Food System for Sustainable Healthy Diets: Global and Local Efforts

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Summary  Global efforts for sustainable healthy diets include the Sustainable Development Goals by the United Nations in 2015, the Sustainable Healthy Diets by the Food and Agriculture Organization of the United Nations and the World Health Organization in 2019 and the Planetary Health Diet by the EAT-Lancet Commission. The food system is a dynamic and complex system, and systems approach is useful in providing stakeholders and policymakers with a comprehensive understanding of the broader food system. As local efforts, some of the recent articles using systems approach are introduced. They include systems modelling for local sustainability, policy activities for healthy and sustainable diets, food-related policymaking processes, low fruit and vegetable intake in children, and livestock-derived food system. In light of the existence of various stakeholders and policymakers, redesigning of the food system using systems approach may help mitigate climate change.

Key Words  Sustainable Development Goals, Sustainable Healthy Diets, Planetary Health Diet, food system, systems approach

The current food system is essential for our daily dietary life. It encompasses food production, processing, distribution, retail, consumption and waste disposal. It is not confined to one country but it involves international trade and transportation with substantial greenhouse gas (GHG) emissions. Thus, the food system is one of the causes of climate change worldwide.

The total GHG emissions from the food system is estimated to account for one-third of the global GHG emissions, and per capita GHG emissions in developed countries was about twice as high as in developing countries in 2018 (1).

The food system is a dynamic and complex system where a small change causes larger consequences, which was named the butterfly effect originally in chaos theory. Due to this nature of the food system, systems approach is one of the methods to appropriately deal with its dynamics and complexity. In this review, major global efforts for sustainable healthy diets are overviewed, and recent studies at the local level using system dynamics are introduced.

Global efforts for sustainable healthy diets

In September 2015, the Sustainable Development Goals (SDGs) was adopted by all member states at the United Nations General Assembly. It succeeded the Millennium Development Goals which started in 2001 and focused on challenges in developing countries, but the SDGs calls for actions in both developing and developed countries. It has 17 goals and 169 targets (Table 1), and the food system is related to most of the goals, especially Goals 2 (Zero Hunger), 3 (Good Health and Well-Being), 6 (Clean Water and Sanitation), 9 (Industry, Innovation and Infrastructure), 12 (Responsible Consumption and Production), 13 (Climate Action), 14 (Life Below Water) and 15 (Life on Land).

In 2019, the Food and Agriculture Organization of the United Nations (FAO) and the World Health Organization (WHO) released “Sustainable healthy diets: Guiding principles” (2). Considering the detrimental environment impact of current food systems and concerns raised about their sustainability, it urges the promotion of diets that are healthy and have low environmental impacts. It contributes to the SDGs at a country level, especially Goals 1 (No Poverty), 2 (Zero Hunger), 3 (Good Health and Well-Being), 4 (Quality Education), 5 (Gender Equality), 12 (Responsible Consumption and Production) and 13 (Climate Action). There are 16 guiding principles, five of which are regarding environment aspects (Table 2). As one of the actions for its implementation, it proposes to "analyze existing food systems to identify potential changes needed to encourage the production, processing, packaging, storage, distribution, marketing and retailing, and consumption of a diversity of foods needed for Sustainable Healthy Diets."

In 2019, the EAT-Lancet Commission published the Planetary Health Diet (3). It urged a radical transformation of the global food system, and proposed that a diet rich in plant-based foods and with fewer animal-source foods confers both improved health and environmental benefits. Transformation to healthy diets by 2050 requires substantial dietary shifts, and it indicated a more than doubling in the consumption of healthy foods such as fruits, vegetables, legumes and nuts, and a greater than 50% reduction in global consumption of less healthy foods such as added sugars and red meat. There is a big “diet gap” between current dietary pat-
terms and intakes of food in the planetary health diet. Five strategies for a great food transformation include: 1) Seek international and national commitment to shift toward healthy diets; 2) Reorient agricultural priorities from producing high quantities of food to producing healthy food; 3) Sustainably intensify food production to increase high-quality output; 4) Govern the land and oceans strictly and cooperatively; and 5) At least halve food losses and waste, in line with UN Sustainable Development Goals.

**Local efforts for sustainable healthy diets using systems approach**

A system dynamics model is useful in providing stakeholders and policymakers with a comprehensive understanding of the broader food system. Some of the recent articles using systems approach are introduced below.

**Systems modelling for local sustainability**

Moalemii et al. reviewed how system dynamics can contribute to sustainability research and implementation framed by the SDGs (4). They reviewed 357 system dynamics studies on a local scale between 2015 and 2020 in four key areas: diversity of scope, interdisciplinarity of the approaches, degree of stakeholder participation, and the analysis of SDG interactions.

As for diversity of scope, the main focus has been limited to a few goals such as Goals 6 (Clean Water and Sanitation), 9 (Industry, Innovation and Infrastructure) and 11 (Sustainable Cities and Communities). A few countries dominated the case studies related to each SDG. Issues related to Goals 3 (Health and Well-Being) and 17 (Partnership for the Goals) were less discussed overall and particularly in developing countries.

As for an interdisciplinary approach, most of the reviewed studies were identified as interdisciplinary. A broad range of disciplinary areas associated with different SDGs included sustainable development (32%), water and hydrology (18%), and agricultural studies (11%), but areas such as climate change (3%), transportation (4%) and ecology (4%) were less common. The majority of the studies (51%) adopted a mixed qualitative and quantitative approach. Thirty-seven percent of the studies primarily adopted a participatory approach, and two examples were exploring non-linear complex interactions and analyzing the effects of long-term uncertainties on system behavior.

As for stakeholder participation, only 28% of the studies were identified as participatory. Compared with studies related to Goals 4 (Quality Education), 10 (Reduced Inequalities) and 17 (Partnerships for the Goals), those related to Goals 6 (Clean Water and Sanitation), 9 (Industry, Innovation and Infrastructure) and 13 (Climate Action), had a limited share of participatory studies.

As for interaction analysis, some of the prominent interactions were between Goals 8 (Decent Work and Economic Growth) and 12 (Responsible Consumption and Production), between Goals 2 (Zero Hunger) and 14 (Life Below Water) and between Goals 6 (Clean Water and Sanitation) and 12.

**Policy activities for healthy and sustainable diets**

Public health nutrition and environmental sustainability problems are complex and their causes and solutions are unclear. Lawrence et al. developed a policy formulation tool for strategically informing food and nutrition activities to promote health and sustainable diets (HSD) (5).

The policy formulation tool consisted of two complementary components: a conceptual framework of the environment-public health nutrition relationship and an 'Orders of Food Systems Change' schema drawing on systems dynamic thinking.

The conceptual framework of the environment-public health nutrition relationship comprised three integrated dimensions: a structure built around a bidirectional relationship mediated via the food system; internal mechanisms that operate through system dynamics; and external interactions that influence the nature and scope of the framework within ecological parameters (physical limits on the food system, complex inter-
connected relationships within the food system, and dynamic nature of the food system).

The Orders of Food Systems Change schema was presented in a table. Its columns were organized around three orders of change for redesigning food systems. The first order related to the need to compensate for and/or build resilience to existing HSD problems. The second order related to the need to reduce the risk of HSD problems. The third order related to the need to promote the food system as a resource for HSD. The schema’s rows specified details of the following criteria: (i) how the HSD problem is framed and its cause ascribed to the food system; (ii) the process for change; (iii) participation of stakeholders; and (iv) governance arrangements.

Food-related policymaking processes

Obesity and non-communicable diseases are major public health issues in the Pacific Islands. Waqa et al. conducted a study to apply systems thinking to identify the causes and consequences of poor evidence use in food-related policymaking (6).

Policymakers in developing food-related policies at the Ministry of Health and Medical Services and the Ministry of Agriculture in Fiji were invited to group model-building workshops. The causal loop diagrams identified the causes and consequences of insufficient use of evidence in developing food policies. These were consultation, engagement with stakeholders, access and use of evidence, and delays in policy processes.

Low fruit and vegetable intake in children

A study was conducted to identify systemic barriers to children meeting fruit and vegetable guidelines in New Zealand (7). The researchers, in collaboration with a Ministry of Health-funded prevention initiative, invited participants and held group model-building workshops. The following four subsystems were identified: the home environment, fast food, community nutrition and health outcomes. Barriers to children’s intake of fruit and vegetables included the saturation of fast-food outlets in the community, the high cost of fresh produce compared to fast food, and parents with little time for food preparation.

Livestock-derived food system

Livestock-derived food (LDF) is a major contributor to climate change. The growth of LDF consumption is associated with changes in food systems. LDF system was examined in South Africa using a system dynamics model (8).

The researchers held a participatory workshop to map the whole system and to find key nexus points. Twenty-nine participants who represented various stakeholders and important informants created a map of the LDF system to identify nexus points with interrelational causal loops between them. As a result, the participants identified key nexus points in a systems map with the following rank (highest to lowest): 1) land access, 2) climate change (joint first place), 3) small-scale vs. commercial farming, 4) livestock management, 5) livestock productivity, 6) food preservation/safety, 7) policy articulation, 8) agricultural education, and 9) income and 9) land management (joint ninth place).

Conclusions

In light of the existence of various stakeholders and policymakers in local settings, redesigning of the food system using systems approach may help mitigate global climate change.

Disclosure of state of COI

No conflicts of interest to be declared.

Acknowledgments

This study was supported by Health and Labor Sciences Research Grants from the Japanese Ministry of Health, Labour and Welfare [19FA1004].

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