

A Food Systems Approach for Food and Nutrition Security

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Too often, the global discourse on food security focuses on how we will grow enough food to feed a population of 9 billion people by 2050. This neglects to acknowledge that broader food and nutrition security requires more than just producing enough calories. It concerns how we can ensure access for each individual to a quality and safe diet with adequate macro- and micronutrients. It also neglects the fact that we already face a major problem today, with billions of people suffering from malnutrition in various forms.

At the World Food System Center at ETH Zurich, we believe that this discourse, and the design of appropriate solutions to ensure food and nutrition security both now and in the future, could benefit from a broader adoption of a food systems approach.

How do we understand a food system?

We conceptualize a food system as comprising the various activities and actors in food value chains involved in transforming inputs into outcomes, which for a sustainable food system should include food and nutrition security, environmental quality, and human well-being.^{1,2,3} A food system includes, is shaped by, and interacts with, a variety of boundary conditions, namely the environmental, social, political and economic conditions and realities which determine how it can function at a particular place of interest (see [Figure 1](#)). These boundary conditions are not static; rather they interact with trends and change drivers across national and geographic borders. For example, what types of crops can be grown in a particular area and their nutritional quality is determined by the climatic conditions, atmospheric composition, soil quality and resource availability, which can all be potentially impacted over time by climate change.⁴

What does this mean for decision making?

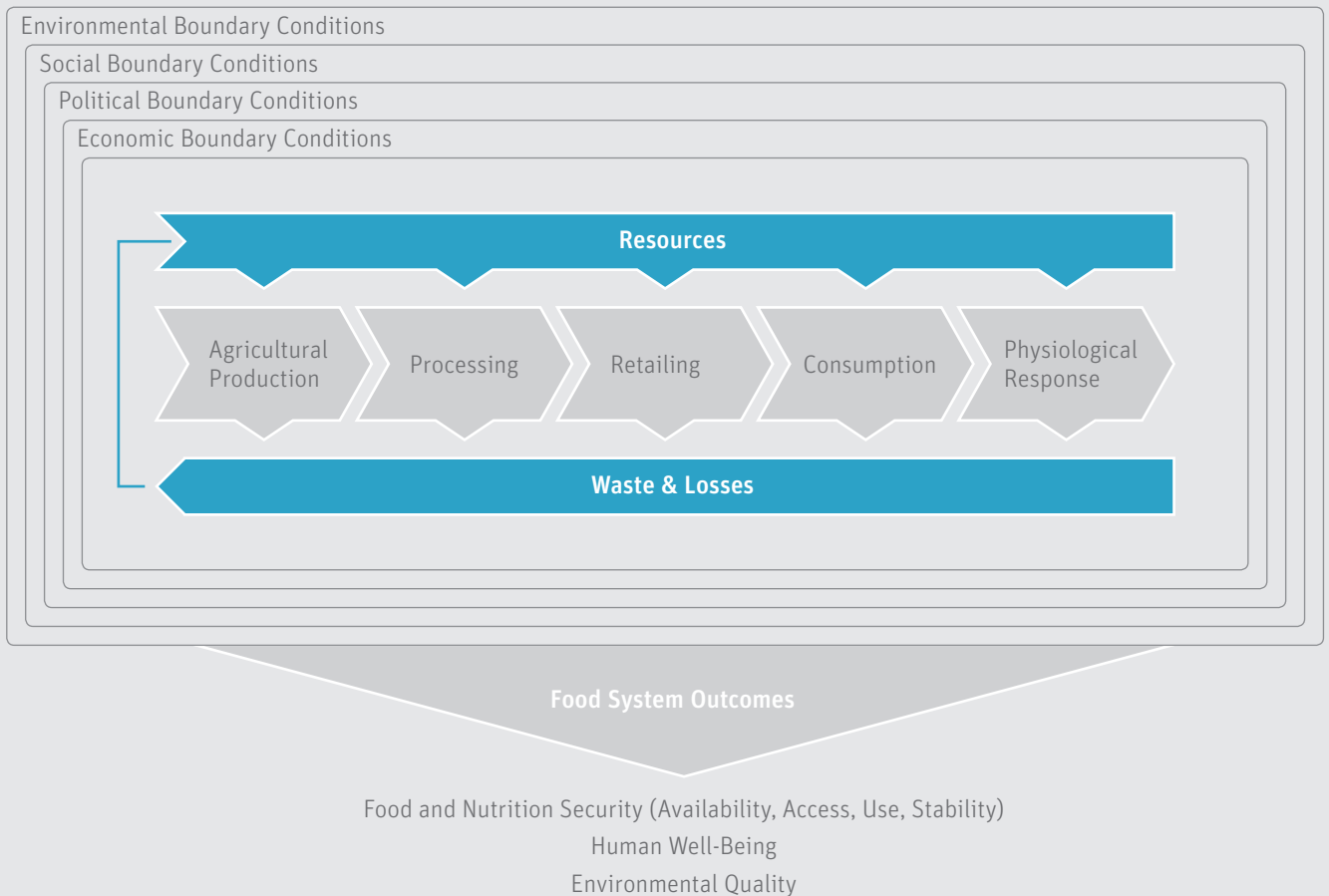
The food systems concept helps to highlight the relationships,

interactions and dependencies that come into play whenever we try to address food and nutrition security.³ It allows us to appreciate that food systems are complex adaptive systems, meaning that the whole system has properties greater than the sum of its parts, that there are high levels of connectedness and interaction across scales and levels and with diverse agents, and that outcomes may be reached by many possible pathways which are influenced by many factors.^{3,5} This complexity makes policy and intervention design highly challenging, as the interconnectedness and dynamics can easily lead to unanticipated outcomes and unintended consequences.

All too often, we see examples of unintended consequences that result from interventions that have been designed without taking the broader system into account. This can also happen due to interactions between different systems – for example, energy and food systems. A case in point is the United States ethanol policy, which resulted in an increased demand for corn as a feedstock for biofuel production. This contributed to increased prices for corn for human food and livestock feed, which, combined with other factors, impacted food security in other countries.⁶

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Aside from unintended consequences, complex system interactions may also result in interventions not fully achieving the intended outcome. For example, modeling the scale-up of a package of ten nutrition-specific interventions to 90 percent coverage in high-burden countries revealed that, collectively, these interventions could reduce the burden of stunting by only 20 percent.⁷ Although significant, this also highlights the fact that for broader impact there is a need for combined nutrition-

FIGURE 1: Key Elements of a Food Systems Concept¹

specific and nutrition-sensitive interventions that are designed from a systems perspective to holistically address food and nutrition security and to build long-term health and resilience.⁸ Systems approaches can help us identify critical leverage points and design interventions across sectors in a way that identifies underlying causes and builds on synergies. This can mean that small interventions can build on tipping points to have bigger contributions to overall food system outcomes.⁵

How do we understand a food systems approach?

A food systems approach relates to a more holistic way of thinking and of working. Often it begins with taking a step back to look beyond a specific focus area so as to understand the broader system and goals. An example of this can be found in initiatives that support actors from the agriculture, health, nutrition and development sectors to come together and explore the role of biodiversity in food systems to support resilient production systems, livelihoods, dietary diversity and nutritional outcomes.⁹

Such approaches require working in inter- and trans-disciplinary ways, which calls for individuals and institutions to

build new networks of partners and to design new ways of working together and communicating with one another. This often demands additional management and coordination activities, which should be factored into funding programs from donor and government agencies. All of this necessitates the streamlining of terminology and the building of a shared understanding of the benefits and limitations of different methodological approaches.

A systems approach often begins with multi-stakeholder problem-framing and problem-mapping exercises which aim to use collective knowledge to identify system elements, interactions and leverage points, and to start to analyze trade-offs. New quantitative and qualitative tools that build on these conceptual models are needed for further analysis. A number of systems modeling techniques that have traditionally been applied in other fields are now contributing to food systems analysis, such as agent-based modeling, system dynamics modeling, and companion modeling (ComMod) approaches.¹⁰ Further work is needed to identify and develop new tools and adapt those already available to food systems contexts.

In order for the above to be successful, there is a need for new sets of co-located data that allow cross-sectoral design and analysis of interventions.⁹ This means that further efforts are needed to ensure that measurements of human health and well-being are gathered in the same locations and at the same scales as other data related to agriculture, environment and markets.

How do we try to implement this in our work at the World Food System Center?

The Swiss Federal Institute of Technology in Zurich (ETH Zurich) recently made a strategic decision to support such approaches at an institutional level through the establishment of the World Food System Center (WFSC). As a research university, the core contribution of ETH Zurich to addressing food and nutrition security is through the generation of new knowledge and the training of the next generation of leaders and decision-makers. At the WFSC, we focus on trying to leverage this through supporting systems approaches that bring together researchers and external partners to work together in inter- and trans-disciplinary settings. Internally, the Center coordinates a network of 37 research chairs from seven different departments of the university and provides management support, funding and platforms for these network members to engage in research, education and outreach activities that address food system challenges. Aside from connecting these members internally, we link individuals, groups and projects with external partners from a variety of sectors to engage in the research process.

To support the integration of systems approaches into research for food and nutrition security, the Center is now establishing flagship research projects. These aim to be larger scale collaborations that bring together experts from multiple disciplines and sectors and take a systems approach. The Center works with the researchers to coordinate the process, help build up new networks, connect and involve stakeholders from different sectors, and integrate relevant methods and tools from both the social and the natural sciences. The first project being established focuses on assessing and designing resilience for food systems. The ultimate aim of this project is to provide a practical framework, guideline and toolkit that can be used by a variety of food system stakeholders to identify leverage points and design interventions that can improve system resilience in order to *“provide sufficient, appropriate and accessible food to all in the face of various and unforeseen disturbances.”*¹¹

Systems approaches require working across disciplines, sectors and scales, which demands new networks of collaborators, methods and tools. This year, the WFSC will host a conference that will bring together a group of thought leaders from academia, industry, international organizations, government agencies and the not-for-profit sector to share lessons learnt in addressing food and nutrition security. The conference will include a

focus on resilience and a workshop that harnesses the collective expertise of the diverse group to develop indicators for the operationalization of a resilience framework for food systems. The intention is to build this event into a regular series that creates a global forum to support systems approaches for food and nutrition security through a network of collaborators who can share methods, tools, experiences and lessons learnt.

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Looking to the future, it is critical that the next generation of leaders and decision-makers are equipped with the knowledge, tools, skills and networks to understand and manage complexity to improve food system outcomes. At the WFSC we support this through an annual training program open to students, junior researchers and young professionals from all disciplines, cultures and countries. The two-week program, last year hosted in India and Switzerland, follows the structure of the food system and includes lectures, workshops, group work, field trips, role plays, design approaches and hands-on field work. Through exchange with experts and peer-to-peer learning, the participants gain new knowledge and skills and explore their role in working with and influencing complex food systems. This experience helps prepare them to connect their work to bigger issues and influencing factors, and builds their competence to collaborate across disciplines, sectors and scales.

Delivering food and nutrition security over the long term

Building resilient food systems that deliver food and nutrition security over the long term is one of the defining challenges of our time. Only through systems approaches, building new partnerships and collaborating across boundaries will we be able handle multifactorial problems and design interventions that ensure positive long-term impacts. We hope that our work here at ETH Zurich, together with our partners, can play a role in contributing to these integrated approaches.

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Food systems require a multisectoral approach

A food system comprises the various activities and actors in food value chains involved in transforming inputs into outcomes, which for a sustainable food system should include food and nutrition security, environmental quality, and human well-being.^{1,2,3}

There is typically no single solution or disciplinary approach that is appropriate for all levels and contexts. For this reason, a systems approach that brings together experts from different academic fields and representatives from different sectors to work together collaboratively is critical for designing appropriate interventions that positively support food system outcomes. This means moving beyond a focus on one sector – for instance, only agriculture or only nutrition – to consider together the interactions with other sectors such as health, food, environment, energy, and development. A food systems approach uses inter- and trans-disciplinary methods that consider activities, outcomes, interactions, and feedbacks and attempt to engage all relevant stakeholders. This requires new tools, new ways of thinking and new ways of working together.

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