and middle-income countries.

A household-level intervention can influence how households interact with their natural and built food environments. When referencing the

BOX 7. FOOD ENVIRONMENT: ACCESSING AND DEMANDING SAFE AND NUTRITIOUS FOODS

As consumers, producer households need to be able to access safe and nutritious foods. When selling, increased demand for these foods will incentivize vendors. Support for strengthening the environment for supply could include:

- Household actions: Provide information on what foods are safe and nutritious and generate household demand using SBC approaches.
- System actions: Support local policies to ensure hygienic food processing and marketing practices and promote consumer education about consuming safe foods.

RFS Conceptual Framework, the elements of the pathways in the food environment component are **food prices, agriculture income, food access, and the food market environment**. Household-level interventions can further enhance diet and nutrition outcomes if practitioners consider the interplay between the pathways and their corresponding food environment components.

Food and Water Utilization

Food and water utilization reflects individual and household behavior on acquiring, storing, and consuming food; its intra-household allocation; and the acquisition of clean water. Personal preferences and the food environment influence and shape these behaviors. Alternately, changes in consumer behavior can influence sustainable food systems to improve diet and nutrition (USAID 2021a).

The elements of the pathways intersecting with the food and water utilization component are **food expenditure, non-food expenditure, women's energy expenditure, caring capacity and practices, and health care**. These elements align with subcomponents of the food system's food and water utilization component—**purchasing power, behaviors and preferences, intra-household dynamics and vulnera-**

bilities, preparation and waste, and hygiene behaviors. When interventions focus on improving the quality of household food consumption, overcoming barriers and constraints to food and water utilization will support positive diet and nutrition outcomes.

Food Systems Drivers

Food systems drivers affect the ability of the food system to sustainably deliver safe, nutritious diets. Drivers, listed in figure 1, represent external forces that might positively or negatively impact, and be impacted by, the food system (USAID 2021a).

The elements of the pathways corresponding with the food system drivers are **national economic growth and nutrition profiles; health, water, and sanitation; nutrition and health knowledge and norms; and natural resource management**. These external influences can enhance or impede household-level interventions and their ability to improve diet and nutrition.

Food System Investment Levers

Investment levers represent specific areas where USAID and public and private actors can strengthen and influence the food system to enact sustainable progress. Investment lever categories are **research and technology; infrastructure,**

BOX 8. FOOD AND WATER UTILIZATION: ENSURING HOUSEHOLDS CAN USE FOOD AND WATER TO IMPROVE NUTRITION

Young children in producer households, especially when in close contact with livestock, can experience frequent diarrheal diseases and develop malnutrition despite having sufficient food. Support for maximizing food and water for nutritional and health status could include:

- Household actions: Promote hygiene and sanitation practices for caregiving and food preparation. Provide training on separation of human and livestock spaces within the household.
- System actions: Facilitate linkages with micro- and small enterprises and service providers to support access to water, hygiene, and sanitation services and products, such as education around keeping livestock away from household water sources, chicken coops, and fencing.

BOX 9. DRIVERS: MANAGING NATURAL RESOURCES FOR FOOD PRODUCTION

Producer households need to manage natural resources to optimize the use and drainage of water, decrease the depletion or degradation of soils, and continue to access productive land, especially in the face of climate change. Support for ensuring natural resource management for production of nutritious foods could include:

- Household actions: Train household members to adopt conservation farming techniques and access improved, drought-tolerant seeds.
- System actions: Conduct research into new technologies, increase access to existing technologies, and tailor context-specific solutions to local agro-ecologies and climate conditions.

policy, and governance; social protection and human capital; risk mitigation and adaptation; capacity, education, and behavior change; and information access and connectivity (USAID 2021a). Although the pathways do not identify equivalent components, investment in each of these levers can have positive outcomes and effects along the Agriculture-to-Nutrition Pathways. For example, an investment in infrastructure could facilitate smallholder households' ability to access markets for purchasing inputs and nutritious foods and for selling agricultural products. Similarly, an investment in capacity, education, and behavior change could enable

households to plant nutritious crops, determine how much food to sell and keep, and encourage women's participation in household decisions.

THE WAY FORWARD

Agriculture is fundamentally linked to diet and nutrition. The Agriculture-to-Nutrition Pathways have helped practitioners understand how programs might improve nutrition and identify entry points by—

- removing barriers to women's empowerment
- supporting greater or more diverse food production

BOX 10. INVESTMENT LEVERS: INVESTING IN WOMEN'S ACCESS TO LAND AND FINANCE

Women in producer households need to have access to and control over resources such as land, information, and financial services to benefit from crop production and income generation. Support for investing in women to ensure their empowerment and income generation could include:

- Household actions: Connect women to financial services and institutions so they have the resources to maintain and invest in land. Strengthen the capacity of women in digital technology to ensure access to financial and market data.
- System actions: Address local policies that hinder women from securing land tenure and underlying factors that contribute to the gender digital divide. Work with agriculture and financial service providers to address the unique needs of women.

- supporting increased and focused use of income.

More than 10 years of learning from these nutrition-sensitive agriculture programs have demonstrated that not only are the factors influencing diet and nutrition within the household complex, but they are also simultaneously affected by positive and negative external influences.

Any household-level investments designed to work through the pathways must consider how elements of the food system can influence and strengthen intended impacts. Programming that targets systemic changes can result in measurable improvements in diets and nutrition for households and individuals. The RFS Food Systems Conceptual Framework assists practitioners in identifying actions to address both household and systemic factors to improve sustainable diet and nutrition outcomes. Begin this process by considering the following questions:

- Where along the pathways am I working?
- At which points and how do these pathway points interact with the food system?

- How can I incorporate food system elements to make interventions more effective and diet and nutrition outcomes more sustainable?

Practitioners can harness the interplay between the Agriculture-to-Nutrition Pathways and the Food System Conceptual Framework to ensure household-level interventions reach their potential for impact and sustainability of diet and nutrition outcomes for all.

KEY RESOURCES

- [Food Processing for Improved Diets Brief](#)
- [Multi-Sectoral Nutrition Strategy \(MSNS\) 2014–2025](#)
- MSNS Food Systems Brief (link pending)
- [MSNS Gender and Food Systems Brief](#)
- [RFS Food Systems Conceptual Framework](#)
- [Understanding and Applying the Primary Pathways and Principles](#)
- [U.S. Global Food Security Strategy 2022–2026](#)

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This Technical Brief will be periodically updated. Comments from readers are welcome, especially comments to help clarify the information provided or where additional information may be useful.

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