Critical Mapping for Sustainable Food Design

Food Security, Equity, and Justice

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1 Critically mapping a wicked solution to food insecurity

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1 Critically mapping a wicked solution to food insecurity

Food sustains life, and without it, humanity would cease to exist. The Food and Agriculture Organization (FAO) of the United Nations (UN) at their 1996 World Food Summit in Italy defined food security as "a state where all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (FAO 2008). Subsequently, in the report titled "An Introduction to the Basic Concepts of Food Security," the FAO introduces four dimensions of food security that operate simultaneously: availability, access, utilization, and stability. Availability refers to the physical supply of food daily through generative production, level of stock or inventory, and trade (1). Economic and environmental factors, like income and geographic location, respectively, determine household and individual access to the physical supply of food (1). Once an individual gains access to a food supply, how they utilize that food to retrieve the nutrients their body needs daily depends on their culturally based and cognitive "feeding practices, food preparation, diet, and intra-household" practices of distributing food along with their body's biological functionality and its ability to utilize the nutrients accordingly (1). To be food-secure requires balancing availability, access, and daily utilization to achieve the fourth dimension of food security, stability. A lack of equilibrium in the food system can bring about too little or too much food on an individual level; and both of these states can have negative health ramifications that, over time, can lead to preventable illnesses and mortality for human beings (1).

As food security is an overall life-or-death balancing act influenced by environmental, biological, political, economic, ethical, aesthetic, and socio-cultural factors, the FAO created a scale and household and individual survey instruments (see Appendix IV Food Insecurity Experience Scale Instruments) to assess the range of food security for households and individuals across the globe ("The State of Food Security and Nutrition in the World" 2018, 7). The FAO's measuring scale illustrated in Figure 1.1 strategically uses semiotic hues for danger and safety, ranging from green (food-secure) to green-yellow (mild food insecurity) to yellow-orange (moderate food insecurity) to orange-red (severe food insecurity).

Subsequently, in its 2021 update titled "The State of Food Security and Nutrition in the World: Transforming Food Systems for Food Security, Improved

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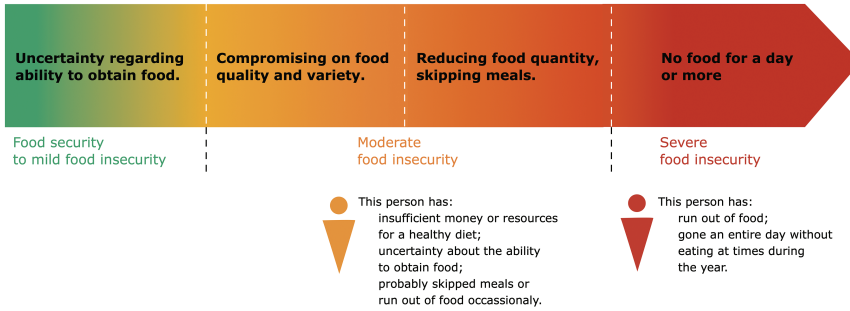

Figure 1.1 FAO's food insecurity experience scale ranges from food secure to mildly food insecure to moderately food insecure to severely food insecure. It is used to measure the state of food security among people individually and in households across the globe. Image courtesy of FAO.

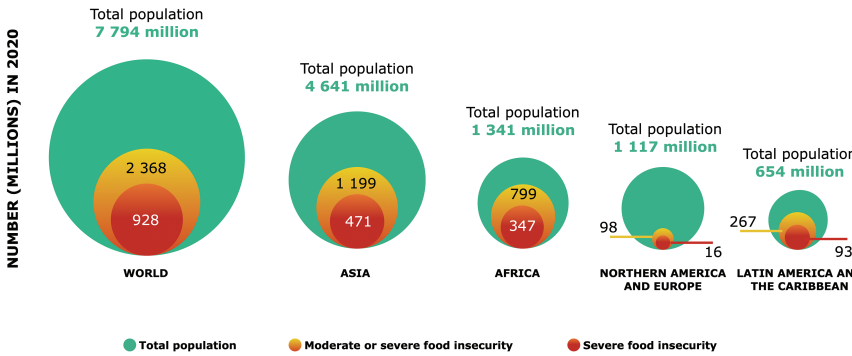

Figure 1.2 The concentration and distribution of food insecurity by severity differ significantly across the world's regions—Asia, Africa, Northern America and Europe, Latin America and the Caribbean—with food insecurity being most prevalent in Asia and Africa respectively. Image courtesy of FAO.

Nutrition and Affordable Healthy Diets for All," the FAO reports that "moderate or severe food insecurity has been climbing slowly since 2015 and, as of 2021, affects more than 30 percent of the world population" with over 900 million people experiencing severe food insecurity as shown in Figure 1.2 (19). As shown, "the concentration and distribution of food insecurity by severity differ greatly across the different regions of the world with food insecurity being more prevalent in Asia and Africa respectively" (20).

The United States Census Bureau estimates that of its approximate 300 million population (United States Census Bureau n.d.), 50% are female, and 31.9% are people of color experiencing high levels of food insecurity. According to the FAO (2021, 22), "globally and in every region, the prevalence of food insecurity

is higher among women than men". In terms of race and ethnicity, the United States Department of Agriculture's (USDA) Economic Research Service (ERS) provides open access to its food security data online.[1] One chart titled "Trends in food insecurity by race and ethnicity, 2001–21" shows that Black (non-Hispanic) and Hispanic households have experienced substantially more food insecurity in the past decade than other racial and ethnic households. This reality grossly contradicts the aims of the FAO that, as noted previously, defines food security as "a state where *all* people, at *all* times, have…access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (2008, emphasis added). Penniman blames this disparity on age-old racism noting:

> Racism is built into the DNA of the US food system. Beginning with the genocidal land theft from Indigenous people, continuing with the kidnapping of our ancestors from the shores of West Africa for forced agricultural labor, morphing into convict leasing, expanding to the migrant guestworker program, and maturing into its current state where farm management is among the whitest professions, farm labor is predominantly Brown and exploited, and people of color disproportionately live in food apartheid neighborhoods and suffer from diet-related illness.
>
> (2018, 5)

In the edited book titled *Cultivating Food Justice: Race, Class, and Sustainability*, Alkon and Agyeman (2011) concur, discussing how "food is not only linked to ecological sustainability, community, and health but also racial, economic, and environmental justice" (15). Referencing Winne (2008), Alkon and Agyeman clarify that the injustice of food insecurity centers on access; communities of color tend to lack ease of access to healthy food due to geographic location and affordability—that is, healthy food that is available likely is too expensive and more costly than similar food in wealthier areas (Alkon and Agyeman 2011, 17). Undeniably, food insecurity is a pressing social justice issue in the present period of multiple social challenges, including climate change, COVID-19, war, and white supremacy. As good health depends mainly on food security for *all*, the next section discusses the negative ramifications of food insecurity on health.

Food insecurity and its dire health consequences

The World Health Organization (WHO) uses the term "malnutrition" to represent the negative impact of food insecurity on human health. WHO defines malnutrition (the "double burden of malnutrition") as:

> deficiencies, excesses, or imbalances in a person's intake of energy and nutrients. The term malnutrition addresses three broad groups of conditions: 1) undernutrition, which includes wasting (low weight-for-height), stunting (low height-for-age), and underweight (low weight-for-age); 2)

> micronutrient-related malnutrition, which includes micronutrient deficiencies (a lack of important vitamins and minerals) or micronutrient excess; and 3) overweight, obesity, and diet-related non-communicable diseases (such as heart disease, stroke, diabetes, and some cancers).
>
> (World Health Organization 2017)

Figure 1.3 illustrates how food insecurity can follow two distinct pathways to bring about malnutrition in individuals and households that can lead to mortality. The process of malnutrition begins with an individual's lack of or inconsistent access to food, whether by their agency or the impact of their household status. The consequences of this "uncertain food access" affect the quantity, quality, and continuity of their food consumption and even their mental health—the latter of which also negatively impacts the quantity, quality, and continuity of their food consumption (FAO 2018). On the one hand, if too few calories, proteins, vitamins, and minerals are consumed, malnutrition through undernutrition and micronutrient deficiencies ensues. On the other hand, if too many high calories and nutrient-poor foods are consumed, malnutrition through overweight, obesity, and diet-related non-communicable disease can occur.

As of June 9, 2021, WHO's webpage provides key facts on malnutrition estimates that 1.9 billion adults are overweight or obese, 462 million adults are underweight, 149 million children under five are stunted (too short for age), 45 million children are wasted (too thin for height), 38.9 million children are overweight or obese. In regard to race and ethnicity, as of 2020, 41.6% of Blacks, 38.8% of American Indian/Alaska Natives, 38.5% of Hawaiian/Pacific Islanders, 36.6% of Hispanics, 30.7% of Whites, and 11.8% of Asians in the United States were obese (United Health Foundation, n.d.). Foster (1992) and Leathers and Foster (2004) argue that malnutrition, specifically undernutrition, is a perennial challenge in developing nations. However, WHO's malnutrition webpage on malnutrition also notes that economically developed countries, too, are challenged by malnutrition through excess consumption that leads to obesity—the gateway physical state to life-threatening illnesses such as diabetes, cancer, and heart disease. This simultaneity of seemingly opposing health consequences (i.e., overweightness and undernutrition) at alarming rates caused by food insecurity contributes to it being a wicked problem, and the pervasiveness of food insecurity in communities of color makes it a critical social justice issue, further adding to the complexity of the problem.

While it is evident that malnutrition presents a significant and complex challenge in global society today, some argue that it will persist into the future. For instance, Nelson et al. (2018) predict that between now and 2050, when the world population grows to 10 billion, obesity and undernutrition will continue. That is in part because of "the 'nutrition transition' in many countries where, as incomes grow, diets shift away from traditional diets towards 'western' diets that are typically higher in saturated fat, sugar, and salt" (16). Thus the global food problem's focus will evolve to center more on micronutrient deficiencies exacerbated, in some regions, by climate change, increasing incomes,[2] and evolving diets. Their

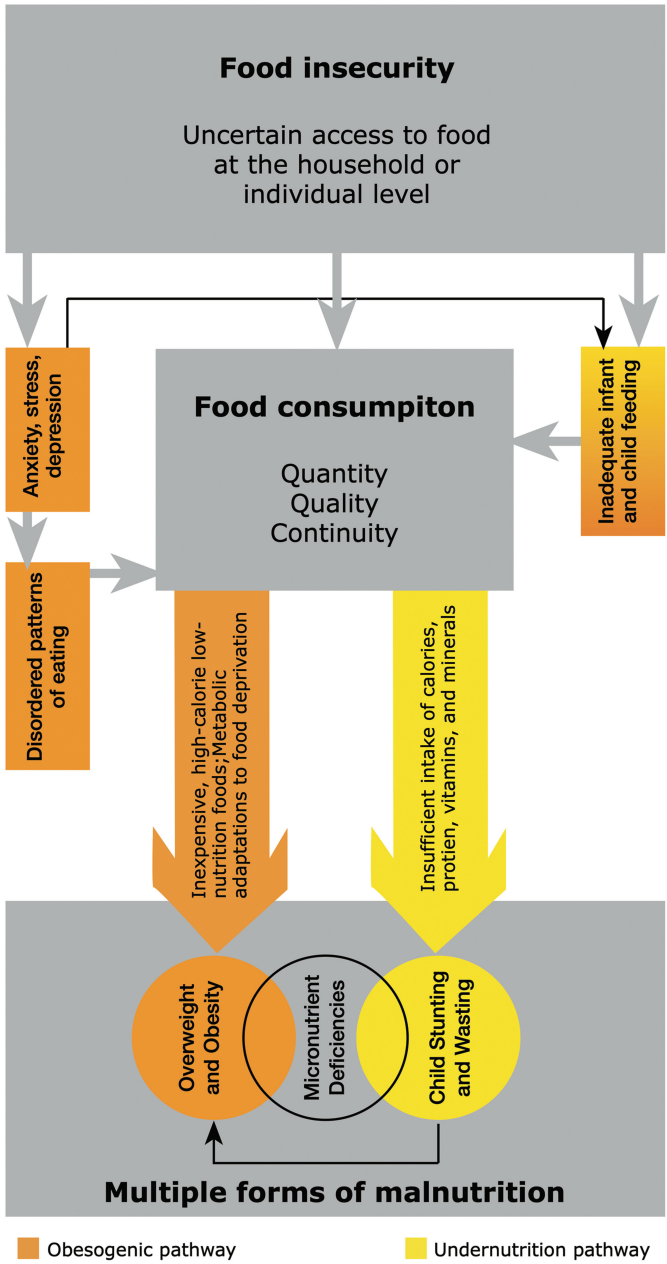

Figure 1.3 Pathways from food insecurity or inadequate food access to multiple forms of malnutrition. Image courtesy of FAO.

findings indicate that the global food problem in 2050 may be more about "providing nutritious diets rather than adequate calories" (Nelson et al. 2018). In the next section, we discuss the drivers that systemically undermine food security and malnutrition towards addressing food insecurity moving forward.

Factors driving malnutrition and food insecurity

In 2017, WHO also reported that there are socio-cultural, behavioral, biological, and environmental factors that influence an individual's nutrition (World Health Organization 2017, 4). Lifestyle habits and socio-economic status, food supply, portion sizes, and cost are some of the factors that constantly and simultaneously interact while influencing one's daily access to healthy food (5). While the drivers of the double burden of malnutrition might be thought of as a linear progression in time that cycles with no clear starting point, the reality of the situation with malnutrition is that it is arguably more the simultaneity of occurrence of these factors that influences one's nutrition. If malnutrition is an effect of food insecurity, then the factors driving malnutrition contribute to those driving food insecurity.

Recently, the USDA attempted to paint a broader picture of the food security system that includes the drivers mentioned earlier of malnutrition, and extended the repertoire to include climate change, political conflict, and even design (i.e., technology and innovation) (FAO 2021). As depicted in Figure 1.4, the FAO comprehensively illustrates food security as a system of activities composed of drivers affecting complex activities ranging from local to global, individual to institution. The complex activities occurring in the food system include subsystems of activities related to the production of food to its supply within environments where access to healthy food is influenced by numerous top-down and bottom-up drivers.

Attaining a state of food security means creating an equitable and just balance across the four dimensions of food security discussed earlier in this chapter (i.e., availability, access, utilization, and stability) and two more (agency and sustainability)[3] (FAO 2021, 53). Agency is "the capacity of individuals or groups to make their own decisions about what foods they eat; what foods they produce; how that food is produced, processed and distributed within food systems; and their ability to engage in processes that shape food system policies and governance" (190). Whereas, sustainability is "the long-term ability of food systems to provide food security and nutrition in a way that does not compromise the economic, social and environmental bases that generate food security and nutrition for future generations" (190).

The current state of the food system, however, is the opposite of the kind of food-secure balance that we seek. As the earlier statistics in this chapter reveal, populations worldwide are struggling to achieve food security due to major drivers, including political conflict, climate variability and extremes, economic slowdowns and downturns, unaffordability of healthy diets, and underlying poverty and inequality that emerge from top-down and bottom-up activities in the food

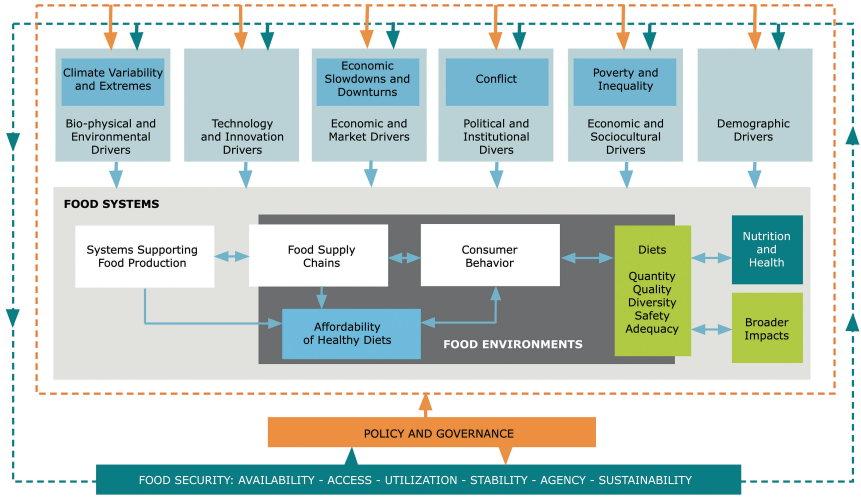

Figure 1.4 FAO's "food systems diagram…illustrates how the drivers behind recent food security and nutrition trends specifically create multiple impacts throughout food systems (food systems, including food environments), leading to impacts on the four [traditional] dimensions of food security (availability, access, utilization and stability), as well as the two additional dimensions of agency and sustainability. These drivers have impacts on attributes of diets (quantity, quality, diversity, safety and adequacy) and nutrition and health outcomes (nutrition and health)" (2021, 53). Image courtesy of FAO.

system. On the one hand, there are top-down institutional activities and natural factors (e.g., the environment and climate changes) that can cause poverty, economic recession, war and conflict, and varied and extreme climates that negatively impact the flow of the food system and create a state of food insecurity, inequity, and injustice for many communities, especially those of color. On the other hand, there are bottom-up demographic and environmental factors, including nutrition, health, income level, heritage, geographic location, and dieting habits that influence when, where, what, how, and how much an individual consumes, and thus can lead to prolonged experiences of food insecurity.

To mitigate the negative drivers on the food system towards food security for all, the FAO (2021, 88) outlines the following six possible pathways to intervene and transform the global food system towards food security:

1. Integrating humanitarian, development, and peacebuilding policies in conflict-affected areas.
2. Scaling up climate resilience across food systems.
3. Strengthening the resilience of the most vulnerable to economic adversity.
4. Intervening along the food supply chain to lower the cost of nutritional foods.

5. Tackling poverty and structural inequalities, ensuring interventions are pro-poor and inclusive.
6. Strengthening food environments and changing consumer behavior to promote dietary patterns that positively impact human health and the environment.

While the intent of providing these pathways may be for top-down intervention, we interpret them as potential interventional pathways for top-down *and* bottom-up activities within the realm of design for social innovation and appropriation. A secure food future depends on the continued development of innovative interventions that can disrupt drivers of food insecurity and redirect the system towards greater security that is equitable, just, and sustainable. Designers of all kinds working with other professional and community stakeholders in the food system, can play a vital role in creating such a future. In the next section, we discuss the need for three seemingly disparate fields—sustainability, food, and design—to come together to address food insecurity, inequity, and injustice through sustainable food design.

The convergence of sustainability, food, and design

With an increasing awareness of the environmental impact of development on the planet, sustainable development emerged as a mainstream concept with the publishing of *Our Common Future* in 1987 by the United Nations, often referred to as the Brundtland Report[4] (Du Pisani 2007). In the report sustainable development was defined as development that "seeks to meet the needs and aspirations of the present without compromising the ability to meet those of the future" (World Commission on Environment and Development 1987, 51). The report expressed concerns on future global equity and focused on the redistribution of resources to stimulate economic growth in poorer nations to ensure that basic needs were met for all humans. Sustainable development is based on the idea that social equity, economic growth, and environmental stewardship could be integrated in various areas including agriculture and food. The concept of the integrated sustainability lens of social, economic, and environmental would later be the basis for the concept of the triple bottom line (Du Pisani 2007). The triple bottom line is a sustainability construct, a framework that measures performance and organizational success in business based on three lines: economic, social, and environmental (Goel 2010). Elkington (2008) coined the concept and used the terms "profit," "people," and "planet" to reference the three pillars. The triple bottom line in sustainability is based on the integration of the social, environmental, and economic, and places an equality of emphasis on each of the lines (Alhaddi 2015).

Many sustainable development frameworks have been created and used in local, regional, and global contexts, based on the three components of the triple bottom line—social, economic, and environmental—and they vary widely in their scope and effectiveness (Orenstein and Shach-Pinsley 2017). The "three pillars" approach has been challenged due to the complexities within each system

and the limits of compromise when trying to achieve balance among all three pillars (Miller 2014). Other sustainability paradigms have emerged, including the concepts of social sustainability (Eizenberg and Jabareen 2017; Vallance et al. 2011), "just sustainability" (Agyeman 2008; Agyeman et al. 2003; Sherriff 2009), and sustainable livelihoods (Chambers and Conway 1992; Knutsson 2006; Miller 2014). Social sustainability varies widely in its definition and scope in practice and theory. Eizenberg and Jabareen (2017) view the risks from climate change and its threat on social spheres as a key concept of sustainability and they offer that social sustainability seeks to address social issues while confronting these risks. Just sustainability considers social justice and environmental justice and recognizes the inextricable links between humans and the earth (Agyeman 2008; Alkon and Agyemen 2011; Sherriff 2009). Sustainable livelihoods include access to the tools and resources needed for living and being able to weather shocks and stressors, now and in the future (Chambers and Conway 1992).

As sustainable development concepts and applications emerged after the Brundtland Report, most focused on the environmental aspects, neglecting the components of poverty, equity, and health, even though these were addressed in the report (Eizenberg and Jabareen 2017). Design and sustainability were also initially focused on the environment with a particular emphasis in areas of product design and engineering (Bhamra and Hernandez 2021; Ceschin and Gaziulusoy 2016). Victor Papanek's book titled *Design for the Real World: Human Ecology and Social Change* introduced the impact of design on consumption and the environment and encouraged the design profession to transform (1985). As sustainable development frameworks and focus have expanded, sustainable design's emphasis evolved from a focus on the environment and the impact of a product to the emphasis on sustainability as a property of the system (Bhamra and Hernandez 2021; Ceschin and Gaziulusoy 2016). This shift in focus has expanded the role of the designer. Manzini (2015) writes about design and social change towards sustainability and the roles of both diffuse designers, non-experts using their natural abilities, and design experts, trained professionals. The designer's role in addressing complex social issues like food has expanded to social innovation and radical transformation. These everyday designers can make changes locally that can have a broader impact, or they may begin with a big vision and recognize the need to accomplish it by working locally (Manzini 2015). While this may happen as a matter of course, a vision and radical processes are necessary to achieve societal change (Reynolds 2017). The idea of radical innovation can lead to changing systems (Manzini 2015), which leads us back to food systems and design.

According to semiotician Roland Barthes (2018) in "Toward a Psychosociology of Contemporary Food Consumption," food is a system of communication composed of "signifying units" (24) that "imply a set of images, dreams, tastes, choices, and values" (23). As such, food falls within the intellectual scope of scholarly and creative production in design, even in its subdisciplines like graphic design, visual art, and visual communication and information design. However, in the College Art Association's panel presentation titled "Design History: The State of the Art" (2016), art historian Grace Lees-Maffei noted that even with the development

of the International Food Design Society in 2009, nearly a decade later, food was still a "relatively unexplored area of design" (Lees-Maffei 2016). Yet, three years after Lees-Maffei's 2016 presentation, Flood and Sloan—in an edited collection that accompanies the 2019 food exhibit titled "Food: Bigger than the Plate" at the Victoria and Albert Museum in Britain—offer another perspective asserting that design has been fundamental to food since industrialization, with design practitioners participating in every aspect of the commodification of food, from its production to its consumption (2019, 13).

In fact, in the early twenty-first century, food design had been evolving steadily, with various definitions emerging to determine its scope. The use of the term "food design" was being used in academia in the early 2000s as intersections in design and food began to be explored.

For instance, the Association for the Study of Food and Society and the Agriculture, Food & Human Values Society (ASFS/AFHVS) have been holding professional conferences on food-related themes since 1987;[5] and their 2005 conference titled "Visualizing Food and Farm" was particularly groundbreaking in its focused exploration of the role of design through visualization in food knowledge production. The conference's program included the following scholarly talks:

- Lori S. Ball, Matthew Pottieger, and M. E. Deming presented "Revealing the Role of the Local Food System in the Formation of Landscape Patterns," making landscape patterns in the food system visible by collecting data through local farm visits, reviewing aerial photos and maps, then analyzing them to create new maps and compositions, creating a spatial phenomenon and revealing a narrative of the local food system.
- Also examining patterns, Daniel Block presented "Supermarkets, Ethnic Markets, and Corner Stores in Chicago: Geographic Patterns, Ties to Community, and Provision of Fresh Foods," an ongoing mapping project examining spatial patterns between types of markets and demographics in Chicago.
- Alison Grace Cliath presented on blue-green labeling and how it can help consumers make equitable, sustainable choices in "Seeing Shades: Ecologically and Socially Just Labeling." Utilizing visual sociology, Cliath explored blue-green labeling and the challenge created by some industries developing their own "greenwash" labels without actually being environmentally friendly or socially just.

Subsequently, Francesca Zampollo founded the International Food Design Society in 2009,[6] with the First International Symposium on Food Experience Design in 2010 in London.[7] Then, ASFS/AFHVS held another professional conference at Indiana University in 2010 that included separate food experience design lectures by Sonia Massari and Francesca Zampollo on the first food design panel in food system education (Massari 2017). Additional academic conferences on food and design propagated worldwide. For instance, the First International Conference on Designing Food and Designing for Food was held

in London in 2012,[8] and the biennial conference titled "GLIDE'12: Global Interaction in Design Education" was organized by the first author in consultation with design consultants Michele Washington, Adream Blair, and Gloria Gomez. Hosted at Rensselaer Polytechnic Institute in Troy, New York, design scholars from around the world convened virtually, including Clinton Carlson, Whitney Peake, Sónia Matos, Karin Vaneker, Erwin Slaats, Sonia Massari, and others to contribute peer-reviewed, research findings on the use of visual communication design resources to address the global food problem. The conference culminated in the publication of a special issue titled "GLIDE'12: Consumed"[9] in *Iridescent*, the International Council of Design's journal on design research. In 2013 the Latin American Food Design Network[10] (redLaFD) was established by Pedro Reissig and Daniel Bergara, with assistance from Francesca Zampollo. Additional relevant conferences then occurred including the First European Conference on Understanding Food Design in 2015, where the second author presented on "The Future of Food Design"[11] and also spoke at the preceding 2nd Food Design x Education (FDxE)[12] event, the Second International Conference on Food Design in New York City in 2015,[13] and the First International Food Design and Food Studies Conference in 2017 in Lisbon, Portugal.[14] Additional events and conferences on the topic have been held since then.

Interestingly, the International Food Design Society became inactive during this emergent period at which time its founder, Francesca Zampollo, shifted resources and efforts to the development of the *International Food Design Journal* in 2016. Today, the *International Journal of Food Design* continues and is dedicated to understanding food design. To wrestle with the broad definitions of food and design, Zampollo originally categorized food design into the subcategories of "design with food," "design for food," "food space design" (interior design for food), "food product design," "design about food," "eating design" (Zampollo 2013) and more recently "food design thinking" (Zampollo and Peacock 2016). Within each of these subcategories of food design research, food content knowledge experts interact with chefs, food scientists, architects, interior designers, product designers, and industrial designers. As more designers connect with food knowledge, the field of food design will continue to expand (Zampollo 2016). When the *International Food Design Journal* was first published in 2016, food design was still relatively new as an area of research; the journal has helped to expand the field and scholarship since then, though global research databases still reveal limited indexed publications specific to food design (Juri et al. 2022). The original guidelines for the journal stated that it is "open to any research and project that simply connects food and design" (8).

In the inaugural issue of the *International Food Design Journal* in 2016, editor Francesca Zampollo collected and presented definitions from professionals working in food and design, in addition to contributions from the editorial and advisory boards of the journal. The definitions range from reflecting a heavy focus on food as food design to wider, more systemic visions. Fabio Parasecoli, formerly Director of Food Studies Initiatives at The New School in New York City, and

formerly the Director of the Food Studies PhD program at New York University, defined food design with a wider lens:

> Food design includes ideas, values, methods, processes, and activities aiming to modify, improve and optimize individual and communal interactions with and around food, including but not limited to edible materials, objects, experiences, natural and built environments, services, systems, and networks.
>
> (Zampollo 2016, 7)

Zampollo advocated against choosing one definition and instead embraced varied definitions for their complexity and intersections, a reflection of the field of food design (2016). Food design practitioner, social entrepreneur, and scholar Pedro Reissig (2017) invited the collective to shape the definition of food design, recognizing the oft-cited interpretation that food design solely means the aesthetic qualities of food; he proposed the following working definition:

> any "action" that can "improve" our "relationship" with food individually or collectively in diverse ways and instances, including the design of food products, materials, experiences, practices, technology, environments, and systems. By useful, I mean a definition that frames a way of thinking and acting, motivating open and critical thinking with a propositive attitude.
>
> (5)

Inherent in this definition of food design is the understanding that it is a platform that considers the complex; it requires an examination of relationships with foods from all aspects (Reissig 2017). However, as the food system comprises a complex system of activities that currently effects insecurity, inequity, injustice, and environmental damage, the scope of food design must expand to include impact through the inclusion of sustainability with social justice framing. In the proceedings of the 2nd International Food Design and Food Studies Conference, "Experiencing FOOD: Designing Sustainable and Social Practices," Pires acknowledged the growing need for design solutions that focus on sustainability and creativity in food systems, recognizing both the layered complexities in food systems and the need for inclusivity of diversity, culture, education, and history (Bonacho et al. 2021).

As Nicola Twilley notes, "food is an incredibly powerful tool for connecting seemingly disparate issues…If you design for food and food systems, you will inevitably address all considerations needed to create a sustainable, workable community" (*Urban Omnibus* 2010). Sustainability, food, and design are fields encompassing wide perspectives, methods, and contexts. Variations and cross-combinations of these subjects have been expanded upon in the literature in recent decades, including "sustainability transformation" (Abson et al. 2016; Artmann et al. 2020; Elmqvist et al. 2019; Dorninger et al. 2020), "sustainability transitions" (Köhler et al. 2019; Markard et al. 2012; Gaitán-Cremaschi et al. 2019; Gaziulusoy and Öztekin 2019), "food systems sustainability" (Béné et al. 2019; El Bilali and

Allahyari 2018; Haysom et al. 2019; Mourad 2016; Weber et al. 2020), "design of food systems" (Ballantyne-Brodie and Telalbasic 2017; Manzini 2015), "design for sustainability" (Bhamra and Hernandez 2021; Ceshin and Gaziulusoy 2016; Rocha et al. 2019; Spangenberg et al. 2010), "eating design" (Schouwenburg and Vogelzang 2011), "food experience design" (Massari 2012), and human food interaction design (Choi and Blevis 2010; Comber et al. 2014; Dolejšová et al. 2020). Within this broad scholarly context, "food design" (Bordewijk and Schifferstein 2020; van Hinte 2016; Guixe et al. 2010; Juri et al. 2022; Massari 2017; Reissig 2017; Zampollo 2016) arguably solidified as a subset field of design. As the worldwide pandemic beginning in 2020 has significantly impacted all facets of the food system, positioning a more inclusive definition of sustainability within food design has gone from being a call to action to an imperative.

Underpinning this imperative, the 2015 United Nations 17 Sustainable Development Goals (SDGs) in its 2030 Agenda (United Nations, n.d.) announced the following 17 goals to design a sustainable world by 2030:

Goal 1. End poverty in all its forms everywhere.
Goal 2. End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.
Goal 3. Ensure healthy lives and promote well-being for all at all ages.
Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.
Goal 5. Achieve gender equality and empower all women and girls.

Figure 1.5 Sustainable Development Goals.

Goal 6. Ensure availability and sustainable management of water and sanitation for all.
Goal 7. Ensure access to affordable, reliable, sustainable, and modern energy for all.
Goal 8. Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all.
Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation.
Goal 10. Reduce inequality within and among countries.
Goal 11. Make cities and human settlements inclusive, safe, resilient, and sustainable.
Goal 12. Ensure sustainable consumption and production patterns.
Goal 13. Take urgent action to combat climate change and its impacts.
Goal 14. Conserve and sustainably use the oceans, seas, and marine resources for sustainable development.
Goal 15. Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation, and halt biodiversity loss.
Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all, and build effective, accountable, and inclusive institutions at all levels.
Goal 17. Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development.

It has been argued that all of the goals relate to food security (FAO 2018; Massari 2020) but SDG number 2 explicitly states the goal of ending hunger. Utilizing the wedding cake model theory of Rockström and Sukhdev (2016), Massari expands on how food design can have a positive impact on potentially all 17 SDGs by moving to a systemic or ecocentric approach from an anthropocentric approach for each of the three sustainability pillars, referred to in Rockström and Sukhdev's model as the biosphere, society, and economy (2020). In Rockström and Sukhdev's model, the biosphere is the base and supports the societal and economic layers. Adding sustainability to food design clarifies the broad definition of food design by embracing a clear intention of sustainability when designing with, for, or about any area of food (Massari 2020). Working from Parasecoli and Reissig's definitions, in this book we define sustainable food design as pursuing design outcomes (DOs) and processes for any area in a food system that seek to improve and optimize the environment, the economy, and society, both individually and collectively, through a systemic lens that centers equity and justice.

Looking forward to the professional playing field of sustainable food design, we propose that:

> the task and job of the food designer is not to grant the same vision for everybody, but to establish the conditions for different visions that can interact and lead to sustainable solutions. If in the last decade we've worked to

> explain how to design the best food experiences and focused on the systemic approach in the food world, today more than ever we need to unify this knowledge into a common project: designing more sustainable food systems. (Massari 2020, 31)

Our ever-changing food system, impacted by climate, socio-economic disparities, political divisions, trade, and health issues, highlights the need for sustainable, equitable, and just design solutions. To solidify this understanding of sustainable food design that considers the need to acknowledge the current state of insecurity, inequity, and injustice in the food system, we propose an extended definition of sustainability development beyond the three pillars. Other definitions of sustainability as a goal imply a destination, which is unrealistic with the global seismic shifts and inequities worldwide. The dynamic nature of society, the economy, and the environment require a lens that adjusts and adapts as necessary, moving towards greater food security that is equitable and just and facilitates balanced nutrition that leads to improved sustenance of all of humanity and the natural ecosystem. We therefore introduce the following eight dimensions of sustainability that we call the 8 Es of sustainability (8Es) and use as the criteria for assessing DOs, which include:

- Ethical: the DO does not harm humans or communities or the earth.
- Equitable and just: the DO facilitates greater inclusivity, that is, all people having access to resources and benefits in an equitable and just manner.
- Environmental: the DO improves the environment without harming it.
- Economical: the DO permits value to return to all actors in the system thereby yielding "generative justice" (Eglash 2016).
- Ecological: the DO contributes to the healthy balance of the social ecosystem.
- Enduring: the DO is durable and lasts a long time.
- Effectuated: the DO has been implemented within a public context.
- Effective: evidence shows that the DO works.

In the 8Es, all criteria interconnect, interrelate, and rely on integration and in terms of food security, consider food justice and food sovereignty as critical components of sustainable food design. Food justice is connected to food sovereignty with "food justice spurring short-term action and rights in domestic contexts, while food sovereignty movements support longer-term national, regional and international networks and political action" (Clendenning et al. 2016, 175).

Food justice focuses on examining and addressing inequalities within the food system that impacts race and class disproportionately (Gottlieb and Joshi 2010). Gottlieb and Joshi define food justice as "ensuring that the benefits and risks of where, what, and how food is grown and produced, transported, and distributed, and accessed and eaten are shared fairly" (2010, 6). While food justice can focus on many facets and issues of inequality within the food system, scholarship

related to food justice is grounded in both ecological sustainability and social justice, or "just sustainability" (Agyeman 2008).

Food sovereignty is a related concept brought to the global stage by La Via Campesina,[15] an international peasant movement (Clendenning et al. 2016). In 2007 it was defined at the Nyéléni International Forum on Food Sovereignty:

> the right of peoples to healthy and culturally appropriate food through ecologically sound and culturally appropriate methods, and their right to define their own food and agricultural systems. It puts the aspirations and needs of those who produce, distribute, and consume food at the heart of the food systems and policies rather than the demands of markets and corporations. It defends the interests and inclusion of the next generation.
>
> (Nyéléni 2007)

The social aspect of sustainability is expanded in the 8Es to include categories of ethics and inclusivity, which *feeds* into a more equitable and just society. That is, sustainability is not limited to the environment but also considers social, ecological, and ethical implications. Economic sustainability returns unalienated value equitably to all stakeholders within the system who contribute to creating it. Finally, to be sustainable, a DO ideally should be effective and endure, both actively and residually.

Meeting the 8Es criteria for sustainable food design is an incredible challenge for designers across disciplinary and cultural domains who are investigating food insecurity, as food insecurity is itself a wicked problem that is global in scope, multidimensional, multifaceted, and intercultural. The question then is: where *should* these designers intervene in the food system to create a more sustainable food future that is secure, equitable, and just? Addressing this question requires understanding what has been done in design across professional domains to address food insecurity to know what is needed moving forward. In the next section, we introduce a design method for seeing and analyzing the current state of the sustainable food design system to find leverage points or places to intervene to move the system towards greater security.

Critically mapping sustainable design: a design approach to addressing wicked problems

In the seminal 1982 text titled "Designerly Ways of Knowing," design scholar Nigel Cross grapples with the Royal College of Art's (RCA) assertion that general education lacks a "third area" (1982, 221). Reviewing opposing previous arguments that "design with a capital D" or "technology" should fill this lacuna in a future triad of general education, Cross posits that the missing area should be "designerly" ways of knowing that would contrast with the existing objective and subjective ways of knowing in the sciences and the humanities (including the arts), respectively (222). The inclusion of design in general education aimed to elevate design from the skills-based role it played in the middle to late twentieth

century within technical or vocational training to a discipline that contributes to students' intellectual and character development.

In response to the RCA's report titled "Design in General Education" that states, "there are things to know, ways of knowing them, and ways of finding out about them that are specific to "design" (quoted in Cross 1982, 223), Cross posits that the designerly way of knowing entails using constructive thinking and codes in a solution-focused problem-solving process to tackle ill-defined problems (226). In differentiating the kind of problems that designers address from those that scientists and humanists/artists typically confront, Cross reveals a narrow view of design that summons the counter-argument this paper makes when he says:

> It is also now widely recognized that problems are ill-defined, ill-structured, or "wicked." They are not the same as the "puzzles" that scientists, mathematicians and other scholars set themselves. They are not problems for which all the necessary information is, or ever can be, available to the problem solver. They are therefore not susceptible to exhaustive analysis, and there can never be a guarantee that "correct" solutions can be found for them. In this context, a solution-focused strategy is preferable to a problem-focused one: it will always be possible to go on analyzing "the problem," but the designer's task is to produce "the solution".
>
> (224)

Cross's position that solution generation should dictate problem definition in designerly processes likely influenced the rise of "coevolution" (Maher et al. 1996), which contemporary designers generally define as "the re-interpreting of a design problem in the light of an exploration of possible solutions until a good 'fit' between problem and solution ('an idea') emerges" (Dorst 2019).

However, solution-focused designing has had a seemingly limited effect on wicked problems as nearly half a century later, society is still grappling with them and contemporary designers are still challenged by their complexity. One could argue that coevolution through solution-focused designerly inquiry has encouraged a contemporary mode of design that leads to superficial success. This success typically manifests as DOs that may reflect only incremental aesthetic changes supported by professional organizations and trade journals and imitated in design education but that ultimately lead to failure (Winkler 2009) or the perpetuation of societal problems.

Should we only be "celebrating failures"[16] (Poggenpohl and Winkler 2009) though, or also learning and adjusting from our successes by critically mapping them to identify lacunae, if any, surrounding them to determine which of the gaps we can—or rather should—fill through future design innovation or appropriation? Are coevolution, solution-focused design, and our relentless pursuit of novelty serving society well enough? One could argue that many contributions from solution-focused, designerly practices tend to enable, perpetuate, or contribute to food's systemic challenges with goals that are unsustainable. A quick

visit to a local grocery store, for instance, can provide ample evidence affirming solution-based, designerly inquiry's questionable participation in food through food packaging design. One can readily observe a variety of brands of consumable goods with excess sugar, sodium, fat, etc., packaged with high aesthetics aimed at outselling the competition rather than honestly informing the consumer of the product's low nutritional value and the negative impact of consuming it. If a solution-based designerly inquiry is a way of knowing, then what's needed in design arguably is greater "accountability" (Bennett 2012) in the decision-making leading to an outcome and the impact of the DO on humanity and the environment.

Towards this end, it's been nearly half a century since the publication of Cross's text, and the discipline of design has matured in its cognizance of the societal impact of its outcomes. For instance, Berman (2008) shows that professional designers are taking responsibility for their creative actions. Even the design research community is now grappling with emerging principles of "design justice" (Costanza-Chock 2020) that include:

1. Using design to sustain, heal, and empower our communities, as well as to seek liberation from exploitative and oppressive systems.
2. Centering the voices of those directly impacted by the outcomes of the design process.
3. Prioritizing design's impact on the community over the designer's intentions.
4. Viewing change as emergent from an accountable, accessible, and collaborative process rather than as a point at the end of a process.
5. Seeing the role of the designer as a facilitator rather than an expert.
6. Believing that everyone is an expert based on their own lived experience and that we all have unique and brilliant contributions to bring to a design process.
7. Sharing design knowledge and tools with our communities.
8. Working towards sustainable, community-led and -controlled outcomes.
9. Working towards non-exploitative solutions that reconnect us to the earth and to each other.
10. Before seeking new design solutions, looking for what is already working at the community level. Honoring and uplifting traditional, indigenous, and local knowledge and practices.

Though the discipline of design is evolving to be more ethical and socially and environmentally conscious, society continues to battle lingering, ill-defined problems (e.g., poverty, food insecurity, sustainability, racism, climate change, etc.) along with emerging ones. For instance, our present-day battle with COVID-19 and the marriage of visualization to medical innovation reveals an interesting interdependency between problem-focused and solution-focused inquiries to save lives. At the outset of the pandemic, we relied heavily on visualizations to understand the spread of the virus and its symptoms as we worked expeditiously to design effective solutions through medical innovation—implementing strategies

like social distancing, hand-washing and mask-wearing, medicinal appropriation, and finally, vaccination. This real-world reliance on visuals to navigate a societal problem may indicate a missed opportunity in the design discipline towards including rigorous problem-focused designerly thinking that centers around visual analysis to reveal design intervention opportunities or to "look for what is already working" (Costanza-Chock 2020, 7). We propose that such a pivot in designerly inquiry would enable designers to use their plenty and powerful visualization resources to identify more strategic places to intervene with designerly ways of knowing that yield substantive change in society's wicked problems. Indeed, the analysis of problems in design needs to become more salient as the discipline matures and hears the clarion call to use design's resources to identify and address societal problems (e.g., food insecurity), problems that are complex by nature—"ill-defined, ill-structured, 'wicked'" (Cross 1982, 224) and multidisciplinary and multicultural. We propose the design resource of mapping to serve this purpose.

Mapping in the fields of food and design

Mapping, in general, has been integral to research inquiries across disciplines, including food and design. In the field of food, it has been used in both educational and non-educational contexts as "an approach to understanding 'eco-agri-food systems'"(Zhang et al. 2018) and to define "food justice" (Loo 2014). Edwards and Mercer (2010, 156) bring to light the use of mapping pervasively in food to enable their students to see the urban agriculture system in Australia's local context. Additionally, they reviewed the use of food mapping across disciplines to "chart...food insecurity, food 'deserts' and poverty," show "the connections between food and transportation," and even "trace community commodity chains" locally to globally (156). In non-educational contexts, Edward and Mercer (2010) also disclose how New York City was the starting place for the participatory development of an ecological map by eco-designer Wendy Brawer. Known as the Green Map, Brawer's concept has been adopted by hundreds of other cities around the world (156).

Within the area of food, mapping has been used in a participatory manner to identify the causes of problems within food systems to determine how to effect change. For instance, Sedlacko (2014) discusses the participatory construction of "causal loop diagrams" for "knowledge brokerage" between research scientists and policymakers. In their system, they aim to link experts in different disciplines and professions.

Within the design disciplines, Zahedi and Heaton (2016) show how designers use mapping cognitively to understand their creative thinking and the interrelatedness of concepts. Whereas Jones and Bowes (2017) argue specifically for the use of "synthesis mapping" to address "socially complex problems," Sevaldson (2011) and Buchanan (2019) argue for the inclusion of systems thinking into design thinking processes that aim to address complex problems. Other studies (Frerichs et al. 2018; Kokotovich 2008; Eden 2004; Dorst 2019) argue for

mapping specifically in the problem definition phase. For instance, Suoheimo et al. (2021) map different categories of problems—tame to complex to wicked—to the well-known Freudian iceberg model of the conscious and subconscious mind to enable deeper problem understanding in the design process.

Design historian Victor Margolin supports Flood and Sloan's perspectives on there being historical precedence for food design within the discipline of design, as he too implies an historical relationship between food studies and design studies (Margolin 2013). Indeed, within the design discipline's evolving oeuvre there exist countless food design assets, but sustainable food design at present is an emerging school of thought arguably due to the recent rise and impact of climate change, the COVID-19 pandemic, and other perennial social injustices that are compromising food security. Indeed, as food insecurity continues to ravage the health of communities locally and globally, society's evolving repertoire of existing food DOs is scattered across the globe like disconnected nodes in a dysfunctional system. Many of these DOs are not accessible or are known only among a local community with only a few of them attaining national or international prominence. We propose that compiling existing effectuated food DOs that address food insecurity, inequity, and injustice and visualizing them in an affinity diagram (a method first introduced by Japanese anthropologist Kawakita Jiro (Plain 2007)) can enable designers and other stakeholders to meaningfully stunt Nelson et al.'s (2018) dire predictions of society's food future. Such a visualization can enable designers to better determine places to intervene to tweak the system towards a more sustainable, secure, equitable, and just food future.

Overview of critical mapping

The *critical* mapping framework this book introduces facilitates knowledge exchange among transdisciplinary designers around societal problems involving cross-cultural and -disciplinary stakeholders about where to start a social innovation design process.

Compiling a wicked problem's existing sustainable DOs to create a wicked solution visualization—an approach we introduce as critical mapping—aids problem understanding and definition in the design process towards identifying opportunities for innovation of more sustainable designs. Critical mapping aims to visualize existing sustainable DOs as a system of interdependent nodes engaged in systemic interaction towards annihilating a wicked problem. The critical mapping approach compiles and organizes existing DOs that address the wicked problem sustainably. It is a problematizing, reflective approach to analyzing systemic societal problems like food insecurity to mediate more strategic innovation or appropriation within the system towards designing a more sustainable future.

Critical mapping begins with placing an intellectual boundary around the wicked problem, fencing it in, by naming and operationalizing it. This initial step of critical mapping includes compiling evidence (e.g., statistical information) that proves the societal problem is real and devastating to humanity, that it exists and is worthy of resources and time. For instance, part of step 1 of critically

mapping a wicked solution to food insecurity has been done in the introduction to this chapter. In the second step, we conduct secondary research on the wicked problem to identify existing design solutions that are sustainable. To this end, an "integrative literature review" (Torraco 2005; Snyder 2019) is conducted to identify existing DOs that address the wicked problem and to assess their degree of sustainability. Sustainable DOs, in the third step, are then affinitively organized and plotted onto a wicked solution grid contextualized across a field of possibilities with two sets of dimensions: top-down or bottom-up and localized or memetic (i.e., widespread or passing from one to many). Along the vertical axis are sustainable DOs that emerge bottom-up by citizens and communities impacted by the wicked problem or top-down from a position of economic power (e.g., public or private institutions). Along the horizontal axis lie sustainable DOs that range from memetic to localized, that is, from being replicated globally to situated locally. In the fourth step of critical mapping, we analyze the data and look for gaps in need of design intervention through future innovation or appropriation. In the next section, we begin critical mapping by naming and operationalizing the wicked problem of food insecurity. In doing so, we take illustrative steps to depict the food system to see and analyze its actors and activities towards understanding the wicked problem of food insecurity.

Step 1: Naming and operationalizing the wicked problem of food insecurity

We cannot adequately address food insecurity until we understand it; and "to fully appreciate the magnitude of the challenges that we face and what will be needed to bring about a new food system in harmony with this human need *and* the environment, we need to understand and confront the social, economic, and political foundations that create—and maintain—the food system we seek to change" (Holt-Giménez 2015, 23–25). To understand the forces that influence the food system and perpetuate food insecurity, Jacobi et al. (2019) argue that knowledge of the "actors and activities" in the system is necessary. In their study of food systems in Kenya and Bolivia, they sought to make visible the actors that participated in four phases of food that they delineated as "agricultural inputs and production, processing and storage, distribution and trade, and consumption and recycling" (Jacobi et al. 2019, R4). Their stages of food supply—from creation to recycling—updates the linear process commonly thought of in global society's top-down, large-scale industrial system, that is creating food that travels long distances from a remote farm to the household plate and finally to the landfill. Instead, their stages of food imply a more circular process with a recycling process that redirects food waste to the generation of new food.

Deploying the design resource of visualization that includes the tool of mapping to understand the food system is a necessary next step because food is a complex system comprising what von Braun et al. (2021) call "interlinked systems" of global and local actors and activities (748). In other words, the food system includes "local food" (Granvik et al. 2017; Chase and Grubinger 2014)

systems that are "interlinked" and interacting with the global food system to enable greater participation from local small-scale farms and even home gardens. Accordingly, Chase and Grubinger (2014) illustrate the food system with concentric circles to indicate interlaced and scaled levels of interdependent activities and actors that range from the individual (the inner circle) to the household, local, regional, national, and global spheres.

Grubinger et al. (2010) define a food system as:

> an interconnected web of activities, resources, and people that extend across domains involved in providing nutrition that sustains health, including production, processing, packaging, distribution, marketing, consumption, and disposal of food.
>
> (6)

Using both Jacobi et al. (2019) and Grubinger et al.'s (2010) definitions of the food system, we can operationalize the food system as a set of scaled and interdependent sustainable activities that occur across the following spectrum:

- Agri/aquaculture: planting and growing "raw food materials" and breeding and caring for animals that will be used for food. Other related activities include training and managing labor, land management, innovating or acquiring, maintaining and using farming technologies (Ericksen 2008, 238), and caring for "aquatic animals and plants" for food in "fresh, brackish and marine environments" (Pillay and Kutty 2005, 3). "A variety of factors determine these activities, from climate conditions to land tenure, input prices, agricultural technology and government subsidy provisions intended to protect or promote" (Ericksen 2008, 238).
- Production: harvesting crops and slaughtering animals (238).
- Processing: transforming raw food material (vegetable, fruit, animal) for trade by altering its appearance, storage life, nutritional make-up, and content (238).
- Distribution: moving processed food from one place to another, typically from place of origin to retail spaces for consumption. Activities in the distribution phase of the food system include various forms of shipping, governmental trade, and storage regulations (238).
- Communication: the visual and verbal communication technologies like symbols, apps, and educational training programs that contribute to the food system's functionality.
- Accessibility: one's ability to acquire enough healthy food to sustain life. The factors and activities that influence one's ability to acquire enough healthy food include:
    - Affordability: one's "purchasing power" that depends on "pricing policies and mechanisms, seasonal and geographical variations in price, local prices relative to external prices, the form in which households are paid, income, and wealth levels" (240).

- Allocation: governmental policies and social and political capital governing when, where, how, and how much food one can access at a given time in a given private or public space (240).
- Preference: social or cultural norms, heritage, and values (e.g., religion, season, advertising, preparation requirements, human capital, tastes, customs that influence consumer demand for certain types of food) (240).

- Consumption: choosing, purchasing, or otherwise acquiring, preparing, eating, and digesting food. Factors affecting these activities include price, income level, cultural traditions or preferences, social values, education, health, and household status among other things (238).
- Waste: composting, recycling, and disposal of expired and unconsumed but still-edible food and materials involved in its production and consumption.

While Grubinger's use of the term "production" may be inclusive of agriculture, we aim to bring clarity to the food system by separating early stages of food production into two phases: agriculture or aquaculture and production. We also added accessibility to include activities related to equity and justice and communication

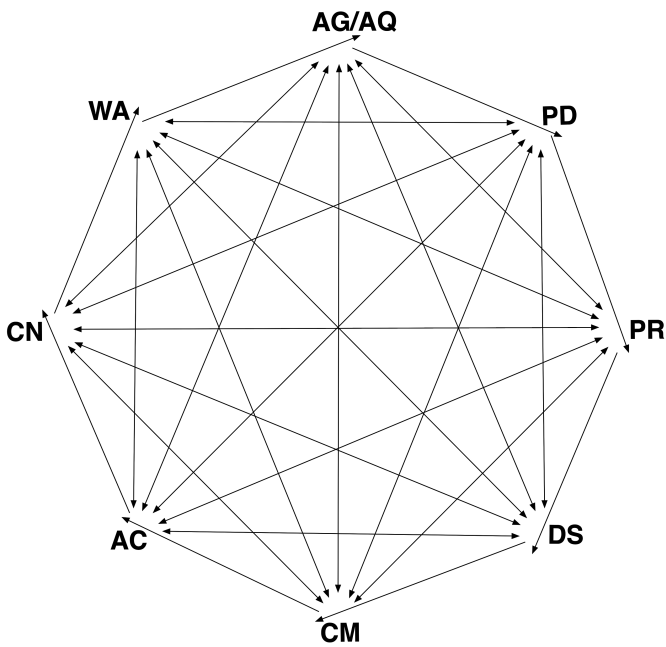

Figure 1.6 The interconnected food system comprising eight phases including agriculture/aquaculture (AG/AQ), production (PD), processing (PR), distribution (DS), communication (CM) (including recall, marketing, safety, packaging), accessibility (AC), consumption (CN), and waste (WA) where sustainability is integral to all eight categories. Image courtesy of Audrey G. Bennett.

and to further clarify the important role graphics, communication, and visual communication design plays or can play in the food system.

In our representation of the food system illustrated in Figure 1.6, there are eight phases of activities—agriculture/aquaculture (AG/AQ), production (PD), processing (PR), distribution (DS), communication (CM) (including recall, marketing, safety, and packaging), accessibility (AC), consumption (CN), and waste (WA). The activities of food systems reflect and respond to social, cultural, political, economic, health, and environmental conditions and can be identified at multiple scales, from an individual's plate to a household kitchen to a community restaurant to a regional foodbank to a nation (Grubinger 2010, 3).

In Figure 1.7 we show the flow of value that occurs between producers and consumers in large-scale, industrial food systems where a grand producer provides mostly processed food to a consumer at cost. The consumer has limited agency in the control of their food choices or what they eat, and that agency may be further compromised based on various factors (e.g., affordability and geographic location) affecting their access to healthier fresh and unprocessed options. Attaining food security depends on citizens becoming empowered to contribute to the production of the food they consume. In addition to large-scale, industrial, agricultural production, a food system thrives when there are also home gardens, community gardens, urban farms, and training. "Strip a system of redundancy, and you increase its efficiency; but you also reduce its adaptability and resilience" (Cockrall-King 2012, 59); a sustainable food system includes production actors inclusive of mainstream food businesses, small alternative food businesses, and citizen activists coordinated through strategic plans and policies.

A sustainable food system designed to address inequity and injustice engages consumers and producers (the actors) in all phases of the food system (as depicted in Figure 1.8).

Understanding these independent actors (i.e., producers, consumers, and consumer-producers) and the interdependency of their activities in the sustainable

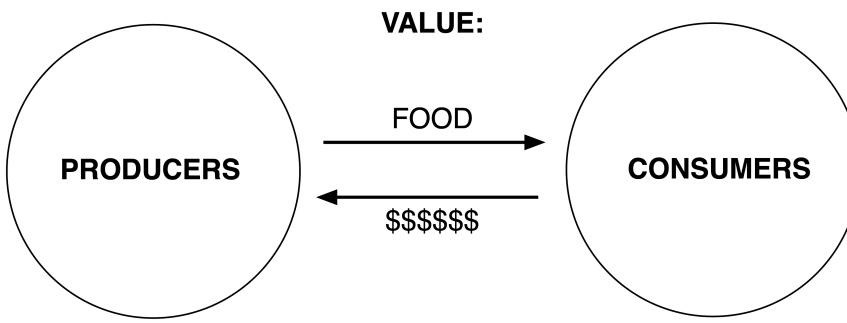

Figure 1.7 The food system visualized as producers providing food for consumers for profit which leads to a perennial wicked problem of food insecurity. Image courtesy of Audrey G. Bennett.

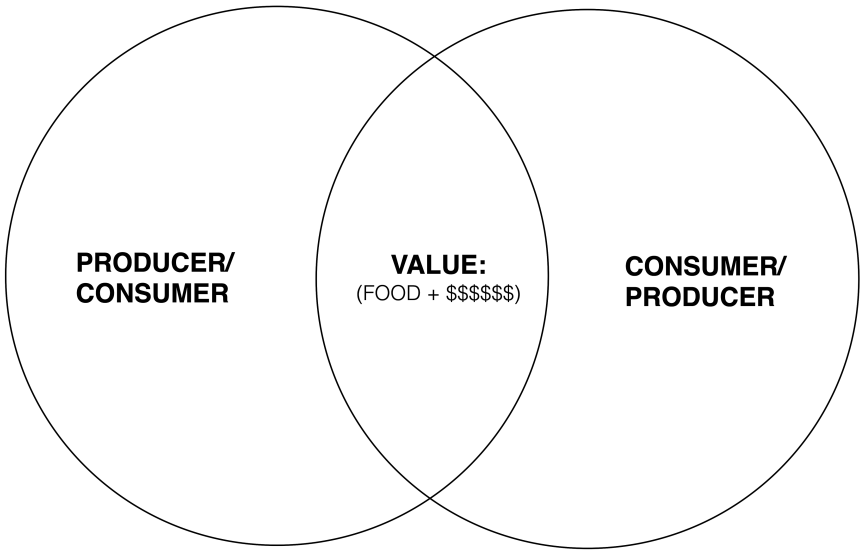

Figure 1.8 A sustainable food system where the producer and consumer engage in all phases of the food system leading to food security that is sustainable, equitable, and just. Image courtesy of Audrey G. Bennett.

food system is essential to mediating and supporting their interaction towards a more sustainable food-secure future. We argue that to attain this essential understanding and food-secure state where all people have access to healthy food daily should also entail compiling and analyzing the existing sustainable food DOs. Only then can one see the current state of the food system and where there may be gaps for design innovation or appropriation. In the next section we introduce the design method of critical mapping to assess the current state of the system of sustainable food design for food insecurity in order to find leverage points or places to intervene with design innovation or appropriation.

Step 2: Integrative literature review to identify sustainable food DOs

Which sustainable DOs currently comprise the wicked solution to food insecurity? Addressing this question entails conducting secondary research to glean existing sustainable food DOs that we then plot onto a wicked solution visualization modeled in Figure 1.9. In doing so, we aim to facilitate an analysis of the food system to identify what Meadows (1999) calls "leverage points…places within the system where a small shift in one thing can produce big changes in everything."

Our secondary research on the wicked solution to food insecurity entailed conducting an integrative literature review to find and compile a broad set of

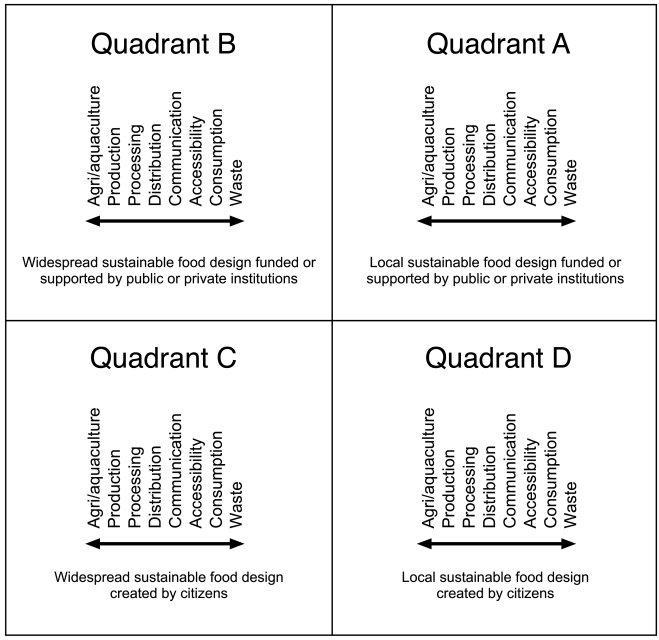

Figure 1.9 Bennett's wicked solution model applied to food insecurity. Image courtesy of Audrey G. Bennett.

peer-reviewed, sustainable food DOs that currently address food insecurity according to the 8Es of sustainability criteria. The integrative literature review was conducted using 123 databases available by way of ProQuest at the University of Michigan. We chose ProQuest instead of Web of Science as the former provides a multidisciplinary scope of scholarly articles inclusive of a broad array of humanities, arts, and design databases. The goal of using an integrative literature review instead of a systematic or semi-systematic one was to compile a multidisciplinary and inclusive set of scholarly articles focused on sustainable food design for security, equity, and justice.

To begin, we conducted a general ProQuest search of the individual terms "sustainable," "food," and "design" that yielded 790,974 results. Next, we modified the search to include full texts and only those that were peer-reviewed, and narrowed the results to 141,630 results. While ProQuest provides searches of newspaper and magazine articles, we limited our integrative literature review to peer-reviewed articles as we wanted the wicked solution proof of concept to consist of sustainable DOs that emerge from mostly peer-reviewed research and to make the literature review more manageable. In an effort to retrieve a more manageable set of peer-reviewed results within the scope of our research, we modified the search further to include only scholarly journals, and that change yielded almost the same quantity of results, 141,095.

The year 2009 was then used strategically as a start date to further narrow the results to correlate with the founding of the International Food Design Society in that same year. However, when we modified the search by adding the date range from 2009 to 2021, we still yielded a high 127,402 results. Thus, we modified the search for the exact phrase "sustainable food design," which yielded a singular result that, after a cursory review of the title, abstract, and subject keywords, we determined fit the scope of our research. However, with only one result, we reverted back to the most recent search terms and this time added the exact phrase "food security" and the previous 127,402 results dropped significantly to 22,881 results. Of those results, we selected those in English only, which narrowed our results down to 22,767 results. When we limited the search further to the location of the United States, the results dropped more significantly to 2,296 results.

With the goal to compile sustainable DOs generated from scholarly research, we specifically targeted peer-reviewed articles published in design and design research journals. A study conducted by Friedman et al. (2008) found the following five design and design research journals as the top venues for the dissemination of design research scholarship: *Design Studies*, *Design Issues*, *International Journal of Design*, *Design Journal*, and *Journal of Design History*. Subsequently, Mansfield (2016) conducted a similar study to identify the top design research journals based on the "highest ranked 'design' submissions" (904) and found the following journals to be the most popular "design-focused" journals: *The Design Journal*, *Applied Ergonomics*, *Ergonomics*, *Journal of Design Research*, and *Design Issues*. In an attempt to find results from the aforementioned design research journals on both Friedman et al.'s and Mansfield's lists, we broadened our search terms for design to include similar keywords in use in the discipline. Towards that end, we added the term "innovation" as a synonym for design to the search query of the 2,296 results previously found and consequently narrowed those results to a more manageable 886 results. Of these 886 results, after a cursory review of titles, abstracts, and subject keywords, we identified 25 articles that fit the scope of our research.

ProQuest conveniently allows the saving of searches, so we went back to the previous search that yielded 886 results with the added term "innovation" and replaced the term "food security" with "food equity," and yielded 22 results of which we identified one article that fit the scope of our research. Thus, again, we went back to the previous search that yielded 886 results and replaced the term "food security" with "food justice," and yielded 49 results of which we identified 22 articles that fit the scope of our research after a review of titles, abstracts, and subject keywords. Still, none of the journals from the ProQuest searches came from any of the flagship design journals. Thus, we returned to the previous search that yielded 2,296 results and replaced the term "innovation" with "appropriation" as another pseudo-synonym for design. Consequently, we yielded 88 results. Of those 88 results, we identified one relevant article after another cursory review of titles, abstracts, and subject keywords. Once again, we returned to the previous search that yielded 2,296 results and replaced the term "innovation" with "repair"

as another pseudo-synonym for design. Consequently, we arrived at 131 results. Of those 131 results, we identified 6 relevant articles after a cursory review of titles, abstracts, and subject keywords that fit the scope of our inquiry.

Next, we conducted a new ProQuest search for design publications specifically: pub(design) AND ft(sustainable) AND ft(food) AND ti(design). This targeted search of design journals resulted in 76 articles of which 31 used the terms "sustainable," "food," and "design" in the text and were published in design journals. However, when we qualified the search further by adding the term "food security" the results narrowed to 14 including 6 articles that were also in the previous 31 results. After a cursory review of titles, subject keywords, and abstracts, we identified 5 articles as relating closely to the scope of our research inquiry. Then, when we modified the previous search that yielded 76 results further by replacing the term "food security" with "food justice," that resulted in 12 articles of which one fit the scope of our research. Again, we modified the previous search that yielded 76 results by replacing the term "food security" with "food equity," resulting in 8 articles of which only one fit the scope of our research and matched a previous article we had already found.

In our integrative literature review, we found a total of 62 peer-reviewed journal articles that fit the scope of our research after a cursory review of titles, abstracts, and subject keywords. To be more thorough and potentially garner a broader set of peer-reviewed publications from top-ranked, design research journals and publishers, we decided to conduct a second phase of the integrative literature review by conducting an exploratory search for articles and books using our university libraries' general search function and our own knowledge of publications within the disciplines of art and design. This second phase of our integrative literature review yielded additional journals and books helping us to meet our goal for a more thorough review. Texts in the second phase included an exhaustive review of the articles in all published issues of the *International Journal of Food Design*. After reading these articles and other publications in full to confirm fit with our research agenda we identified and extracted additional sustainable food DOs to further populate our wicked solution to food insecurity, providing the proof of concept illustrated in Figure 1.10. At times the found publication itself was the DO.

When reviewing all of the peer-reviewed articles in depth and evaluating the DOs they disclose for fit with sustainable food design we used categories from Figure 1.6. We used our sustainability criteria (i.e., the 8Es) to decide whether to include or not a DO in the wicked solution. The sustainable DOs in the wicked solution to food insecurity meet some but not necessarily all of the 8Es of sustainability criteria (see Appendix III). Our next step entailed categorizing each sustainable food DO according to its design form.

Heskett (2005) notes that "design should be the crucial anvil on which the human environment, in all its detail, is shaped and constructed for the betterment and delight of all" (1). Towards this end, Heskett categorizes design as:

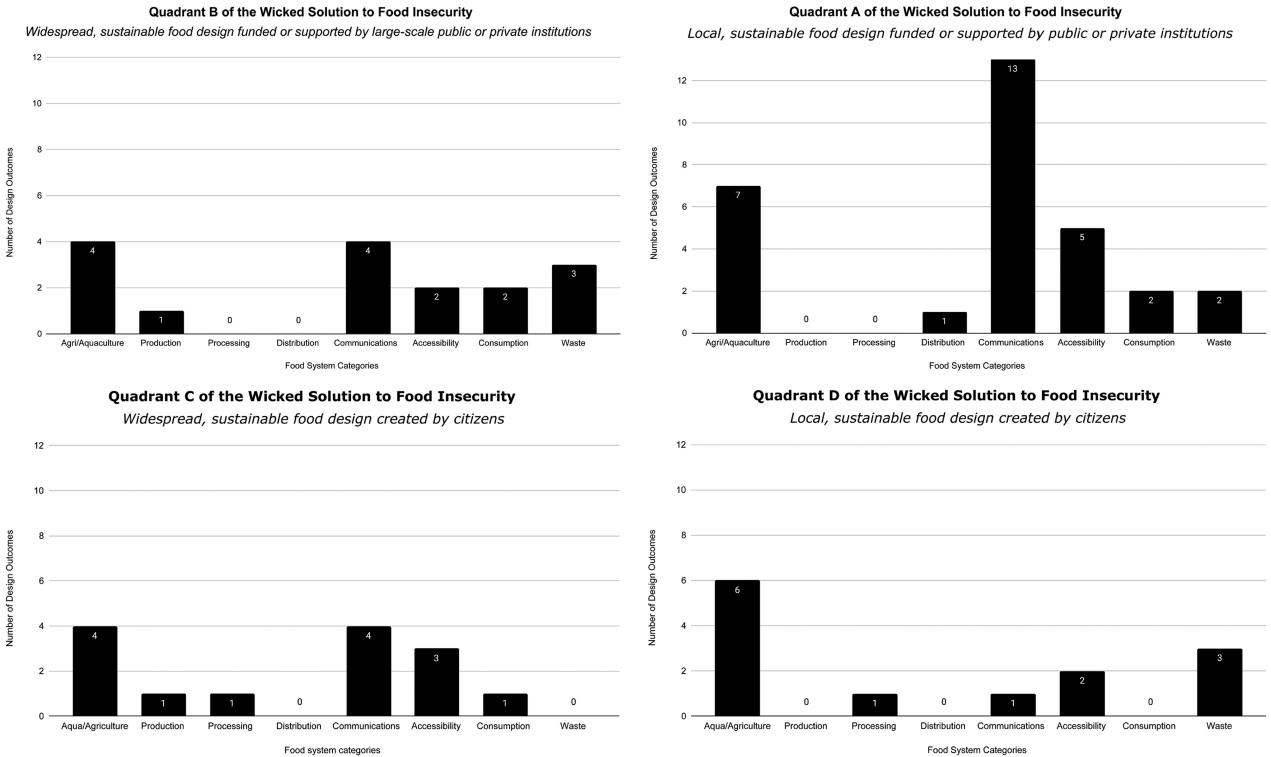

Figure 1.10 Proof of concept of the wicked solution to food insecurity critically mapped. Each actor or layer comprises DOs or activities across a spectra—top-down (policy-driven) to bottom-up (individual-driven or engendered agency) and localized (affecting a limited amount of people) to memetic or widespread (affecting many)—that contribute to the wicked solution to the wicked problem of food insecurity. Image courtesy of Audrey G. Bennett.

- Objects: single- and multi-purposed, multi- and intersensory, three-dimensional objects (e.g., a saltshaker, refrigerator, or a farming tool) encountered in private and public spaces that function in some capacity that is intuitive or learned (56).
- Communications: two-dimensional imagery accompanied by text (e.g., hashtags, package designs, a logo, an interface, or an app) that can evoke an array of emotions and actions and influence cognition and behavior (82).
- Environments: frameworks that facilitate activities, patterns of use, behavior, and expectations within living, learning, and working spaces (102).
- Identities: any strategic combination of objects, communications, and environments that expresses meaning intended to shape, even pre-empt, what others perceive or understand (125).
- Systems: interacting, interrelated, or interdependent elements that form a collective and functioning entity (145).
- Contexts: the professional organization and management of the knowledge set, scope, conduct, and playing field of a specialized activity, including but not limited to a program, professional organization, or governing policy (166).

In addition, recent scholarship in design extends Heskett's categories to include the following *actions* as design forms:

- Futures: a series of speculative or imaginary activities directed towards a desired outcome (e.g., a campaign or movement). See Taylor (2019) for other definitions.
- Service: a mindset, process, toolset, cross-disciplinary language, or management approach that improves a service or creates a new one (Stickdorn et al. 2018).
- Interaction: the shaping of use-oriented qualities of digital artifacts (Löwgren and Stolterman 2004) for a satisfactory or improved experience.
- Experience: the strategic orchestration of an engagement with something that is functional, engaging, purposeful, compelling, memorable, and enjoyable (McLellan 2000).

In assessing fit with sustainable food design as previously operationalized, for each article we asked the following questions:

1. Is there a DO that fits one of the design categories (i.e., object, communication, environment, identity, system, context, future, service, interaction, or experience)?
2. Is the DO effectuated and discussed as effective?
3. Does the DO align with one or more of the other 8Es of sustainability criteria?
4. Does the DO address a part of the food system (i.e., aqua/agriculture, production, processing, distribution, communication, accessibility, consumption, or waste)?

From this review of the original articles we eliminated those that fell outside the qualitative scope of our research agenda to compile effective and sustainable food

DOs that address the wicked problem of food insecurity through the lenses of equity and justice. Appendix I lists the 49 peer-reviewed publications from which we gleaned 73 sustainable DOs to critically map a proof of concept of the wicked solution to food insecurity.

Step 3: Plotting sustainable design outcomes onto a wicked solution grid

In the introduction to the "GLIDE 2012: Global Interaction in Design Education" conference's proceedings, Bennett (2012) argues that the global food problem epitomizes a wicked problem that is an ill-defined and confounding challenge because it exists within an evolving and complex system of smaller, context-specific, and cross-cultural challenges. Thus, it is improbable that any single communication design solution can solve it. Moreover, as no single solution can address the wicked problem of food, no single discipline can address it either. Thus, Bennett (2012, 2–10) posits the need for a wicked solution—an equally complex system of independent solutions derived from transdisciplinary inquiry inclusive of design perspectives—that systemically, over time, can address a wicked problem. In confirming the relationship between food studies and design studies, design historian Victor Margolin supports this proposition when encouraging consideration of:

> both food and design as embedded in systems and to initiate a mapping process to define the scope of each system and identify points of connection between the two. In this way, we can expand the conceptual space of each field and consequently discover themes and issues that may result in new methodological, narrative, and activist approaches by scholars in both of them.
>
> (2013)

To this end, applying Bennett's model of a wicked solution to the food system in Figure I.1, we depict the wicked solution to food insecurity as the visualization illustrated in Figure 1.10 onto which sustainable DOs are organized by two sets of dimensions: top-down or bottom-up and localized or memetic. Along the vertical axis we group sustainable food DOs that emerge bottom-up by individuals and communities (quadrants C and D) impacted by the wicked problem versus top-down from a status of economically funded or otherwise supported by public or private institutions (quadrants A and B). Along the horizontal axis we group sustainable food DOs that range from memetic (quadrants B and C) to localized (quadrants A and B), that is, from being replicated globally to situated locally.

Returning to the question of where designers *should* intervene in the food system to create a more sustainable food future that is secure, equitable, and just, we integrated Bennett's model of a wicked solution visualization from the introduction of this book with the food system's categories in Figure 1.6 to depict the wicked solution applied to food insecurity in Figure 1.9.

Next, we compiled all 73 DOs culled from the integrative literature review phase and organized them using a spreadsheet (see Appendix II) with four separate tables, where each table represents a quadrant in the wicked solution. Within each table we grouped the sustainable DOs gleaned from the literature review according to the categories of food and design that each addresses. We found 30 DOs that fit quadrant A, 16 DOs that fit quadrant B, 14 DOs that fit quadrant C, and 13 DOs that fit quadrant D.

We determined the primary food category to which each DO contributes. We also determined a primary design category that each DO represents. It is important to note that though a DO may arguably contribute to multiple food and design categories, we selected a primary food and design category for each DO. For each DO we noted the year of creation, place of use or implementation, and the in-text citation for peer-review publication from which it came.

Quadrant A's 30 sustainable food DOs are funded or supported by public or private institutions for implementation within local geographic contexts. Figure 1.10 shows the quantity of DOs that addresses each category of food in quadrant A. As shown, we found:

- 7 DOs that address the agricultural/aquacultural phase of the food system.
- 0 DOs that address the production phase of the food system.
- 0 DOs that address the processing phase of the food system.
- 1 DO that addresses the distribution phase of the food system.
- 13 DOs that address the communications phase of the food system.
- 5 DOs that address the accessibility phase of the food system.
- 2 DOs that address the consumption phase of the food system.
- 2 DOs that address the waste phase of the food system.

Quadrant B's 16 sustainable food DOs are also funded or supported by public or private institutions for implementation on a more widespread scale. As Figure 1.10 shows, we found:

- 4 DOs that address the agricultural/aquacultural phase of the food system.
- 1 DO that addresses the production phase of the food system.
- 0 DOs that address the processing phase of the food system.
- 0 DOs that address the distribution phase of the food system.
- 4 DOs that address the communications phase of the food system.
- 2 DOs that address the accessibility phase of the food system.
- 2 DOs that address the consumption phase of the food system.
- 3 DOs that address the waste phase of the food system.

Quadrant C's 14 sustainable food DOs are designed by citizens for implementation on a more widespread scale. As Figure 1.10 shows, we found:

- 4 DOs that address the agricultural/aquacultural phase of the food system.
- 1 DO that addresses the production phase of the food system.

- 1 DO that addresses the processing phase of the food system.
- 0 DOs that address the distribution phase of the food system.
- 4 DOs that address the communications phase of the food system.
- 3 DOs that address the accessibility phase of the food system.
- 1 DO that addresses the consumption phase of the food system.
- 0 DOs that address the waste phase of the food system.

Quadrant D's 13 sustainable food DOs are designed by citizens for implementation in a local context. As Figure 1.10 shows, we found:

- 6 DOs that address the agricultural/aquacultural phase of the food system.
- 0 DOs that address the production phase of the food system.
- 1 DO that addresses the processing phase of the food system.
- 0 DOs that address the distribution phase of the food system.
- 1 DO that addresses the communications phase of the food system.
- 2 DOs that address the accessibility phase of the food system.
- 0 DOs that address the consumption phase of the food system.
- 3 DOs that address the waste phase of the food system.

The sustainable food DOs all together represent a proof of concept of food insecurity's wicked solution and what Vokoun (2018) describes as socially responsive design and art that democratize food. The solutions, categorized by bar charts and plotted to the field of four quadrants, neither represent all existing solutions in use in present-day society nor do they solve the food insecurity problem. However, they contribute to a proof of concept for a wicked solution to food insecurity that arguably has the potential to contribute to solving (at the very least addressing more strategically) the food problem as the gaps in the diagram are filled and quantities balanced.

Step 4: Finding places to intervene in the system to attain a more sustainable food future

The question that remains—where *should* designers intervene in the food system to create a more sustainable food future that is secure, equitable, and just?—can now be addressed. Delineating food problems that design should address to create a better food future requires analyzing the evolving food insecurity's wicked solution in Figure 1.10 to understand and identify what Meadows (1999) calls "leverage points," that is, "places within the system where a small shift in one thing can produce big changes in everything." Similarly, Hamdi (2013) examines design solutions from a global perspective and notes that imagination and creativity are valued as the impetus for generating an idea, while reason and planning can carry an idea through. Hamdi's work in participatory planning is relevant, as we examine the food system as a key component of a community, both on a local and global level. Like Meadows's "leverage points," Hamdi (2010) advocates for looking for starting points, looking where to intervene, likening it to urban acupuncture, finding a way to release the energy of a

place, and creating positive ripples of change. Note that Meadows (1999) acknowledges that we have no direct influence on the system and cannot change the system directly, but we can act on the variables around it. A leverage point in the food system derives from an experience of perceiving the state of the system as unbalanced and determining the activity or set of activities within the spectrum producing it; then, in turn, applying goal-oriented tweaking that produces a discrepancy in inflow or outflow to attain a more desired state. Meadows's (1999) model of using leverage points to address complex systems change works on any system, large or small.

Finding leverage points for design intervention in the food system, we argue, entails critically analyzing the wicked solution. For instance, the evolving wicked solution to food insecurity in Figure 1.10, while not exhaustive and inclusive of all the activities of all stakeholders, reflects a probable need for a range of more top-down and bottom-up innovation or appropriation. Perceiving this state in the food system, based on visual analysis, can inform one's design goal. However, the critical mapping we propose also involves deriving design goals based on a participatory analysis of research-generated knowledge that comes from scholarly and/or lay expertises. For instance, as noted earlier, Nelson et al. (2018) implore that future research priorities should emphasize nutritional quality by increasing the availability and affordability of nutrient-dense foods and improving dietary diversity. Using this scholarly finding, a design researcher conducting transdisciplinary research on food can conduct primary research to derive appropriation plans or additional sustainable food DOs to balance the wicked solution. As boundaries of traditional academic disciplines have expanded (Hadorn et al. 2008), transdisciplinary research has emerged with varied definitions. The *Handbook of Transdisciplinary Research* identifies four core concerns found in definitions of "transdisciplinarity" (29). The first is a "focus on life-world problems" (29); the second, "transcending and integrating of disciplinary paradigms" (29); the third, "participatory research" (29); and finally, "the search for unity of knowledge beyond disciplines" (29). While there is general agreement on the first two core concerns, the third and fourth are oft debated (29). For the purposes of this book, transdisciplinary research includes the idea of participatory research and the unifying of knowledge beyond disciplines, and we use Klein's description based on the European transdisciplinary movement: "trans-sector, problem-oriented research involving a wider range of stakeholders in society" (2008, S117). Through this lens, participatory analysis of the wicked solution might derive goals that center on the activities in the food system related to food availability, affordability, and improved dietary diversity. Accessibility and consumption, then, may be places in the food system where designers can intervene to create better food futures based on that goal.

Conclusion

In this chapter, we identified some of the existing sustainable DOs in the food system that are contributing to the wicked solution to food insecurity, and the current leverage points or gaps that exist to design a more sustainable food future.

We used critical mapping, a problematizing and reflective framework, to visualize the food system as an interdependent network of actors and activities engaged in systemic interaction to communicate: 1) the places—leverage points—where designers should intervene to create a more sustainable food future, and 2) the analysis needed at those places to impact the state of the food system more sustainably. In the next four chapters, we discuss the sustainable food DOs giving a general sense of the actors and activities occurring in each phase of the food system. One will find that not all phases are included in each quadrant. If a phase of the food system is missing it is because there were no sustainable food DOs that emerged from the integrative literature review of peer-reviewed publications. The sustainable food DOs come from peer-reviewed sources published after 2009—the founding year of the International Food Design Society—though some of them may have an earlier creation or effectuation date. We discuss each DO generally in terms of 1) the challenge it addresses and why the challenge is significant, 2) which global or local context/community the challenge impacts, 3) how the DO addresses the challenge, 4) how the DO works or functions and what it comprises, 5) when and where it was effectuated, tested, or implemented, and found to be effective, and 6) who the stakeholders are and what their activities are. We conclude each chapter by analyzing that quadrant of the wicked solution and gleaning leverage points to intervene with further design innovation or appropriation.

Notes

1 See United States Department of Agriculture Economic Research Service, n.d., "Interactive Charts and Highlights," accessed [February 22, 2023], https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-u-s/interactive-charts-and-highlights/.
2 As income increases, people consume more meat and high-calorie, processed foods that lack the micronutrients needed to sustain good health and contribute to obesity.
3 Agency and sustainability were "proposed by the High Level Panel of Experts (HLPE) of the Committee on World Food Security (CFS)" in their publication titled "Food Security and nutrition: Building a global narrative towards 2030" available at https://www.fao.org/3/ca9731en/ca9731en.pdf (FAO 2021, 53).
4 Named after Gro Harlem Brundtland, former prime minister of Norway, and chair of the Brundtland Commission, formerly the World Commission on Environment and Development, a sub-organization of the United Nations.
5 See: https://afhvs.wildapricot.org/Past-Conferences
6 While no longer active, the development of the International Food Design Society was a significant step forward for the field.
7 See: https://phd-design.jlscmall.ac.narkive.com/aXKeP4zX/1st-international-symposium-on-food-experience-design.
8 See: https://www.core77.com/posts/22865/International-Conference-on-Food-Design-2012-Food-from-Waste-and-Wall-mounted-Bread.
9 See: https://www.theicod.org/en/resources/publications/iridescent/iridescent-vol-2-issue-3.
10 See: https://www.lafooddesign.org.
11 See: https://www.foodesignmanifesto.org/1st-european-conference-on-understanding-food-design/.

12 The first FDxE was held in Colombia in 2014. While the website for FDxE is no longer active, the organization hosted symposiums around the world centered on developing didactics and pedagogy for food design education.
13 See: https://thisismold.com/event/conferences/the-designers-role-in-food-systems-and-hospitality-the-2nd-annual-food-design-conference.
14 See: http://labcom-ifp.ubi.pt/files/experiencing-food/.
15 See: https://viacampesina.org/en/.
16 One of the most successful special issues of *Visible Language*, a flagship journal in visual communication design, focused on design failure. It generated content to populate three journal issues between 2009 and 2010.

Bibliography

Abson, David J., Joern Fischer, Julia Leventon, Jens Newig, Thomas Schomerus, Ulli Vilsmaier, Henrik von Wehrden, Paivi Abernathy, Christopher D. Ives, Nicolas W. Jager, and Daniel J. Lang. 2016. "Leverage Points for Sustainability Transformation." *Ambio* 46, no. 1: 30–39. https://doi.org/10.1007/s13280-016-0800-y.

Agyeman, Julian. 2008. "Toward a 'Just' Sustainability?" *Continuum* 22, no. 6: 751–756.

Agyeman, Julian, Robert Doyle Bullard, and Bob Evans, eds. 2003. *Just Sustainabilities: Development in an Unequal World*. Cambridge, MA: MIT Press.

Alhaddi, Hanan. 2015. "Triple Bottom Line and Sustainability: A Literature Review." *Business and Management Studies* 1, no. 2: 6–10. http://dx.doi.org/10.11114/bms.v1i2.752.

Alkon, Alison Hope, and Julian Agyeman. 2011. *Cultivating Food Justice: Race, Class, and Sustainability*. Cambridge, MA: MIT Press.

Artmann, Martina, Katharina Sartison, and Jan Vávra. 2020. "The Role of Edible Cities Supporting Sustainability Transformation–A Conceptual Multidimensional Framework Tested on a Case Study in Germany." *Journal of Cleaner Production* 255: 120220. https://doi.org/10.1016/j.jclepro.2020.120220.

Ballantyne-Brodie, Emily, and Ida Telalbasic. 2017. "Designing Local Food Systems in Everyday Life through Service Design Strategies." *The Design Journal* 20, no. sup1: S3079–S3095. https://doi.org/10.1080/14606925.2017.1352816.

Barthes, Roland. 2018. "Toward a Psychosociology of Contemporary Food Consumption." In *Food and Culture: A Reader, Fourth Edition*, edited by Carole Counihan, Penny Van Esterik, and Alice Julier, 13–20. London: Routledge.

Béné, Christophe, Peter Oosterveer, Lea Lamotte, Inge D. Brouwer, Stef de Haan, Steve D. Prager, Elise F. Talsma, and Colin K. Khoury. 2019. "When Food Systems Meet Sustainability – Current Narratives and Implications for Actions." *World Development* 113: 116–130. https://doi.org/10.1016/j.worlddev.2018.08.011.

Bennett, A. 2012. "Good Design is Good Social Change: Envisioning an Age of Accountability in Communication Design Education." *Visible Language* 46, no. 2: 66–78.

Berman, David B. 2008. *Do Good Design: How Design Can Change Our World*. Berkeley, CA: Peachpit Press.

Bhamra, Tracy, and Ricardo J. Hernandez. 2021. "Thirty Years of Design for Sustainability: An Evolution of Research, Policy and Practice." *Design Science* 7: e2. https://doi.org/10.1017/dsj.2021.2.

Bonacho, Ricardo, Maria José Pires, and Elsa Cristina Carona de Sousa Lamy, eds. 2021. *Experiencing Food: Designing Sustainable and Social Practices: Proceedings of the 2nd International Conference on Food Design and Food Studies (EFOOD 2019)*, 28–30 November 2019, Lisbon, Portugal. London: CRC Press.

Bordewijk, Marielle, and Hendrik N. J. Schifferstein. 2020. "The Specifics of Food Design: Insights from Professional Design Practice." *International Journal of Food Design* 4, no. 2: 101–138. http://dx.doi.org/10.1386/ijfd_00001_1.

Buchanan, Richard. 1992. "Wicked Problems in Design Thinking." *Design Issues* 8, no. 2: 5–21.

Buchanan, Richard. 2019. "Systems thinking and design thinking: The search for principles in the world we are making." *She Ji: The Journal of Design, Economics, and Innovation* 5, no. 2: 85–104.

Ceschin, Fabrizio, and Idil Gaziulusoy. 2016. "Evolution of Design for Sustainability: From Product Design to Design for System Innovations and Transitions." *Design Studies* 47: 118–163. https://doi.org/10.1016/j.destud.2016.09.002.

Chambers, Robert, and Gordon Conway. 1992. *Sustainable Rural Livelihoods: Practical Concepts for the 21st Century*. Brighton, UK: Institute of Development Studies.

Chase, Lisa, and Vern Grubinger. 2014. *Food, Farms, and Community: Exploring Food Systems*. Durham, NH: University of New Hampshire Press.

Choi, Jaz Hee-Jeong, and Eli Blevis. 2010. "HCI & Sustainable Food Culture: A Design Framework for Engagement." In *Proceedings of the 6th Nordic Conference on Human-computer Interaction: Extending Boundaries*, edited by Ebba Þóra Hvannberg, Marta Kristín Lárusdóttir, Ann Blandford, and Jan Gulliksen, 112–117. Reykjavik, Iceland.

Clendenning, Jessica, Wolfram H. Dressler, and Carol Richards. 2016. "Food Jjustice or Food Sovereignty? Understanding the Rise of Uban Food Movements in the USA." *Agriculture and Human Values* 33, no. 1: 165–177. https://doi.org/10.1007/s10460-015-9625-8.

Cockrall-King, Jennifer. 2012. *Food and the City: Urban Agriculture and the New Food Revolution*. Amherst, NY: Prometheus Books. https://play.google.com/store/books/details?id=d7d1DwAAQBAJ.

Coleman-Jensen, Alisha, Matthew P. Rabbitt, Christian A. Gregory, and Anita Singh. 2021a. "Household Food Security in the United States in 2020." U.S. Department of Agriculture, September 2021.

———. 2021b. "Overview." USDA Economic Research Service-food Security in the U.S., September 2021. https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/.

Comber, Rob, Jaz Choi, Hoonhout Jettie, and Kenton O'Hara. 2014. "Designing for Human-food Interaction: An Introduction to the Special Issue on 'Food and Interaction Design'." *International Journal of Human-Computer Studies* 72, no. 2: 181–184. http://dx.doi.org/10.1016/j.ijhcs.2013.09.001.

"Conference Program - Afhvs.wildapricot.org." Accessed August 12, 2022. https://afhvs.wildapricot.org/resources/Documents/Conference%20programs/2005-AFHVS-ASFS-Program.pdf.

Costanza-Chock, Sasha. 2020. *Design Justice: Community-led Practices to Build the Worlds We Need*. Cambridge, MA: MIT Press.

Cross, Nigel. 1982. "Designerly Ways of Knowing," *Design Studies* 3, no. 4: 221–227.

Dolejšová, Markéta, Sjef Van Gaalen, Danielle Wilde, Paul Graham Raven, Sara Heitlinger, and Ann Light. 2020. "Designing with More-than-human Food Practices for Climate-resilience." In *Companion Publication of the 2020 ACM Designing Interactive Systems Conference*, edited by Ron Wakkary, Kristina Andersen, Will Odom, Audrey Desjardins, and Marianne Graves Petersen, 381–384. https://doi.org/10.1145/3393914.3395909.

Dorninger, Christian, David J. Abson, Cristina I. Apetrei, Pim Derwort, Christopher D. Ives, Kathleen Klaniecki, David P. M. Lam, Maria Langsenlehner, Maraja Riechers, Nathalie Spittler, and Henrik von Wehrden. 2020. "Leverage Points for Sustainability Transformation: A Review on Interventions in Food and Energy Systems." *Ecological Economics* 171: 106570. https://doi.org/10.1016/j.ecolecon.2019.106570.

Dorst, Kees. 2019. "Co-evolution and Emergence in Design." *Design Studies* 65: 60–77. https://doi.org/10.1016/j.destud.2019.10.005.

Du Pisani, Jacobus A. 2007. "Sustainable Development–Historical Roots of the Concept." *Environmental Sciences* 3, no. 2: 83–96. https://doi.org/10.1080/15693430600688831.

Eden, Colin. 2004. "Analyzing Cognitive Maps to Help Structure Issues or Problems." *European Journal of Operational Research* 159, no. 3: 673–686. https://doi.org/10.1016/S0377-2217(03)00431-4.

Edwards, Ferne, and Dave Mercer. 2010. "Meals in Metropolis: Mapping the Urban Foodscape in Melbourne, Australia." *Local Environment* 15, no. 2: 153–168. https://doi.org/10.1080/13549830903527662.

Eglash, Ron. 2016. "An Introduction to Generative Justice." *Revista Teknokultura* 13, no. 2: 369–404. http://doi.org/10.5209/rev_TEKN.2016.v13.n2.52847.

Eizenberg, Efrat, and Yosef Jabareen. 2017. "Social Sustainability: A New Conceptual Framework." *Sustainability* 9, no. 1: 68. https://doi.org/10.3390/su9010068.

El Bilali, Hamid, and Mohammad Sadegh Allahyari. 2018. "Transition Towards Sustainability in Agriculture and Food Systems: Role of Information and Communication Technologies." *Information Processing in Agriculture* 5, no. 4: 456–464. https://doi.org/10.1016/j.inpa.2018.06.006.

Elkington, John. 2008. "The Triple Bottom Line: Sustainability's Accountants." In *Environmental Management, Second Edition*, edited by Michael V. Russo, 49–66. Los Angeles, CA: Sage Publications, Inc.

Elmqvist, Thomas, Erik Andersson, Niki Frantzeskaki, Timon McPhearson, Per Olsson, Owen Gaffney, Kazuhiko Takeuchi, and Carl Folke. 2019. "Sustainability and Resilience for Transformation in the Urban Century." *Nature Sustainability* 2, no. 4: 267–273. https://doi.org/10.1038/s41893-019-0250-1.

Ericksen, Polly J. 2008. "Conceptualizing Food Systems for Global Environmental Change Research." *Global Environmental Change* 18, no. 1: 234–245. https://doi.org/10.1016/j.gloenvcha.2007.09.002.

Flood, Catherine, and May Rosenthal Sloan, eds. 2019. *Food: Bigger than the Plate*. London: V&A.

Food and Agriculture Organization of the United Nations (FAO). 2008. "Food Security Information for Action: An Introduction to the Basic Concepts of Food Security." EC - FAO Food Security Programme. https://www.fao.org/3/al936e/al936e00.pdf.

Food and Agricultural Organization of the United Nations (FAO). 2018. *The State of Food Security and Nutrition in the World 2018: Building Climate Resilience for Food Security and Nutrition*. Rome: FAO. https://www.fao.org/3/I9553EN/i9553en.pdf#page=28.

Food and Agricultural Organization of the United Nations (FAO). 2021. *The State of Food Security and Nutrition in the World 2021: Transforming Food Systems for Food Security, Improved Nutrition and Affordable Healthy Diets for All*. Rome: FAO. https://doi.org/10.4060/cb4474en.

Foster, Phillips Wayne. 1992. *The World Food Problem: Tackling the Causes of Undernutrition in the Third World*. Boulder, CO: Lynne Rienne Publishers.

Friedman, Ken, Deirdre Barron, Silvana Ferlazzo, Tania Ivanka, Gavin Melles, and Jeremy Yuille. 2008. "Design Research Journal Ranking Study: Preliminary Results." https://researchbank.swinburne.edu.au/items/cdc86f43-a015-495a-9162-f46f25a98f6a/1/.

Frerichs, Leah, Tiffany L. Young, Gaurav Dave, Doris Stith, Giselle Corbie-Smith, and Kristen Hassmiller Lich. 2018. "Mind Maps and Network Analysis to Evaluate Conceptualization of Complex Issues: A Case Example Evaluating Systems Science Workshops for Childhood Obesity Prevention." *Evaluation and Program Planning* 68: 135–147. https://doi.org/10.1016/j.evalprogplan.2018.03.003.

Gaitán-Cremaschi, Daniel, Laurens Klerkx, Jessica Duncan, Jacques H. Trienekens, Carlos Huenchuleo, Santiago Dogliotti, María E. Contesse, and Walter A. H. Rossing. 2019. "Characterizing Diversity of Food Systems in View of Sustainability Transitions. A Review." *Agronomy for Sustainable Development* 39, no. 1: 1–22. https://doi.org/10.1007/s13593-018-0550-2.

Gaziulusoy, İdil, and Elif Erdoğan Öztekin. 2019. "Design for Sustainability Transitions: Origins, Attitudes and Future Directions." *Sustainability* 11, no. 13: 3601. https://doi.org/10.3390/su11133601.

Goel, Puneeta. 2010. "Triple Bottom Line Reporting: An Analytical Approach for Corporate Sustainability." *Journal of Finance, Accounting & Management* 1, no. 1: 27–42.

Gottlieb, Robert, and Anupama Joshi. 2010 *Food Justice*. Cambridge, MA: MIT Press.

Granvik, Madeleine, Sofie Joosse, Alan Hunt, and Ingela Hallberg. 2017. "Confusion and Misunderstanding—Interpretations and Definitions of Local Food." *Sustainability* 9, no. 11: 1981.

Grubinger, Vern, Linda Berlin, Elizabeth Berman, Naomi Fukagawa, D. N. Kolodinsky, B. Parsons, A. Trubek, et al. 2010. "Proposal for a Food Systems Spire of Excellence at the University of Vermont." *UVM Extension Faculty Publications*. https://scholarworks.uvm.edu/extfac/3/.

Guixe, Marti, Octavi Rofes, Inga Knölke, and Jeffrey Swartz. 2010. *Food Designing, Second Edition*. Mantova: Corraini Edizioni.

Hadorn, Gertrude Hirsch, Holger Hoffmann-Riem, Susette Biber-Klemm, Walter Grossenbacher-Mansuy, Dominique Joye, Christian Pohl, Urs Wiesmann, and Elisabeth Zemp, eds. 2008. *Handbook of Transdisciplinary Research*. Vol. 10. Dordrecht: Springer.

Hamdi, Nabeel. 2010. *The Placemaker's Guide to Building Community*. London: Routledge. https://www.taylorfrancis.com/books/mono/10.4324/9781849775175/placemaker-guide-building-community-nabeel-hamdi.

———. 2013. *Small Change: About the Art of Practice and the Limits of Planning in Cities*. London: Earthscan. https://play.google.com/store/books/details?id=-JB4JYQjawgC.

Haysom, Gareth, E. Gunilla Almered Olsson, Mirek Dymitrow, Paul Opiyo, Nick Taylor Buck, Michael Oloko, Charlotte Spring, Kristina Fermskog, Karin Ingelhag, Shelley Kotze, and Stephen Gaya Agong. 2019. "Food Systems Sustainability: An Examination of Different Viewpoints on Food System Change." *Sustainability* 11, no. 12: 3337. https://doi.org/10.3390/su11123337.

Heskett, John. 2005. *Design: A Very Short Introduction*. Vol. 136. Oxford: Oxford University Press.

HLPE. 2020. *Food Security and Nutrition: Building a Global Narrative towards 2030: A Report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security*. Rome, Italy. https://www.fao.org/3/ca9731en/ca9731en.pdf.

Holt-Giménez, Eric. 2015. "Racism and Capitalism: Dual Challenges for the Food Movement." *Journal of Agriculture, Food Systems, and Community Development* 5, no. 2: 23–25. https://doi.org/10.5304/jafscd.2015.052.014.

Jacobi, Johanna, Grace Wambugu, Mariah Ngutu, Horacio Augstburger, Veronica Mwangi, Aymara Llanque Zonta, Stephen Otieno, Boniface P. Kiteme, José M. F. Delgado Burgoa, and Stephan Rist. 2019. "Mapping Food Systems: A Participatory Research Tool Tested in Kenya and Bolivia." *Mountain Research and Development* 39, no. 1: R1–R11. https://doi.org/10.1659/MRD-JOURNAL-D-18-00024.1.

Jones, Peter, and Jeremy Bowes. 2017. "Rendering Systems Visible for Design: Synthesis Maps as Constructivist Design Narratives." *She Ji: The Journal of Design, Economics, and Innovation* 3, no. 3: 229–248. https://doi.org/10.1016/j.sheji.2017.12.001.

Juri, Silvana, Sonia Massari, and Pedro Reissig. 2022. "Editorial: Food+Design - Transformations via Transversal and Transdisciplinary Approaches." In *DRS2022: Bilbao*, edited by D. Lockton, S. Lenzi, P. Hekkert, A. Oak, J. Sádaba, and P. Lloyd, 25. https://doi.org/10.21606/drs.2022.1060.

Klein, Julie T. 2008. "Evaluation of Interdisciplinary and Transdisciplinary Research: A Literature Review." *American Journal of Preventive Medicine* 35, no. 2: S116–S123.

Knutsson, Per. 2006. "The Sustainable Livelihoods Approach: A Framework for Knowledge Integration Assessment." *Human Ecology Review* 13, no. 1: 90–99.

Köhler, Jonathan, Frank W. Geels, Florian Kern, Jochen Markard, Elsie Onsongo, Anna Wieczorek, Floortje Alkemade, Flor Avelino, Anna Bergek, Frank Boons, Lea Fünfschilling, David Hess, Georg Holtz, Sampsa Hyysalo, Kirsten Jenkins, Paula Kivimaa, Mari Martiskainen, Andrew McMeekin, Marie Susan Mühlemeier, Bjorn Nykvist, Bonno Pel, Rob Raven, Harald Rohracher, Björn Sandén, Johan Schot, Benjamin Sovacool, Bruno Turnheim, Dan Welch, and Peter Wells. 2019. "An Agenda for Sustainability Transitions Research: State of the Art and Future Directions." *Environmental Innovation and Societal Transitions* 31: 1–32. https://doi.org/10.1016/j.eist.2019.01.004.

Kokotovich, Vasilije. 2008. "Problem Analysis and Thinking Tools: An Empirical Study of Non-hierarchical Mind Mapping." *Design Studies* 29, no. 1: 49–69. https://doi.org/10.1016/j.destud.2007.09.001.

Leathers, Howard D., and Phillips Foster. 2004. *The World Food Problem: Tackling the Causes of Undernutrition in the Third World: Third Edition*. Boulder, CO: Lynne Rienner Publishers.

Lees-Maffei, Grace. 2016. "Design History: The State of the Art." CAA *Reviews*. https://doi.org/10.3202/caa.reviews.2016.153.

Loo, Clement. 2014. "Towards a More Participative Definition of Food Justice." *Journal of Agricultural & Environmental Ethics* 27, no. 5: 787–809. https://doi.org/10.1007/s10806-014-9490-2.

Löwgren, Jonas, and Erik Stolterman. 2004. *Thoughtful Interaction Design: A Design Perspective on Information Technology*. Cambridge, MA: MIT Press.

Margolin, Victor. 2013. "Design Studies and Food Studies: Parallels and Intersections." *Design and Culture* 5, no. 3: 375–392. https://doi.org/10.2752/175470813X13705953612327.

Maher, Mary Lou, Josiah Poon, and Sylvie Boulanger. 1996. "Formalising Design Exploration as Co-evolution." In *Advances in Formal Design Methods for CAD: Proceedings of the IFIP WG5.2 Workshop on Formal Design Methods for Computer-aided Design, June 1995*, edited by John S. Gero, and Fay Sudeweeks, 3–30. New York: Springer New York. https://link.springer.com/book/10.1007/978-0-387-34925-1.

Mansfield, Neil J. 2016. "Ranking of Design Journals Based on Results of the UK Research Excellence Framework: Using REF as Referee." *The Design Journal* 19, no. 6: 903–919. https://doi.org/10.1080/14606925.2016.1216212.

Manzini, Ezio. 2015. *Design, When Everybody Designs: An Introduction to Design for Social Innovation*. Translated by Rachel Coad. Cambridge, MA: MIT Press.

Markard, Jochen, Rob Raven, and Bernhard Truffer. 2012. "Sustainability Transitions: An Emerging Field of Research and Its Prospects." *Research Policy* 41, no. 6: 955–967. https://doi.org/10.1016/j.respol.2012.02.013.

Massari, Sonia. 2012. "Introducing food experience design in the food studies curriculum." In *GLIDE'12 Conference Proceedings* 7.

Massari, Sonia. 2017. "Food Design and Food Studies: Discussing Creative and Critical Thinking in Food System Education and Research." *International Journal of Food Design* 2, no. 1: 117–133. https://doi.org/10.1386/ijfd.2.1.117_1.

Massari, Sonia. 2020. "Design Methods to Inspire the New Decade. Agency-centered Design. Toward 2030." In *Experiencing Food: Designing Sustainable and Social Practices: Proceedings of the 2nd International Conference on Food Design and Food Studies (EFOOD 2019), 28–30 November 2019, Lisbon, Portugal*, edited by Ricardo Bonacho, Maria José Pires, and Elsa Carona de Sousa Lamy, 13–35. London: CRC Press.

McLellan, Hilary. 2000. "Experience Design." *Cyberpsychology and Behavior* 3, no. 1: 59–69. https://doi.org/10.1089/109493100316238.

Meadows, Donella H. 1999. *Leverage Points: Places to Intervene in a System*. Hartland, VT: The Sustainability Institute. https://donellameadows.org/wp-content/userfiles/Leverage_Points.pdf.

Miller, Ethan. 2014. "Economization and Beyond: (Re)Composing Livelihoods in Maine, USA." *Environment and Planning A: Economy and Space* 46, no. 11: 2735–2751. https://doi.org/10.1068%2Fa130172p.

Mourad, Marie. 2016. "Recycling, Recovering and Preventing 'Food Waste': Competing Solutions for Food Systems Sustainability in the United States and France." *Journal of Cleaner Production* 126: 461–477. https://doi.org/10.1016/j.jclepro.2016.03.084.

Nelson, Gerald, Jessica Bogard, Keith Lividini, Joanne Arsenault, Malcolm Riley, Timothy B. Sulser, Daniel Mason-D'Croz, Brendan Power, David Gustafson, Mario Herrero, Keith Wiebe, Karen Cooper, Roseline Remans, and Mark Rosegrant. 2018. "Income Growth and Climate Change Effects on Global Nutrition Security to Mid-century." *Nature Sustainability* 1, no. 12: 773–781. https://doi.org/10.1038/s41893-018-0192-z.

Nyéléni. 2007. "Declaration of Nyéléni." Accessed February 27, 2007. https://nyeleni.org/en/declaration-of-nyeleni/.

Office of Assistant Director-General (Forestry Department). 2006. *Forests for Improved Nutrition and Food Security*. Food and Agriculture Organization of the United Nations. http://www.fao.org/3/a-i2011e.pdf.

Orenstein, Daniel E., and Dalit Shach-Pinsley. 2017. "A Comparative Framework for Assessing Sustainability Initiatives at the Regional Scale." *World Development* 98: 245–256. https://doi.org/10.1016/j.worlddev.2017.04.030.

Papanek, Victor. 1985. *Design for the Real World: Human Ecology and Social Change*. London: Thames & Hudson.

Penniman, Leah. 2018. *Farming While Black: Soul Fire Farm's Practical Guide to Liberation on the Land*. White River Junction, VT: Chelsea Green Publishing.

Pillay, Thundathil Velayudhan Ramakrishna, and Methil Narayanan Kutty. 2005. *Aquaculture: Principles and Practices, 2nd Edition*. Oxford: Blackwell Publishing.

Plain, Craig. 2007. "Build an Affinity for KJ Method." *Quality Progress* 40, no. 3: 88.

Poggenpohl, Sharon, and Dietmar R. Winkler. 2009. "Celebrating Failure." *Visible Language* 43, no. 2/3: 104–111.

Reissig, Pedro. 2017. "Food Design Education." *International Journal of Food Design* 2 no. 1: 3–13. https://doi.org/10.1386/ijfd.2.1.3_2.

Reynolds, Kristin. 2017. "Designing Urban Agriculture Education for Social Justice: Radical Innovation Through Farm School NYC." *International Journal of Food Design* 2, no. 1: 45–63. https://doi.org/10.1386/ijfd.2.1.45_1.

Rocha, Cristina Sousa, Paula Antunes, and Paulo Partidário. 2019. "Design for Sustainability Models: A Multiperspective Review." *Journal of Cleaner Production* 234: 1428–1445. https://doi.org/10.1016/j.jclepro.2019.06.108.

Rockström, Johan, and Pavan Sukhdev. 2016. "Keynote Speech at the EAT Stockholm Food Forum." Accessed June 20, 2016. https://eatforum.org/learn-and-discover/keynote-speech-prof-johan-rockstrom-ceo-pavan-sukhdev/.

Schouwenburg, Louise, and Marije Vogelzang. 2011. *Eat Love: Food Concepts by Eating-designer Marije Vogelzang*. Amsterdam: BIS Publishers.

Sedlacko, Michal, Andre Martinuzzi, Inge Røpke, Nuno Videira, and Paula Antunes. 2014. "Participatory Systems Mapping for Sustainable Consumption: Discussion of a Method Promoting Systemic Insights." *Ecological Economics* 106: 234. https://doi.org/10.1016/j.ecolecon.2014.07.002.

Sevaldson, Birger. 2011. "GIGA-mapping: Visualisation for Complexity and Systems Thinking in Design." *Nordes* 4. http://nordes.org/opj/index.php/n13/article/view/104.

Sherriff, Graeme. 2009. "Towards Healthy Local Food: Issues in Achieving Just Sustainability." *Local Environment* 14, no. 1: 73–92. https://doi.org/10.1080/13549830802522566.

Snyder, Hannah. 2019. "Literature Review as a Research Methodology: An Overview and Guidelines." *Journal of Business Research* 104: 333–339. https://doi.org/10.1016/j.jbusres.2019.07.039.

Spangenberg, Joachim H., Alastair Fuad-Luke, and Karen Blincoe. 2010. "Design for Sustainability (DfS): The interface of sustainable production and consumption." *Journal of Cleaner Production* 18, no. 15: 1485–1493. https://doi.org/10.1016/j.jclepro.2010.06.002.

Stickdorn, Marc, Markus Edgar Hormess, Adam Lawrence, and Jakob Schneider. 2018. *This is Service Design Doing: Applying Service Design Thinking in the Real World*. Sebastopol, CA: O'Reilly Media, Inc.

Suoheimo, Mari, Rosana Vasques, and Piia Rytilahti. 2021. "Deep Diving into Service Design Problems: Visualizing the Iceberg Model of Design Problems through a Literature Review on the Relation and Role of Service Design with Wicked Problems." *The Design Journal* 24, no. 2: 231–251. https://doi.org/10.1080/14606925.2020.1838696.

Taylor, Damon. 2019. "Design Futures." In *A Companion to Contemporary Design Since 1945*, edited by Anne Massey, and Dana Arnold, 51–71. Oxford: Blackwell.

Torraco, Richard J. 2005. "Writing Integrative Literature Reviews: Guidelines and Examples." *Human Resource Development Review* 4, no. 3: 356–367.

United Health Foundation. n.d. "Explore Obesity in Michigan: 2021 Annual Report." Accessed August 13, 2022. https://www.americashealthrankings.org/explore/annual/measure/Obesity/population/Obesity_Hispanic/state/MI.

United Nations. 2015. "The 17 Goals | Sustainable Development." Accessed August 13, 2022. https://sdgs.un.org/goals#history.

United States Census Bureau. n.d. "Quickfacts: United States." Accessed May 24, 2022. https://www.census.gov/quickfacts/US.

Urban Omnibus. 2010. "Food and the Shape of Cities." February 24, 2010. Accessed July 29, 2022. https://urbanomnibus.net/2010/02/food-and-the-shape-of-cities/.

Vallance, Suzanne, Harvey C. Perkins, and Jennifer E. Dixon. 2011. "What is Social Sustainability? A Clarification of Concepts." *Geoforum* 42, no. 3: 342–348. http://dx.doi.org/10.1016/j.geoforum.2011.01.002.

van Hinte, Ed. 2016. *Katja Gruiters: Food Design. Exploring the Future of Food*. Amsterdam: TerraLannoo Publishers.

Vokoun, Jennifer A. 2018. "Food Democracy: Critical Lessons in Food, Communication, Design and Art." *Design and Culture* 10, no. 2: 227–229. https://doi.org/10.1080/17547075.2018.1469964.

von Braun, Joachim, Kaosar Afsana, Louise Ottilie Fresco, Mohamed Hassan, and Maximo Torero. 2021. "Food System Concepts and Definitions for Science and Political Action." *Nature Food* 2, no. 10: 748–750. https://doi.org/10.1038/s43016-021-00361-2.

Weber, Hanna, Karoline Poeggel, Hallie Eakin, Daniel Fischer, Daniel J. Lang, Henrik Von Wehrden, and Arnim Wiek. 2020. "What Are the Ingredients for Food Systems Change Towards Sustainability?—Insights from the Literature." *Environmental Research Letters* 15, no. 11: 113001. https://doi.org/10.1088/1748-9326/ab99fd.

Winkler, Dietmar R. 2009. "Failure? Isn't It Time to Slay the Design-dragon?" *Visible Language* 43, no. 2/3: 253.

Winne, Mark. 2008. *Closing the Food Gap: Resetting the Table in the Land of Plenty*. Boston, MA: Beacon Press.

World Commission on Environment and Development. 1987. *Report of the World Commission on Environment and Development: Our Common Future towards Sustainable Development 2. Part II. Common Challenges Population and Human Resources*. New York: United Nations. https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf.

World Health Organization. 2017. "The Double Burden of Malnutrition: Policy Brief." Accessed May 17, 2017. https://www.who.int/publications/i/item/WHO-NMH-NHD-17.3.

Zahedi, Mithra, and Lorna Heaton. 2016. "Mind Mapping as a Tool, as a Process, as a Problem Solution Space." In *DS 83: Proceedings of the 18th International Conference on Engineering and Product Design Education (E&PDE16), Design Education: Collaboration and Cross-disciplinarity, Aalborg, Denmark, 8th–9th September 2016, 166–71, 2016*, edited by Erik Bohemia, Ahmed Kovacevic, Lundon Buck, Christian Tollestrup, Kaare Eriksen, and Nis Ovesen. Aalborg, Denmark.

Zampollo, Francesca. 2016. "Welcome to Food Design." *International Journal of Food Design* 1, no. 1: 3–9. https://doi.org/10.1386/ijfd.1.1.3_2.

Zampollo, Francesca, and Matthew Peacock. 2016. "Food Design Thinking: A Branch of Design Thinking Specific to Food Design." *The Journal of Creative Behavior* 50, no. 3: 203–210. https://doi.org/10.1002/jocb.148.

Zampollo, Francesca. 2013. "Food and Design: Space, Place and Experience." *Hospitality & Society* 3, no. 3: 181–187. https://doi.org/10.1386/hosp.3.3.181_2.

Zhang, Wei, Jessica Paula Rose Thorn, John Gowdy, Andrea Bassi, Monica Santamaria, Fabrice DeClerck, Adebiyi Adegboyega, et al. 2018. "Systems Thinking: An Approach for Understanding 'Eco-Agri-Food Systems'." In *TEEBAgriFood "Scientific and Economic Foundations" Report*, 37. TEEB for Agriculture and Food "Scientific and Economic Foundations" Report. Geneva: The Economics of Ecosystems and Biodiversity. https://eprints.whiterose.ac.uk/164950/.