

Food system resilience contributions by urban agriculture

by

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Abstract

Food systems face continued disruptions, including pandemics and severe weather events. Resilience is the ability of a system to respond and adapt to disruptions. The capacity of urban and peri-urban agriculture (UA) sites to provide resilience is an important part of nutritional security in cities. While research in this field is growing, there are gaps in understanding for resilience contributions from specific categories of UA sites.

This thesis provides literature and research-based accounts of how urban agriculture can contribute to resilience. Chapter one provides a review of food system assessment instruments that are used in research. A PRISMA review was used to collect academic and nonacademic assessment tools for food system resilience and compare the intended audience; spatial scope; data type; data collection; strengths; and ease of use. The frameworks matched some but not all of the selected resilience attributes. Intended audience, data collection needs, and ease of use varied. Several limitations were identified including burden of data collection and analysis, and lack of consideration for farm labor. Based on the results of the review, recommendations were made for diverse actors within the food system to select an appropriate assessment tool.

Chapter two is a review of the literature that sought to identify specific resilience attributes with a narrative literature review, including situating the urban food system as a socioecological system with resilience capacities for responding to disruptions. We identified behavior-based indicators of social resilience, including civic engagement, political engagement, social capital, and transformational capacity, that were appropriate for UA site operators and participants.

Chapter three comprises original research that is part of a four-pronged transdisciplinary assessment of urban food systems; other assessment areas include environmental sustainability, agricultural productivity, and community health. This study aimed to develop a survey instrument

to assess and compare resilience capacities of six types of UA sites: urban production, periurban production, intensive production, community gardens, high school gardens, and training farms. Civic engagement, political engagement, social capital including trust and collaboration, and transformational capacity were selected to measure social resilience for participants and operators of UA sites. Methods including validated surveys and interview questions were developed with an advisory board of food system experts. Site operators and participants indicated they felt qualified to participate in the political process, tended to follow local politics, and felt they could have an impact on making their communities better places to live. Operators also had strong patterns of outreach and collaboration, diverse allies, and a multitude of motivating factors. The effect of site type was significant for participants and some types of political engagement, such as signing petitions and indicators of social capital, including trust. Community garden and intensive production site participants had strong indicators of social capital and political engagement significantly correlated with site type, and all site types had strong indicators of civic and political engagement and social capital. These data provide a picture of social resilience contributions by UA site type and underscore the need for planners and policymakers to develop appropriate supports for growing food in and around cities, regardless of the site type. The results could be used to inform UA policy for socially resilient communities.

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Dedication

For Nan.

Chapter 1 - A Comparison of Seven Academic and Nonacademic Food System Resilience Assessment Frameworks

Abstract

Diverse food system resilience frameworks and assessment tools are being developed to measure food system performance in the face of disruptive events. The divide between academic research and gray literature can result in inaccessibility of assessment tools to communities and non-academic researchers. The authors performed a literature review and selected seven urban food system resilience assessment frameworks for comparison with resilience attributes, as well as consideration of their intended audience; spatial scope; data type; data collection; strengths; and ease of use. The frameworks were found to match between three and seven of the ten identified resilience attributes, with a range of intended audiences. Framework data collection methodologies included surveys, spatial data analysis, and mixed methods approaches to collect quantitative, semi-quantitative, and qualitative data. Most of the included frameworks include flexible indicators and metrics for investigators to collect relevant data for their planning goals. While the ability to develop unique metrics can be a strength, undefined metrics present an issue for non-academic researchers in communities seeking to effectively assess their own food system. Limitations in existing assessment tools include a wide range of intended outcomes and burdensome data collection. The comparison of the assessment tools resulted in recommendations of frameworks for academic and non-academic researchers and revealed gaps including a lack of fair labor considerations. This review allows researchers to develop effective frameworks for diverse users to prioritize resilience in food systems.

1 Introduction

The urban food system continues to face disruptive events and long-term stressors, including the COVID-19 pandemic and climate change. Frameworks and assessment tools are being developed at a quickening pace in response to disruptive events, particularly since 2000 (KC et al., 2025). Existing assessment frameworks and tools span diverse areas of the food system, including scales ranging from farm- and household-level assessments to sub-national and national-scale tools intended to measure, among other outcomes, nutrition security, governance, or social and economic capital.

Still, there exists a need for resilience-focused systems-level frameworks to measure the problem of food system resilience and sustainability (Worstell & Green, 2017). Food systems research requires a holistic approach that considers food system activities, socioeconomic and environmental drivers, outcomes, and feedback loops (Ericksen et al., 2010). Because resilience is a systems property, frameworks seeking to measure resilience should approach the food system at the system level with food security as a “non-negotiable goal” (Hodbod & Eakin, 2015). Regional approaches, including the city region food system approach, allow food systems spanning multiple proximal cities to be assessed as a system (Blay-Palmer et al., 2018).

Definitions of resilience typically include the ability of a system to respond over time to shocks and stressors (Tendall et al., 2015). Assessment tools should be able to measure changes in metrics of resilience to illustrate changes in resilience capacity over time. Existing frameworks present the challenge of determining what to measure and what data to collect, and developing common metrics would allow for measurement and comparison from community to community (Atoloye et al., 2023).

Several frameworks are validated and used by academics; other entities like governments, non-governmental organizations (NGOs), and community groups often develop and use their own frameworks. Building on previous reviews of food systems assessments, this article seeks to develop a table to facilitate the selection of the most appropriate food system assessment tool for academic and nonacademic practitioners. The goal of this manuscript is to (1) review assessment frameworks of food systems resilience that can be used to facilitate sustainable food systems redesign; (2) compare frameworks based on strengths, data requirements, and user-friendliness; and (3) provide a recommendation for academic and nonacademic researchers. By comparing and evaluating frameworks for assessment and development of resilient food systems, including frameworks published in both academic and gray literature, the researchers seek to provide an overview of the distinct arguments offered. A resource including data about each framework can allow food system actors, advocates, and governments to make informed decisions about appropriate frameworks for their food system assessment.

1.1 Review of food system resilience measurement approaches

There are varying definitions of resilience as it applies to food systems. Using the definition of resilience developed by Tendall et al. (2015), resilience is the “capacity over time of a food system and its units at multiple levels, to provide sufficient, appropriate and accessible food to all, in the face of various and even unforeseen disturbances” (p. 19). Béné et al. (2023) further refine this definition to include “the ability of the different individual and institutional actors of the food system to maintain, protect, or successfully recover the key functions of that system despite the impacts of disturbances” (p. 1438). Roosevelt et al. (2023) note that with the recent upward trend

of research on measurement of resilience in food systems and related fields across disciplines, concepts could face degradation through conceptual disagreements.

Resilience can only be measured through proxy measurements of metrics that allow the researcher to predict the capacity of a system to return to full operation after a disruptive event. Thus, assessment tools seeking to measure resilience must measure metrics that allow the assessor to generalize about the system's latent capacity for resilience (Béné et al., 2023).

There are gaps in existing research, particularly regarding resilience and sustainability. Sirdey et al. (2023) found that food systems assessment tools fall within a polar gradient, wherein one pole includes frameworks for quantitative data that are applicable to national-level food systems, while the other pole is a mixed-methods and participatory approach at sub-national levels. The authors state that “although resilience concept is considered in almost half of the methods, its articulation with sustainability is regarded in various ways: (i) as a means (or a condition) to achieve sustainability, (ii) as a dimension of sustainability (or associated to some of the dimensions, e.g., economic resilience), or (iii) linked to sustainability in an imprecise way,” especially in city-region level participatory assessment tools (Sirdey et al., 2023, p. 9). Roosevelt et al. (2023) found that resilience is often framed as a subconcept of sustainability, particularly in large-scale assessment tools. These examples illustrate the need for assessment tools that consider resilience as a concept more precisely than as an aspect of environmental or economic sustainability. Accordingly, Ujjwal et al. (2024) found through literature review that sustainability was the most-cited reason for development of food system resilience research. Lew et al. (2016) position sustainability and resilience as distinct but equally important concepts that offer communities a choice in perspective. Hodbod et al. (2024) support including both backwards and forwards thinking through increased participatory data collection in resilience assessment.

Campbell et al. (2022) present a participatory method for developing shared values to include in assessment tools. Atoloye et al. (2023) propose a database be maintained for local food systems assessments to include common metrics.

There are varying qualitative, quantitative, and mixed methods approaches represented in food system assessment tools, including food system mapping; statistical analysis of values derived from metrics; case studies; and two- and three-dimensional matrices. Existing research on the inclusion of resilience concepts of food system assessment tools illustrates the variety of goals and measurement options (Table 12). Roosevelt et al. (2023) developed 8 adaptive capacities that should be included in resilience assessments and point to the need for a strong definition of resilience across assessment tools. Worstell and Green (2017) developed 8 criteria to place frameworks in context of a sustainability/resilience index. Béné et al. (2023) propose five emergent properties to include in resilience analysis and argue that resilience of the system cannot be separated from the well-being and resilience capacities of local households, populations, and all actors of the food system, underscoring the importance of a systems approach to resilience assessment. The first three sets of attributes are intended to guide the development of resilience assessment frameworks (Béné et al., 2023; Roosevelt et al., 2023; Worstell and Green, 2017). The final set of attributes describes existing indicators (Atoloye et al., 2023).

Table 1.1 Resilience Assessment Attributes Suggested by Existing Research

Authors	Resilience Assessment Attributes
Moore et al. (2022): Food system attributes, descriptions, and examples	Diversity Redundancy Connectivity Capital reserves (social, financial, natural, political) Flexibility Preparedness Procedural equity Distributional equity Structural equity Intergenerational equity
Worstell & Green (2017): Qualities of resilient systems	Modular connectivity Locally self-organized Increasing physical infrastructure Responsive redundancy/backups Complementary diversity Conservative innovation Ecologically self-regulated Embracing disturbance for transformation
Béné et al. (2023): Food system emergent properties	Connectivity Redundancy Diversity Rule of law/competitiveness Inclusiveness
Roosevelt et al. (2023): Adaptive capacities	Economic Political/institutional Social Physical/infrastructure Informational Environmental Agricultural Nutritional
Atoloye et al. (2023): Nine domains	Justice and fairness Strong communities Vibrant farms Healthy people Sustainable ecosystem Thriving local economies Food access Food supply chain Racial equity

Development of food system tools for resilience will be crucial to plan and develop food systems that can respond and adapt to disasters. Risk identification and management is a preliminary step in determining to what disruptive events food systems may need to be resilient (Roosevelt et al., 2023). Measures of resilience typically seek the capacity of a system to return to normal functioning after a disruptive event, Béné et al. (2023) suggest a one-analysis-to-one-event assessment to collect data directly related to resilience responses by individual actors within the food system.

2 Methods

The researchers focused this review on assessment frameworks of regional, urban, and peri-urban food systems to illustrate the connection between food systems and community resilience. We have narrowed the literature search to include only assessment frameworks of regional food systems that facilitate holistic views of the food system with a focus on resilience.

Academic frameworks were found using a PRISMA framework. The researchers used the search term ““food system*” AND framework or assessment or indicator or metric AND resilience* AND urban” in ProQuest, Scopus, Academic Search Premier, and SpringerLink. Results were limited to peer-reviewed articles in the English language published from 2000 to 2024. Papers were rejected for being about anything besides food systems and resilience; for prioritizing agricultural production or sustainability over resilience; for being national-scale assessment tools; and for strictly concerning food system governance. Duplicate results were excluded. Searches were performed in ProQuest (8,440 results); Academic Search Premier (29 results); Scopus (88 results); and SpringerLink (1,148 results).

Grey literature assessment tools were found using the same search terms in with results narrowed to non-academic journal sources published from 2000–2024: audio and video works; blogs, podcasts, and websites; conference papers and proceedings; dissertations and theses; magazines; and newspapers. Document types were limited to annual report; blog; conference, conference paper, and conference proceeding; dissertation or thesis; or essay. Searches were performed in Google Scholar (12,200 results) and ProQuest (1745 results). Further grey literature assessment tools were identified through research of other food system assessment reports. In both cases, papers that provided a framework for measuring resilience in food systems with indicators and metrics were retained. Most papers were rejected for prioritizing sustainability over resilience. Search biases in our review include the small number of databases searched. Bias in the gray literature search includes difficulty in finding gray literature through a PRISMA review, leading to possible researcher bias.

The frameworks were compared with the local food system resilience attributes found in “Food System Resilience: A Planning Guide for Local Governments” by the Johns Hopkins Center for a Livable Future (Moore et al., 2022). The researchers chose this set of attributes because the 10 attributes overlapped generally with the other three sets of attributes presented in Table 1; the inclusion of 4 equity attributes facilitate assessment tool analysis in accordance with principles of equity and food justice. Frameworks were labelled with intended audience; ease of use; spatial scopes; strengths; and adherence to resilience attributes (Table 13).

Table 1.2 Comparison of Food System Assessment Tools with Resilience Attributes and Relevant Descriptors

Attribute ¹	“Resilient Food Systems: A Qualitative Tool for Measuring Food Resilience” (Toth et al., 2016).	“A Framework to Assess the Resilience of Farming Systems” (Meuwissen et al., 2019)	“Food System Resilience Measurement: Principles, Framework and Caveats” (Béné et al., 2023)	Self-Evaluation and Holistic Assessment of Climate Resilience of Farmers and Pastoralists (SHARP+) (Hernández Lagana et al., 2022)	Community & Agriculture Resilience Audit Tool (CARAT) (NAFSN, 2023)	City-Region Food System (CRFS) Indicator Framework (Carey & Dubbeling, 2017)	The Resilience of America’s Urban Food Systems: Evidence from Five Cities (Zeuli & Nijhuis, 2017)
Diversity of food system elements	x	x	x	x		x	x
Redundancy of food system elements	x	x	x	x			x
Connectivity between food system elements	x	x	x	x	x		
Capital reserves (social, financial, natural, capital)		x		x	x	x	x
Flexibility of food system elements during disruption		x	x	x			
Preparedness for operations during disruption					x	x	x
Procedural equity for equitable planning processes					x	x	x
Distributional equity for share of planning benefits and burdens			x		x	x	x
Structural equity to change inequitable and unjust outcomes					x		x
Intergenerational equity for resource conservation into the future					x		
Audience	Planners; academic researchers	Academic researchers	Academic researchers; community and food system actors	Pastoralists and communities	Community and food system actors	Planners; food system actors	Planners; academic researchers

Spatial scope	City to sub-national Links (flows of food) and nodes (food system activities)	City to regional	City; city region	Single farm to city region	City; city region 101 defined indicators with example qualitative metrics	City; city region	City to region
Data type		Qualitative and quantitative Mixed methods, including statistical analysis, modeling, and interviews	Quantitative; semi- quantitative	Defined indicators and survey questions		210 possible indicators and suggested data sources	Quantitative, qualitative, and spatial data
Data collection	Qualitative data for food system patterns		Surveys	Surveys Applicable to producer household resilience as well as system-level resilience	Mixed methods, as determined by user	Existing and new qualitative and quantitative data	Mixed methods, including spatial data analysis
Strengths	Comparing resilience of possible scenarios for supply chains and distribution	Collects data on diverse food system actors	Measures individual and collective response to disruption Multiple steps needed (4); difficulty in isolating disruptive events; requires development of survey questions for individual actors to collect relevant group data		Extensive framework of food system capitals accessible for non- academic researchers	Customizable to city desired outcomes; allows cities to find baseline and monitor changes	Focus on disaster planning for nutritional security
Ease of use	No specified data; qualitative data for link and node resilience does not exist; extensive modeling	Difficulty in collecting specified data		Self-administered pre-written validated survey	Wide body of data; undefined metrics require research into municipal and local programs, planning, and policy	Difficulty in agreeing on priorities; efficiently collecting a wide body of data	Requires determination of at-risk areas for a given natural disaster and development of applicable metrics

¹Adapted from Moore et al., 2022

3 Results

Three academic frameworks were considered. “Resilient Food Systems: A Qualitative Tool for Measuring Food Resilience” (Toth et al., 2016) is a modeling approach with nodes (food system activities) and links (flows of food) to find R values, wherein a lower R value equals higher resilience. “A Framework to Assess the Resilience of Farming Systems” (Meuwissen et al., 2019) has been used throughout Europe and measures both specific and general resilience, including resilience of what; to what; for what purpose; what resilience capacities exist; and what enhances resilience. “Food System Resilience Measurement: Principles, Framework and Caveats” (Béné et al., 2023) includes resilience capacities and emergent properties for system analysis and assessment of individual and food system response to one disruptive event.

Four gray literature frameworks were considered. Community & Agriculture Resilience Audit Tool (CARAT) (North American Food Systems Network (NAFSN), 2025) is a community self-assessment tool to gather data about food system asset use. The Resilience of America’s Urban Food Systems: Evidence from Five Cities (Zeuli & Nijhuis, 2017) is intended to identify vulnerabilities and analyze at-risk areas of the food system for disaster preparedness planning. Self-Evaluation and Holistic Assessment of Climate Resilience of Farmers and Pastoralists (SHARP) (Hernández Lagana et al., 2022) is a self-administered survey that includes questions in 13 behavior-based indicators to assess the resilience of households and agroecosystems. The City Region Food System (CRFS) Indicator Framework (Carey & Dubbeling, 2017) is an assessment and planning tool with a whole-system approach to gather data, identify weaknesses, and inform planning decisions.

Table 2 illustrates the review of assessment tools. No tool matched all 10 resilience attributes. Scores ranged from 3 to 7 resilience attributes, with diversity being the most used and

structural and intergenerational equity being the least. The intended audiences included planners and policy advocates; academic and nonacademic researchers; pastoralists; and community and food system actors. The tools represent a diversity of methods and approaches, ranging from modeling frameworks to self-administered surveys. A strength in existing tools is an emphasis on resilience and identifying vulnerabilities within food systems. The frameworks are applicable on multiple scales and appropriate for assessment at the systems level. SHARP+, Meuwissen et al. (2019), and Béné et al. (2023) allow for assessment of individual households, farms, and actors as part of systems assessment.

Each framework contains indicators that may align with resilience attributes and frames resilience differently, as observed by varying attributes included (Table 2). Indicators are described by metrics, which are relevant data points. Metrics can be used to measure change over time and allow for the interpretation of indicators to determine the resilience of the food system. SHARP+ describes indicators as “overarching principles” that are useful to contextualize metrics and provide consistency and a systemic approach to assessment (Hernández Lagana et al., 2022). The frameworks take varying approaches to indicators and metrics. The modeling approach developed by Toth et al. (2016) uses attributes, such as length, fragility, and capacity, and factors, such as cost, time, and redundancy, to describe food system links; these are analogous to indicators and metrics. Béné et al. (2023) include the collective resilience capacity indicator “level of agency, inclusion and empowerment” in the food system; the indicator meets the resilience attribute of capital reserves, particularly social capital. The metric is unspecified semi-quantitative data suggested to be based on community-level resilience research of food system actors. The CRFS Indicator Framework includes the indicator “number of food education services that involve other food system actors (farmers, cooks, food vendors, policy makers) as educators,” which meets the

resilience attribute of connectivity. The authors suggest 7 metrics to collect data for this indicator, including “reports from city food networks or community food organizations or NGO’s” and “school food education surveys” (Carey and Dubbeling, 2017).

4 Discussion

While frameworks and assessment tools are often developed to be broadly applicable, variations in each food system preclude any tool from fitting every situation perfectly (Campbell et al., 2022). Many farm resilience assessments do not include adequate consideration of farm labor conditions. Perrin et al. (2024) found that resilient farms are not necessarily associated with fair working conditions, and otherwise resilient farms can have poor conditions for labor. Of the frameworks included in this study, labor is generally considered from an economic or social capital perspective; the CRFS Indicator Framework includes the largest focus on fair labor conditions. Urban agriculture has benefits for sustainable cities, but there is a research gap in planning and governance, pointing to the need for inclusion of governmental, planning, and policy support in assessments (Tapia et al., 2021).

Though adjusting the assessment area to include a city region can provide system-level data, increased data collection presents a challenge (Meuwissen et al., 2019). There is also a significant time and resource commitment in practical application of the included tools that increases with scale. The meso or regional level of food system is also open to changes and feedback from systems at both the micro (for example, farm-level) and macro (global) scale, and each scale faces different constraints and challenges (Ge et al., 2016). Ujjwal et al. (2024) found that assessment is important at granular levels to capture interactions between systems and actors, in addition to coarser sub-national and national levels. Each included tool allows users the option

to scale data collection up or down at a minimum from city to city-region, with SHARP+ allowing for collection of household-level data and Toth et al. (2016) being applicable to subnational levels.

Gaps in existing frameworks include disparity of expected outcomes; disagreement on concept definitions; and the burden of data collection, particularly when data are suggested but not prescribed. Researchers note the importance of customizing indicators and metrics for specific food systems. Campbell et al. (2022) describe a methodology for developing metrics that are broadly applicable to a food system through gaining approval of a panel of local food system experts. Toth et al. (2016) state that “Indicators provide insight into the characteristics of a system, but do not reveal the gaps or missing links in that system.” Existing assessment tools offer starting points for interested parties to begin collecting data about food system resilience; gaps can be filled through development of shared or unique metrics to collect system-specific data. This can pose a limitation for some users, but it also allows significant freedom for users to identify their own data collection needs.

The process of conducting a food system assessment increases the need for stakeholder and community participation, pointing to the possibility of tools facilitating collaboration for participatory food system redesign. Results of the assessment can provide needed data and evidence for municipal policy and planning advocacy, funding opportunities, and program partnerships to foster resilience capacities.

Academic researchers may effectively use Béné et al. (2023), which matches 5 resilience attributes, to collect system-wide resilience data; however, the extensive methodology at play may exclude non-academic researchers. Both CARAT and Zeuli and Nijhuis (2017) match 7 resilience attributes; provide defined indicators; and allow for customization of metrics, making them appropriate for both academic and non-academic researchers. Researchers and stakeholders

seeking an overview of community resilience strengths and vulnerabilities can use the former, while researchers seeking to improve disaster planning can use the latter.

5 Conclusion

Developing resilient urban food systems with validated assessment frameworks aligns with several of the UN's Sustainable Development Goals, including 1: No Poverty; 2: Zero Hunger; 3: Good Health & Wellbeing; and 11: Sustainable Cities & Communities. Appropriate resilience assessment tools are vital to show existing strengths and weaknesses; to create equitable food systems with fair labor practices; provide food security and food sovereignty; and support strong communities that respond to and recover from disruptive events.

We identified seven assessment frameworks that can be used to study food systems resilience at the community or regional scale. Table 2 presents concise information for interested parties to choose an appropriate assessment tool. Examining gaps in existing food systems assessment tools supports the goal of developing unified measures of resilience and answers the call to collect quantitative data of resilience metrics (Worstell and Green, 2017). Development and deployment of resilience assessments will allow researchers to answer questions about food system redesign for long-term resilience (Hodbod and Eakin, 2015), decrease inequality and develop general and specific resilience (Campbell et al., 2022), and identify priorities for redesign (Roosevelt et al., 2023). Continued development and comparison of frameworks and assessment goals will help to drive research on resilient food systems. Future research should develop shared resilience definitions and indicators specifically for urban food systems to produce effective and user-friendly tools for diverse food system researchers and practitioners.

Chapter 2 - Food System Resilience Contributions by Urban

Agriculture: Literature Review

Introduction

Food systems face continual disruptions, including climate change, economic downturns, natural disasters, and pandemics. Vulnerabilities including labor shortages, supply chain breakdowns, and nutritional insecurity are exposed by disruptions to the system. Interest in local food systems is increasing as vulnerabilities and inequities bring attention to shortfalls and research uncovers potential benefits of urban agriculture, local food systems, and civic agriculture. Delind & Bingen (2008) position local agriculture as a response to the lack of sense of place Americans may have.

Urban Food Systems and Resilience

The food system includes every step of food production, including planting, agricultural inputs, and production; storage, transportation, processing, and retail; food service, provisioning, and consumption; and waste. The food system includes everyone who eats, and it interacts with other systems at all scales. Anderson et al. (2026) suggest that researchers avoid “tunnel vision” in food systems thinking, noting that food systems are inextricably linked to structures like financial systems and power structures. Though these other structures may seem outside of the scope of food system transformation, they must be considered to enact sustainable, equitable, and resilient food systems.

Resilience is an ecology concept used to describe the stability of animal populations and ecological systems. Holling (1973) wrote that “Resilience determines the persistence of relationships within a system and is a measure of the ability of these systems to absorb changes of

state variables, driving variables, and parameters, and still persist,” and the author clarifies that resilience is a property of systems (p. 17). Further, resilience is distinct from stability in Holling’s definition, as stability is “the ability of a system to return to an equilibrium state after a temporary disturbance” (p. 17). Berkes & Folke (2002) suggest the term social-ecological system to underpin their assertion that “social and ecological systems are in fact linked, and that the delineation between social and natural systems is artificial and natural systems is artificial and arbitrary” (p. 4). The socioecological framework for understanding food systems emphasizes the interaction between humans and the environment inherent in all food activities; as a result, resilience as a concept emerged as a relevant aspect of food systems. Ericksen (2008) calls for systems thinking in food research to improve understanding of food system interactions, ecosystem services, food security, and the tradeoffs necessary for the system to function. Hodbod & Eakin (2015) argue that resilience in the food system is distinct from resilience in socioecological systems because food security is non-negotiable for human survival.

Resilience is distinct from sustainability, though the terms have some overlap. In food system literature, resilience is considered in inconsistent ways, and resilience is frequently treated as a component of sustainability (Roosevelt et al., 2023; Sirdey et al., 2023). Lew et al. (2016) found that while resilience and sustainability have similarities in research application and goals, there are significant differences that should be addressed to develop strong communities. Crucially, a criticism of resilience is that it “does not address the causes of social and environmental change,” while sustainability is “poorly defined and highly politicized” (p. 22). The authors suggest that integrating sustainability and resilience into development fosters a more robust approach to building strong communities.

Tendall et al. (2015) define food system resilience as “capacity over time of a food system and its units at multiple levels, to provide sufficient, appropriate and accessible food to all, in the face of various and even unforeseen disturbances” (p. 19). This definition necessarily includes sustainability as an aspect of resilience, ensuring that food systems continue to provide food in the future. The authors also emphasize that food system resilience requires “a built-in, continuously developing capacity” to respond and adapt to change. This view of resilience as a capacity positions food system assessment as a tool for developing the ability of the food system to maintain function in the face of shocks and stresses.

Roosevelt et al. (2023) reviewed the literature to define concepts and identify measurements within food systems and resilience. The authors found that resilience is a vast, complex term, and there are conflicting definitions. Some consider resilience to be the ability to return to normal functions quickly after disruption, while others consider resilience to be the ability to maintain normal functions as much as possible during and after disruption. It is important to consider the adaptive capacities of a food system as a measure of resilience. Measures of resilience tend to focus on outcomes and not the response to disruption. Sanderson Bellamy et al. (2021) argue for examination of food system vulnerabilities exposed by the COVID-19 pandemic, which increased inequality in food access. Because the Covid-19 pandemic is not the only crisis food systems will have to overcome, weaknesses exposed by the pandemic should be studied and rectified to make a more resilient, just, and environmentally friendly food system. Further, resilience includes relationships between several concepts culminating in food security (Roosevelt et al., 2023).

Attributes and External Conditions for Resilient Urban Food Systems

Carpenter et al. (2012) used aspects of socioecological systems to propose a set of systems properties for general resilience. The properties include diversity, modularity, openness, reserves, feedbacks, nestedness, monitoring, leadership, and trust. Several of these properties include behavioral capacities, like social interactions resulting in trust and networks and ability to transform and rebuild systems after interruptions (p. 3253-4).

Adaptive Capacities

Adaptability is “the capacity of actors in the system to influence resilience” in socioecological systems, noting that adaptability describes humans’ capacity to manage a system’s resilience by changing attributes of latitude, resistance, precariousness, and panarchy (pg. 5). (Walker et al., 2004, p. 5). Transformability is defined as “The capacity to create a fundamentally new system when ecological, economic, or social (including political) conditions make the existing system untenable” (Walker et al., 2004, p. 4). Frankenberger et al. (2015) describe capacities to respond to food system disruptions, defining adaptive capacity as “the ability to make proactive and informed choices about alternative livelihood strategies based on changing environmental, climatic, social, political and economic conditions,” and absorptive capacities as “the ability of individuals, households, communities or higher-level systems to minimize their exposure to shocks and stressors and to recover quickly when exposed” (p. 14). These capacities are behavior-based and describe people within the food system's ability to adapt and respond to changing circumstances.

De Grandpré et al. (2022) found that soft adaptation, or changes in practice that do not require infrastructure or inputs is key to developing resilient agricultural systems. Hard adaptations include solutions like infrastructure improvements and the construction of new buildings. Soft

adaptations include intangible solutions like changing land management strategies, irrigation regimes, or planting schedules due to changes in weather patterns. Soft adaptations also include developing plans to respond to disruptions or building new collaborations with others in the food system. Many of the metrics in food system resilience are examples of soft adaptations, including social ties and collaborations, training new growers, and producers' willingness to change. De Grandpré et al. (2022) identified five disturbance types for agricultural producers (institutional/political; environmental/biological; social/human; economic; and technological). The authors define adaptation as a process wherein strategies are implemented to adjust to shocks and stressors to continue with agricultural livelihoods. Soft adaptation is an integral part of resilience in agriculture, but participants report using hard adaptation strategies as a direct response to disturbances over soft adaptation strategies (De Grandpre et al., 2022). The lack of willingness to implement soft adaptation strategies, despite understanding the importance of concepts like social capital, is keeping the food system from being more resilient. Researching soft adaptation could allow researchers to communicate strategies and their benefits in ways that make them more appealing to implement. Focusing on hard adaptation strategies has supported a more depletive food system reliant on expensive infrastructure and technological fixes to production issues, while a focus on soft adaptation strategies can help to increase regenerative, extensive food systems. Soft adaptation can increase flexibility and decrease risk, as well as allow producers to develop less centralized operations. Specifically, researchers could focus on helping to develop spaces for developing social capital and knowledge sharing (De Grandpré et al., 2022).

Behavior-based capacities such as adaptation and transformation, as well as indicators of social capital, are soft adaptations because they require only a change in actions and decision-making and do not necessarily require infrastructure for the behavior to occur. Examples of

behavior-based capacities that can be described as soft adaptations include patterns of behavior around seeking opportunities for civic engagement and social ties (Putnam, 2000) and attitudes toward changing land management practices (Marshall et al., 2012).

Social Capital

Social capital impacts the resilience of communities. Social capital is a vast concept that refers to community ties, including between members and between members and resources like civil groups and NGOs, and the level of trust between community members, among other social ties (Aldrich & Meyer, 2015). Social capital can be grown or degraded depending on planning decisions, policies, and other civic interventions. Community layout and architecture impacts social capital, as well. Bonding social capital is strong ties between emotionally close friends, family, and social group members. Bridging social capital refers to ties between people and between people and organizations that are looser than bonding ties and can cross socioeconomic groups (Aldrich & Meyer, 2015). Bridging ties are referred to as weak ties, but these ties are critical for developing resilience.

Social capital, including bridging and bonding ties, can be built through activities that bring people into contact with one another. Volunteerism and membership with community groups, clubs, and labor unions, among other activities, was shown to be declining in the United States. The impacts of the decline in social capital, including a reduced trust level between community members and communities and governments, can reduce safety and quality of life within communities as well as a potential erosion of democracy (Putnam, 2000). Social capital is again shown to be an important part of a functioning and resilient society.

Social capital as “the collection of social networks, norms, and trust that facilitate cooperation and collaboration between individuals and groups” (Elton et al., 2021, p. 2). Using

social networks, trust, reciprocity, and engagement as indicators of social capital, Elton et al. (2021) illustrated social capital within a local food system. The Okanagan bioregion is in south-central Canada with a strong history of agricultural production. The results support a positive connection between food system participants and social networks and show that food systems are an important part of fostering community social capital. Notable results include finding that 97% of participants feel that their community is positively impacted by local food systems and 81% agree that connections between community members and participation in the food system are interrelated (Elton et al., 2021., p. 5). Respondents indicated that the local food system has resulted in stronger social bonds and connections. The authors assert that ‘placemaking,’ where a sense of place is developed through social connection, is an important part of social networks resulting from participation in the food system. For example, study participants shared that the farmers’ market was an important area for building connections between community members. Importantly, the authors note that these places can be exclusionary for community members who are non-white; less affluent; and less educated. The authors conclude that “There is a strong relationship between participation in local food systems and indicators of social capital, particularly social networks and the meaningful degrees of trust and reciprocity” (p. 3).

Social capital has been shown to increase resilience capacities that contribute to strong disaster responses. LaLone (2012) describes the “neighbors-helping-neighbors social norm of rural Appalachia,” as well as strong social ties and reciprocity, that resulted in rapid and large response to tornados striking the area. When governmental and non-governmental organizations ceased meal programs for those affected by the tornados, the community continued to provide for each other’s needs thanks to strong social networks and social capital. Roberts (2019) found that factors impacting social capital in the Ninth Ward of New Orleans, including lack of political power and

uneven distribution wealth and other forms of capital including transportation, diminished reserves of social capital needed for the community to adapt to and recover from the aftermath of Hurricane Katrina. While the neighborhoods in the Ninth Ward had strong indicators of social bonds and ties within their boundaries, they lacked access to resources outside of the neighborhood due to barriers like diminished civic skills for engaging with governmental and political processes. This case highlights the importance of understanding and supporting the growth of social capital in communities for disaster preparedness and general resilience (Roberts, 2019)

Civic and political engagement

Civic and political engagement can be measured as two separate groups of behavior-based indicators, though they have significant overlap. Notably, the National Academies considers civic and political engagement to be aspects of social capital but measures civic engagement as a subgroup of political engagement. Civic engagement encompasses actions undertaken to improve the community, including volunteerism, problem-solving, and group membership, while political engagement includes activities like voting, campaigning, and contacting elected officials (*Civic Engagement and Social Cohesion*, 2014).

Much of the existing scholarship on the effects of local and global capitalism are outdated as the market continues to change. Clark & Record (2017) undertook research on the local engagement of locally owned farm businesses; the supply chain as it correlates to the local political and civic involvement of the business owner; and the degree of social embeddedness of operators and its correlation with levels of local engagement. The authors differentiate between local firms that primarily operate and participate in the local food market and firms that are locally operated but primarily sell in a non-local market. The authors found a positive correlation between operators of local businesses who market their products as local and levels of civic and political engagement.

Business operators who work in local markets, as opposed to mixed or non-local markets, are more likely to be civically and politically engaged, and higher social embeddedness generally results in higher civic engagement, but not necessarily higher political engagement. Neither dependent variable showed a high correlation with profit motivation. The conclusion supports the idea that local businesses that sell directly to local consumers are good for communities, but the data shows that there are more factors that determine the local benefit than simply a local and non-local distinction (Clark & Record, 2017). More research should be done to determine how local businesses in any market can benefit their communities while still participating in globalized capitalism.

Civic agriculture refers to locally-based food production that contributes to the growth of social and economic capital within communities (Lyson, 2004). Obach & Tobin (2014) measured the civic engagement of civic agriculture participants through a survey that included questions about self-assessed ability to make an impact on the respondent's community, volunteerism, interest in politics, and motivations for buying local food. The researchers found that participation in civic agriculture in different forms, including community-supported agriculture (CSA) and food procurement from farmers markets and independent food stores, is linked to improved indicators of civic engagement. Respondents involved in CSA, a more socially embedded pattern of food procurement, had higher levels of civic engagement than respondents involved in less socially-embedded patterns of shopping at farmers markets and local retailers. However, the sample of civic agriculture participants had higher civic engagement than people who did not take part in civic agriculture.

Trust

The National Academies measures trust as an aspect of social cohesion through trust between a survey respondent and others in the community. Trust is used as a behavior-based measure of social capital. Trust at varying scales, from between friends to between strangers and non-alike groups, is an important part of the growth of social capital needed for encouraging civic and political engagement. Trust can also encourage the formation of social ties and improve social cohesion. Low levels of trust can decrease social cohesion through polarization between groups (*Civic Engagement and Social Cohesion*, 2014).

Community resilience research includes trust and social interactions in assessments of resilience after disruptions including natural disasters. Susanto et al. (2023) found that among dimensions of social capital, trust and networks were most found as indicators of social resilience following natural disasters. The authors note that trust is an important part of recovery after disasters, and that social networks facilitate collaborations and knowledge-sharing (Susanto et al., 2023).

Trust is an important part of enacting food system change, both within governance and between the government and producers and other actors (Rico Mendez et al., 2021). Carpenter et al. (2012) write that “Leadership and trust confer resilience on social-ecological systems and social relations in general,” explaining that trust can be developed through social interactions and can help to mitigate the negative resilience impacts of negative social actions (p. 3253). Elton et al. (2021) include trust in their definition of social capital and found that local food systems can contribute to building trust.

Transformational Capacity

In the context of food systems, transformational capacity is the ability of a producer to change the way they operate to adapt to new stresses and shocks. Strong social capital, including social ties between people and organizations in the system and strong collaborative networks, is required for systems to transform (Aldrich & Meyer, 2015). Marshall et al. (2012) proposed a set of four indicators to measure transformational capacity and willingness to change in the face of climate change, particularly for producers who tend to be influenced by attachment to place and occupation. The indicators include management of risks; planning, learning, and reorganizing skills; financial and psychological flexibility; and willingness to change (Marshall et al., 2012). Transformational capacity as a proxy of resilience stands in for ability to bounce back after disruptive events.

Transforming in response to food system disruptions can be challenging for producers. Nichols et al. (2022) interviewed producers to understand their adaptations to the disruptions of the Covid-19 pandemic. Adaptation can come at a social and emotional cost for producers within local food systems, and it is particularly stressful for those who are less financially stable or have dependents. These costs are unsustainable and must be met through investment in resilient food systems. Considering these stresses in research could allow for transformative resilience in the food system. It also shows the importance of developing social capital and informs the support structures needed within the food system. The authors also argue that universal healthcare would improve the lives of producers and thus result in a more resilient and sustainable food system (Nichols et al., 2022).

Motivating Factors

Urban food systems projects are often driven by workers and volunteers who feel a strong intrinsic motivation to improve some aspect of the food system. A social network analysis such as the analysis completed by Luxton & Sbicca (2020) compares the motivations of organizations and individual actors within the food system to map collaborations between issue areas to find collaborative niches. Nogeire-McRae et al. (2018) found that home gardens did not make a significant difference in the nutrition and money savings of the gardeners, but that gardeners and farmers tend to be driven by social goals as well as food production goals. Kirby et al. (2020) collected survey data from support actors, farmers, and community gardeners around motivations in the themes of community building, social and environmental justice, economic factors, and health. They found that all groups agreed with motivating factors of community building, social environmental justice, and health, but that the groups neither agreed nor disagreed with economic factors as a whole. Farmers showed the highest agreement with economic motivations for UA participation. The researchers conclude that UA participants fall into one of two categories of motivating factors: primarily motivated by either personal reasons (like access to healthy foods) or by factors of justice and community. UA participants in the second category had stronger adaptive capacities when compared to participants in the first but had higher barriers to entry. This could imply decreased transformational capacity of UA participants motivated by justice and community building. The support networks of the UA participants lacked diversity in terms of categories of sources, potentially indicating a resilience vulnerability.

Urban Planning and Policy Supports for Food Systems

Governments must support resilience to mitigate the impacts of disruptions, though there are challenges in developing policy that improves immediate and short-term outcomes while also building long-term resilience (Carpenter et al., 2012).

Urban agriculture has both benefits and drawbacks for cities. Urban agriculture plays an important role in the sustainable development of cities, including economic, social, and environmental aspects. Use of urban land for agriculture is generally less economically sound than other non-agricultural commercial or industrial uses. However, the environmental, social, and economic benefits of urban agriculture often outweigh the negatives of agricultural land use (Azunre et al., 2019).

Food systems are complex and contain food production and distribution, as well as food acquisition and service. Clark et al. (2021) write that some aspects of urban food systems are regulated more than others, and some parts are fragile and less visible to policymakers and planners. One issue is that food is not a constitutional right in the United States. The authors found that more policymakers are considering urban food systems, but that policy tools to increase resilience should be prioritized and used across the US. Particular attention should be paid to middle infrastructure of the food system, which is made up of processing, wholesale, and distribution. Clark et al. (2021) found that middle infrastructure receives less policy support than production.

Hodbod & Eakin (2015) describe the “multifunctionality” of food, writing that “failure in meeting food security objectives can be interpreted as the lack of current governance arrangements to consider the full and differential dimensions of food system functions—economic, ecological, and social—at appropriate scales” (p. 5:474). The researchers call for a change in policy to support

more than just profitability and to recognize food as both economic and moral commodity to improve resilience assessment and management. Lew et al. (2016) note that while governance is often informed by sustainability, resilience should be included in policy development to build strong communities. Prioritizing either sustainability or resilience over the other can hinder governance and development efforts (Anderson et al., 2026; Lew et al., 2016).

While urban food production is not new, cultural attitudes surrounding it have changed and differ between urban residents and city planners. Raja & Diao (2016) used a national survey of local governments and city planners to find trends in attitudes toward and involvement in planning for urban agriculture. The authors found that most respondents have little to no involvement in food systems planning. Further, about half are unfamiliar with food systems planning. Survey respondents cited several hinderances to food systems planning, including lack of political support and grant funding; food systems planning not being included in job descriptions; and lack of resources in their community. Community planning and architecture that includes third spaces for community members to meet and talk with each other are crucial components of developing social capital that improve resilience; urban planners and policy makers should prioritize the inclusion of these principles of community layout to develop resilient cities (Aldrich & Meyer, 2015). UA sites can serve as these third spaces, particularly those sites that have institutional support or operate as a non-profit, but any connections developed on UA sites may result in the growth of social capital.

Food systems are faced with an increasing number of threats. Cities are dependent on global resources that are characterized by unstable supply chains and repeated shocks from various crises (Gulyas & Edmondson, 2021). Gulyas & Edmondson (2021) describe five factors that are characteristic of successful urban agriculture. These factors are large scale; efficient; inclusive;

integrated; and safe. The authors found that urban agriculture is limited by availability of land, as there are competing interests like housing and industry. Further, the scale of urban agriculture can be limited by lack of participation by community members; difficulty with achieving high integration between the site and urban systems as well as the site and consumers; and lack of equitable access to resources, including land. Safety continues to be an issue, as urban land is often contaminated. Environmental contamination from UA sites is typically not strictly monitored. These issues point to the need for improved governance and policy support for UPA sites. De Schutter (2014) writes that “Ultimately, only through more democracy in the food systems can change happen,” underscoring the need for participatory food systems (p. 152). Researchers also call for the right to food to be legally recognized (Clark et al., 2021; De Schutter, 2014). Food system governance should consider both resilience and sustainability and prioritize democratic participation in policy-making and community planning to ensure equitable food system transformation.

Urban Agriculture and Potential Benefits

Urban agriculture (UA) refers to food production occurring within and around urban areas. The USDA writes that “Urban agriculture includes the cultivation, processing, and distribution of agricultural products in urban and suburban areas. Community gardens, rooftop farms, hydroponic, aeroponic and aquaponic facilities, and vertical production, are all examples of urban agriculture. Tribal communities and small towns may also be included” (Farmers.gov (USDA), n.d.) There are many site types involved in UA at different scales of production and with varying ownership, business structures, and institutional support. UA includes periurban agriculture in the contiguous zones between urban and rural areas. UA sites can be for-profit businesses owned and operated singly or by multiple people; these can be production farms located on city lots or intensive

production farms in urban buildings. Other UA sites are structured as nonprofits with or without institutional support, including some community gardens, gardens at high schools or hospitals, and training farms operated by non-governmental organizations intended to teach others how to grow food. UA can also encompass home gardens; loosely structured community gardens, orchards and food forests; and guerilla gardening.

While there are noted benefits to cities from urban agriculture, it is unclear how urban agriculture and urban food systems contribute to food security. Siegner et al. (2018) write that the impacts of urban agriculture on food security are not understood; there is little data on the distribution of food produced by urban agriculture. Further research could help to develop effective distribution to increase access with special attention paid to equity in food access, including racial equity.

Azunre et al. (2019) performed a review of secondary data about the value of urban agriculture in building more sustainable cities. Urban agriculture plays an important role in the sustainable development of cities, including economic, social, and environmental aspects. Use of urban land for agriculture is generally less economically sound than other non-agricultural commercial or industrial uses. However, the benefits of urban agriculture for environmental, social, and economic benefits often outweigh negatives of agricultural land use. The authors researched several key components of sustainable cities that are directly affected by urban agriculture, including employment and income; tax revenue; education, civic engagement, health benefits, and safety; emissions, energy efficiency, and water and waste management, and termed this group of outcomes the “Urban agriculture-sustainable city nexus” (Azunre et al., 2019). There are both positives and negatives to using urban land for agriculture; however, the benefits are

profound. The unique characteristics of cities should be considered when determining the role urban agriculture plays in sustainable development (Azunre et al., 2019).

Nutritional security and co-benefits of UA

Calls for holistic assessment of the food system to identify vulnerabilities and develop interventions to increase food security underscore the importance of assessing all areas of the food system, including at the farm-level, to collect metrics of resilience (Ingram, 2011). However, the interactions between agriculture and food security are often poorly understood (Nicholson et al., 2020).

The United States Department of Agriculture uses definitions of food security and insecurity developed by Anderson (1990) with an expert panel. Food security is defined as “access by all people at all times to enough food for an active, healthy life and includes at a minimum: a) the ready availability of nutritionally adequate and safe foods, and b) the assured ability to acquire acceptable foods in socially acceptable ways (e.g., without resorting to emergency food supplies, scavenging, stealing, and other coping strategies). Food insecurity exists when ever the availability of nutritionally adequate and safe foods or the ability to acquire acceptable foods in socially acceptable ways is limited or uncertain” (Anderson, 1990, p. 1560). However, food security and nutritional security are differing concepts; while food production has been greatly increased, consumers are suffering from issues of malnutrition (Ingram, 2020).

Sonnino & Milbourne (2022) write that “the notion of ‘co-benefits’ also helps to uncover the differential socio-ecological impacts that synergies or trade-offs typically have on different communities” when considering food system transformations (p. 921). Interventions should be considered for their potential co-benefits for impacted communities, including improved food access and economic opportunities (Sonnino & Milbourne, 2022).

Social capital development on urban farms and community gardens

Christensen (2017) notes that while community gardens are generally believed to be sites where social capital is grown, that claim is not always backed up with data demonstrating the improvement of social capital metrics; thus, mixed-methods research should be undertaken to demonstrate the development of social capital in community gardens. Taylor et al. (2022) found that community gardeners display attributes of community social resilience.

Research does not support that UA sites facilitate the growth of social capital in all cases. Pole & Gray (2013) found that community-minded indicators of social capital are not a primary motivator for joining community-supported agriculture (CSA) programs. Kaika & Racelis (2021) found that “studies document a correlation between civic agriculture and civic engagement but none effectively addresses the issue of causality. There may be even be a mutually re-enforcing effect between civic agriculture and civic engagement.” More research on the development of social capital at UA sites is needed.

Nichols et al. (2022) found that local food systems are generally more resilient than larger food systems because they have smaller producers and shorter supply chains; more diverse both in products and market outlets; and they are more highly socially embedded and contain elements of the moral economy. The moral economy refers to the fact that profit or economic self-interest is not the sole factor in purchases within the local food system. Instead, values including justice and fairness, as well as social relations and risk sharing, drive transactions (Nichols et al., 2022).

Specific risks associated with UA

Tapia et al. (2021) assert that while urban agriculture has major benefits for cities, there are also externalities associated with urban food production, including problems that must be solved with planning and governance. Externalities cited include environmental effects like

contamination and pollution, which are a result of lack of knowledge about best practices. However, the benefits of urban agriculture are more than just the produce grown. Tapia et al. (2021) developed a framework to monitor and evaluate the sustainability of urban agriculture sites using sustainability pillars, their dimensions and relevance, and the ecosystem services provided by each pillar. Each pillar is also linked to a sustainable development goal (SDG). The framework includes components that are left out of other frameworks for assessing sustainable urban design, and the indicators account for both positive and negative effects of the urban agriculture site. There are 4 pillars and 87 indicators. The pillars are environmental resilience and resource efficiency; inclusive society; food security and income generation; and sustainable urban design (Tapia et al., 2021).

UA and its associated alternative food networks (AFNs) have sociocultural implications that must be examined to improve equity and inclusion. Guthman (2008) argues that UA projects can center whiteness, both through the number of white people involved, particularly in food access and justice projects, and the “whitened cultural histories” that participants can bring to UA projects in urban areas. Slocum (2007) describes the whiteness of community food, including around nodes of UA, and concludes that the community built around AFNs can result in exclusionary white spaces that fail to build true community across socioeconomic bounds; the author goes on to call for both recognition of race relations within AFNs and change in the proximity of white bodies in AFN nodes. UA and AFNs can fulfill the neoliberal function of weakening social safety nets and replacing state aid in food access with other avenues of food security, namely by shifting responsibility for food provisioning to nonprofit organizations and other civic agriculture operations (McClintock, 2014). Meenar & Hoover (2012) reviewed urban agriculture sites in Philadelphia and found that the sites did not draw the majority of their

production help from surrounding neighborhoods. Further, they found a disconnect between who is involved in the production and who primarily benefits from the food produced. The authors assert that to close the food gap and create a more just and equitable food system, issues of race and class within urban agriculture need to be studied and addressed to reduce social exclusion.

Measurement of Urban Food System Resilience

Béné et al. state that “as a latent variable, [resilience] cannot be measured directly but can be approached by proxies such as self-assessed recovery to a specific shock” (2023). By measuring indicators of social capital, transformational capacity, and civic and political engagement, researchers can develop a set of proxy metrics for the resilience of a system without measuring response to any one disruptive event.

Food system disruptions can be described as shocks or stressors. Shocks are short-term disruptions like damaging storms or fires, while stressors are long-term disruptions including climate change, pandemics, and droughts. Frankenberger et al. (2015) call for improved measurement of shocks and stressors across scales and improved understanding of interconnectedness and political landscape around disruptions. The researchers call for measuring objective and subjective responses of those who experience the disruption and long-term measurement of shocks and stressors and impacts their impacts. Collection of this data will help to build resilience through “investing in activities that strengthen the absorptive, adaptive and transformative capacities of vulnerable populations to cope with and recover from specific shocks and stressors” (Frankenberger et al., 2015, p.13).

Food systems can be considered at any scale, from the farm-level or regional scale to national or international scale. Food system practitioners should take care to avoid the “local trap,” or uncritically positioning local food production activities as superior in matters of ethics or

sustainability. Local food systems are not inherently more secure and sustainable and are as likely as food systems at other scales to have injustice (Born & Purcell, 2006). Planners and policymakers should carefully consider scale and food system interventions without falling into the local trap. Systems must be observed at multiple scales to be understood, particularly in terms of the people within the system who hold diverse opinions about the outcomes of the system (Walker et al., 2004).

Assessment frameworks use indicators and metrics to collect data about a given subject; in this case, food systems are examined and broken down into appropriate scales for measurement. Metrics are data points collected to describe the indicators. KC et al. (2024) define an indicator as “A factor or variable that is used to assess a quantity or outcome” and a framework as a collection of explicitly described variables. The authors also note the importance of measuring food systems at varying levels and collecting temporal data across systems to assess response to disruption.

Small-scale resilience assessments can start at the household or farm level, such as the Self-Evaluation and Holistic Assessment of Climate Resilience of Farmers and Pastoralists (SHARP+) developed by the Food and Agriculture Organization of the United Nations (Hernández Lagana et al., 2022). The next-largest unit is the city or the city region, such as with the City Region Food System Indicator Framework developed by the RUAF Foundation (Carey & Dubbeling, 2017). Blay-Palmer et al. (2018) described the city region and food systems as “conceptual building blocks” that can “build increasingly coherent transformational food systems.” City regions are distinct from cities because city regions include the resource flows and relationships between urban and rural areas within a geographic region, with consideration for both large cities and smaller towns in that region (Blay-Palmer et al., 2018). Many assessment frameworks intended for smaller-scale data collection are appropriate for both city and city region scales, including the

Community & Agriculture Resilience Audit Tool (CARAT) developed by the North American Food Systems Network (NAFSN, 2025) and frameworks developed by researchers Béné et al. (2023), Meuwissen et al. (2019), and Zeuli & Nijhuis (2017). Some assessment tools such as the modeling framework developed by Toth et al. (2016) have the flexibility to be used from the city to the sub-national scale. KC et al. (2024) noted that resilience measurement at granular levels can be underrepresented, pointing to the need for assessment at multiple scales.

Cabell & Oelofse (2012) developed a framework of thirteen behavior-based indicators to assess the resilience of agroecosystems. Presence of the indicators within the system “suggest that [the agroecosystem] is resilient and endowed with the capacity for adaptation and transformation” (Cabell & Oelofse, 2012, p. 17). Each missing indicator is a vulnerable point where improvements to resilience could be made. The indicators are based on biometric aspects of ecosystems and defined for agricultural practices. The indicators are socially self-organized; ecologically self-regulated; appropriately connected; functional and response diversity; spatial and temporal heterogeneity; exposed to disturbance; coupled with local natural capital; reflective and shared learning; globally autonomous and locally interdependent; honors legacy; builds human capital; and reasonably profitable (Cabell & Oelofse, 2012, pp. 18-19). Each indicator that is present within an agroecosystem is a signifier that the food system is more likely to withstand difficulties and meet the needs of people now and in the future.

Campbell et al.(2022) developed a tool to assess the resilience of community food systems. The ten core values are agricultural and ecological sustainability; community health; place-based economics; human infrastructure; food sovereignty; focus on the farmer and food maker; community self-reliance; distributive and democratic leadership; food justice; and racial justice. The core values include 35 primary indicators; 61 sub-indicators; and 20 core benefits. Further,

the researchers developed seven core themes to inform policies and programs that complement the core values. These themes are: agricultural and ecological sustainability; community health; community self-reliance; distributive and democratic leadership; focus on the farmer and food maker; food justice; and place-based economics (Campbell et al., 2022). These core themes informed the themes and indicators included in the CARAT assessment tool (NAFSN, 2025).

Use of behavior-based indicators to determine UA's ability to promote UFS resilience

It remains unclear how UA contributes to UFS resilience. Researchers have noted deficits in the existing literature and have issued calls for improved measurement of both resilience contributions from UA and resilience of the food system. The broad subject matter with many coexisting conceptualizations and measurements is a major challenge in food systems resilience research. The diversity of options for definitions and measurement could be a strength for future research to find clarity in terms and uncover important feedback loops and cross-level interactions (Roosevelt et al., 2023). A preliminary study by Fargue-Lelièvre & Clerino (2022) indicated that the number of frameworks developed to measure sustainability of urban agriculture is generally growing each year, though the number of articles published still tends to be small. KC et al. (2024) describe the continuous evolution of the field of food system resilience assessment and call for the development of a comprehensive tool.

Rao et al. (2022) found through a systemic literature review that research tended to fall into six themes in three sustainability pillars. The research was also more commonly focused toward the Global North, although the authors did exclude papers that were in languages other than English. The authors found that environmental stability was the most common theme in the literature, followed by, from most to least represented, food and nutritional security; wellbeing

(material and subjective); labor and livelihoods; land and tenure security; and gender and social differentiation. The authors also found that research in the global north tends to emphasize the environmental aspects of urban and periurban agriculture, while research in the global south tends to emphasize the economic aspects. The authors also note that “there were relatively few quantified assessments of UPA as an effective nature-based solution with co-benefits for social, economic and environmental sustainability, especially in the Global South” (Rao et al., 2022, p. 12). KC et al. (2025) developed a framework to measure national food system resilience but recommend that food system actors also use local indicators and data points in addition to national data to get a clear picture of resilience. These criticisms of existing assessment tools point to the need for further research into the combined effects of urban and periurban agriculture and their contribution to urban food system resilience.

Food system assessments and interventions should be implemented following socioecological principles for transformation with equity and distribution of power in mind. Sonnino & Milbourne (2022) write that “The food system is characterised by highly uneven power relations, which systematically exclude some communities from the benefits of participation in sustainable development initiatives and projects” (p. 922). Marginalized communities must be included in data collection. Further, food system transformations should be informed by food justice. Sbicca (2018) writes that food justice “advocates for the right to healthy food that is produced justly, recognizes diverse cultural foodways and historical traumas, and promotes equitable distribution of resources, democratic participation, and control over food systems. In brief, food justice includes not only social struggles often outside the purview of the food movement but also justice in terms of recognition, process, procedure, and outcome.” Appropriate frameworks for food system assessment should include a wide body of data points to address these

points and develop sustainable, resilient, just, and equitable food systems that result in food security.

Conclusion

Food is integral to human lives and has been a major activity for humanity throughout all our history. Over the past 50 years, the way we see food has changed; food is no longer seen as something held in common that sustains human lives, but as an economic and political tool. The current global food system is not socially just (Sumner 2011). Because humans need food to live and the food system will continue to face shocks and stressors requiring adaptation and transformation, food system resilience assessment remains an important field of research moving forward. As urban agriculture grows in popularity both through necessity and through interest, researchers will have more opportunities to observe and quantify UA contributions to food system resilience in terms of nutritional security, social capital, adaptive capacities, and environmental co-benefits. The results of food system resilience assessments can be used to inform city planners, policymakers, regulators, community advocates, civic agriculture projects, and other food system actors.

Chapter 3 - Food System Resilience Contributions by Urban

Agriculture Sites

Abstract

Food systems face continued disruptions due to climate change, pandemics, and supply line disruptions. Interest in urban agriculture (UA) is growing as people recognize vulnerabilities within the urban food system. This study was part of a four-pronged transdisciplinary urban food system assessment, including environmental sustainability, agricultural productivity, and community health. We developed a survey instrument and interview to assess and compare social resilience indicators for site operators and participants of six types of UA sites: urban production, periurban production, intensive production, community gardens, high school gardens, and training farms. Site operators and participants showed high levels of civic and political engagement, with site type significant for some indicators of political engagement and social capital for participants. Operators were active in their communities, seeking outreach and collaboration with community members and other urban entities. We also identified a wide variety of allies and motivating factors for UA site operators, including equity- and justice-based motivating factors. Some indicators of social capital and political engagement were found to be significant by site type for community gardens and intensive production sites, potentially correlated with increased social capital growth through participation in UA-specific education. The data illustrate social networks, patterns of collaboration, and contributions to social resilience from UA sites and provide opportunities for city planners to increase social resilience through support of UA sites, regardless of site type.

Introduction

Interest in urban agriculture (UA) remains high as vulnerabilities in the food system are exposed by disruptions like climate change and pandemics. Urban agriculture includes any food production occurring in urban areas and can include diverse production systems and methods. The United States Department of Agriculture (USDA) defines UA as “cultivation, processing, and distribution of agricultural products in urban and suburban areas. Community gardens, rooftop farms, hydroponic, aeroponic and aquaponic facilities, and vertical production, are all examples of urban agriculture. Tribal communities and small towns may also be included” (Farmers.gov (USDA), n.d.). These production methods can be used on different types of UA sites with varying organizational structures. Sites may be for-profit, including urban and periurban production farms on urban land parcels and intensive production sites inside buildings. UA sites also include not-for-profit organizations, driven by a social or environmental mission, and may be organized to operate with or without the support of an overarching institution. Examples of not-for-profit UA sites include high school gardens, training farms, and community gardens.

UA sites are often situated in areas of high population density, making them part of neighborhoods and communities. UA sites may also be locally-owned and locally-focused businesses that can improve civic and political engagement (Clark & Record, 2017). Because most UA sites are local operations that have strong patterns of community engagement, these projects often fit the definition of civic agriculture.

Civic agriculture refers to local food production involved in the development of community-based social and economic capitals (Lyson, 2004). Civic agriculture can include “the emergence and growth of community-based agriculture and food production activities that not only meet consumer demands for fresh, safe, and locally produced foods but create jobs, encourage

entrepreneurship, and strengthen community identity” (Lyson, 2004). While care should be taken to avoid the “local trap” of categorizing all consumption of local food as equitable and sustainable (Born & Purcell, 2006), research has shown that consumers involved in civic agriculture and locally-facing businesses may display higher levels of civic and political engagement (Clark & Record, 2017; Obach & Tobin, 2014). There remain questions about the benefits and externalities of UA at the city level; researchers have called for increased understanding of the benefits of urban agriculture and improved policy supports to reap the benefits of local and civic agriculture (Gulyas & Edmondson, 2021; Ilieva et al., 2022).

Food systems are “convoluted entanglements of relations” that are “characterized by highly uneven power relations” (Sonnino & Milbourne, 2022). Food systems are economic operations that meet the nutritional needs of cities and provide jobs from production to retail to consumption; however, parts of the infrastructure of the urban food system are fragile, inequitable, and often invisible to policymakers, in part due to the lack of a constitutional right to food in the United States (Clark et al, 2021). In light of events like pandemics, supply chain breakdowns, and severe weather events due to climate change, it is increasingly important to identify vulnerabilities within the food system and address gaps that could result in loss of nutritional security for communities.

Resilience is “the ability of a system to respond and adapt to changing circumstances and withstand disruptions” (Tendall et al., 2015). Though UA has the potential to increase city food system resilience, there is a lack of understanding about resilience contributions by UA sites (Gulyas & Edmondson, 2021). While studies have shown that community gardens result in improved social capital, this claim is not always substantiated with data. A mixed-methods approach is needed to collect data about social capital in community gardens and farms (Christensen, 2017).

The field of food system resilience assessment is growing, though there is disagreement on how to best measure resilience. Cabell & Oelofse (2012) assessed the resilience of agroecosystems through a framework of thirteen behavior-based indicators to collect information about food system ability to change and adapt. Ingram (2011) calls for a food systems approach to address food security at a global scale to identify vulnerabilities where interventions can be made. Systems should be assessed at multiple scales to develop a better understanding (Walker et al., 2004). While there is a growing body of knowledge about social capital and community gardens, there is little research about contributions from other site types in the resilience literature (Agustina & Beilin, 2012; Christensen, 2017; Taylor et al., 2022). One motivation for undertaking this study was to fill the gaps within existing literature with regards to resilience contributions from particular types of UA.

The primary objective of this research was to assess the contribution of urban agriculture to urban food resilience, as measured through patterns and indicators of social resilience. Additionally, the research sought to a) investigate how indicators of resilience vary across different types of urban agriculture entities; b) explore differences in social resilience between UA sites operated by organizations or groups and those managed by sole proprietors; and c) determine if participation in specific UA types influences individuals' social resilience. To start, a literature review was conducted to develop a framework of social resilience contributions of urban agriculture. A framework of behavior-based adaptive capacities appropriate for a farm-level assessment of community and social resilience was established. Using the framework, the researchers designed surveys for both UA site operators and participants, along with in-depth interviews for site operators.

This study was one prong of a four-pronged approach to assess urban agriculture's societal contributions. This research addressed social and community resilience. The other prongs considered agricultural productivity, environmental sustainability, and community health. For a holistic picture of resilience, each prong is needed. However, assessment of smaller parts of the food system at granular levels, called for by KC et al. (2024), can provide rich data, as illustrated in this study.

Literature review and theoretical framework

Tendall et al. (2015) define food system resilience as “capacity over time of a food system and its units at multiple levels, to provide sufficient, appropriate and accessible food to all, in the face of various and even unforeseen disturbances” (p. 19). Food system resilience requires “a built-in, continuously developing capacity” to respond and adapt to change (Tendall et al., 2015). Béné et al. (2023) state that “as a latent variable, [resilience] cannot be measured directly but can be approached by proxies”. Behavior-based indicators and adaptive capacities are used as proxy measurements for resilience. Resilience data can be collected at any scale. This study examined resilience capacities at the site-level scale.

Adaptive capacities within the food system can be used to measure the ability of that system to respond to shocks and stressors (Roosevelt et al., 2023). Social capital is a soft adaptation, or a way of changing behavior to adapt and respond to disruptions that does not require infrastructure or inputs (De Grandpré et al., 2022). Social capital is a crucial part of community resilience; Aldrich & Meyer (2015) argue that evidence shows that “social, not physical, infrastructure drives resilience” (p. 254). Indicators of social capital for measuring social resilience include attitudinal and cognitive measures and behavioral manifestations. Within these categories, data about social networks and ties, including bridging and bonding ties, describe the level of social connectedness

that comprises social capital (Aldrich & Meyer, 2015). Social events increase social capital, in addition to more resource-intensive transformations of community layout that encourage interaction between community members. Improved community layout and architecture that includes “third places” for residents to meet and talk results in improved social capital that can increase resilience after disasters (Aldrich & Meyer, 2015; Oldenburg, 1996). Some aspects of social capital can be collected through survey data, while other elements of social capital are more difficult to capture (*Civic Engagement and Social Cohesion*, 2014). Outreach through educational and social events and engagement with others in the food system are measures of social capital.

Political engagement and civic engagement are components of social capital that share considerable overlap but are separately measured behaviors according to the National Academies of Science, Engineering, and Medicine (*Civic Engagement and Social Cohesion*, 2014). Civic engagement includes involvement with the community, like club membership and volunteerism. Strong patterns of civic engagement are required to maintain a functioning democratic society (Putnam, 2000). Political engagement includes civic activities that bring a person into contact with political systems. These activities include voting, attending political meetings, and signing petitions. Researchers note that community members need civic engagement skills and behaviors to engage effectively with political systems (Putnam, 2000). Obach & Tobin (2014) found that civic agriculture participants tended to have improved indicators of civic and political engagement, while Clark & Record (2017) found that locally-owned and locally-serving businesses fostered improved civic and political engagement. Strong patterns of civic engagement are required to drive political engagement that allows a society to maintain a functioning democracy; as such, they are important parts of communities advocating for themselves and improving resilience (Putnam, 2000).

Strong social networks, including connections with diverse groups and individuals within the food system, are an important indicator of food system resilience. Professional and personal networks, built across scales, contribute to the ability of systems to transform (Moore & Westley, 2011). Behavioral capacities are required to enact transformations within the food system at any scale and can be measured at the farm level through questions about attitudes and opinions. Transformational capacity was measured using questions replicated from Marshall et al. (2012), who used validated questions for measuring adaptive capacity that seek data about the opinions and attitudes of respondents. Six questions measuring two dimensions of transformational capacity were replicated from Marshall et al. (2012). Questions were intended to measure “The level of skills in planning, learning and reorganizing livelihood activities” and “The level of financial and emotional flexibility” (p. 5). A question about confidence in training others to grow food was also included in this section. Kirby et al. (2020) note the importance of collecting data about “long-term perspectives required for transformational capacity,” underscoring the need to include questions about farmers’ thoughts and opinions in measurements of transformational capacity.

Motivating factors describe the “why” for people involved in UA. Food production in urban areas can be challenging for many reasons, including proximity to neighbors, increased pressure from zoning regulations, and tight profit margins from higher-cost yet smaller parcels of land. Kirby et al. (2020) found that motivating factors fell into four categories: community building, social and environmental justice, economic, and health motivations. Some motivating factors, including those informed by community and justice, have correlations with resilience factors and may be an important part of developing community resilience through UA sites (Kirby et al., 2020). Motivations can inform collaborations and partnerships formed within food systems, as food system organizations can have missions that motivate collaborations, such as education,

development, or local food production, but particular attention should be paid to uneven resource mobilization within these motivating factors (Sbicca et al, 2019). Uncovering motivating factors allows for improved data collection about associated social resilience indicators.

Food system allies and collaborative social networks serve as a measurement of social ties for site operators and participants. Social ties, including different types of ties, are an important indicator of social resilience (Aldrich & Meyer, 2015). Food system allies can be described as bridging ties, which are relationships that are not defined by closeness but rather can be loose and cross socioeconomic bounds. Bridging ties may result in better resilience capacities than tighter social bonds, like those between family members or close friends, due to improved ability to access resources outside of the immediate community (Aldrich & Meyer, 2015). Collaborations within the food system can foster these bridging ties and enable UA sites to access funds, equipment, land, and other resources needed to respond and adapt to changing situations. Social network data can illustrate social ties, embeddedness, and nuanced relationships required to maintain the food system (Luxton & Sbicca, 2020). Table 1 summarizes the selected social resilience indicators appropriate for a farm-level scale used in this study. These four indicators of transformational capacity, civic engagement, political engagement, and social capital result in social resilience due to their contributions to individual ability to respond and adapt to challenges and disruptions.

Table 3.1 Selected Social Resilience Indicators

Indicator	Metric	Source
Transformational capacity	Opinions and attitudes towards change	Marshall et al. (2012)
Civic engagement	Involvement with the community	Clark & Record (2017)
Political engagement	Voting, signing petitions, and other political activities	Clark & Record (2017) Obach & Tobin (2014)
Social capital	Trust for, talking with, and doing favors for people	National Academies of Science, Engineering, and Medicine (<i>Civic Engagement and Social Cohesion</i> , 2014)
	Collaborations within the food system; food system allies; patterns of outreach and engagement	Kirby et al. (2020)
	Motivating factors	Kirby et al. (2020) Sbicca et al. (2019)

Materials and Methods

The indicators and capacities selected from the literature review were used to develop a survey instrument and a follow-up semi-structured interview, including the replication and adaptation of validated questions (Table 3.1). The survey was developed to collect qualitative and quantitative data from operators and participants of the UA sites. The semi-structured interview was designed to collect qualitative and quantitative information from site operators about their resilience capacities. Both the survey and interview questions were developed to collect indicators of social capital, particularly bridging ties and linking social capital, through both attitudinal and

behavioral measures as outlined by Aldrich & Meyer (2015). Indicators of civic engagement and political engagement, as well as measures of social cohesion, an aspect of social capital, were developed in accordance with the National Academy's recommended metrics. There is overlap between the two; the National Academies considers civic engagement to be a subset of what is measured by political engagement. Civic and political engagement are considered separate groups of indicators for the purposes of this study. Civic engagement includes activities geared toward improving community life such as volunteerism and membership in civic groups. Political engagement includes activities like voting, discussing politics, and contacting operators. Social cohesion was measured through questions about the frequency of talking and favors, and the level of trust for people at varying degrees of closeness to the respondent (*Civic Engagement and Social Cohesion*, 2014).

Purposive sampling was used to select the UA sites included in the study. The sites do not constitute a random sample; rather, they were selected to meet the predetermined criteria for six different site categories. UA sites had to be involved in the production of food in urban or periurban areas and had to be in operation for at least five years. Sites were selected in six categories with the criteria described below. The project team included Extension personnel and faculty from the Kansas State University urban food system initiative who have a large network of relationships with UA sites in the region. Sites were situated in urban areas in Missouri, Kansas, and Ohio, including the greater Kansas City metropolitan area in both Kansas and Missouri; Columbia, MO; Manhattan, Lawrence, and Wichita, KS; and Akron, Ohio. The site in Ohio was included due to lack of UA sites engaged in intensive production in Missouri and Kansas.

Site Type Selection Criteria

Urban Production Farm

- Located in a high-density census block within an urban county

- Markets directly to communities in urban areas
- For-profit business

Periurban Production

- Situated in a lower density census block within or adjacent to an urban county, or located in a transition zone between city and countryside
- Markets directly to communities in urban areas
- For-profit business

Intensive Production Farm

- Operation grows crops and plants in a protected or controlled environment using advanced technologies and intensive growing conditions (Controlled Environment Agriculture (CEA) Production, 2023)
- Markets directly to communities in urban areas
- For-profit business

Training Farm

- The mission statement or the organization's main mission is to provide training and skill development related to cultivating food crops and starting food businesses
- The site must have a physical location
- Trains at least 5 people per year

High School Garden

- Located at an educational institution that serves high school students
- Urban or peri-urban location

Community gardens

- Plot or cooperative community garden with publicly available beds
- Operates independently or through the support of an organization
- Urban or peri-urban location

There were four sites in each category with the exception of the intensive production category, which had three participating sites due to recruitment difficulty. In order to address objective three, site categories were aggregated into UA sites operated by sole proprietors with a for-profit model (urban production farms, periurban production farms, and intensive production

farms) and sites operated with organizational support and a not-for-profit model (community gardens, high school gardens, and training farms).

Data was collected from UA site operators as well as participants. The research team requested that a person with a managerial or leadership role in the operations of the UA site complete the survey and interview; these roles could include owner, operator, manager, or volunteer. This contact person is called the site operator. Survey responses were collected from site operators from March 27 to July 17, 2025, while interviews were completed between May 21, 2025, and January 7, 2026. The survey instrument and interview were qualified as exempt by the Kansas State University Institutional Review Board. All site operators and participants signed a consent form before engaging with the survey and/or interview.

Sampling of UA Participants

To understand how UA sites influence their communities, site operators distributed a survey to people who participate in activities at the site. Participants could be involved through purchasing or receiving food; volunteering or working at the site; or attending workshops, trainings, or other events at the site. Participants were informed that the survey would take about 20 minutes, and answers were confidential. Site operators received an email with suggested language and a link to the survey to share with social media pages and email lists, as well as a poster to print inviting farm participants to take the survey with a QR code. Each site had a unique alphanumeric code to differentiate between data sets. We requested responses from people who were at least 18 years old and were involved with the site as any of the following: staff/volunteer/member, food recipient, customer, training participant, event/workshop attendee, or other form of participation. Respondents could select more than one option and/or write in their

role. The first 30 respondents for each site were eligible to receive a \$15 digital gift card distributed by email after completion of the survey.

Survey instrument development

The site operator survey is included in Appendix A. Several questions replicated from Clark & Record (2017) were used to gather information about civic and political engagement. Political engagement was measured through self-efficacy and engagement with local government. Civic engagement was measured through volunteerism, membership in civic organizations, and working to solve problems in the community.

Questions were replicated from the National Academies of Science, Engineering, and Medicine to collect data about indicators of social capital, including social cohesion, measured through self-reported frequency of talking with, doing favors for, and trust in people in the respondents' networks. These questions were adapted to include responses for each of the following three groups: people within the organization, site neighbors, and other organizations working in the food system. Further, self-efficacy was reported by asking UA operators and participants about self-perceived level of impact on their community.

Obach & Tobin (2014) developed questions to measure civic and political engagement and motivation for purchasing local foods in civic agriculture participants. These questions were adapted to measure relevant activities for UA operators and participants included in this study. Political engagement was measured through participation in activities like voting, petition signing, and contacting public officials. Questions written by Marshall et al. (2012) were included to measure transformational capacity were replicated. Respondents were asked to rate their level of agreement with several statements concerning approaches to farming, as well as confidence to train others to farm. The survey and interview questions were shared with an advisory board made up of 13 food system experts to collect and incorporate feedback before being used for data collection.

The survey was developed in Qualtrics (Provo, UT) and completed online by study participants. Demographic data, including race, gender, age, and level of education, were collected for site operators and participants, along with types of UA-related training, events, and courses completed, and the number of years involved in food production. Income data were collected during the participant survey.

The participant survey was a truncated version of the operator survey (appendix B). It was intended to reach respondents who interacted with the urban agriculture site in some way (termed the “participants” of the UA site). The survey was built on Qualtrics, and the link was distributed to the contact person at each UA site to distribute.

Interview protocol

An interview protocol was developed to collect deeper information about collaborations with urban entities, community social and educational outreach activities, and distribution channels for the goods produced at the UA site (appendix A). The survey and interview were developed simultaneously. The interview was intended to collect qualitative and quantitative information from operators, including qualitative information to complement survey questions. The online survey was designed to minimize text entry, so qualitative data was collected in the interview. Following Sbicca et al. (2019), the UA site operator interview included a question about the respondents’ top five food system allies to collect data for social network analysis. The interviewer also recorded the top three motivations for food system organizations and actors. Other questions were written to collect social capital indicators, such as collaboration activities, deepening the qualitative depth about UA site social networks. The interviewer discussed several of the survey questions with the site operators to collect further information, nuance, and opinions,

particularly about interactions and collaborations. When needed, the interviewer prompted further discussion by asking whether the respondent had anything to add to their answer.

Data Analysis

The interviews were conducted with farm operators in person, through Zoom, or over the phone, depending on respondent location and availability, and recorded with voice recorder, phone call recording, cell phone voice recorder, or through Zoom software, as appropriate. Interviews were frequently recorded with more than one tool to ensure clarity. Interviews were transcribed, inductively coded, and analyzed using Nvivo software (Lumivero, version 15) and Excel. The inductive coding and thematic analysis methodology described by Naeem et al. (2023) was used to collect data about interactions, collaborations, community outreach, funding, and motivating factors.

Due to the purposive sampling technique and small sample size, statistical inferences were not performed on survey responses from the site operators. Rather, data is presented with descriptive statistics for quantitative measures of social resilience and related to qualitative data from the interviews to address research objectives and draw conclusions. Site operator survey data were analyzed by comparing means between site type. The interviews were inductively coded to find emerging themes. Hennink et al. (2017) found that code saturation is often reached upon the completion of 9 interviews, with interviews after that generally contributing to the depth of understanding with rich data for the codes found in the first 9 interviews. This study included 23 interviews and code saturation was met. The data were analyzed using thematic coding; developing categories of motivating factors, sales channels, and allies; and counting collaborations with urban entities.

The participant survey responses underwent several rounds of cleanup using both Qualtrics data tools and human quality assurance. Qualtrics tools allowed the researchers to exclude responses from potential bots using IP address tracking, as well as duplicate responses and potentially fraudulent responses. The researchers then manually removed responses that used an incorrect site code; contained no response for the majority of questions; contained illogical responses for text entry questions, including repeating answers or naming organizations in areas far from the site; and illogical responses for demographic data in the community health portion of the survey.

The participant survey data were analyzed using a one-way ANOVA to determine whether participation in a particular UA site type influenced social resilience indicators. Data analysis was performed with SAS (SAS version 9.4, Car, NC, USA). Demographics are known to impact social capital, civic, and political engagement, so gender, race, education, income, and age were included in the model with the independent variable of UA site type. Twenty-four models were run, corresponding to the 24 indicators of social resilience in the participant survey. To account for uneven sample sizes between the 6 site types, type II sums of squares were used in all the models. When the overall F-test was significant, the means separation for site type was carried out with a Tukey-Kramer adjustment to control for type I error. Indicator means are presented as least squares means.

Results

We collected survey responses and interviews from 23 UA site operators. We selected 444 surveys from site participants for analysis. The operator data revealed themes for motivating factors and patterns of collaboration, as well as illustrating the level of community engagement for education and social outreach and self-assessed transformational capacity. The participant survey data illustrates civic and political engagement trends and differences between types of UA sites for some but not all social capital and political indicators.

Sample Demographics

The positions held by site operators varied across site types (Table 3.2). Community garden operators were all volunteers with some level of responsibility for the garden. High school garden operators included one director, two staff members, and one operator. Training farm operators included one operator and three staff members. Intensive production farm operators and periurban production farm operators were all owner/operators. Urban production farm operators included two owner/operators and two staff members. Respondents were 56% male, and the majority (56%) of site operators were between the ages of 35-44, with a mean age of 45 (range 35-76). Overall, the operators had a high level of education, with all operators reporting at least some college and 86.9% reporting a degree. Periurban production farm operators had the most average years of food production experience, while intensive production farms had the least. The site participant sample was 75% white and 60.81% male (Table 3.3). The majority of respondents were in the age categories of 25-34 and 35-44 (29.73% and 24.55% respectively, range 18-86). For post-secondary education, 91.44% reported some college or more and 75.9% reported holding a degree. A wide range of responses were seen related to informal education and training in UA practices. For example, community garden operators received information from all categories identified whereas

the intensive production farms received training online and at conferences. Overall, conferences, webinars, and workshops were repeatedly utilized as resources for UA site operators.

A wide range of demographics were seen among UA participants across the 23 sites (Table 3). The site participant sample was 75% white, 14.9% Black or African American, and 4.1% Latino or Hispanic respondent. The group was 60.8% male. The majority of respondents ranged from 18-86 and the majority were 25 to 44 years old, but none of the age categories represented less than 9.5% of the respondents. For post-secondary education, 91.4% reported some college or more and 75.9% reported holding a degree. The respondents included a broad range of income categories, but the largest percentage (34.5%) reported earning more than \$100,000. Over 12% of respondents reported an annual salary of less than \$35,000. The participants engaged with UA-related education and training, with single-day workshops, online classes, and webinars most frequently attended. Community garden and intensive production participants had particularly high rates of attendance at educational events, with 29.2% of community garden participants attending a conference and 37.3% attended a webinar. For intensive production sites participants, 31.4% reported a higher education degree or certificate program related to UA.

Table 3.2. Urban Agriculture Site Operator Demographics (%)

		Not for profit site types			For profit site types			
		Community Gardens (n = 4)	High School Gardens (n = 4)	Training Farms (n = 4)	Intensive Production Farms (n = 3)	Periurban Production Farms (n = 4)	Urban Production Farms (n = 4)	All Sites (n = 23)
Race	Black or African American				33.3		25.0	8.7
	American Indian or Alaska Native; White				33.3			4.3
	White	100.0	100.0	100.0	33.3	100.0	75.0	87.0
Gender	Male	75.0	50.0	75.0	66.7	25.0	50.0	56.5
	Female	25.0	50.0	25.0	33.3	75.0	50.0	43.5
Age	18-24							0
	25-34		50.0					8.7
	35-44	50.0		100.0	33.3	75.0	75.0	56.5
	45-54		75.0				25.0	13.0
	55-64	25.0			33.3	25.0		13.0
	65 and up	25.0			33.3			8.7
	Mean age (years)	51.0	41.25	37.0	58.33	44.25	41.25	45
Education	Less than a high school degree							
	High school diploma/GED							
	Some college						75.0	75.0
	Undergraduate degree	75.0		50.0		75.0		34.8
	Vocational/technical degree							
	Some postgraduate studies		25.0		33.3	25.0		13.0
Training, events, or courses completed related to UA*	Postgraduate degree	25.0	75.0	50.0	66.7		25.0	39.1
	Extension/non-profit single day workshop(s)	75.0	25.0	100.0		75.0	75.0	60.9
	Higher education degree program or certificate	25.0		25.0				8.7
	Attended a conference(s)	25.0	75.0	100.0	66.7	100.0	25.0	65.2
	Online class	75.0	50.0	75.0	33.3	50.0		47.8
	Webinars	75.0	25.0	100.0	66.7	75.0	50.0	65.2
	None	25.0					25.0	8.7
	Other		25.0				50.0	13.0
Years involved in production at any scale (mean)		25	14.25	18.5	12	19.75	13.25	17.4

*Responses do not add up to n because respondents could select more than one answer.

Table 3.3. Urban Agriculture Site Participants Demographics (%)

		Not for profit site types			For profit site types		
		Community Gardens (n = 161)	High School Gardens (n = 72)	Training Farms (n = 64)	Intensive Production Farms (n = 35)	Periurban Production Farms (n = 50)	Urban Production Farms (n = 62)
Race	White	75.2	79.2	90.6	51.4	66.0	74.2
	Black or African American	18.0	2.8	3.1	40.0	22.0	12.9
	Hispanic or Latino	1.2	11.1	3.1	5.7	4.0	3.2
	Asian	1.7	4.2	1.6		2.0	
	Middle Eastern or North African	0.6				2.0	
	American Indian or Alaska Native				2.9		
	Native Hawaiian or Pacific Islander						
	More than one race	2.5	2.8	1.6		2.0	9.7
	Other	0.6					
Gender	Male	47.2	69.4	89.1	34.3	52.0	79.0
	Female	52.8	30.6	10.9	65.7	48.0	19.3
	Other						1.6
Age	18-24	3.1	57.0	4.7	2.9	6.0	
	25-34	39.1	4.2	15.6	60.0	22.0	38.7
	35-44	22.4	15.3	31.2	37.1	26.0	25.8
	45-54	6.2	12.5	17.12		24.0	12.9
	55-64	11.2	9.7	12.5		6.0	9.7
	65 and up	18.0	1.4	18.7		16.0	12.9
	Mean age	43.9	30.9	46.9	32.4	44.5	42.6
Education	Less than a high school degree				25.7	2.0	
	High school diploma/GED	1.2	27.8	1.6	5.7	2.0	3.2
	Some college	17.4	20.8	10.9	17.1	12.0	11.3
	Undergraduate degree	26.7	8.3	29.7	42.9	28.0	38.7
	Vocational/technical degree	10.6	1.4		20.0	10.0	3.2
	Some postgraduate studies	8.7		15.6	2.89	12.0	9.7
	Postgraduate degree	35.4	29.2	42.2	11.4	34.0	33.9
Income	Less than \$20,000	5.6	9.7	3.1		2.0	4.8
	\$20,000-\$34,999	5.0	5.6	6.2	17.1	14.0	6.5
	\$35,000-\$49,999	6.8	4.2	3.1	14.3	6.0	12.9
	\$50,000-\$74,999	15.5	25.0	18.7	28.6	22.0	25.8
	\$75,000-\$99,999	24.2	9.7	17.2	25.7	20.0	8.1

	\$100,000 or more	34.2	30.6	43.7	14.3	36.0	40.3	34.5
	Prefer not to say	8.7	15.3	7.8			1.6	7.0
Training, events, or courses completed related to UA*	Extension/non-profit single day workshop(s)	26.7	11.1	17.2	22.9	24.0	8.1	19.6
	Higher education degree program or certificate	21.1	2.8	14.1	31.4	12.0	1.6	14.2
	Attended a conference(s)	29.2	8.3	9.4	14.3	20.0	3.2	17.1
	Online class	31.1	9.7	7.8	25.7	14.0	3.2	18.0
	Webinars	37.3	4.2	15.6	20.0	20.0	6.5	21.2
	None	9.3	47.2	6.3	2.9	2.0	3.2	12.8
	Other	5.0	8.3	10.9	2.9	0.0	3.2	5.4
	Years involved in production at any scale (mean)	12.1	2.7	3.3	6.3	5.8	6.2	7.3

*Responses do not add up to n because respondents could select more than one answer.

Urban Agriculture Site Operator Results

Transformational Capacity

Table 3.4 provides data related to transformational capacity by the site operators. For all questions, survey respondents were asked if they: 1- strongly disagree, 3 - are neutral, or 5 - strongly agree with the question that was asked and the mean value and standard deviation of the responses are provided. Higher values represent a greater transformational capacity. Of the questions replicated from Marshall et al. (2012), site operators had the lowest level of agreement with the question, “Regardless of what happens, we have made sure that we are financially secure,” and it was the only question that scored less than “neutral” when averaged across the sites. Site operators indicated the highest agreement with “I like to experiment with new ways to farm”. All sites indicated some willingness to transform. Community garden operators had the highest overall mean response to questions intended to measure transformational capacity, showing agreement with statements about flexibility and financial preparedness and disagreement with statements that indicate unwillingness to transform. High school garden operators followed.

Table 3.4. Site Operators Transformational Capacity Descriptive Statistics

	Community Gardens (n = 4)		High School Gardens (n = 4)		Training farms (n = 4)		Intensive Production Farms (n = 3)		Periurban Production Farms (n = 4)		Urban Production Farms (n = 4)		All Sites (n = 23)	
	$\bar{x}$	$sd(\pm)$	$\bar{x}$	$sd(\pm)$	$\bar{x}$	$sd(\pm)$	$\bar{x}$	$sd(\pm)$	$\bar{x}$	$sd(\pm)$	$\bar{x}$	sd	$\bar{x}$	sd
If there is a drought, I just hope for the best (1: strongly disagree, 3: neutral, 5: strongly agree)	4.00	1.41	3.33	1.53	3.00	1.29	4.00	0.47	3.00	1.83	3.00	2.00	3.42	1.43
Current approaches for dealing with present climate challenges will be sufficient for dealing with future climate challenges*	4.75	0.50	4.25	0.96	3.25	1.26	4.50	0.71	3.25	1.50	4.00	0.82	4.05	1.05
I do not really believe in long-term planning; things are too uncertain*	4.75	0.50	4.25	0.96	3.75	0.96	2.67	2.08	3.75	1.26	3.50	1.00	3.91	1.20
I like to experiment with new ways to farm	4.25	1.50	5.00	0.00	4.00	0.50	3.33	1.53	4.00	0.00	4.00	2.00	4.17	1.15
Regardless of what happens, we have made sure that we are financially secure	4.00	1.00	2.00	1.00	3.00	0.96	3.33	1.15	3.00	1.41	2.75	1.26	2.95	1.16
If needed, I am prepared to completely change the way I manage my property in order to survive as a farmer	4.25	0.96	4.00	0.00	3.00	0.82	3.33	2.08	3.00	0.00	4.00	1.15	3.59	1.05
Mean transformational capacity response	4.35		3.90		3.33		3.40		3.33		3.57		3.79	1.22
I feel confident enough to train others to grow food (1: strongly disagree, 3: neutral, 5: strongly agree)	3.75	1.26	4.00	0.82	4.00	0.00	5.00	0.00	4.00	1.41	4.33	0.58	4.32	0.95

*: values reversed; higher response indicates greater transformational capacity

Motivating Factors

UA site operators reported motivating factors in 12 distinct categories. Figure 3.1 illustrates frequency of site operators reporting motivating factors in the 12 categories, with darker colors indicating a higher frequency for each site type. The most mentioned categories were lifestyle benefits, which referred to personal motivations for engaging in UA, like preferring to work with their hands and spend time outside, and the category of education, empowerment, and next generation, which included themes of preparing children and adults to engage in food production. The second most mentioned categories were environmental stewardship and justice, which included themes of environmentalism and improving life through ecological actions in urban areas, food system security, community health, and response to a broken system, which included motivations for improving nutritional security and food system vulnerabilities. Money and employment were the least frequently cited motivational factors. High school gardens were most likely to cite education, empowerment, and next generation, while intensive production farms cited lifestyle benefits the most. Training farms had the greatest diversity of motivations, citing all motivating factors except for money.

Figure 3.1. Site Operators Motivating Factor Themes Mentioned Per Site Type*

Motivating Factors	Community Gardens (n=4)	High School Gardens (n=4)	Training Farms (n=4)	Intensive Production Farms (n=3)	Periurban Production Farms (n=4)	Urban Production Farms (n=4)	All Sites (n = 23)
Build community	1	1	1		1	1	5
Education, empowerment, and next generation	1	7	3		1	1	13
Employment					1		1
Environmental stewardship and justice	1	2	1	1	2	2	9
Ethical consumption			1		2		3
Feed the world	1	1	1	2	1		6
Food system security, community health, and response to broken system	2	1	1	1	2	2	9
Health benefits	2		1			1	4
Lifestyle benefits	2		1	4	3	3	13
Policy advocacy			1			1	2
Sustainable cities			1			1	2
Money				1			1

*Each number represents the total number of times a motivating factor was mentioned in each category for each site type. An operator could mention multiple motivating factors that fell in the same category; each factor within that category would be counted.

Social Capital, Food System Allies, and Collaboration

Operators reported a diverse network of allies within the food system, mentioning individuals and organizations in 16 categories (Figure 3.2). The intensive production and high school garden operators only mentioned 5 to 6 categories of food system allies whereas the other types of UA sites mentioned 8 to 11 categories of food system allies. Training farm operators had the highest frequency of mentions (24) of food system allies across all categories. Food and farm organizations were mentioned the most, followed by farmers markets, food hubs, and other channels mentioned second most frequently, and city, county, and state governments were mentioned third. Other farmers and growers were cited as allies, and this was the only category that spanned all six categories other than food and farming-based organizations. Urban production farms mentioned food and farm advocates and organizations the most frequently, while intensive production farms mentioned farmers' markets, food hubs, and other sales channels most frequently. City, county, and state governments were the most often cited ally for community gardens.

UA site operators reported a high level of collaboration (Table 3.5). Nearly all operators reported engaging with at least one nonprofit or non-governmental organization, with 10 sites reporting engagement with 3 or more organizations. Further, 20 of 23 site operators reported engagement with food banks or pantries. High school garden operators did not have themes of seeking collaboration, whereas it was mentioned by 50%-75% of the respondents in all of the other categories. High school garden operators also listed the fewest sales channels. In general, for-profit site operators displayed collaboration-seeking behavior more than not for profit sites, while not for profit site operators were more likely to engage with themes of seeking community outreach.

Barriers

Table 3.6 includes emergent themes from the operator interviews in the areas of collaboration community outreach, and funding. While site operators displayed positive behaviors of seeking collaboration and community outreach and indicated successes in funding, operators also noted difficulties and barriers in the three thematic categories. Lack of time and resources were mentioned as major barriers to collaboration and community outreach across all categories. Not-for-profit and for-profit sites mentioned funding difficulties equally, though for-profit sites indicated more successes in funding than not-for-profit sites. A notable challenge for operators was finding and applying for grants; challenges included finding grants appropriate for the profit status of the site and having the time and skills needed to complete grant applications. Community garden operators described difficulties in completing projects due to lack of funding. Periurban production farm operators noted difficulty securing funding due to the crops they grew; traditional crop insurance and securing collateral were more challenging for specialty crop growers. Several also mentioned that they would not be able to start their farm without successfully receiving financial support through various programs.

Figure 3.2. Site Operators Mentions of Food System Ally Category Per Site Type

Ally Categories	Community Gardens (n=4)	High School Gardens (n=4)	Training Farms (n=4)	Intensive Production Farms (n=3)	Periurban Production Farms (n=4)	Urban Production Farms (n=4)	All Sites (n = 23)
City, county, and state government	4		4		1	3	12
Composting organizations			1			1	2
Customers			1		2	1	4
Employees		1			2		3
Extension	3		2		1		6
Family and Neighbors					2	1	3
Farmers	1	2	2	1	1	2	9
Farmers markets, food hubs, and other sales channels		1	2	5	3	2	13
Finance and business resources				4	2		6
Food and farm advocates and orgs	2	3	4	1	2	8	20
Food pantry, bank, or rescue	3	1	1				5
NGOs, nonprofits, and faith-based organizations	3		4				7
Parks and Rec	1		1				2
Schools, school districts, and school administrators	1	6	1				8
Small businesses					1	1	2
Supplier				1			1

The reported number indicates the number of times an ally in each category was mentioned in each site type. More than one ally per category could be counted per interview; for instance, a community garden operator could name two allies in Extension, and this would be reported as two.

Table 3.5. Site Operators Reporting Collaborative Behaviors, Community Outreach, and Funding

Theme Category	Theme	Not for profit site types			For profit site types			All Sites (n = 23)
		Community Gardens (n = 4)	High School Gardens (n = 4)	Training Farms (n = 4)	Intensive Production Farms (n = 3)	Periurban Production Farms (n = 4)	Urban Production Farms (n = 4)	
Collaborations with other organizations	Seeking collaboration	2 (50.0)*		2 (50.0)	2 (66.7)	3 (75.0)	2 (50.0)	11 (47.8)
	Difficulties in collaboration	1 (25.0)				1 (25.0)	3 (75.0)	5 (21.7)
Social or educational outreach	Seeking community outreach	3 (75.0)	1 (25.0)	3 (75.0)	2 (66.7)	3 (75.0)		12 (52.2)
	Difficulties in community outreach		1 (25.0)			1 (25.0)	2 (50.0)	4 (17.3)
Funding experiences	Funding success			2 (50.0)	1 (33.3)	2 (50.0)	2 (50.0)	7 (30.4)
	Funding difficulties	3 (75.0)	1 (25.0)		1 (33.3)	2 (50.0)	1 (25.0)	8 (34.8)

*Each value indicates the number of times a theme in each theme category came up in an interview for each site type. A theme was counted once per interview, regardless of how often it came up within that interview.

Table 3.6. Site Operators Selected Quotes for Thematic Analysis Categories

Theme Category	Theme	Statement
Collaborations with other organizations	Seeking collaboration	“It's a small community, so luckily, you know, if you want to get a hold of somebody, they're probably going to call you back. And then you can kind of create that relationship, you know, yourself. So, within the United States, you know, like I have a handful of the growers that I know and can reach out to if I had an issue. But on a smaller scale, it would be really hard. Like, when I first started, there wasn't anybody that I could turn to.” (Intensive production farm)
		“...we basically function as a food hub, an online food hub, and so we act as aggregators for small farms in our, uh, sort of in our region, producer only small farms. And we, we sell their product on our website. [...] And so those are all really important relationships in terms of, um, you know, other food producers in our community and, you know, building relationships between them and, um, the consumers in our community as well.” (Periurban production farm)
		“So we're working on trying to continue the work of aggregating different producers' product for a shared CSA for our market. Um, for collaboration around food pantries. So everybody's not having to do everything themselves.” (Training farm)
	Difficulties in collaboration	“Yeah. To a certain degree, I've went after them. But, like, you know, I don't have the staff to actively pursue them.”
		“Because you're so busy out here to lift your head up and go someplace else.” (Community garden)
		“We've been approached by [schools], but have never, never followed up with it. Mostly off of just a limitation within our production.” (Periurban production farm)

		“Well, I don't know if I would use the word collaborators to describe the relationship between farmers. I would say supporters. I think we as a collective are supportive of each other. I don't know that we do a lot of collaborating because we're too busy to collaborate.” (Urban production farm)
Social or educational outreach	Seeking community outreach	“I think, you know, one of the things that we've tried to accomplish, and our mission statement is to obviously grow food to people, for people who need it, but it was to develop community. And to me, developing that community is helping these people be successful.” (Community garden)
		“So certainly, um, uh, we're out as active as we can be for as busy as we are in an operation and, you know, trying to make sure our community feels like we are available and an open door in that sense.” (Periurban production farm)
		“We also do open houses on our farm, usually twice a year, where we, you know, people are allowed to come out here and whatever, see baby goats and, um, we do a holiday open house as well. And those are, those are events where, of course, you know, obviously we're trying to sell something as well, but it's also just about people being able to come see where their food is grown and where their animals that they eat are raised.” (Periurban production farm)
	Difficulties in community outreach	“I'm trying to put on my neighborly hat and I want to encourage our neighborhood that's across the street that keeps harvesting our food that if they would like to have the food, then they need to help with the garden. And so if they would like to participate and have a community bed, which I am more than willing to set up, one of the beds can be a community bed and they put in some sweat equity. Then they are welcome to harvest it. But it has been a little bit of a growing pain that the neighbors just come over and they're like, wow, the kale looks great. And then

		they just harvest their own kale, or they took-- one year I came and I loosened all the potatoes. I brought them near the surface, um, because I wanted the kids to be able to get them out. And one of the neighbors came, and they just took all the potatoes.” (High school garden)
		“I think that that is an expectation that a lot of people place on urban farms, whether they're production or not. Just because of this idea that we need to be like giving back to the community or whatever, but it's something that if-- it's like you have employees that are relying on it, you can't be wasting time with that stuff, right? So. So yeah, I feel like, I don't know, I'm-- I've thought a lot about that and I would like to do more of it, but it has to fit in to whether or not it can even happen, like financially.” (Urban production farm)
Funding experiences	Funding success	“...The other 50% was financed through an FSA beginning farmer loan, which afforded us, you know, a really low interest rate initially on the purchase. Um, and as first generation of farmers that are really coming into this with very little money, it was-- we weren't able to build a business plan, an idea of this place, without being able to kind of arrange around that more manageable mortgage payment.” (Periurban production farm)
		“And then I would say, like our large donors, you know, we all have a hard time with our capitalistic system. And amidst that, we're working with people who are very different than us. And they are so committed to using their money for good things. So yeah, our big donors have made it so that multiple people can pay their bills.” (Training farm)
	Funding difficulties	“I'm now noticing that a lot of funding and grants are drying up for programs like this, and that makes me a little concerned.” (High school garden)

		“Then I tried to write for grants, you know, when I should be sleeping because I'm exhausted. And that didn't work well, because you know you got to get in the zone and you have to really, quite frankly be connected in that arena too. That wasn't me. So after two years of getting nothing, I went ahead and started paying a grant writer who had been working in ag for many, many years, actually lobbied and worked in DC for a while.” (Intensive production farm)
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Civic Engagement

Table 3.7 presents data for questions related to operator civic engagement from the online survey. Higher values indicate more frequent engagement with the listed behavior or belief. All site operators reported engaging with civic activities and these parameters ranged from 2.6 to 2.7 on a 3-point scale. All respondents across all of the UA categories believed that people like them could have a big impact in making the community a better place to live. Training farms reported engaging in civic activities most frequently and all the training farm sites reported civic engagement activities within the last 12 months. High school garden operators reported the highest mean personal efficacy in the community, with all sites reporting that they believed they could have a big impact on the community. Training farm and urban farm operators followed. Intensive production farm operators reported the lowest mean level, as they indicated they could have some impact on the community.

Table 3.7. Site Operators' Civic Engagement Indicators

	Not for profit site types						For profit site types						All Sites (n = 23)	
	Community Gardens (n = 4)		High School Gardens (n = 4)		Training Farms (n = 4)		Intensive Production Farms (n = 3)		Periurban Production Farms (n = 4)		Urban Production Farms (n = 4)			
	$\bar{x}$	$sd(\pm)$	$\bar{x}$	$sd(\pm)$	$\bar{x}$	$sd(\pm)$	$\bar{x}$	$sd(\pm)$	$\bar{x}$	$sd(\pm)$	$\bar{x}$	$sd(\pm)$	$\bar{x}$	$sd(\pm)$
Working with someone or some group to solve a problem in the community (1: No, never; 2: Yes, but not in the past 12 months; 3: Yes, within the past 12 months)	2.50	1.00	2.75	0.50	3.00	0.00	2.00	1.00	2.75	0.50	2.75	0.50	2.65	0.65
Being a member of a local club, community organization or institution	3.00	0.00	2.00	0.00	3.00	0.00	3.00	0.00	2.50	1.00	2.75	0.50	2.70	0.56
Volunteering with a local nonpolitical group	3.00	0.00	3.00	0.00	3.00	0.00	2.00	1.00	2.25	0.96	2.75	0.50	2.70	0.63
Overall average of civic engagement activity indicators*	2.83		2.58		3.00		2.33		2.50		2.75		2.68	
Overall, how much impact do you think people like you can have in making your community a better place to live? (1: no impact, 3: some impact, 5: big impact)	4.00	1.41	5.00	0.00	4.00	0.50	3.67	0.58	4.25	0.96	4.50	1.00	4.35	0.93

*Overall averages were used to illustrate trends among questions that used the same scale and were not used in analysis

Political Engagement

Across all of the sites and UA site categories, 96% of the operators indicated that they had discussed politics within the past year (Table 3.8). Further illustrating pattern of strong political eng, 22 of 23 site operators indicated that they followed local government at least some of the time. Periurban production farm and training farm operators indicated that they felt the most qualified to participate in local politics, followed by high school gardens and urban production farms. Community gardens and intensive production farms had the lowest mean response. However, all site type operators indicated they agreed they felt qualified to participate in the political process.

Periurban farm operators had the most frequent political activity, closely followed by training farm and community garden operators. Intensive production site operators had the lowest frequency in political activity, but the second highest frequency of following local government.

Table 3.8 Site Operators' Political Engagement Indicators

	Not for profit site types						For profit site types						All Sites (n = 23)	
	Community Gardens (n = 4)		High School Gardens (n = 4)		Training Farms (n = 4)		Intensive Production Farms (n = 3)		Periurban Production Farms (n = 4)		Urban Production Farms (n = 4)			
	$\bar{x}$	$sd(\pm)$	$\bar{x}$	$sd(\pm)$	$\bar{x}$	$sd(\pm)$	$\bar{x}$	$sd(\pm)$	$\bar{x}$	$sd(\pm)$	$\bar{x}$	$sd(\pm)$	$\bar{x}$	$sd(\pm)$
How often do you follow what's going on in local government and public affairs? (1: never, 3: sometimes, 5: always)	4.00	1.15	4.00	0.00	4.75	0.50	4.67	0.58	4.00	1.15	3.25	1.71	4.09	1.04
I consider myself well qualified to participate in the political process (1: strongly disagree, 3: neutral, 5: strongly agree)	3.75	1.89	4.00	1.15	4.75	0.50	3.67	0.50	4.75	0.50	4.00	1.41	4.17	1.11
Political activity (1: No, never; 2: Yes, but not in the past 12 months; 3: Yes, within the past 12 months)														
Advocated for urban agriculture-specific topics	1.75	0.96	2.25	0.50	2.75	0.50	2.00	1.00	2.50	0.58	2.50	1.00	2.30	0.76
Discussed politics	3.00	0.00	3.00	0.00	3.00	0.00	2.33	1.15	3.00	0.00	3.00	0.00	2.91	0.42
Voted	3.00	0.00	3.00	0.00	3.00	0.00	3.00	0.00	3.00	0.00	2.50	1.00	2.91	0.42
Signed a petition	2.25	0.96	2.50	0.58	2.5	1.00	2.67	0.58	2.75	0.50	2.25	0.96	2.48	0.73
Contributed money to a political cause	2.00	1.15	1.75	0.50	2.5	0.58	1.67	1.15	2.5	1.00	1.50	0.58	2.00	0.85
Contacted a public official	2.25	0.96	2.00	0.00	3.00	0.00	2.33	0.58	3.00	0.00	2.25	0.96	2.48	0.67
Participated in a political meeting	2.00	1.15	1.75	0.50	2.25	0.96	1.33	0.58	2.50	0.58	2.25	0.96	2.04	0.82
Worked for a political campaign	2.00	1.15	1.00	0.00	1.50	0.58	1.00	0.00	1.50	1.00	1.50	0.58	1.43	0.73
Other political activity	1.50	0.71	1.00	0.00	2.00	1.41	1.00	0.00	3.00	0.00	2.00	1.15	1.60	0.91
Overall average of political activity*	2.21		2.03		2.63		1.94		2.65		2.21		2.24	

*Overall averages were used to illustrate trends among questions that used the same scale and were not used in analysis.

Social Capital: Indicators, Interactions, and Community Outreach

In contrast to the previous sections, questions related to social capital were inversely related with a positive response. In Table 3.9, increases in the respondent value generally indicates lower social capital. Operators of intensive production farms, periurban farms, and training farms all reported talking to others within the organization basically every day. All site operators reported talking to others within the organization at least a few times a week. Training farm operators reported the highest mean frequency of talking with all listed groups, followed by urban farms. High school garden operators had the least frequency of talking. Training farm and urban farm operators had the highest mean frequency of doing favors for others. The other sites did favors, on average, a few times per month or less. Community garden operators reported trusting the most people, followed by training farms. Periurban farm operators had the lowest level of trust. On average, all site type operators reported trusting more people within the organization than outside of the organization.

Table 3.10 presents the interactions with urban entities as described by UA operators in surveys and interviews. With the exception of the intensive production farms, there is a clear pattern of regular interactions between all of the sites and other urban entities; 100% of the respondents indicated that they interact with a non-profit or NGO and 65% of all the respondents interact with other farmers as well as university/Extension partners. Similar to previous data trends, the intensive production farms and high school gardens interacted the least with other entities. Periurban production farm operators were the most likely to report product aggregation of collective supply ordering. Training farms and urban farms were the only other categories that specifically mentioned both of these connections.

In UA, sales and distribution outlets can serve as a place for social ties and collaborations to develop. For our site operators, a wide and diverse pattern of sales and distribution channels were identified. Food banks or pantries were mentioned as a distribution channel for every site type category. Farmers markets were the most frequently reported distribution point for product sales. CSAs, on-farm sales, restaurants, and online sales were also frequently mentioned. Periurban production farm and urban production farm operators mentioned the most diverse distribution channels, while high school garden and community garden operators reported the fewest channels.

Table 3.9. Site Operators' Social Capital Indicators

	Not for profit site types						For profit site types						All Sites (n = 23)	
	Community Gardens (n = 4)		High School Gardens (n = 4)		Training Farms (n = 4)		Intensive Production Farms (n = 3)		Periurban Production Farms (n = 4)		Urban Production Farms (n = 4)			
	$\bar{x}$	$sd(\pm)$	$\bar{x}$	$sd(\pm)$	$\bar{x}$	$sd(\pm)$	$\bar{x}$	$sd(\pm)$	$\bar{x}$	$sd(\pm)$	$\bar{x}$	$sd(\pm)$	$\bar{x}$	$sd(\pm)$
Over the past year, how often did you talk with: (1: basically every day; 2: a few times a week; 3: a few times a month; 4: once a month; 5: less than once a month; 6: not at all)														
People within the organization	2.00	0.82	1.00	0.00	2.25	1.26	1.00	0.00	1.00	0.00	1.25	0.50	1.45	0.80
Site neighbors	3.50	1.91	2.00	1.41	4.00	2.16	4.00	0.71	3.75	1.50	1.50	1.00	3.09	1.77
Other organizations	3.00	1.41	1.5	0.58	3.50	1.29	1.67	1.15	2.00	1.15	2.25	1.50	2.35	1.30
Do favors for:														
People within the organization	2.25	1.26	1.75	0.96	3.00	0.82	3.67	2.08	2.50	1.00	2.25	0.96	2.52	1.20
Site neighbors	3.75	2.06	3.5	1.73	5.25	0.96	3.67	1.53	4.25	1.50	2.75	0.50	3.87	1.52
Other organizations	4.25	1.71	2.75	1.26	1.75	0.96	4.00	2.65	4.00	1.41	4.00	1.83	3.87	1.55
Overall average of talking and favors*	3.42		2.67		3.33		3.78		3.58		3.00		3.42	
Generally speaking, how much do you trust: (1: all of the people; 2: most of the people; 3: some of the people; 4: none of the people)														
People within the organization ^z	1.50	0.58	1.50	0.58	1.25	0.50	1.33	0.58	2.00	0.82	1.25	0.50	1.48	0.59
Site neighbors	2.00	0.82	2.00	0.00	2.50	0.58	2.00	0.00	2.50	0.58	2.00	0.00	2.17	0.49
Other organizations	1.75	0.50	2.00	0.00	2.00	0.00	2.33	0.58	2.50	0.58	2.5	0.58	2.17	0.49
Overall average of trust*	1.75		1.83		1.92		1.89		2.33		1.92		1.94	

* Overall averages were used to illustrate trends among questions that used the same scale and were not used in analysis.

Table 3.10. Site Operators Participation in Interactions, Sales Outlets, Allies, Training, Collective Action, and Community Outreach (%)

		Not for profit site types			For profit site types			All Sites (n = 23)
		Community Gardens (n = 4)	High School Gardens (n = 4)	Training Farms (n = 4)	Intensive Production Farms (n = 3)	Periurban Production Farms (n = 4)	Urban Production Farms (n = 4)	
Interactions with urban entities (sites per site type category reporting yes)	Water supply	75.0	50.0	75.0	33.3	75.0	100.0	69.6
	Food waste management	75.0	50.0	100.0	33.3	50.0	50.0	65.2
	Flood risk management	25.0	25.0	50.0		50.0	25.0	30.4
	Schools	75.0	100.0	100.0	33.3	75.0	50.0	73.9
	Parks and recreation	100.0	25.0	75.0		25.0	50.0	47.8
	Land bank	25.0		50.0		25.0	75.0	30.4
	Food bank or pantry	100.0	75.0	100.0	33.3	100.0	100.0	87.0
	Other urban entities	25.0	25.0	25.0			50.0	21.7
Interactions with other entities	Nonprofits or NGOs	100.0	100.0	100.0	100.0	100.0	100.0	95.7
	Farmers or other growers	25.0	25.0	100.0	66.7	100.0	75.0	65.2
	Public or government institutions			75.0		50.0	25.0	26.1
	Universities/research	75.0	50.0	75.0	33.3	100.0	50.0	65.2
Collective action	Aggregates with other producers			75.0	33.3	75.0	25.0	34.8
	Participates in collective ordering		25.0	50.0		75.0	25.0	30.4
Sales Channels (number of sites reporting channel per site type category; may include multiple outlets per type of channel)	Community-supported agriculture (CSA)			75.0			100.0	30.4
	Farm stands, storefronts, and on-farm sales		50.0		33.3	25.0	75.0	30.4
	Farmers markets	25.0		75.0	66.7	100.0	100.0	60.9
	Food banks and pantries	100.0	25.0	50.0	33.3	100.0	25.0	56.5
	Food hubs and aggregators				33.3	75.0		17.4
	Free distribution	25.0		50.0			25.0	17.4
	Grocery stores and retailers				66.7	75.0	25.0	26.1
	Online				33.3	75.0	75.0	30.4
	Personal use	100.0						17.4
	Produce wholesalers and auctions					25.0		4.3
	Restaurants		25.0			75.0	75.0	30.4
	Used by supporting institution		75.0	50.0				21.7
	Wholesale (independent)			50.0	33.3	25.0		17.4
	Has engaged in at least one community social or educational outreach event	100.0	100.0	100.0	66.7	100.0	100.0	95.7

Urban Agriculture Participant Results

Civic Engagement

The four civic engagement questions were not significant by site type when controlling for demographic factors, though all site participants showed high mean frequency of engagement in civic life (Table 3.11). Response variability for the civic engagement indicators tended to remain small. The range of mean frequency tended to remain small across site types for the civic engagement indicators, with a range of 0.15 (2.28-2.43) for frequency of working with someone or some group to solve a problem within the community. All site type participants showed some level of agreement with having the ability to make their community a better place to live.

Table 3.11. Site Participant Least Squares Means of Civic Engagement Indicators

	Not-for-profit site types			For-profit site types			<i>p</i> value
	Community Gardens (<i>n</i> = 161)	High School Gardens (<i>n</i> = 72)	Training Farms (<i>n</i> = 64)	Intensive Production Farms (<i>n</i> = 35)	Periurban Production Farms (<i>n</i> = 50)	Urban Production Farms (<i>n</i> = 62)	
Working with someone or some group to solve a problem in the community (1: no, never; 2: yes, but not in the past 12 months; 3: yes, within the past 12 months)	2.43	2.35	2.43	2.28	2.34	2.43	n.s.
Being a member of a local club, community organization or institution	2.45	2.37	2.42	2.30	2.31	2.24	n.s.
Volunteering with a local nonpolitical group	2.12	1.93	2.24	1.86	2.12	2.05	n.s.
Overall average of civic engagement activity indicators*	2.33	2.22	2.36	2.15	2.26	2.24	
Overall, how much impact do you think people like you can have in making your community a better place to live? (1: no impact, 3: some impact, 5: big impact)	3.84	3.97	4.25	3.81	3.86	3.91	n.s.

*Overall averages were used to illustrate trends among questions that used the same scale and were not used in analysis.

Political Engagement

Out of the 11 political engagement survey questions, three were significantly different for site types when controlling for other demographic factors: signed a petition; worked for a political campaign, and other political activity (Table 3.12). Urban production farm participants were less likely to work for a political campaign than intensive production farms ($P < 0.05$) significantly different from intensive production farms in working for a political campaign, with intensive production site participants reporting this activity more frequently. Donating money to a political cause, participating in political meetings, and working in political campaigns had lower overall mean frequencies across all site participants, while discussing politics, voting, and signing petitions had higher mean frequencies.

Table 3.12. Site Participant Least Squares Means of Political Engagement Indicators

	Not-for-profit site types			For-profit site types			<i>p</i> value
	Community Gardens (<i>n</i> = 161)	High School Gardens (<i>n</i> = 72)	Training Farms (<i>n</i> = 64)	Intensive Production Farms (<i>n</i> = 35)	Periurban Production Farms (<i>n</i> = 50)	Urban Production Farms (<i>n</i> = 62)	
How often do you follow what's going on in local government and public affairs? (1: never, 3: sometimes, 5: always)	3.41	3.24	3.38	3.24	3.53	3.35	n.s.
I consider myself well qualified to participate in the political process (1: strongly disagree, 3: neutral, 5: strongly agree)	3.55	3.26	3.36	3.53	3.32	3.73	n.s.
Political activities (1: no, never; 2: yes, but not in the past 12 months; 3: yes, within the past 12 months)							
Advocated for urban agriculture-specific topics	1.96	1.71	1.94	1.90	2.03	2.05	n.s.
Discussed politics	2.49	2.57	2.56	2.42	2.64	2.66	n.s.
Voted	2.42	2.45	2.58	2.24	2.47	2.49	n.s.
Signed a petition	2.26 ^{ab}	2.14 ^b	2.62 ^a	2.16 ^b	2.24 ^{ab}	2.60 ^a	0.0003*
Contributed money to a political cause	2.23	2.15	2.29	2.27	2.40	2.17	n.s.
Contacted a public official	2.15	2.18	2.40	2.19	2.28	2.44	n.s.
Participated in a political meeting	1.56	1.59	1.45	1.77	1.57	1.72	n.s.
Worked for a political campaign	1.24 ^{ab}	0.98 ^{ab}	0.98 ^{ab}	1.42 ^a	1.13 ^{ab}	0.97 ^b	0.014*
Other political activity	1.93 ^a	1.62 ^{ab}	1.49 ^b	1.70 ^{ab}	1.84 ^{ab}	1.88 ^{ab}	0.0277*
Overall average of political activities**	2.04	1.96	2.05	2.02	2.07	2.12	

Means followed by the same letter are not significantly different according to Tukey-Kramer paired comparisons where $\alpha=0.05$

*Probability value for the overall ANOVA F-test using Type II hypothesis test where $\alpha=0.05$

**Overall averages were used to illustrate trends among questions that used the same scale and were not used in analysis.

Social Capital

Similar to Table 3.9, Table 3.13 includes social capital indicators and the higher respondent values generally indicate lower social capital. Seven of the nine questions about social capital indicators (frequency of talking with others, trust with others, and doing favors for others) were significantly different by site type (Table 12). Training farm, community garden, periurban farm, and intensive production site participants reported talking the most often with people within the organization, and the means of these sites were significantly different from urban production farms and high school gardens. Training farm and urban production farm participants had lower indicators of interaction, such as talking and doing favors, for those around the site, while community gardens had high mean frequency of doing favors for and talking to others within the organization, as well as for talking with, doing favors for, and trusting site neighbors. Community garden participants had strong social capital indicators for all three categories concerning interactions with neighbors, as well as for doing favors for others within the organization. Site type was found to be significant for all three questions about talking with, doing favors for, and trusting neighbors, and community garden participants reported the most frequent interactions in each of these categories. Intensive production farm participants also showed high mean frequency of interactions, including talking with site neighbors, talking with and doing favors for other organizations working in the food system, and talking with site neighbors. Urban production farm participants reported the least frequent talking with others working in the food system. Overall, trust was a major contributor to social capital across all of the sites. Community garden, periurban farm, and intensive production site participants had higher levels of trust for site neighbors, with community garden participants having significantly different least-sum means from training farm, urban production farm, and high school garden participants.

Table 3.13. Site Participant Least Squares Means of Social Capital Indicators

	Not for profit site types			For profit site types			
	Community Gardens (<i>n</i> = 161)	High School Gardens (<i>n</i> = 72)	Training Farms (<i>n</i> = 64)	Intensive Production Farms (<i>n</i> = 35)	Periurban Production Farms (<i>n</i> = 50)	Urban Production Farms (<i>n</i> = 62)	<i>p</i> value
Over the past year, how often did you talk with: (1: basically every day; 2: a few times a week; 3: a few times a month; 4: once a month; 5: less than once a month; 6: not at all)							
People within the organization	3.21 ^{bc}	4.08 ^a	3.04 ^c	3.80 ^{abc}	3.45 ^{abc}	3.80 ^{ab}	0.0004*
Site neighbors	3.06 ^c	5.05 ^a	5.24 ^a	3.57 ^{bc}	3.76 ^b	5.27 ^a	<0.0001*
Other organizations	3.45 ^{ab}	4.00 ^{ab}	3.72 ^{ab}	3.30 ^{ab}	3.10 ^b	4.01 ^a	0.0145*
Do favors for:							
People within the organization	2.50 ^b	3.63 ^a	3.71 ^a	2.36 ^b	3.23 ^{ab}	3.77 ^a	<0.0001*
Site neighbors	3.41 ^b	4.96 ^a	5.34 ^a	3.91 ^b	4.02 ^b	5.19 ^a	<0.0001*
Other organizations	3.28 ^c	4.22 ^a	4.10 ^{ab}	2.78 ^c	3.28 ^{bc}	4.00 ^{ab}	<0.0001*
Overall average of talking and favors**	3.15	4.32	4.19	3.29	3.47	4.34	
Trust: (1: all of the people; 2: most of the people; 3: some of the people; 4: none of the people)							
People within the organization ^z	2.11	2.19	1.99	2.23	2.13	1.99	n.s.
Site neighbors ^z	1.93 ^b	2.44 ^a	2.32 ^a	2.01 ^{ab}	2.17 ^{ab}	2.35 ^a	<0.0004*
Other organizations ^z	2.40	2.36	2.28	2.46	2.51	2.46	n.s.
Overall average of trust	2.82	3.66	3.53	2.94	3.07	3.65	

Means followed by the same letter are not significantly different according to Tukey-Kramer paired comparisons where $\alpha=0.05$

*Probability value for the overall ANOVA F-test using Type II hypothesis test where $\alpha=0.05$

**Overall averages were used to illustrate trends among questions that used the same scale and were not used in analysis.

Discussion

This study sought to uncover how urban agriculture contributes to food system resilience through the patterns and indicators of social resilience and to determine if there are meaningful differences in social resilience factors based on involvement in the following UA site types: community gardens, high school gardens, training farms, for-profit intensive production farms, for-profit periurban production farms, and for-profit urban production farms. Social resilience indicators include transformational capacity, civic and political engagement, and social capital. Lastly, the study illustrated differences in indicators between sites operated by sole proprietors or organizations.

Due to the nature of the sampling protocol, our study had a relatively low sample size for the UA site operators ($n=23$). Assessment of the food system at granular levels can provide rich data (KC et al., 2024). This study was part of a larger transdisciplinary project that also assessed agricultural productivity, community health, and environmental sustainability outcomes. This specific study is an examination of resilience indicators through online survey questions and in-depth interviews with each of the 23 UA site operators. Mixed method studies that include interviews and/or focus groups are needed for adding depth and breadth when conducting qualitative research, particularly within UA (Christensen et al., 2019; Luxton & Sbicca, 2020). The mixed methods approach combined with purposive sampling allows for granular level data that is rich and meaningful. Furthermore, it may be difficult to obtain with methods that maximize response rates and absolute participation.

Transformational Capacity

Transformational capacity, measured as willingness to change, was assessed through attitudinal and behavioral survey questions. The three categories of production farms with a for-profit model showed the lowest mean transformational capacity response. The fact that some sites needed income to continue, while others operate with the support of donors and funders, could potentially affect site operator attitudes towards drastic changes in management style. For-profit business operators, which may be structured to be dependent on resources to make a profit, may have difficulty enacting transformations (Marshall et al., 2012). Non-profit organizations, which play a major part in food systems, may be more likely to both lack capital and rely on unpaid labor; both conditions can put nonprofits in a position that requires them to respond to changes in the greater food system; thus, nonprofit organizations may be likely to engage in transformations, experimentation, and risk in production systems to maintain their place in their collaborative network (Sbicca et al., 2019). However, all of the sites in our study had characteristics of the capacity to transform. Climate change was an important topic to our respondents as none of the site types agreed with the statement “Current approaches for dealing with present climate challenges will be sufficient for dealing with future climate challenges.” Climate change is inevitable and its effects are felt across the world (Masson-Delmotte et al., 2021). Research shows an increase in farmer recognition of the threat of climate change to agriculture and the need for transformation to respond to its impacts upon their livelihoods (Stuart, 2018). Marshall et al. (2012) found a negative correlation between transformational capacity and growers’ attachment to place and occupation, underscoring the social and psychological elements of the capacity to change and adjust to challenges such as climate change. The site operators in our study agreed that transformation will be required to address climate challenges and indicated some level of

agreement with each transformational capacity. Transformation will likely be required to respond to disruptions and should be understood and undertaken before a crisis (Rickards & Howden, 2012). However, transformation can be extremely stressful for farmers, especially when compounded with other stressors involved in food production (Nichols et al., 2022). The capacity for transformation should be supported and encouraged in urban agriculture, with particular attention paid to challenges cited by UA operators.

Civic and Political Engagement

As an urban land use, UA sites inherently engaged in the political activity and civic life of the city in which they operate. UA sites must comply with the codes and regulations for the urban land use. As such, UA site operators and participants may be exposed to civic and political constraints and challenges. As we found with motivating factors, there are often other reasons for getting engaged in UA which can extend to being civically and politically engaged. Operators and participants who identify with motivating factors such as policy advocacy and sustainable cities may be motivated to be politically and civically engaged. All sites involved in our study were locally owned and produced food for the surrounding urban area. Locally-owned and locally-serving businesses tend to have a bigger impact on indicators of civic and political engagement than businesses that are not locally owned or are engaged in business mainly outside of their surrounding area (Clark & Record, 2017).

Kaika & Racelis (2021) found that “studies document a correlation between civic agriculture and civic engagement, but none effectively addresses the issue of causality. There may even be a mutually re-enforcing effect between civic agriculture and civic engagement.” However, researchers dispute the connection between civic agriculture and civic engagement (Pole & Gray, 2013). Our study found that site type was important for some indicators of political engagement

and social capital for UA participants, but not for civic engagement. More research is needed to determine the causality and impact of UA and site type on social capital in communities. Further, without a matched sample from individuals not engaged in UA for comparison, the impact of site cannot be fully analyzed. The interviews provide leads for future research around policy recommendations and interventions to address challenges in collaboration and engagement.

Social Capital

The significance of the site types on some indicators of social capital could indicate that UA sites or interactions with UA sites are serving as a “third place”, as defined by Oldenburg (1996), who observes that third spaces are most successful when they are walkable and locally-owned and can be supported by effective planning. Oldenburg (1996) writes that third places can welcome retired people, bring people with common interests together, including those of differing ages and political leanings, and can serve as meeting places in the case of disasters. Many of the sites represented in this data site have low barriers of entry, including the high school gardens and community gardens, making them an ideal “port of entry” for people to become more engaged with the community (Oldenburg, 1996). A strong link between social capital and involvement in local food systems has been demonstrated (Elton et al., 2021). Even in the absence of other forms of capital, strong social capital has been shown to help communities respond to disasters and adapt to the new reality after a disruption (LaLone, 2012; Roberts, 2019). Researchers have shown that strong social networks, including bridging and bonding ties between community members, results in improved social capital (Aldrich & Meyer, 2015). The data from this study suggests that the UA sites contributing to the social resilience of their communities.

The UA site operators included in this study displayed strong and diverse social networks, with diverse categories of allies, strong collaboration, and community outreach behaviors. Two

operators from urban farms identified their sites as having a high level of collaboration as an organization, in part due to personal connections and advocacy work. Two operators expressed interest in improving collaborations with specific urban entities like parks and recreation, schools, and food waste management organizations. Social events are a way for community members to develop ties (Putnam, 2000). Almost all (91%) UA site operators indicated that they had engaged in at least one educational or social outreach event. These events included on-farm educational and social activities, as well as participation in off-farm educational events. Community outreach activities provide the opportunity for farm operators and participants to meet each other and form social ties.

Barriers including difficulties in funding and lack of time hampered the efforts of UA site operators to achieve their desired level of collaboration and outreach. Difficulty in seeking and maintaining collaborations was attributed to lack of time to foster collaborative relationships and lack of local expertise for particular production types. Four operators indicated difficulties in maintaining their desired level of community social and education outreach. Difficulties included financial and time constraints that limited the extent of social and educational outreach to the community. One periurban farm operator mentioned the lack of infrastructure to allow for large groups of people on the farm, underscoring the importance of community architecture to improve access to third spaces. For-profit farm operators also cited the need to prioritize production through time and resources to provide livelihoods for the farm workers as a limiting factor in community outreach activities.

Diversity in sales channels could impact the ability of people to make ties and connections around UA sites. With 13 categories of sales channels and distribution channels described by operators, there were many opportunities for developing relationships with community members.

Some market sectors, like farmers markets, expose the UA site to a wide variety of community members, while others present fewer opportunities for relationship-building. Several of the distribution channels, including community supported agriculture (CSA), food hubs, farm stands, and farmers markets, represent socially-embedded outlets that could be described as civic agriculture and increase the likelihood of participants having increased civic and political engagement (Clark & Record, 2017; Lyson, 2004; Obach & Tobin, 2014). While production farms tended to have a larger number of sales outlets, community gardens and high school gardens had fewer outlets. This could be related to the amount of food being produced and the nature of the sites as for-profit or not for profit, but it could result in decreased opportunities for the farm to serve as a space for building relationships and increasing social capital.

Food System Allies

The diversity in food system allies mentioned indicates a wide-reaching social network among the UA site operators that we interviewed. Diverse social networks are associated with improved resilience (Aldrich & Meyer, 2015; Kirby et al., 2020). Urban agriculture support agencies can play a big role in urban food systems. Kirby et al. (2020) wrote that “It is important to assess where the system might be burdened and where greater connectivity might increase resilience through more redundancy and diversity.” Our results show high levels of engagement with food and farm nonprofits, indicating that farmers and urban growers feel the need to engage with these support organizations. We also saw a very high prevalence of UA site operators working directly with or learning from other farmers or farming operations. Supporting diversity and redundancy of organizations working within the food system can strengthen the food system and fill gaps that could result in vulnerabilities (Kirby et al., 2020).

Motivating Factors

Motivating factors inform decisions and practices on UA sites and guide the collaborations and social ties formed by operators and participants. Strong overlap with several motivating factors both between and within site types could indicate that UA sites can find other food system entities and form collaborative partnerships based around motivating factors. Collaboration around motivations can allow organizations and entities to access resources like funding and support (Sbicca et al., 2019). Motivating factors have been found to differ based on site type, as well as have some impact on wellbeing derived from UA participation. However, there is some agreement with motivating factors across UA site types. Environmental motivations may have more participant agreement than access to fresh food (Kirby et al., 2021). While access to fresh and ethically-produced food was cited as a factor for some operators, other motivating factors were cited more often. Kirby et al. (2020) found that “Individuals who reported stronger motivations for building community and social and environmental justice showed significant correlations to several resilience indicators, indicating that those motivations may be important to system resilience.” Building community was mentioned five times, while other motivating factors of social and environmental justice were mentioned collectively 29 times. The motivating factors underscore the idea of UA sites as a form of civic agriculture that impacts the social resilience indicators of participants (Lyson, 2004; Obach & Tobin, 2014).

Business Models and Organizational Entities

There were some key differences between sites that were for-profit and not for profit, particularly in transformational capacities, with some differences in allies and motivating factors. Differences could be attributable to the particularities of managing unique site types. For example, high school garden site operators were strongly motivated by education and cited school districts and officials as allies. Nonprofit sites mentioned food pantries and banks as allies, while for-profit

farms were more likely to name sales channels as allies. However, there does not appear to be other significant differences between for-profit sole proprietor sites and not-for-profit sites operating with organizational support. Rather, differences might be attributable to other particularities of site type. Potential operational requirements include high school gardens being bound by curriculum requirements or intensive production farms producing food within buildings and in a less visible way than traditional outdoor production of food.

Participation in UA Sites

Participation in a particular type of UA site appears to have some impact on civic and political engagement and social capital. There were significant differences between participants of some site types for some indicators of political engagement, but there was no clear pattern of significance. Rather, civic and political engagement and indicators of social capital were high across all six site types with some variability.

Community garden and intensive production participants consistently ranked in the highest significant means of social capital indicators, with periurban production farms appearing as a close third for most frequent interactions. Community garden participants were highly active in political engagement in our study, and higher than other site types. This aligns with existing research about community garden contributions to social resilience; research has shown that social resilience indicators can be measured in community gardens (Christensen, 2017; Firth et al., 2011; Kingsley et al., 2020; Taylor et al., 2022). Participation in community gardens result in the development of social ties, including close ties and bonds, and an increased sense of belonging to a community (Kingsley et al., 2020). Civic engagement is correlated with participation in community gardens, as participants have been found to develop improved psychological wellbeing and increased sense of social responsibility that results in patterns of participatory engagement with civic life; exposure to

sustainability and other food system issues may be related to the increased sense of social justice found in participants (D'Amore et al., 2026). The act of gardening may serve as social lubricant that results in ties; further, social capital developed on community gardens may be an important part of accessing resources to maintain the garden itself, potentially providing incentive to develop and maintain ties (Glover et al., 2005).

While there is a wide body of research on social capital and community gardens, other site types showed potential for development of indicators of social resilience. Intensive production farm participants showed high mean frequency of doing favors for others within the organization and for site neighbors, as well as talking with other food system organizations. While consumers may be skeptical about the potential benefits of intensive production sites using controlled environment methods, the produce grown on these sites may fit consumers' ideas of good food, potentially driving participation (Broad et al., 2022). Intensive production farms could also fit the model of a social enterprise when operators are motivated by justice or equity in food access, further increasing the likelihood of being in contact with politically engaged participants who share their motivations (Wilkinson et al., 2021). Intensive production and community garden participants had particularly high levels of engagement with UA education as reported in Table 3.3. These increased rates of participation could be related to social ties developed within the food system associated with increased social capital.

Future Research

The results of our study, including the demographics of respondents and patterns of social resilience indicators, indicate clear pathways for future research. While the body of research on social resilience within the field of UA continues to grow, there is a gap in knowledge about the impacts of particular site types on their communities. In-depth case studies of urban agriculture

site types with representative samples could show impacts of UA site types on social resilience. Our research engaged in purposive sampling to collect data from specific categories of UA sites. Most site operators (87.0%) identified as white, which is higher than the proportion of United States census respondents who identify as white at 74.8% (*U.S. Census Bureau QuickFacts*, n.d.). Site participants more closely matched the US population, with 75% identifying as white. It is important to collect representative data of urban agriculture site operators, including by engaging with racially diverse populations and conducting interviews in languages other than English. Guthman (2008) writes that “more attention to the cultural politics of alternative food might enable whites to be more effective allies in anti-racist struggles.” Meenar & Hoover (2012) note that UA sites may not draw participants from the immediate neighborhood, underscoring the need to further examine issues of race and class in UA sites to promote inclusion. Christensen (2017) calls for “moving beyond only or primarily focusing on the cognitive dimension of social capital, and including the structural aspect of social capital” and notes the importance of collecting rich qualitative data to include race and other sociodemographic data to describe the character of social networks developed in community gardens.

Conclusion

Our study demonstrated that urban agriculture sites are important to communities beyond the food they provide. The UA sites included in our study produce food that is distributed in many ways, including for sale and donation, with scale of production varying greatly. While the contribution of food to the urban food system cannot be ignored, we have demonstrated that UA sites show a commitment to making connections within the community and are strongly motivated by justice, equity, sustainability, and education. The sites contribute to social resilience by fostering social ties through collaboration, outreach, and participation opportunities. UA site

operators and participants demonstrate high levels of civic and political engagement and the UA site operators displayed strong social networks and community engagement. UA site operators interact with urban entities, collaborate with others in the food system, and participate in and/or host social and educational outreach activities. Strong motivational factors in the areas of community building and justice indicate that the UA sites involved in this study could be an important part of developing socially resilient communities. These factors should be recognized by cities when developing urban agriculture policies and planning for social resilience. The UA site operators expressed the desire to collaborate and engage with the community and cited challenges that prevented them from engaging more fully. City planners and others could respond to these challenges, including financial and time constraints and infrastructure limitations, to facilitate the growth of social capital while supporting food production in cities.

The differences between site type categories and between for-profit status, including in motivating factors and allies, points to the need for future research to examine categories of UA in greater depth. The challenges shared by UA site operators indicate opportunities to address funding gaps that could ease time and resource constraints, which currently prevent UA operators from engaging with collaborators and community members at their desired level. The UA sites, regardless of type or organizational structure, are contributing to social resilience by developing social networks and patterns of collaboration and interaction. Differences in site type for some indicators of social capital highlight promising avenues for future research. In order to gain the benefits of community resilience through urban agriculture, planners and policy makers should support the existence of different types of urban agriculture sites, both for-profit and not, that could facilitate the growth of social capital and collaboration.

References

- Agustina, I., & Beilin, R. (2012). Community Gardens: Space for Interactions and Adaptations. *Procedia - Social and Behavioral Sciences, ASEAN Conference on Environment-Behaviour Studies (AcE-Bs), Savoy Homann Bidakara Hotel, 15-17 June 2011, Bandung, Indonesia*, 36, 439–448. <https://doi.org/10.1016/j.sbspro.2012.03.048>
- Aldrich, D. P., & Meyer, M. A. (2015). Social Capital and Community Resilience. *American Behavioral Scientist*, 59(2), 254–269. <https://doi.org/10.1177/0002764214550299>
- Anderson, C. R., Ferrando, T., Blay-Palmer, A., Espinosa-García, F. J., Cabral, L., Termine, P., Wilkes, J., Soma, T., Bhalla, G., Madzorera, I., Antwi-Agyei, P., & Zurek, M. (2026). Time for a vision exam: Diagnosing problems in the pursuit of equitably transformative resilience in food systems. *Agroecology and Sustainable Food Systems*, 50(3), 457–476. <https://doi.org/10.1080/21683565.2025.2588252>
- Anderson, S. A. (1990). Core Indicators of Nutritional State for Difficult-to-Sample Populations. *The Journal of Nutrition*, 120, 1555–1598. https://doi.org/10.1093/jn/120.suppl_11.1555
- Atoloye, A., Schouboe, S., Misiaszek, C., Harding, J., Stowers, K. C., Bassarab, K., & Calancie, L. (2023). Developing a food system indicators database to facilitate local food systems assessments: Using a scoping review approach. *Journal of Agriculture, Food Systems, and Community Development*, 13(1), Article 1. <https://doi.org/10.5304/jafscd.2023.131.008>
- Azunre, G. A., Amponsah, O., Peprah, C., Takyi, S. A., & Braimah, I. (2019). A review of the role of urban agriculture in the sustainable city discourse. *Cities*, 93, 104–119. <https://doi.org/10.1016/j.cities.2019.04.006>
- Béné, C., Frankenberger, T. R., Nelson, S., Conostas, M. A., Collins, G., Langworthy, M., & Fox, K. (2023a). Food system resilience measurement: Principles, framework and caveats. *Food Security*, 15(6), 1437–1458. <https://doi.org/10.1007/s12571-023-01407-y>
- Béné, C., Frankenberger, T. R., Nelson, S., Conostas, M. A., Collins, G., Langworthy, M., & Fox, K. (2023b). Food system resilience measurement: Principles, framework and caveats. *Food Security*, 15(6), 1437–1458. <https://doi.org/10.1007/s12571-023-01407-y>
- Berkes, F., & Folke, C. (Eds.). (2002). *Linking social and ecological systems: Management practices and social mechanisms for building resilience* (Transferred to digital printing). Cambridge Univ. Press.
- Blay-Palmer, A., Santini, G., Dubbeling, M., Renting, H., Taguchi, M., & Giordano, T. (2018). Validating the City Region Food System Approach: Enacting Inclusive, Transformational City Region Food Systems. *Sustainability*, 10(5), 1680. <https://doi.org/10.3390/su10051680>

- Born, B., & Purcell, M. (2006). Avoiding the Local Trap: Scale and Food Systems in Planning Research. *Journal of Planning Education and Research*, 26(2), 195–207. <https://doi.org/10.1177/0739456X06291389>
- Broad, G. M., Wythe, M., & Maya, E. (2022). Perceptions of high-tech controlled environment agriculture among local food consumers: Using interviews to explore sense-making and connections to good food. *Agriculture and Human Values*, 39(1), 417–433. <https://doi.org/10.1007/s10460-021-10261-7>
- Cabell, J. F., & Oelofse, M. (2012). An Indicator Framework for Assessing Agroecosystem Resilience. *Ecology and Society*, 17(1). <https://www.jstor.org/stable/26269017>
- Cabell, J., & Oelofse, M. (2012). An Indicator Framework for Assessing Agroecosystem Resilience. *Ecology and Society*, 17(1). <https://doi.org/10.5751/ES-04666-170118>
- Campbell, C., Papanek, A., DeLong, A., Diaz, J., Gusto, C., & Tropp, D. (2022). Community food systems resilience: Values, benefits, and indicators. *Journal of Agriculture, Food Systems, and Community Development*, 11(4), Article 4. <https://doi.org/10.5304/jafscd.2022.114.006>
- Carey, J., & Dubbeling, M. (2017, November). *City Region Food System Indicator Framework*. RUAF Foundation.
- Carpenter, S. R., Arrow, K. J., Barrett, S., Biggs, R., Brock, W. A., Crépin, A.-S., Engström, G., Folke, C., Hughes, T. P., Kautsky, N., Li, C.-Z., McCarney, G., Meng, K., Mäler, K.-G., Polasky, S., Scheffer, M., Shogren, J., Sterner, T., Vincent, J. R., ... Zeeuw, A. D. (2012). General Resilience to Cope with Extreme Events. *Sustainability*, 4(12), Article 12. <https://doi.org/10.3390/su4123248>
- Christensen, S. (2017a). Seeding Social Capital? Urban Community Gardening and Social Capital. *Civil Engineering and Architecture*, 5(3), 104–123. <https://doi.org/10.13189/cea.2017.050305>
- Christensen, S. (2017b). Seeding Social Capital? Urban Community Gardening and Social Capital. *Civil Engineering and Architecture*, 5(3), 104–123. <https://doi.org/10.13189/cea.2017.050305>
- Christensen, S., Malberg Dyg, P., & Allenberg, K. (2019). Urban community gardening, social capital, and “integration”—A mixed method exploration of urban “integration-gardening” in Copenhagen, Denmark. *Local Environment*, 24(3), 231–248. <https://doi.org/10.1080/13549839.2018.1561655>
- Civic Engagement and Social Cohesion: Measuring Dimensions of Social Capital to Inform Policy* (p. 18831). (2014). National Academies Press. <https://doi.org/10.17226/18831>

- Clark, J. K., Conley, B., & Raja, S. (2021). Essential, fragile, and invisible community food infrastructure: The role of urban governments in the United States. *Food Policy, Urban Food Policies for a Sustainable and Just Future*, 103, 102014.
<https://doi.org/10.1016/j.foodpol.2020.102014>
- Clark, J. K., & Record, M. (2017a). Local Capitalism and Civic Engagement: The Potential of Locally Facing Firms. *Public Administration Review*, 77(6), 875–887.
<https://doi.org/10.1111/puar.12791>
- Clark, J. K., & Record, M. (2017b). Local Capitalism and Civic Engagement: The Potential of Locally Facing Firms. *Public Administration Review*, 77(6), 875–887.
<https://doi.org/10.1111/puar.12791>
- Controlled Environment Agriculture (CEA) Production*. (2023). Congressional Research Service.
https://www.congress.gov/crs_external_products/IF/PDF/IF12485/IF12485.2.pdf
- D’Amore, C., Cohen, L., Chen, J., Owen, P., & Ball, C. (2026). Community gardens and the cultivation of social capital. *Current Opinion in Psychology*, 67, 102149.
<https://doi.org/10.1016/j.copsyc.2025.102149>
- De Grandpré, A., Elton, C., Senese, D., & Mullinix, K. (2022a). Soft adaptation: The role of social capital in building resilient agricultural landscapes. *Frontiers in Agronomy*, 4.
<https://www.frontiersin.org/articles/10.3389/fagro.2022.980888>
- De Grandpré, A., Elton, C., Senese, D., & Mullinix, K. (2022b). Soft adaptation: The role of social capital in building resilient agricultural landscapes. *Frontiers in Agronomy*, 4.
<https://www.frontiersin.org/articles/10.3389/fagro.2022.980888>
- De Schutter, O. (2014). The Right to Adequate Nutrition. *Development*, 57.
<https://doi.org/10.1057/dev.2014.64>
- Delind, L. B., & Bingen, J. (2008). Place and civic culture: Re-thinking the context for local agriculture. *Journal of Agricultural & Environmental Ethics*, 21(2), 127–151.
<https://doi.org/10.1007/s10806-007-9066-5>
- Elton, C., Senese, D., & Mullinix, K. (2021). *Assessing the Impact of Local Food Systems on Social Capital in the Okanagan Bioregion*.
- Ericksen, P. J. (2008). Conceptualizing food systems for global environmental change research. *Global Environmental Change*, 18(1), 234–245.
<https://doi.org/10.1016/j.gloenvcha.2007.09.002>
- Ericksen, P., Stewart, B., Dixon, J., Barling, D., Loring, P., Anderson, M., & Ingram, J. (2010). The Value of a Food System Approach. In *Food Security and Global Environmental Change* (pp. 47–70). Routledge.

- Fargue-Lelièvre, A., & Clerino, P. (2022). Do we still need to develop new tools to assess the sustainability of urban agriculture? *Acta Horticulturae*, (1356), 93–98. <https://doi.org/10.17660/ActaHortic.2022.1356.14>
- Firth, C., Maye, D., & Pearson, D. (2011). Developing “community” in community gardens. *Local Environment*, 16(6), 555–568. <https://doi.org/10.1080/13549839.2011.586025>
- Frankenberger, T., Choularton, R., Kurtz, J., & Nelson, S. (2015). *Measuring Shocks and Stressors as Part of Resilience Measurement* (Resilience Measurement Technical Working Group Technical Series; No. 5). Food Security Information Network.
- Ge, L., Anten, N. P., van Dixhoorn, I. D., Feindt, P. H., Kramer, K., Leemans, R., Meuwissen, M. P., Spooler, H., & Sukkel, W. (2016). Why we need resilience thinking to meet societal challenges in bio-based production systems. *Current Opinion in Environmental Sustainability, Open Issue, Part I*, 23, 17–27. <https://doi.org/10.1016/j.cosust.2016.11.009>
- Glover, T. D., Parry, D. C., & Shinen, K. J. (2005). Building Relationships, Accessing Resources: Mobilizing Social Capital in Community Garden Contexts. *Journal of Leisure Research*, 37(4), 450–474. <https://doi.org/10.1080/00222216.2005.11950062>
- Gulyas, B. Z., & Edmondson, J. L. (2021). Increasing City Resilience through Urban Agriculture: Challenges and Solutions in the Global North. *Sustainability*, 13(3), Article 3. <https://doi.org/10.3390/su13031465>
- Guthman, J. (2008). Bringing good food to others: Investigating the subjects of alternative food practice. *Cultural Geographies*, 15(4), 431–447. <https://doi.org/10.1177/1474474008094315>
- Hennink, M. M., Kaiser, B. N., & Marconi, V. C. (2017). Code Saturation Versus Meaning Saturation: How Many Interviews Are Enough? *Qualitative Health Research*, 27(4), 591–608. <https://doi.org/10.1177/1049732316665344>
- Hernández Lagana, M., Phillips, S., & Poisot, A. (2022). *Self-evaluation and Holistic Assessment of Climate Resilience of Farmers and Pastoralists (SHARP)*. Food and Agriculture Organization of the United Nations (FAO). <https://openknowledge.fao.org/items/32d0eec6-4b72-49d3-9d62-e0e46c17a845>
- Hodbod, J., & Eakin, H. (2015). Adapting a social-ecological resilience framework for food systems. *Journal of Environmental Studies and Sciences*, 5. <https://doi.org/10.1007/s13412-015-0280-6>
- Hodbod, J., Goralnik, L., Vicari, L., & White, S. (2024). From Theory to Transdisciplinary Practice: Community-Based Resilience Visioning in Urban Agriculture. *Society & Natural Resources*, 37(1), 143–167. <https://doi.org/10.1080/08941920.2023.2228264>

- Holling, C. S. (1973). Resilience and Stability of Ecological Systems. *Annual Review of Ecology, Evolution, and Systematics*, 4(Volume 4, 1973), 1–23. <https://doi.org/10.1146/annurev.es.04.110173.000245>
- Ilieva, R. T., Cohen, N., Israel, M., Specht, K., Fox-Kämper, R., Fargue-Lelièvre, A., Ponizy, L., Schoen, V., Caputo, S., Kirby, C. K., Goldstein, B., Newell, J. P., & Blythe, C. (2022). The Socio-Cultural Benefits of Urban Agriculture: A Review of the Literature. *Land (Basel)*, 11(5), 622-. <https://doi.org/10.3390/land11050622>
- Ingram, J. (2011). A food systems approach to researching food security and its interactions with global environmental change. *Food Security*, 3. <https://doi.org/10.1007/s12571-011-0149-9>
- Ingram, J. (2020). Nutrition security is more than food security. *Nature Food*, 1(1), 2–2. <https://doi.org/10.1038/s43016-019-0002-4>
- Kaika, A., & Racelis, A. (2021). Civic agriculture in review: Then, now, and future directions. *Journal of Agriculture, Food Systems, and Community Development*, 10(2), Article 2. <https://doi.org/10.5304/jafscd.2021.102.030>
- KC, U., Campbell-Ross, H., Godde, C., Friedman, R., Lim-Camacho, L., & Crimp, S. (2024). A systematic review of the evolution of food system resilience assessment. *Global Food Security*, 40. <https://doi.org/10.1016/j.gfs.2024.100744>
- KC, U., Friedman, R., Lim-Camacho, L., & Crimp, S. (2025). Measuring resilience in national food systems using “food systems resilience score.” *Data & Policy*, 7, e54. <https://doi.org/10.1017/dap.2025.10021>
- Kingsley, J., Foenander, E., & Bailey, A. (2020). “It’s about community”: Exploring social capital in community gardens across Melbourne, Australia. *Urban Forestry & Urban Greening*, 49, 126640. <https://doi.org/10.1016/j.ufug.2020.126640>
- Kirby, C. K., Goralnik, L., Hodbod, J., Piso, Z., & Libarkin, J. C. (2020). Resilience characteristics of the urban agriculture system in Lansing, Michigan: Importance of support actors in local food systems. *Urban Agriculture & Regional Food Systems*, 5(1), e20003. <https://doi.org/10.1002/uar2.20003>
- Kirby, C. K., Specht, K., Fox-Kämper, R., Hawes, J. K., Cohen, N., Caputo, S., Ilieva, R. T., Lelièvre, A., Ponizy, L., Schoen, V., & Blythe, C. (2021). Differences in motivations and social impacts across urban agriculture types: Case studies in Europe and the US. *Landscape and Urban Planning*, 212, 104110. <https://doi.org/10.1016/j.landurbplan.2021.104110>
- LaLone, M. B. (2012). Neighbors Helping Neighbors: An Examination of the Social Capital Mobilization Process for Community Resilience to Environmental Disasters. *Journal of Applied Social Science*, 6(2), 209–237.

- Lew, A., Ng, P., Ni, C., & Wu, T.-C. (2016). Community sustainability and resilience: Similarities, differences and indicators. *Tourism Geographies*, 18, 18–27. <https://doi.org/10.1080/14616688.2015.1122664>
- Luxton, I., & Sbicca, J. (2020). Mapping movements: A call for qualitative social network analysis. *Qualitative Research*, 21, 146879412092767. <https://doi.org/10.1177/1468794120927678>
- Lyson, T. A. (2004). *Civic Agriculture: Reconnecting Farm, Food, and Community*. Dartmouth College. <http://ebookcentral.proquest.com/lib/ksu/detail.action?docID=1085080>
- Marshall, N. A., Park, S. E., Adger, W. N., Brown, K., & Howden, S. M. (2012). Transformational capacity and the influence of place and identity. *Environmental Research Letters*, 7(3), 034022. <https://doi.org/10.1088/1748-9326/7/3/034022>
- Masson-Delmotte, V., Zhai, P., Pirani, A., Connors, S. L., Péan, C., Berger, S., Caud, N., Chen, Y., Goldfarb, L., Gomis, M. I., Huang, M., Leitzell, K., Lonnoy, E., Matthews, J. B. R., Maycock, T. K., Waterfield, T., Yelekçi, Ö., Yu, R., & Zhou, B. (Eds.). (2021). *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press. <https://doi.org/10.1017/9781009157896>
- McClintock, N. (2014). Radical, reformist, and garden-variety neoliberal: Coming to terms with urban agriculture's contradictions. *Local Environment*, 19(2), 147–171. <https://doi.org/10.1080/13549839.2012.752797>
- Meenar, M., & Hoover, B. (2012a). Community Food Security via Urban Agriculture: Understanding People, Place, Economy, and Accessibility from a Food Justice Perspective. *Journal of Agriculture, Food Systems, and Community Development*, 143–160. <https://doi.org/10.5304/jafscd.2012.031.013>
- Meenar, M., & Hoover, B. (2012b). Community Food Security via Urban Agriculture: Understanding People, Place, Economy, and Accessibility from a Food Justice Perspective. *Journal of Agriculture, Food Systems, and Community Development*, 143–160. <https://doi.org/10.5304/jafscd.2012.031.013>
- Meuwissen, M. P. M., Feindt, P. H., Spiegel, A., Termeer, C. J. A. M., Mathijs, E., Mey, Y. de, Finger, R., Balmann, A., Wauters, E., Urquhart, J., Vigani, M., Zawalińska, K., Herrera, H., Nicholas-Davies, P., Hansson, H., Paas, W., Slijper, T., Coopmans, I., Vroege, W., ... Reidsma, P. (2019). A framework to assess the resilience of farming systems. *Agricultural Systems*, 176, 102656. <https://doi.org/10.1016/j.agsy.2019.102656>
- Moore, M.-L., & Westley, F. (2011). Ecology and Society: Surmountable Chasms: Networks and Social Innovation for Resilient Systems. *Ecology and Society*, 16(1). <https://doi.org/10.5751/ES-03812-160105>

- Naeem, M., Ozuem, W., Howell, K., & Ranfagni, S. (2023). A Step-by-Step Process of Thematic Analysis to Develop a Conceptual Model in Qualitative Research. *International Journal of Qualitative Methods*, 22, 16094069231205789. <https://doi.org/10.1177/16094069231205789>
- Nichols, D. C., Janssen, D. B., Beamer, C., & Ferring, C. (2022). Pivoting is exhausting: A critical analysis of local food system resilience. *Journal of Rural Studies*, 96, 180–189. Scopus. <https://doi.org/10.1016/j.jrurstud.2022.10.024>
- Nicholson, C. F., Kopainsky, B., Stephens, E., Parsons, D., Jones, A. D., Garrett, J. H., & Phillips, E. (2020). Conceptual frameworks linking agriculture and food security. *Nature Food*. <https://doi.org/10.1038/s43016-020-00142->
- Nogueira-McRae, T., Ryan, E. P., Jablonski, B. B. R., Carolan, M., Arathi, H. S., Brown, C. S., Saki, H. H., McKeen, S., Lapansky, E., & Schipanski, M. E. (2018). The Role of Urban Agriculture in a Secure, Healthy, and Sustainable Food System. *BioScience*, 68(10), 748–759. <https://doi.org/10.1093/biosci/biy071>
- North American Food Systems Network (NAFSN). (2025). *Community & Agriculture Resilience Audit Tool (CARAT)* [Online tool]. <https://carattool.org/>
- Obach, B. K., & Tobin, K. (2014a). Civic agriculture and community engagement. *Agriculture and Human Values*, 31(2), 307–322. <https://doi.org/10.1007/s10460-013-9477-z>
- Obach, B. K., & Tobin, K. (2014b). Civic agriculture and community engagement. *Agriculture and Human Values*, 31(2), 307–322. <https://doi.org/10.1007/s10460-013-9477-z>
- Oldenburg, R. (1996). Our Vanishing “Third Places.” *Planning Commissioners Journal*, (25). <https://plannersweb.com/wp-content/uploads/1997/01/184.pdf>
- Perrin, A., Cournut, S., & Martin, G. (2024). Further consideration of working conditions is needed in farm resilience assessment. *Agricultural Systems*, 214, 103845. <https://doi.org/10.1016/j.agry.2023.103845>
- Pole, A., & Gray, M. (2013). Farming alone? What’s up with the “C” in community supported agriculture. *Agriculture and Human Values*, 30(1), 85–100. <https://doi.org/10.1007/s10460-012-9391-9>
- Putnam, R. D. (2000). *Bowling alone: The collapse and revival of American community*. Simon & Schuster.
- Raja, S., & Diao, C. (2016). Community-Led Urban Agriculture Policy Making: A View from the United States. *Urban Agriculture Magazine*, 31. https://www.researchgate.net/publication/315753794_Community-Led_Urban_Agriculture_Policy_Making_A_View_from_the_United_States

- Rao, N., Patil, S., Singh, C., Roy, P., Pryor, C., Poonacha, P., & Genes, M. (2022). Cultivating sustainable and healthy cities: A systematic literature review of the outcomes of urban and peri-urban agriculture. *Sustainable Cities and Society*, 85, 104063. <https://doi.org/10.1016/j.scs.2022.104063>
- Rickards, L., & Howden, S. M. (2012). Transformational adaptation: Agriculture and climate change. *Crop and Pasture Science*, 63(3), 240–250. <https://doi.org/10.1071/CP11172>
- Rico Mendez, G., Pappalardo, G., & Farrell, B. (2021). Practicing Fair and Sustainable Local Food Systems: Elements of Food Citizenship in the Simeto River Valley. *Agriculture*, 11(1), 56. <https://doi.org/10.3390/agriculture11010056>
- Roberts, P. S. (2019). Social capital and disaster resilience in the Ninth Ward. *Oñati Socio-Legal Series*, 9(3), 400–422. <https://doi.org/10.35295/osls.iisl/0000-0000-0000-1065>
- Roosevelt, M., Raile, E. D., & Anderson, J. R. (2023). Resilience in Food Systems: Concepts and Measurement Options in an Expanding Research Agenda. *Agronomy*, 13(2), Article 2. <https://doi.org/10.3390/agronomy13020444>
- Sanderson Bellamy, A., Furness, E., Nicol, P., Pitt, H., & Taherzadeh, A. (2021). Shaping more resilient and just food systems: Lessons from the COVID-19 Pandemic. *Ambio*, 50(4), 782–793. <https://doi.org/10.1007/s13280-021-01532-y>
- Sbicca, J. (2018). *Food Justice Now!: Deepening the Roots of Social Struggle*. University of Minnesota Press.
- Sbicca, J., Luxton, I., Hale, J., & Roeser, K. (2019). Collaborative Concession in Food Movement Networks: The Uneven Relations of Resource Mobilization. *Sustainability*, 11(10), 2881. <https://doi.org/10.3390/su11102881>
- Siegner, A., Sowerwine, J., & Acey, C. (2018). Does Urban Agriculture Improve Food Security? Examining the Nexus of Food Access and Distribution of Urban Produced Foods in the United States: A Systematic Review. *Sustainability*, 10(9), Article 9. <https://doi.org/10.3390/su10092988>
- Sirdey, N., David-Benz, H., & Deshons, A. (2023). Methodological approaches to assess food systems sustainability: A literature review. *Global Food Security*, 38, 100696. <https://doi.org/10.1016/j.gfs.2023.100696>
- Slocum, R. (2007). Whiteness, space and alternative food practice. *Geoforum, Post Communist Transformation*, 38(3), 520–533. <https://doi.org/10.1016/j.geoforum.2006.10.006>
- Sonnino, R., & Milbourne, P. (2022). Food system transformation: A progressive place-based approach. *Local Environment*, 27(7), 915–926. <https://doi.org/10.1080/13549839.2022.2084723>

- Stuart, D. (2018). Climate Change and Ideological Transformation in United States Agriculture. *Sociologia Ruralis*, 58(1), 63–82. <https://doi.org/10.1111/soru.12175>
- Sumner, J. (2011). Serving Social Justice: The Role of the Commons in Sustainable Food Systems. *Studies in Social Justice*, 5(1), Article 1. <https://doi.org/10.26522/ssj.v5i1.992>
- Susanto, I. W., Kusumasari, B., Santoso, A. D., & Bafadhal, O. M. (2023). Social Capital in Disaster Management: A Systematic Literature Review of Research Trends from 1998 to 2019. *Indonesian Journal of Geography*, 55(2), 179–189. <https://doi.org/10.22146/ijg.71572>
- Tapia, C., Randall, L., Wang, S., & Aguiar Borges, L. (2021). Monitoring the contribution of urban agriculture to urban sustainability: An indicator-based framework. *Sustainable Cities and Society*, 74, 103130. <https://doi.org/10.1016/j.scs.2021.103130>
- Taylor, K. H., Shoemaker, C. A., Pliakoni, E. D., Gibson, H., & Sanderson, M. (2022). Community garden practices as indicators of social resilience. *Acta Horticulturae*, (1356), 233–240. <https://doi.org/10.17660/ActaHortic.2022.1356.27>
- Tendall, D. M., Joerin, J., Kopainsky, B., Edwards, P., Shreck, A., Le, Q. B., Kruetli, P., Grant, M., & Six, J. (2015). Food system resilience: Defining the concept. *Global Food Security*, 6, 17–23. <https://doi.org/10.1016/j.gfs.2015.08.001>
- Toth, A., Rendall, S., & Reitsma, F. (2016). Resilient food systems: A qualitative tool for measuring food resilience. *Urban Ecosystems*, 19(1), 19–43. <https://doi.org/10.1007/s11252-015-0489-x>
- United States Department of Agriculture (USDA). (n.d.). *Urban Growers*. Farmers.Gov. Retrieved March 16, 2026, from <https://www.farmers.gov/your-business/urban-growers>
- U.S. Census Bureau QuickFacts: United States. (n.d.). Retrieved April 27, 2026, from <https://www.census.gov/quickfacts/fact/table/US/PST045224>
- Walker, B., Holling, C. S., Carpenter, S. R., & Kinzig, A. (2004). Resilience, Adaptability and Transformability in Social–ecological Systems. *Ecology and Society*, 9(2). <https://www.jstor.org/stable/26267673>
- Wilkinson, A., Gerlach, C., Karlsson, M., & Penn, H. (2021). Controlled environment agriculture and containerized food production in northern North America. *Journal of Agriculture, Food Systems, and Community Development*, 10(4), 1–16. <https://doi.org/10.5304/jafscd.2021.104.001>
- Worstell, J., & Green, J. (2017). Eight Qualities of Resilient Food Systems: Toward a Sustainability/Resilience Index. *Journal of Agriculture, Food Systems, and Community Development*, 1–19. <https://doi.org/10.5304/jafscd.2017.073.001>

Zeuli, K., & Nijhuis, A. (2017, January). *The Resilience of America's Urban Food Systems: Evidence from Five Cities*. The Initiative for a Competitive Inner City.
https://icic.org/wp-content/uploads/2017/01/ROCK_Resilient_Food_f2.pdf

Appendix A - Operator Survey and Interview Questions

Survey Questions

Demographic Information

1. Site location: Please enter the anonymous site code that you were provided.
2. What is your role at the urban agriculture site?
 - Owner/Operator
 - Staff member
 - Volunteer
 - Other, please specify
3. What is your race? Mark all the options that apply.
 - American Indian or Alaskan Native
 - Asian
 - Black or African American
 - Hispanic or Latino
 - Middle Eastern or North African
 - Native Hawaiian or other Pacific islander
 - White
4. What is your gender?
 - Male
 - Female
 - Other, please specify
 - Prefer not to say
5. What is your age?

6. What is the highest level of education you have completed? Mark one. (Less than a high school degree; High school diploma/GED; Some college; Undergraduate degree; Vocational/technical degree; Some post-graduate studies; Post-graduate degree)
7. What trainings, events, or courses have you completed related to urban agriculture or food systems? Select all that apply. (Extension/non-profit single-day workshop(s); Higher education degree program or certificate program; Attended a conference(s); Online class; Webinars; None; Other, please specify)
8. How many years have you been involved in production at any scale?
9. How many years of experience do you have producing food outside of home/personal gardening?
10. How many years of experience do you have producing food outside of home/personal gardening?

Survey Questions

11. How often do you follow what's going on in local government and public affairs? (1 Never; 2; 3 Sometimes; 4; 5 Always)
12. On a scale of 1 to 5, to what extent do you agree with this statement: "I consider myself well qualified to participate in the political process." (1 Strongly agree; 2; 3 Neutral; 4; 5 Strongly agree)
13. Have you advocated for urban agriculture-specific topics like zoning, farm-to-school programs, or land allocation? (No, never; Yes, but not in the past 12 months; Yes, within the past 12 months)

14. Have you participated in the following activities? (No, never; Yes, but not in the past 12 months; Yes, within the past 12 months)

- Discussed politics
- Voted
- Signed a petition
- Contributed money to a political cause
- Participated in a political meeting
- Worked for a political campaign
- Other political activity, please describe

15. Have you participated in the following activities? (No, never; Yes, but not in the past 12 months; Yes, within the past 12 months)

- Working with someone or some group to solve a problem in the community
- Being a member of a local club, community organization or institution (such as a church, softball league, chamber of commerce, etc.)
- Volunteering with a local nonpolitical group (such as a youth, health, or environmental group)

16. Overall, how much impact do you think people like you can have in making your community a better place to live? (1 No impact; 2; 3 Some impact; 4; 5 Big impact)

17. How secure do you feel about the land access for the urban agriculture site? (Very insecure; Somewhat insecure; Neither secure nor insecure; Somewhat secure; Very secure)

18. How often has the urban agriculture site engaged in the following activities? Maintained formal or informal links with urban entities such as: (Never; Yes, but not in the past 12 months; Yes, within the past 12 months)

- Water supply
- Food waste management
- Flood risk management
- Schools
- Parks and recreation
- Land bank
- Food bank or pantry
- Other, please describe

19. Has the urban agriculture site had difficulty attaining operatorship of land, following zoning laws, understanding current policies, or adapting to new policies? (Never; Yes, but not in the past 12 months; Yes, within the past 12 months)

20. Over the past year, how often did you talk with: (Basically every day; a few times a week; a few times a month; once a month; less than once a month; not at all)

- People within the organization
- Site neighbors
- Other organizations working in the food system, including farms, nonprofits, or governments

21. Over the past year, how often did you and your community do favors for each other? By favors, we mean such things as watching each other's children, lending garden or house

tools, and other small things to help each other. (Basically every day; a few times a week; a few times a month; once a month; less than once a month; not at all)

- People within the organization
- Site neighbors
- Other organizations working in the food system, including farms, nonprofits, or governments

22. We'd like to know how much you trust people. Generally speaking, would you say that you can trust all the people, most of the people, some of the people, or none of the people in the following categories? (All of the people; most of the people; some of the people; none of the people)

- People within the organization
- Site neighbors
- Other organizations working in the food system, including farms, nonprofits, or governments

Transformational Capacity

23. Please rate your level of agreement with the following statements. (1 Strongly disagree; 2; 3 Neither agree nor disagree; 4; 5 Strongly agree)

- If there is a drought, I just hope for the best
- Current approaches for dealing with present climate challenges will be sufficient for dealing with future climate challenges
- I do not really believe in long-term planning— things are too uncertain
- I like to experiment with new ways to farm
- Regardless of what happens, we have made sure that we are financially secure

- If needed, I am prepared to completely change the way I manage my property in order to survive as a farmer
- I feel confident enough to train others to grow food

24. How many new growers or gardeners are trained on the site each year?

Interview Questions

1. What are your top three motivating factors for being involved in urban agriculture?
2. Does the site maintain any formal collaborations or partnerships? Please describe the nature of these relationships.
 - a. Non-governmental organizations (NGOs)
 - b. Farmers or other growers
 - c. Public or government institutions
 - d. University/research projects or programs
3. Who would you consider your top 5 allies within the food system in your area?
4. Is the site part of a collective distribution or resource sharing network?
5. Please answer the following.
 - a. Does the site participate in formal or informal grower education?
 - b. Where does the site go for agricultural information?
 - c. Where does the site go for financial support? What, if any, are the site's funding sources?
6. How difficult is it for the site to find and keep labor? Please describe below.
 - ☐ Extremely difficult
 - ☐ Moderately difficult
 - ☐ Neither difficult nor easy

- ☐ Moderately easy
- ☐ Extremely easy

7. How would you describe the site's community outreach activities like education and social events? Please choose: Never; Yes, but not within the past 12 months; Yes, within the past 12 months. Please describe below.
8. During peak season, how many people interact with your site monthly?
9. To evaluate how consumers value food produced by urban agriculture, how do you rate consumer willingness to pay for food produced at your site?
- ☐ Not willing at all
 - ☐ Somewhat unwilling
 - ☐ Neither willing nor unwilling
 - ☐ Somewhat willing
 - ☐ Extremely willing
10. How strongly does the neighboring public support your site?
- ☐ They do not support it at all
 - ☐ They are somewhat unsupportive
 - ☐ They are neither supportive nor unsupportive
 - ☐ They are somewhat supportive
 - ☐ They are extremely supportive
11. What are the formal documents securing your access to the land?
- ☐ (0) the land is private with no formal agreement
 - ☐ (1) the land is public with no formal agreement

- ☐ (2) the land is private with a formal agreement
- ☐ (3) the land is public with a formal agreement

12. Who owns the land where your site is?

- ☐ (0) marketable land that can be used for other purposes (the land is subject of competition for other functions)
- ☐ (1): in between buildings (public or private land of residential/institutional areas)
- ☐ (2): transitional spaces (public or private land, e.g., construction sites; alongside railways)
- ☐ (3): leftover spaces (public areas that cannot be used for other purposes)

13. What are the competing land uses for the UA site?

14. Do you see the land use changing in the future for this site?

15. Please describe the channels used to distribute the goods produced by the UA site.

Appendix B - Site Participant Survey Questions

Demographic Information

1. Please enter the site code you were provided here.
2. What is your role at the urban agriculture site? Please select all that apply. (Staff member; volunteer; customer; training participant; workshop/event attendee; other, please specify)
3. What is your race? Mark all the options that apply. (American Indian or Alaskan Native; Asian; Black or African American; Hispanic or Latino; Middle Eastern or North African; Native Hawaiian or other Pacific Islander; White; Other, please specify)
4. What is your gender? (Male; female; other; prefer not to say; other, please specify)
5. What is your age? (years)
6. Which category best describes your yearly household income before taxes?

Include all income received from employment, social security, support from children or other family, welfare, Aid to Families with Dependent Children (AFDC), bank interest, retirement accounts, rental property, investments, etc. (Less than \$20,000; \$20,000-\$34,999; \$35,000-\$49,000; \$50,000-\$74,999; \$75,000-\$99,999; \$100,000 or more; Prefer not to say)

7. What is the highest level of education you have completed? Mark one. (Less than a high school degree; High school diploma/GED; Some college; Undergraduate degree; Vocational/technical degree; Some post-graduate studies; Post-graduate degree)
8. What trainings, events, or courses have you completed related to urban agriculture or food systems? Select all that apply. (Display if “staff member” or “volunteer” was selected as role)
 - a. Extension/non-profit single-day workshop(s)
 - b. Higher education degree program or certificate program

- c. Attended a conference(s)
 - d. Online class
 - e. Webinars
 - f. None
 - g. Other, please specify
9. How many years have you been involved in production at any scale?
10. How many years of experience do you have producing food outside of home/personal gardening?
11. How many years of experience do you have producing food outside of home/personal gardening?

Political Engagement

12. How often do you follow what's going on in local government and public affairs? (1 Never; 2; 3 Sometimes; 4; 5 Always)
13. On a scale of 1 to 5, to what extent do you agree with this statement: "I consider myself well qualified to participate in the political process." (1 Strongly disagree; 2; 3 Neutral; 4; 5 Strongly agree)
14. Have you advocated for urban agriculture-specific topics like zoning, farm-to-school programs, or land allocation? (No, never; Yes, but not in the past 12 months; Yes, in the past 12 months)
15. Have you participated in the following activities? (No, never; Yes, but not in the past 12 months; Yes, within the past 12 months)
- a. Discussed politics
 - b. Voted

- c. Signed a petition
- d. Contributed money to a political cause
- e. Participated in a political meeting
- f. Worked for a political campaign
- g. Other political activity, please describe

Political Engagement

16. Have you participated in the following activities? (No, never; Yes, but not in the past 12 months; Yes, within the past 12 months)

- a. Working with someone or some group to solve a problem in the community
- b. Being a member of a local club, community organization or institution (such as a church, softball league, chamber of commerce, etc.)
- c. Volunteering with a local nonpolitical group (such as a youth, health, or environmental group)

17. Overall, how much impact do you think people like you can have in making your community a better place to live? (1 No impact; 2; 3 Some impact; 4; 5 Big impact)

18. Over the past year, how often did you talk with: (Basically every day; a few times a week; a few times a month; once a month; less than once a month; not at all)

- a. People within the organization
- b. Site neighbors
- c. Other organizations working in the food system, including farms, nonprofits, or governments

19. Over the past year, how often did you and your community do favors for each other? By favors, we mean such things as watching each other's children, lending garden or house

tools, and other small things to help each other. (Basically every day; a few times a week; a few times a month; once a month; less than once a month; not at all)

- a. People within the organization
- b. Site neighbors
- c. Other organizations working in the food system, including farms, nonprofits, or governments

20. We'd like to know how much you trust people. Generally speaking, would you say that you can trust all the people, most of the people, some of the people, or none of the people in the following categories? (All of the people; most of the people; some of the people; none of the people)

- a. People within the organization
- b. Site neighbors
- c. Other organizations working in the food system, including farms, nonprofits, or governments

21. What are your top 3 motivating factors for being involved in urban agriculture?

22. Who would you consider your top 5 allies within the food system in your area? By allies, we mean any food system entity you've been involved with, such as farms, organizations, or governments, whose goals generally align with your own.