8-2017

Exploring the Empirical Relationship between Civic Agriculture and Community Resilience

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Exploring the Empirical Relationship between Civic Agriculture and Community Resilience

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy in Environmental Dynamics

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August 2017
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Abstract

Smaller-scale, qualitative and mixed method studies indicate that civic agriculture generates positive, local-level social change, specifically by increasing social, human and economic capital. These social benefits are also identified as some of the crucial components needed for community resilience to disasters. However, literature directly linking civic agriculture to community resilience is sparse and there is little if any research explicitly examining a relationship between civic agriculture and community resilience. This study lends national scope and an empirical examination of evidence for a positive relationship between civic agriculture and community resilience along the applicable domains of social, human and economic capital using the county unit of analysis.

Acknowledgments

I especially thank my husband, as well as, my dearest friends and extended family, who encouraged me tirelessly through this process. Without their love and support, I would never have completed this PhD.

Dedication

I dedicate this dissertation to my son, Samual Tao Pollock, who, along with his peers, will face formidable odds and the need to forge a new human culture devoted to the love of community, the preservation of nature, and a collective mind for resilience.

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Executive Summary

Community resilience has become the new paradigm for disaster preparedness, response and recovery (Norris, Stevens, Pfefferbaum, Wyche, & Pfefferbaum, 2007) and in the face of growing numbers of disasters and increasing severity, community resilience has become a national priority (National Research Council, 2012). A literature review revealed that civic agriculture or local, small-scale agriculture, might contribute to established domains of community resilience, but little empirical research directly links civic agriculture initiatives to community resilience indicators. For instance, no established measure of civic agriculture access exists for communities. This dissertation research will provide such a measure, which will be useful to establish baseline data, provide a variable for comparison, and allow correlation studies with other community indicators pertinent to community resilience. Examining the relationship between civic agriculture and community resilience will be of broad interest to numerous scientific disciplines including sociologists, community developers, public-policy experts, community-resilience and disaster-management researchers, and civic-agriculture experts.

Through mostly qualitative research, civic agriculture has improved community capitals (Draper & Freedman, 2010; Kiptot & Franzel, 2013; Santo, Palmer, & Kim, 2016), established in prior literature as domains of community resilience (Chandra et al., 2013; Norris et al., 2007; B. Pfefferbaum, Van Horn, & Pfefferbaum, 2015; Renschler et al., 2010; Twigg, 2009). This dissertation research measures civic agriculture access at the county level of analysis for the contiguous United States and quantitatively examines the relationship between civic agriculture access and established domains of community resilience, namely social, human, and economic capital.

CHAPTER 1

Introduction

Disaster damages and associated costs are on the rise worldwide (Intergovernmental Panel on Climate Change [IPCC], 2012; O'Brien, O'Keefe, Rose, & Wisner, 2006; United Nations, 2015; World Bank & United Nations, 2010). According to the United Nations International Strategy for Disaster Reduction (UNISDR, 2015), economic damages from natural disasters ranged from $34 to $356 billion between 2005 and 2014, with 1.7 billion lives impacted worldwide during that same period. Between 2005 and 2014, China had the greatest number of disasters, whereas the United States had the largest economic damages (UNISDR, 2015). Climate-related disasters are especially on the rise and this trend is expected to continue (IPCC, 2014; Pachauri & Meyer, 2014). According to the UNISDR (2015), 86% of worldwide disasters were climate related between 1994 and 2014. The concept of community resilience has largely emerged as a response to the increasing frequency and severity of worldwide disasters.

Since 2001, community resilience has gained recognition as a multidimensional process with outcomes that not only prepare communities for disaster, but also improve a community's ability to withstand shocks and mitigate disaster impact (Norris et al., 2007). Between 2011 and 2016, the Boolean phrase "community resilience," generated 981 scholarly hits in the EPSCO*host* database and the Boolean phrase "community disaster resilience" generated 27 in the same database. Between 2001 and 2010, the Boolean phrase "community resilience" generated only 422 scholarly hits. The same search conducted for 1999 and for 2010 revealed a 99% increase in the scholarly literature referencing community resilience, with all of the increase occurring since 2001.

Interest in civic agriculture or small-scale, local production (Lyson, 2004), is also on the rise and has been identified as a social movement (Furman, Roncoli, Nelson, & Hoogenboom, 2013). The following statistics provide evidence for this increase: a 180% increase in farmers' markets from 2006–2014; a 288% increase, during the same period, in food hubs (which aggregate local foods in one location for sale); a 91% increase in community-supported-agriculture (CSA) operations (in which individuals pledge financial support to a farm operation and shares of produce are sold) from 2005 to 2012 (Low et al., 2015); and a 430% increase in farm-to-school programs from 2006 to 2014 (Low et al., 2015).

The U.S. Department of Agriculture (USDA) indirectly monitors civic agriculture trends, referenced as "local and regional food systems," which they define as "place-specific clusters of agricultural producers of all kinds—farmers, ranchers, fishers—along with consumers and institutions engaged in producing, processing, distributing, and selling foods" (as cited in Low et al., 2015, p. 1). Another type of civic agriculture initiative is community gardens, which show a similar increase. Community gardens are not monitored by the USDA, but according to the American Community Gardening Association (ACGA) survey, 87% of ACGA member organizations reported a 64% average increase in community gardens from 2007 to 2011 (Lawson, Drake, & The American Community Gardening Association, 2013). Civic-agriculture initiatives are growing, but still only contribute a small fraction of U.S. agricultural production. For instance, in 2012 the number of farms marketing foods locally only accounted for 7.8% of total farms (Low et al., 2015).

Although increased interest in the community-resilience paradigm and civic agriculture may not directly relate, some extant literature suggests that civic agriculture may indirectly contribute to a community's resilience. Following a review of the literature about civic

agriculture and community resilience, this dissertation lends a quantitative model that examines whether a positive relationship exists between civic agriculture and applicable domains of community resilience.

Background and Research Question

The late sociologist, Lyson (2004), coined the term *civic agriculture*, describing small-scale and local agriculture activities rooted in place with hopes of positive social and economic community outcomes. Civic agriculture includes, but is not limited to community gardens, urban farms, community supported agriculture, farmers' markets and locally-grown, agriculture road side stands. Historically civic-agriculture initiatives spike during times of socioeconomic disturbance, as happened in the United States and Europe after both World Wars and in the United States after the Great Depression. Civic-agriculture initiatives also increased in the early 1970s, when food prices escalated, and with the recent recession of 2008–2009 (Barthel, Parker, & Ernston, 2013). "Recession gardens" is a common reference to the recent rise in civic-agriculture initiatives (Draper & Freedman, 2010). One example of civic agriculture is Tri Cycle Farms in Fayetteville, Arkansas, which identifies as "a community urban farm working to address food insecurity by growing food and teaching other to grow food," as described on the organization's website and goes on to describe the impetus for founding the organization as a neighbor's food insecurity and the "lingering" impact of the 2008 recession (Tri Cycle Farms, "About us," n.d.).

According to mostly small-scale qualitative studies, civic agriculture enhances social, human, natural, and economic capital in communities (Draper & Freedman, 2010; Furman et al., 2013; Kiptot & Franzel, 2013; Marquis, 2013; Meenar, 2015; Poulsen et al., 2014). Social, human, natural, and economic capital are domains of community resilience (Chandra et al.,

2013; Norris et al., 2007; B. Pfefferbaum et al., 2015; Renschler et al., 2010; Twigg, 2009). However, quantitative research to examine a potential relationship between civic agriculture and community resilience is minimal at best. This study will begin to fill this gap by examining if a positive relationship exists between civic agriculture and social, human, and economic capital using publicly available data at the county unit of analysis. Despite some evidence that civic agriculture also contributes to the development of natural capital, another domain of community resilience, this dissertation does not include examination of the relationship between civic agriculture and natural capital. Currently, too little data is available to measure a natural capital indicator at the county unit of analysis. Therefore, the research question for this dissertation study is, "Does civic agriculture indirectly increase community resilience across three applicable domains: social, human and economic capital?"

Problem Statement and Purpose

The purpose of this study is to examine if empirical support exists for civic agriculture as an approach to building community resilience. This study will result in a measure for civic-agriculture access (CAA) at the county unit of analysis for the contiguous United States. Such data will be useful for a variety of research purposes, such as determining where civic-agriculture incidence is high or low, establishing a baseline for future civic-agriculture and community-resilience research, and correlating civic agriculture with a variety of possible community outcomes it may influence.

The community-resilience field is interdisciplinary, with experts of varied backgrounds and disciplines including policymakers, municipal managers, emergency managers, natural-resource managers, sociologists, community developers, and researchers of varying expertise (Kapucu, Hawkins, & Rivera, 2013b). Numerous scientific disciplines, funders, and

policymakers are interested in how to build community resilience to disasters (Kapucu et al., 2013b). For example, municipal leaders seek cost-effective measures to build community resilience through policy for implementation at the community level (Thayer, Rider, & Lerch, 2013). Civic agriculture may be just such a measure. Examining the relationship between civic agriculture and community resilience will be of interest to a broad stakeholder base including disciplines interested in building community resilience, as well as those interested in community applications of civic agriculture. Most critically, this research will contribute knowledge to the societal goal of increasing community resilience. Figure 1 illustrates the conceptual basis of this dissertation. Figure 1 provides an a priori model of how civic agriculture indirectly increases community resilience by contributing to the community-resilience domains of social, human, and economic capital.

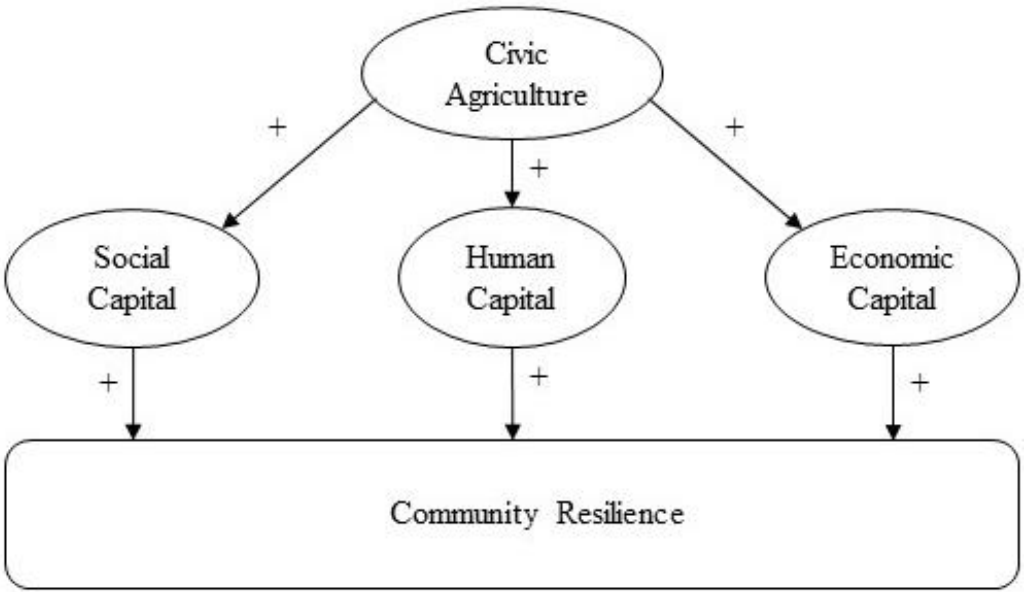

Figure 1. Conceptual basis of the dissertation.

CHAPTER 2

Literature Review

Lyson (2004) postulated that small-scale, locally oriented agriculture has significant social, ecological, and economic societal benefits at the community level. Examples of civic agriculture include community gardens (including school and church gardens, and regardless if the garden is allotment or shared), farmers' markets, direct to consumer sales from farms, roadside markets, CSAs, and others (Lyson, 2004).

The theoretical origins of the civic-agriculture concept take a middle-range development approach that Lyson (2004) used as an empirical basis to develop an explanatory concept for social phenomena that can be empirically tested (Merton, 1968). Two sociological studies commissioned by Congress after World War II influenced the civic-agriculture concept. These studies revealed social differences between communities economically dependent on small, locally owned businesses versus communities more economically dependent on large corporate entities with nonlocal leadership (Lyson, 2004, 2006). The small-business communities (agriculture or otherwise) had stronger civic engagement, higher quality of life, and a deeper commitment to the community of place than those dependent on outside corporate leadership. In *Civic Agriculture, Reconnecting Farm, Food, and Community*, Lyson's (2004) seminal work on civic agriculture, he also credits pragmatism for the theoretical societal benefit of civic agriculture. Pragmatism focuses on the outcomes of practical action and is the basis for symbolic interactionism (Barbalet, 2009). Symbolic interactionism is the theory that the derivation of human behavior is the symbolic meaning ascribed to surroundings, and that this meaning develops and changes through social interaction (McIntyre, 2014).

One of the aforementioned studies, conducted by anthropologist Goldschmidt, specifically compared two California agriculture communities. The two communities had comparable population size, value systems, and customs, but differed in the size and scale of agriculture operations: one had significantly larger farms than the other did (as cited in Lyson, 2004). The community with smaller scale agriculture had better social services, community loyalty, community engagement, social integration, retail trade, and population stability (Lyson, 2004).

Additional literature supported Lyson's civic-agriculture theory, especially with regard to four community capitals (Draper & Freedman, 2010; Furman et al., 2013; Meenar, 2015; Okvat & Zautra, 2011; Santo et al., 2016), identified as domains of community resilience. However, a literature review revealed only three publications that specifically mentioned civic agriculture as a contributor to community resilience, and they were theoretical in nature (Barthel et al., 2013; Barthel, Parker, Folke, & Colding, 2013; King, 2008; Okvat & Zautra, 2011). A recent Johns Hopkins University review of the benefits and limitations of urban agriculture indicated a possible connection to ecological and community resilience (Santo et al., 2016).

Nevertheless, research indicates that civic agriculture positively contributes to community capitals identified as domains of community resilience in the community-resilience literature. Twelve reviewed studies supported a relationship between civic agriculture and social capital: four studies supported a positive relationship between civic agriculture and human capital; two studies supported a positive relationship between civic agriculture and natural capital; and five studies supported a positive relationship between civic agriculture and economic capital. An additional 16 theoretical or review articles described a relationship between civic agriculture and the aforementioned capitals. The majority of research studies are case studies, the

remaining use a variety of techniques including quantitative, qualitative, and mixed methods, but no studies explicitly examined a relationship between civic agriculture and community resilience, and none were national in scope.

Civic agriculture represents a potential approach to building community resilience, especially because it may enhance multiple community-resilience domains: social, human, economic, and natural capitals. Natural capital is not included in this review because too little data examines the relationship between civic agriculture and natural capital at the national level. Small-scale extant research implied that an empirical examination of the relationship between civic agriculture and natural capital should be pursued in the future, as the data allow (Barthel, Parker & Ernston, 2013; Furman et al., 2013; King, 2008; McIlvaine-Newsad & Porter, 2013; Okvat & Zautra, 2011).

Manifestations of Civic Agriculture

Lyson (2005) indicated that civic agriculture manifests as initiatives distinguished from conventional commodity agriculture. As such, civic agriculture is local, small-scale, and unmechanized (Lyson, 2004). Examples of civic agriculture include community and school gardens, food hubs, farmers' markets, CSA operations, on-farm and off-farm small-scale processors, and small-scale specialty producers (Lyson, 2005).

Placing civic agriculture. Lyson (2004) credited civic agriculture with positive social, economic, and potentially ecological outcomes, contrasted with commodity, large-scale agriculture-production models. Civic agriculture is a conceptual framework for understanding alternative food systems to commodity agriculture, considering the sociology of agriculture and community sociological theory (Marquis, 2013). According to Lyson (2004), civic agriculture contributes to a sense of place, strengthens social capital, and encourages civic engagement.

When compared to commodity agriculture, Lyson (2004) also credited civic agriculture with having more consideration for environmental conservation and sustainability. Lyson (2004) indicated that the differences in ecological sensitivity between civic and commodity agriculture stemmed from differences in the ways the two types of agriculture view the use of biology. Commodity agriculture uses experimental biology to achieve high-production outputs, whereas ecological biology informs civic agriculture with practices more harmonious to the natural ecology of a place (Lyson, 2004).

Civic agriculture is especially distinguished from commodity agriculture by the latter's aims to maximize production and profits (Allen, 2004). Commodity agriculture has led to more centralized production, globalized market structures, and the development of a food system dependent on larger but fewer farms nationally (Allen, 2004; Lyson, 2004; Lyson, Torres, & Welsh, 2001). Notably, civic agriculture does seem to concentrate in and around metropolitan areas likely with consideration for profit on the part of civic agriculture farmers (Lyson & Guptill, 2004). Nevertheless, unlike civic agriculture, commodity agriculture is associated with deleterious community impacts including reductions in social capital, decreased community knowledge about food sources and traditional production methods, and ecological degradation (Kaiser, 2011; Patel, 2007, 2011).

Civic agriculture is a term well situated in alternative agrifood-system discourse and is difficult to differentiate from the "local food movement," sustainable agriculture, and the community food-security movement. Lyson (2004) suggested that this idea of civic agriculture aligns well with Beus and Dunlap's (1990) findings describing "sustainable agriculture" as more in harmony with nature, promoting biological and disciplinary diversity, and preserving of community when compared with commodity agriculture. Civic agriculture has even more

emphasis on community-based production, entrepreneurship, and community identity than how sustainable agriculture is typically described (Lyson, 2004).

Perhaps civic agriculture represents a merging of the two food-justice movements. Allen (2004) identified these two food-justice movements as sustainable agriculture and community food security. The environmental movement and community development each influenced the development of sustainable agriculture, which represent agricultural methods seeking harmony among the environment, community needs, and the economy. The community-food-security movement is most concerned with increasing local food security (Allen, 2004). The merging of these two movements has been dubbed the local food movement. The Food, Conservation, and Energy act of 2008 indicated that local or regional food, by definition, will travel less than 400 miles or within the state it was produced (Clark et al., 2010). Civic agriculture may not be strictly synonymous with the local-food movement. Lyson (2004) suggested that civic agriculture occurs in a close-knit, *community of place*, which may imply much less travel than even 400 miles. Civic agriculture may best represent the place-based community manifestations of the local food movement, which is more broadly a *community of interest.*

Civic agriculture as community development. Civic agriculture theoretically aligns well with self-help community development (Marquis, 2013; Wilkinson, 1972). Like the self-help model of community development, those engaged in civic agriculture are people acting locally with the goal of benefiting the local community. People engaged in civic agriculture recognize the importance of community bonds toward meeting community goals, problem solving, and strengthening self-reliance for personal as well as community benefit (Marquis, 2013; Wilkinson, 1972).

Manifestations of civic agriculture occur in urban, rural, and periurban areas (Koc, MacRae, Mougeot, & Welch, 1999). The American Community Gardening Association Greening Review (Lawson et al., 2013) revealed that, although the majority of community gardens (a type of civic agriculture) appears to occur in urban areas, community gardens are increasing in periurban and rural areas as well (Lawson et al., 2013). More research is needed to determine how and why civic agriculture may manifest differently in rural and urban settings. Civic agriculture has a long history in urban-renewal efforts (Koc et al., 1999; Lawson, 2005). Civic agriculture also has great potential for rural development and revitalization, evidenced by programs sponsored by the USDA such as Leveraging Investment for Network Coordination ("Food LINC"). Food LINC is a program offering financial and technical assistance to boost farm sales and the local food sector in rural and urban areas in conjunction with USDA Rural Development (USDA, 2016). The proposed study will examine the amount of civic agriculture access in urban, rural, and communities adjacent to urban centers.

Knowing the historical and social context of civic agriculture is important to understanding how it may relate to community resilience. This study will explore the possibility that the claims of civic agriculture, if valid, may have application for building community resilience. Civic agriculture encourages civic thought and behavior by engaging community members to exercise their own agency (Lyson, 2004; Lyson et al., 2001). Lyson (2004) viewed civic agriculture as a social movement that could lead to systemic social, economic, and ecological change, naming "community problem-solving" as the foundation of civic agriculture (Lyson, 2004, p. 64).

Community Resilience

Although researchers debate definitions of community resilience, community resilience generally refers to attributes, processes, and outcomes that bolster a community's ability to withstand systemic shock or disaster, regain equilibrium, and sometimes develop new capacities (Cutter, Ash, & Emrich, 2014; Norris et al., 2007; R. L. Pfefferbaum, Neas, Pfefferbaum, Norris, & Van Horn, 2013; Tierney, 2007). Authors give much attention to the resilience of communities after a disaster, but also on how to measure (Birkmann, 2006; Cutter, Burton, & Emrich, 2010; Leykin, Lahad, Cohen, Goldberg, & Aharonson-Daniel, 2013; B. Pfefferbaum et al., 2015; Renschler et al., 2010) and build (Abramson et al., 2014; Kafle, 2011; Mayunga, 2007; B. Pfefferbaum, Pfefferbaum, & Van Horn, 2014; B. Pfefferbaum et al., 2015; Wells et al., 2013) community resilience before a disturbance or disaster.

Communities with more robust community capitals exhibit more resilience to disturbances (Abramson et al., 2014; Chandra et al., 2011; Cutter et al., 2014; Mayunga, 2007; Norris et al., 2007; B. Pfefferbaum et al., 2015) and civic agriculture increases social, human, and economic community capitals in mostly small-scale studies (Draper & Freedman, 2010; Furman et al., 2013; King, 2008; Okvat & Zautra, 2011). Members of various disciplines have proposed diverse initiatives to build community resilience (Abramson et al., 2014; Chandra et al., 2013; Colten, Grismore, & Simms, 2015; McCabe et al., 2014; B. Pfefferbaum et al., 2014; Slack & McEwen, 2013; Wells et al., 2013), but none have explicitly included civic agriculture as part of the community-resilience-building strategy. Civic agriculture deserves more scrutiny as a potentially effective approach to build community resilience.

The evolution of community resilience. The *Hyogo Framework for Action* was established in 2005 by the United Nations Office for disaster-risk reduction (DRR) as a 10-year

plan, in part, "to share good practices and lessons learned to further disaster reduction within the context of attaining sustainable development, and to identify gaps and challenges" (UNISDR, 2005, p. 3). The framework document has a subtitle of "Building the Resilience of Nations and Communities to Disaster." Likewise, the National Research Council (2012) identified disaster resilience as a national imperative and the United States has adopted an "all hazards approach," made official by the Post-Katrina Management Reform Act of 2006 (Post-Katrina, 2006). The Act makes clear the need to reduce the impact of disasters on the nation and its communities by enhancing resilience (National Research Council, 2012). Former President Obama issued two executive orders regarding resilience. The first one, issued October 5, 2009 (Exec. Order No. 13,653, 2013) ordered all federal agencies to develop resiliency plans, especially in preparation for the impacts of climate change. The second one on September 23, 2014 specifically ordered the integration of "climate-resilience" strategies into all U.S. international-development initiatives (Exec. Order No. 13,677, 2014).

The idea of community resilience predominantly evolved from ecological resilience theory, but psychosocial concepts of individual and family resilience (Knowles, Sasser, & Garrison, 2009; Norris et al., 2007) also influence the concept. Holling introduced *resilience* in 1973 to conceptualize how ecological systems respond to disturbance (Gunderson, 2000; Holling, 1973). Despite a lack of agreement regarding the nuances of ecological resilience, the theory has proven useful for conceptualizing how systems behave under stress or when impacted by an acute disturbance.

***Ecological systems*.** Resilience theory draws from systems theory (Gunderson, 2000), seen in Holling's (1973) definition of resilience as "the amount of disturbance an ecosystem can withstand without changing self-organized processes and structures," (p. 3). In Holling's seminal

work, *Resilience and Stability of Ecological Systems*, an example of a fresh-water ecosystem specifically references a lake that experienced eutrophication after the development of the Roman Highway Via Cassia around 171 BC. Holling noted that the ecosystem at first remained essentially intact, despite the disturbance, but eventually the whole system succumbed to radical change. Ecological-resilience theory holds the tenet of equilibrium, or a system's tendency to self-regulate to a steady state despite perturbation (Gunderson, 2000). Debates in the literature regarding ecological resilience include comparing equilibrium to transformation and resistance to change (Gunderson, 2000).

Socioecological systems. Gunderson (2000) introduced the concept of *adaptive capacity,* to ecology, now used often to describe a quality of human communities to accommodate the dynamic and variable nature of ecosystems, especially when responding to "human-induced state changes" (p. 428). Gunderson illustrated how humans alter the resilience of different types of ecosystems including shallow lakes, wetlands, and semiarid rangelands. In each example, Gunderson discussed trophic relationships, dominant species, and climatic considerations. The socioecological-resilience literature aims to improve natural-resource management (Gunderson, 2000).

The fields of natural-resource management, human geography, rural sociology, and community psychology contributed to the construct of resilience as a trait or process, not only recognized in ecological systems, but also in human-community systems (Adger, 2000; Berkes & Folke, 1998; Norris et al., 2007). An integrated view of resilience emerged in the literature developed by those in the ecological and sociological fields, acknowledging that humans and ecosystems are in a relationship that is "interdependent and coevolving" (Berkes & Ross, 2013, p. 14), creating a socioecological system (Folke, 2006).

***Community systems*.** Not long before Gunderson (2000) wrote of ecological resilience and natural-resource management, the use of the term resilience had entered the field of emergency management (McEntire, 2005). The concept of communities as resilient to disasters seemed to satisfy criticisms of the then common use of the term disaster resistance. Resistance seemed to imply that humans could prevent disaster, drawing focus from response and recovery, which was untenable to the emergency-management field and pragmatically unrealistic because arguably, not all disasters are preventable. Resilience seemed a concept capable of embodying preparedness, response, and recovery without losing the optimism of resistance (McEntire, 2005).

Although acknowledging controversy with the use of the term resilience, Norris et al. (2007) averred that resilience is useful metaphorically and theoretically when applied to communities for bolstering disaster readiness and response. Norris et al. explored multiple definitions of resilience from the literature of numerous sciences and developed the following definition of community resilience: "A process linking a set of adaptive capacities to a positive trajectory of functioning and adaptation after a disturbance" (2007, p. 130).

The Community & Regional Resilience Institute (CARRI) released the report entitled, *Definitions of Community Resilience: An Analysis, 2013*, that provided a synopsis of how resilience, is used across scientific disciplines including psychological, physical, ecological, economic, and community fields. Whereas Norris et al. (2007) emphasized the usefulness of viewing community resilience as a process, the CARRI report (Cutter, Burton, & Emrich, 2013) detailed the relevance of viewing resilience as a community attribute or outcome, which are two different ways scholars used the term in the literature (Cutter et al., 2013). The CARRI report argued that viewing resilience as an attribute recognizes resilience as a factor that can be increased prior to a disturbance. As a result of the review, CARRI developed a definition of

community resilience: “Community resilience is the capability to anticipate risk, limit impact, and bounce back rapidly through survival, adaptability, evolution, and growth in the face of turbulent change” (as cited in Cutter et al., 2013, p. 10). This discourse seems to suggest that effective community-resilience-building *processes* increase the community-resilience *attribute* by enhancing established domains of community resilience.

Related constructs: Disaster, vulnerability and adaptive capacity. The United Nations Office for Disaster Risk Reduction (2009) indicates that disasters are serious disruptions from a hazardous event, which can be immediate or last for a long period, and most critically, the event exceeds the capacity of a community to cope without outside resources or assistance. Assessing baseline levels of community resilience is an important step toward better understanding which factors in a community need attention to reduce vulnerability and disaster risk. An assessment allows for building more strategic community resilience in advance of a disaster.

Though often thought of as an acute event, *disaster* is largely a social construction in that anthropogenic factors often turn an extreme weather event into an actual disaster for vulnerable populations (Tierney, 2007). Protracted occurrences like droughts, oil spills, and the impacts of the levee damage after hurricane Katrina have had much more devastating impacts economically, psychologically, and to physical health than acute events (Colten et al., 2015; Tierney, 2007). Furthermore, formal disaster declarations are usually not made in the United States unless sufficient real estate or infrastructure damage occurs, regardless of the number of injuries or lives lost (Tierney, 2007).

Some groups are more vulnerable than others to negative outcomes from disaster events, largely due to having less education or income, being isolated, or having chronic mental or physical illness (Chandra et al., 2011). Assessing vulnerability is a critical component of

assessing for risk when beginning the community-resilience planning process (O'Brien et al., 2006). Ideally vulnerability assessments should also include exposure to impacts (IPCC, 2012) and human capital internal to a social system, such as prior disaster experience that can enhance resilience due to learned coping skills (Knowles et al., 2009; Mayunga, 2007). McEntire (2005) further recommended that vulnerability is best perceived in broad terms without only focusing on those in society generally considered more vulnerable, such as those living in poverty or marginalized. If stakeholders thoroughly assess vulnerability by community, they avoid oversimplification and can better target limited resources toward variables that most need change. Food insecurity is a vulnerability in disaster situations; programs to improve food security in advance of disaster are recognized methods of building resilience (Food and Agriculture Organization of the United Nations, 2016). Thus, including civic-agriculture initiatives in an overall community-resilience plan could be sensible, depending on the community and its particular vulnerabilities.

Adaptive capacities are resources across the community-capital domains that enable community resilience in the face of disturbance, perturbation, or disaster. These capacities include not only tangible resources found in economic, natural, and physical-capital domains, but intangible resources found in the social- and human-capital domains, such as community social bonds and competence (Norris et al., 2007). The development of adaptive capacities across the community-capital domains is at the heart of community resilience, which in turn reduces disaster risk, mitigates vulnerability, and better prepares communities for response and recovery following disaster.

More developed countries tend to have more economic losses during disasters, whereas less developed countries have more loss of life from disasters (IPCC, 2012; O'Brien, O'Keefe,

Rose, & Wisner, 2006). Because of the propensity for loss of life, less developed nations are considered more vulnerable to climate change and less able to adapt than more developed nations, which have more economic capital (IPCC, 2012). The IPCC (2012) approach to DRR includes (a) reducing exposure and vulnerability, (b) increasing resilience to changing risks, and (c) mitigating and adapting to climate change as complementary tactics to reduce the adverse impacts and risks of climate change. The global food system is vulnerable to climate change impacts and support for civic-agriculture initiatives may be one effective strategy in a localized community-resilience plan.

Community-resilience controversies. The community-resilience construct is not without controversy and has received criticism from the fields of political science, sociology, anthropology, and others. The concept and the operationalization of community resilience have received criticism in the UK as forms of "governmentality," neoliberalism, and community disempowerment under a guise of empowerment (Bulley, 2013; Rogers, 2013). The potential exists for positive outcomes from community-resilience initiatives, especially if they truly engage the public in participatory governance, but states must be careful not to use community resilience to produce state centric rhetoric that unfairly places the burden of DRR on the public and exercises oppressive behavioral controls through law-enforcement officers and government officials (Bulley, 2013; Rogers, 2013).

Different disciplines have different understandings of *community* (Barrios, 2014), heralding the importance of defining community when determining research methods, resilience approaches, and initiatives. Communities may be geographically or socially bound entities and although they may socially coalesce in a general geographic boundary, they may not (Bates & Bacon, 1972). For example, a geographic border does not bind faith traditions, linguistic, and

culturally connected communities with networks through a large geographic range (Flora, Flora, & Gasteyer, 2016). Additionally, communities are not static and often require mobilization and evacuation after a disaster (Barrios, 2014). Socially bonded communities may be in a city, county, or neighborhood, but they are still dynamic and regularly experience change (Barrios, 2014). Relationships outside the geographic boundary of a city, especially in today's more globalized economy and society, can also enhance or diminish community capacities.

Proponents of resilience thinking have also been accused of (a) disciplinary imperialism or an attempt at unified theory that transcends theories from different disciplines, (b) relying on outdated sociological thinking, and (c) being counterproductive to interdisciplinary collaboration for environmentally and socially integrated problem solving (Olsson, Jerneck, Thoren, Persson, & O'Byrne, 2015). Certainly community resilience is itself a social construct, but that does not mean it lacks merit. Community resilience is a useful concept for encapsulating community variables, which are mutable to decrease vulnerability, reduce disaster risk, and improve readiness so communities better withstand disturbances and rebuild stronger (Norris et al., 2007).

Notwithstanding the need to ensure equitable community-resilience policy, the claims of counterproductivity toward interdisciplinary problem solving seem far-reaching. That is, the community-resilience construct appears to encourage interdisciplinary collaboration, not hinder it. Many interdisciplinary approaches to increase community resilience appear to have promise, such as, the Rockefeller 100 Resilient Cities Challenge (n.d.) and the U.S. Climate Resilience Toolkit (n.d.). The Rockefeller 100 Resilient Cities Challenge provides resources to increase the resilience of selected cities worldwide. The U.S. Climate Resilience Toolkit, developed by a team of partners led by the National Oceanic and Atmospheric Administration, aimed to provide decision support resources to the U.S. federal government, but eventually to "state and local

governments, businesses, and academia and other non-governmental organizations" as the initiative expands (U.S. Climate Resilience Toolkit, n.d., para 16).

Given the problem of exacerbating climate change and the complexity of communities, finding common ground in the community-resilience construct will be integral to the interdisciplinary approaches needed. For example, local government professionals and stakeholders may not always agree on whether climate-change adaptation should be a budgetary measure. However, most can agree that resilience-planning measures to reduce disaster risk are sensible priorities.

Community-resilience assessment. Measuring and assessing community resilience is not a standardized process. Researchers from various theoretical backgrounds and disciplines have proposed unique instruments to establish baseline levels of resilience in a community. Most are in the form of an index measuring indicators from interrelated domains of community resilience. Indicators provide a benchmark for the state of complex systems because they derive from observed or verified quantitative or qualitative facts about the community in question (Cutter et al., 2010; Freudenberg, 2003). Another type of assessment used to measure community resilience is perception surveys that examine community perceptions of factors that can contribute to resilience, as well as vulnerabilities perceived in the respective community (Leykin et al., 2013; R. L. Pfefferbaum, Pfefferbaum, Nitiema, Houston, & Van Horn, 2015).

Some community-resilience-assessment instruments are more comprehensive than others. The different instruments have considerable overlap, but distinct differences as well. Some instruments establish community resilience baseline levels across community capitals or community-resilience domains. Others are broad frameworks that simply provide considerations for community-resilience assessment. For instance, the Baseline Resilience Indicators for

Communities (BRIC; Cutter, Ash, & Emrich, 2016; Cutter et al., 2010) addresses six of the community capitals or community-resilience domains. The two perception-based instruments—the Communities Advancing Resilience Toolkit (R. L. Pfefferbaum et al., 2013) and the Conjoint Community Resiliency Assessment Measure (Leykin et al., 2013)—only address three of the community capitals.

The geography of community resilience. This study seeks to examine the relationship between civic agriculture and community resilience in rural and urban settings and, thus, necessitates review of differences identified in the extant literature on rural and urban community resilience. The majority of community-resilience programs, initiatives, and assessment instruments focus on urban settings or were designed in collaboration with urban leaders (Cutter et al., 2016; Kapucu, Hawkins, & Rivera, 2013a). However, extant literature indicates that contributing factors to community resilience differ between rural and urban settings (Kapucu et al., 2013a). Although civic agriculture has historically concentrated in and near metropolitan areas (Lyson & Guptill, 2004), theoretically, civic agriculture could have benefits in both urban and rural settings. Civic agriculture may also benefit rural and urban areas in different ways. For instance, civic agriculture has a history in urban renewal efforts (Garrett & Leeds, 2014) and may have unique ecological benefits by managing storm water in urban areas, which are vulnerable to flooding due to higher levels of impermeable surfaces than rural areas (Barthel & Isendahl, 2012). U.S. government funding and initiatives is recently directed toward boosting local food systems for both urban and rural economic development (Environmental Protection Agency, 2016).

Urban areas have received more attention in community resilience discourse and research, but the resilience concept may offer fresh perspectives and alternative policy options for rural

development (Scott, 2013). Rural areas have less economic diversification and financial resources for mitigation actions before a disaster and for rebuilding efforts (Janssen, 2006). Urban and rural areas have different types of communication networks and administrative support from government agencies and jurisdictions. Rural areas are more likely to have inadequate communication networks unless robust linkages have been made between community leaders, government agencies, and nonprofit organizations and, in applicable cases, nearby urban areas, prior to a disaster (Janssen, 2006).

Building rural-community capacity in advance of a disaster improves rural resilience (Kapucu et al., 2013a; Norris et al., 2007). Community capacity comprises social capital, problem-solving strategies, skills, flexibility, effective information flows, a fair distribution of economic resources (Kapucu et al., 2013b). Robustness, redundancy, rapidity, and resourcefulness (Bruneau et al., 2003) have been identified as key to community resilience. Robustness is the ability to withstand stress (Norris et al., 2007). Redundancy means an alternative resource is available when first-level resources are damaged (Bruneau et al., 2003). Rapidity means achieving goals with enough haste to mitigate losses, and a community is resourceful if it is able to use human and physical resources to meet predetermined goals and priorities (Bruneau et al., 2003). Civic agriculture may contribute to these capacities by providing a localized food source less dependent on outside resources and transportation.

Redistribution patterns of vulnerable populations following a disaster also show differences between rural and urban areas (Elliott & Pais, 2010). Socially disadvantaged populations tend to be displaced long-term from the portions of urban areas hardest hit by disasters; in contrast, in rural areas, the most vulnerable populations receive concentration of long-term recovery effort (Elliott & Pais, 2010). Researchers suggested that social capital in the

form of place attachment and close-knit relationships may contribute more to community resilience in rural areas than in urban locales (Cutter et al., 2016). Cutter et al. (2016) examined differences between urban and rural areas throughout the contiguous United States using the BRIC assessment index. Outcomes suggested that economic, infrastructure, and institutional capital may contribute more often to urban resilience than social and environmental capital; in contrast, different forms of social and environmental capital contribute more to rural resilience (Cutter et al., 2016). Civic agriculture initiatives to improve community resilience may be relevant to rural areas, which tend to have economic and institutional capacity constraints.

The Community Capitals Framework

The community capitals framework (CCF) is a useful lens to view the connections between civic agriculture and community resilience. The CCF is a systems approach identifying capitals, categorized as natural, cultural, human, social, political, financial, and physical (Emery & Flora, 2006). The CCF provides a framework to explain how civic agriculture theoretically increases community resilience. The literature surrounding civic agriculture and community resilience addresses many community capitals as outcomes of civic agriculture and as necessary for community resilience. The community-development literature explains how the respective capitals synergistically work together to build new capital where investments are made, but also in other capitals without direct investments because, "success builds on success" (Emery & Flora, 2006, p. 22). For example, investments in social, human, and economic capital can lead to increased capacities in those areas, as well as political capital, dubbed the *spiraling-up* effect (Emery & Flora, 2006). Civic agriculture theoretically exhibits a similar spiraling-up effect across multiple capitals identified as pertinent to community resilience.

Defining key capitals. Social capital is the personal and collective benefit from relationships with others, which includes group and organizational inclusion and social networks (Putnam, 2000). Bonding social capital occurs in close-knit, mostly homogenous groups and can be quite beneficial to those in the group, but exclude others from benefits. Bridging social capital stems from associations between people and groups through networks to other groups that may not interact without the existing networks (Putnam, 2000) and can assist in mobilizing community improvements at the neighborhood level (Altschuler, Somkin, & Adler, 2004).

Human capital includes "health, formal education, skills, knowledge, leadership, and potential" (Flora et al., 2016, p. 110). Human capital entails characteristics of community-members that allow them to earn a living and contribute in meaningful ways to their families, community organizations, and broader community. Formal educational attainment is most often used as a measure of human capital, perhaps because educational attainment data is readily available (Flora et al., 2016). Gaining skills and knowledge through other experiences may be equally important to human capital. Furthermore, health problems that diminish one's ability to contribute to community are important indications of reduced human capital (Flora et al., 2016).

Also called *financial capital,* economic capital includes income, loans, philanthropy, taxes, and many other forms, and is commonly assessed through changes in poverty, diversity of businesses, economic-efficiency measures, and changes in other assets (Flora et al., 2016). Distinctions between types of economic capital include public versus private funds, private businesses, the built environment, physical objects of value and real estate. Economic capital is the most mobile of the community capitals (Flora et al., 2016).

Civic agriculture, the community capitals and community resilience. Assuming that reduction of suffering and losses of all kinds is the goal, a clear need exists for effective

approaches to increase community resilience. The field of community-resilience building is in its infancy, but approaches are underway. Current community-resilience-building initiatives vary in comprehensiveness. As with the assessment instruments, approaches or programs may only address some community-resilience domains. Civic agriculture enhances social, human, and economic capital in communities (Draper & Freedman, 2010; Furman et al., 2013; Kiptot & Franzel, 2013; Marquis, 2013; Meenar, 2015; Poulsen et al., 2014), which may indirectly increase community resilience. Table 1 provides a quick reference of the most salient literature from this review, providing a basis for a potential relationship between community resilience and civic agriculture.

Table 1
Salient Literature

Article focus	Social capital (bridging, bonding, linking, community engagement, equity and place attachment)	Human capital (collective efficacy, emergency preparedness, empowerment, skill development, educational programs, health indicators, like food security)	Economic capital (jobs, entrepreneurship, accessible housing, and real estate values)
Community resilience	Abramson et al., 2015; Aldrich & Meyer, 2014 (LR); Chandra et al., 2013 (Ql); Colten et al., 2015 (Ql); Cutter et al., 2010 (LR); IPCC, 2012 (LR); Kafle, 2011 (Ql); Leykin et al., 2013 (LR); Mayunga, 2009 (LR); McEntire, 2005 (LR); Norris et al., 2007 (LR); Ostadtaghizadeh, Ardalan, Paton, Jabbari, & Khankeh, 2015 (LR); B. Pfefferbaum et al., 2014 (LR); B. Pfefferbaum et al., 2015 (LR); Poortinga, 2012 (Qn); Renschler et al., 2010 (LR); Slack & McEwen, 2013 (Ql); Twigg, 2009 (LR); Veil & Bishop, 2013; Wells et al., 2013 (Ql)	Abramson et al., 2015 (LR); Chandra et al., 2013 (Ql); Colten et al., 2015 (Ql); Cutter et al., 2010 (LR); IPCC, 2012 (LR); Mayunga, 2009 (LR); McEntire, 2005 (LR); Norris et al., 2007 (LR); Ostadtaghizadeh et al., 2015 (LR); Paton & Johnston, 2001 (LR); Renschler et al., 2010 (LR); Slack & McEwen, 2013 (Ql)	Abramson et al., 2015 (LR); Chandra et al., 2013 (Ql); Colten et al., 2015 (Ql); Cutter et al., 2010 (LR); Kafle, 2011; Ql; Leykin et al., 2013 (LR); Mayunga, 2009 (LR); McEntire, 2005 (LR); Norris et al., 2007 (LR); Paton & Johnston, 2001 (LR); B. Pfefferbaum et al., 2015 (LR); Renschler et al., 2010 (LR); Slack & McEwen, 2013 (Ql); Veil & Bishop, 2013; Wells et al., 2013
Civic agriculture	Draper & Freedman, 2010 (LR); Furman et al., 2013 (M); Hoffman & Doody, 2014 (Ql); King, 2008 (LR); Kingsley & Townsend, 2006 (Ql); Kiptot & Franzel, 2013 (M); Lyson, 2004 (LR); Macias, 2008 (Ql); Marquis, 2013 (Qn); McIlvaine-Newsad & Porter, 2013 (Ql); Meenar, 2015 (M); Migliore, Schifani, Guccione, & Cembalo, 2014 (M); Okvat & Zautra, 2011 (LR); Porter & McIlvaine-Newsad, 2013 (Ql); Poulsen et al., 2014 (Ql); Santo et al., 2016 (LR); Van Horn, 2011 (Ql)	Draper & Freedman, 2010 (LR); Garrett & Leeds, 2014 (Qn); Kiptot & Franzel, 2013 (M); Lyson, 2005 (LR); Macias, 2008 (Ql); Meenar, 2015 (M); Okvat & Zautra, 2011 (LR); Porter & McIlvaine-Newsad, 2013 (Ql); Santo et al., 2016 (LR)	Draper & Freedman, 2010 (LR); Furman et al., 2013 (M); King, 2008 (LR); Kiptot & Franzel, 2013 (M); Lyson, 2005 (LR); Macias, 2008 (Ql); Meenar, 2015 (M); Santo et al., 2016 (LR)

Note. LR = Literature review, Qn = Quantitative, M = Mixed methods, Q1 = Qualitative.

Civic agriculture, social capital, and community resilience. Resilient communities have certain qualities. Researchers agree that increasing social capital increases community disaster resilience (Aldrich & Meyer, 2014; Federal Emergency Management Agency, 2011; Institute of Medicine, 2015; B. Pfefferbaum et al., 2015; Plough et al., 2013). Also, multiple studies showed that civic-agriculture initiatives generate social capital in communities (Draper & Freedman, 2010; Furman et al., 2013; Kiptot & Franzel, 2013; Marquis, 2013; Poulsen et al., 2014). Participation in social networks provides cultural, economic, and social benefits by connecting people to needed resources, which increases a community's resilience (B. Pfefferbaum et al., 2015).

Social capital alone is not a panacea for mitigating disaster and disaster impact. For instance, if a disaster is severe enough to shut down livelihood activities for an extended period (as with Hurricane Katrina), social capital does not prevent community disruption (Colten et al., 2015). Also, after a disaster event, some altruistic behavior appears to be a social norm, accompanied by an implication that the more social capital a community initially has, the longer altruistic behaviors will endure (Wickes, Zahnow, Taylor, & Piquero, 2015).

Existing approaches to increase community resilience emphasize the need to increase social capital in communities. For example, the community resilience enhancement framework stresses the importance of increasing social capital in advance of disaster so that disaster management can improve in each stage (B. Pfefferbaum et al., 2015). Bonding social capital in neighborhoods can be particularly important to community resilience by encouraging neighbors to assist one another before, during, and after disaster (Colten et al., 2015; Norris et al., 2007; B. Pfefferbaum et al., 2015; Slack & McEwen, 2013). Bonding social capital forms when people coalesce around a common effort, belief system, cause, or recreation (Putnam, 2000) and civic-

agricultural initiatives have increased bonding social capital specifically by providing a location, often a garden, for people to socialize, share ideas, and recreate (Porter & McIlvaine-Newsad, 2013). Numerous studies using multiple methods support that civic agriculture generates social capital (Draper & Freedman, 2010; Poulsen et al., 2014).

Civic agriculture encourages the development of bridging social capital (Kingsley & Townsend, 2006; Poulsen et al., 2014) and bridging social capital enhances the resilience of communities (B. Pfefferbaum et al., 2015; Slack & McEwen, 2013; Veil & Bishop, 2013). Civic agriculture may increase social capital by generating connections and reciprocity that emerges as community groups work collectively to develop a local food system (Glowacki-Dudka, Murray, & Isaacs, 2012). Civic agriculture increases the development of strong social networks in community (Kingsley & Townsend, 2006; Meenar, 2015; Poulsen et al., 2014) by encouraging communication between nonprofit groups, farmers, local food advocates, and those working to increase community food security (Meenar, 2015). Civic agriculture may also contribute to network formation between rural and urban communities (King, 2008), which may benefit rural communities by connecting them to urban resources.

Several community-resilience-building initiatives recognize the importance of community engagement and empowerment, which can lead to the human-capital constructs of community competence, collective action, and efficacy (Kafle, 2011; Norris et al., 2007; B. Pfefferbaum et al., 2014; Wells et al., 2013; White, Edwards, Farrar, & Plodinec, 2015). Civic agriculture enhances "community organizing, empowerment and mobilization" (Draper & Freedman, 2010, p. 484). Draper and Freedman (2010) identified 12 articles that describe how community gardens encourage engagement, empowerment, and mobilization by providing a "social space for individuals to join together" (Draper & Freedman, 2010, p. 484).

The City of Los Angeles began a community-resilience-planning initiative in 2010 (Wells et al., 2013). The city's approach uses the community-partnered participatory research model and emphasizes the importance of stakeholder and community engagement throughout the community-resilience-planning process (Wells et al., 2013). This approach aims to increase qualities needed for a community to be resilient prior to a disturbance. A similar approach, used by the Canadian Red Cross and the Asian Disaster Preparedness Centre in Bangkok, is the Integrated Community Based Risk Reduction method (Kafle, 2011). This method highlights the imperative of forming community-based action teams and the involvement of women and elders (Kafle, 2011), thereby reducing vulnerabilities and capitalizing on the enthusiasm and community knowledge of women and the experience of elders.

CARRI worked with seven communities across the United States to provide online tools and technical support for community-resilience planning and to inform the development of a community resilience system, a six-stage approach to assessment and support for community leaders throughout a resilience-building process (White et al., 2015). The process embraces a whole-community approach and strongly recommends involvement of all sectors including local government, private industry, nonprofit, and academia. Stakeholders should assess all community-service areas for needed improvement because, as Mayor Riley of Charleston, South Carolina said, "disasters accelerate trends that are already in place" (White et al., 2015, p. 206). The Communities Advancing Resilience Toolkit (R. L. Pfefferbaum et al., 2013) is another approach that includes community engagement and empowerment, designed to "enhance community resilience through assessment, group processes, planning and action," and includes "tools," for key informant interviews, data collection, community conversations, neighborhood

infrastructure maps, and community ecological maps for describing the nature of relationships in the community (p. 1).

All of these approaches emphasize the importance of community engagement and community-based empowerment to enhance community resilience. Civic agriculture prepares communities for the community-resilience building process by encouraging mostly positive relationships between diverse groups, as well as encouraging community mobilization and empowerment for social change (Draper & Freedman, 2010). Civic agriculture can also foster collective action through the development and use of social networks (Furman et al., 2013). Because civic agriculture has shown promise in these arenas, working with civic-agriculture networks may be a natural way to engage community members in resilience planning in communities where those networks are strong. Furthermore, community-resilience leaders should include procedures to evaluate and encourage the development of civic-agriculture initiatives where appropriate.

Place attachment. Place attachment or an emotional connection to a site, neighborhood, or city (Mishra, Mazumdar, & Suar, 2010) can increase a community's disaster resilience (Norris et al., 2007). Not surprisingly, civic agriculture also contributes to place attachment or sentiment of place (Marquis, 2013; Van Horn, 2011). Nevertheless, place attachment is somewhat nuanced. For instance, if after a disaster requiring evacuation, people do not return to the geographic site of their prior community to rebuild, that community is said to have lacked resilience. However, if the disaster is severe enough or long enough in duration to threaten the safety of community members, returning may decrease individual or family resilience. Conversely, mobility has been identified as essential to the resilience of Gulf Coast residents (Colten et al., 2015). Furthermore, the more attached people are to a place, the more psychologically devastating displacement can

be, thereby undermining personal resilience in some circumstances (Norris, Watson, Hamblen, & Pfefferbaum, 2005).

However, place attachment, generally accepted as a positive attribute for community resilience, motivates community members to stay (or return) and rebuild. Knowledge of the local environment and a sense of dependency on natural resources for one's livelihood and sustenance can foster deep place attachment (Burley, Jenkins, Laska, & Davis, 2007), enhanced by civic agriculture (Marquis, 2013; Van Horn, 2011). Because civic agriculture increases social capital and related constructs in communities, which are integral to community resilience, civic agriculture may indirectly contribute to a community's resilience. Community-resilience planning to increase social capital should include civic-agricultural initiatives when suited to the respective community. Civic agriculture also positively affects human capital, identified as important for community resilience.

Civic agriculture, human capital, and community resilience. Human capital is important to community resilience because knowledge and skills, health, and the capacity for work allow people to reach their livelihood goals and contributes to economic capital in the community (Mayunga, 2009). Civic agriculture positively contributes to physical and mental health (Draper & Freedman, 2010) and increases community knowledge and skills (Meenar, 2015). The mental health benefits of "horticulture therapy," are well documented (Greenleaf, Bryant, & Pollock, 2014).

Physical health. Keeping a community population physically healthy includes provision of adequate nutrition and the management of chronic disease, both important to a community's resilience (Chandra et al., 2013; Gil-Rivas & Kilmer, 2016; Institute of Medicine, 2015; Poortinga, 2012). Numerous studies highlighted the health benefits of civic agriculture,

especially through increased consumption of fresh produce and increased physical activity (Draper & Freedman, 2010; Poulsen et al., 2014). Exercise motivates participation in civic agriculture (Poulsen et al., 2014). Civic agriculture contributes positively to food security in urban and rural locales, and on Native American reservations, and is commonly cited as a motivation for participation in civic agriculture (Draper & Freedman, 2010). Improved physical health from participation in civic agriculture results from increased consumption of fresh vegetables (Draper & Freedman, 2010; Santo et al., 2016), exercise opportunities (Draper & Freedman, 2010) and improved food security (Draper & Freedman, 2010; Santo et al., 2016); each influence participation.

Mental health. Researchers from the John Hopkins Preparedness and Emergency Response Research Center clearly connected mental health and community resilience (McCabe et al., 2014). They asserted that psychological-injury incidence far exceeds physical injuries with ratios between 4:1 and 50:1, depending on the disaster. They developed a framework that includes forming a partnership between academic health centers, faith-based organizations, and local health departments. These partnerships endeavored to train community members in psychological first aid in advance of disasters to improve community-resilience outcomes (McCabe et al., 2014). Civic agriculture provides places in communities that can provide communities with places for "horticulture therapy," which can improve well-being through the benefits of enhanced nature connectedness (Greenleaf et al., 2014) leading to decreased anxiety and depression symptoms. Horticulture therapy, which is directed by a mental health clinician and has specific treatment goals (Kirby & Peters, 2009), as well as, therapeutic horticulture (informal without specific, clinical treatment goals) programs can be one approach, as part of a comprehensive, community resilience plan, as a measure to enhance community well-being.

Knowledge and skills. Knowledge and education are priorities for community resilience in the Hyogo Framework for Action (UNISDR, 2005), which recommends actions to increase knowledge and education (Kafle, 2011). Civic agriculture contributes to the development of skills and knowledge, nutritional learning, internships, and volunteer opportunities (Meenar, 2015). Civic agriculture enhances social learning and farmer adaptive capacity to climate change (Furman et al., 2013). Civic agriculture is identified as a contributor to social ecological memory and therefore implicated as a positive in the quest toward localized community resilience (Barthel, Parker, Folke, et al., 2013).

Collective efficacy is important for a community's resilience (Leykin et al., 2013). Collective efficacy is similar to Bandura's (1994) self-efficacy, which is the belief in one's capability to perform at certain levels and have some control over occurrences that impact one's life. Likewise, collective efficacy is a sense of communal mastery, meaning a belief that collective difficulties or endeavors can be overcome or accomplished due to the cohesive efforts of a community (Benight, 2007; Norris et al., 2007) and derives from a mutual willingness to assist others for the common good (Teig et al., 2007). Furthermore, Gil-Rivas and Kilmer (2016) emphasize the need to address justice issues in community, such as, power and resource inequities not only to mitigate vulnerability, but to encourage the collaboration needed for collective efficacy and effective community resilience planning.

Civic agriculture, in the form of community gardens, aligns with the development of collective efficacy (Glover, 2004; Teig et al., 2007). Collective efficacy can positively influence the development of collective action (Norris et al., 2007). At the household level, self-efficacy and action-outcome expectancies (the belief that a particular behavior will reduce risk) are predictors of preparedness behaviors (Bennett & Murphy, 1997; Paton, 2003; Paton & Johnston,

2001). Risk-reduction behaviors are more likely in communities with community engagement and collective efficacy (Paton & Johnston, 2001); communities with lower resilience may have circumstances that minimize the sense of collective efficacy (Somasundaram & Sivayokan, 2013). Cox and Hamlen (2015) emphasize the importance of community engagement for effective community resilience planning to address community issues of governance, economies, culture, emergency preparedness, and local resources, particularly in rural communities.

Civic agriculture, economic capital, and community resilience. Economic capital is integral to community resilience. The more economic opportunities communities have, the more capability communities have to reduce disaster risk (Mayunga, 2007). The link between poverty and disaster risk has wide acceptance (Alcantara-Ayala et al., 2015; Juneja, 2009; Lal, Singh, & Holland, 2009). In the United States, economic downturns provide an impetus for the continual renewal of civic agriculture from the victory gardens of World War II (Ferris, Norman, & Sempik, 2001; Schmelzkopf, 1995) to the recession gardens of 2009 (McIlvaine-Newsad & Porter, 2013). Civic-agriculture initiatives contribute to local or regional economies mostly through direct sales from farmers to consumers (Meenar, 2015).

Civic agriculture positively contributes to local economies in a variety of ways (Garrett & Leeds, 2014; Kiptot & Franzel, 2013; Lyson, 2005; Macias, 2008; Meenar, 2015; Okvat & Zautra, 2011). Civic agriculture bolstered the economy of Philadelphia through job creation and retention, assistance to local businesses, and vacant-land remediation (Meenar, 2015). Civic agriculture, particularly community gardens, especially appeal to the working poor (Garrett & Leeds, 2014) and can increase food security at the household level for those engaged in civic agriculture initiatives (Garrett & Leeds, 2014; Lyson, 2004; Lyson & Guptill, 2004). At the community level, social networks created to strengthen local-food systems increased the

affordability and availability of fresh produce (Garrett & Leeds, 2014; Lyson, 2004; Lyson & Guptill, 2004). Civic-agriculture organizers often donate locally grown surplus directly to shelters, food pantries, and community meals or through donation-distribution networks (Lyson, 2004; Lyson & Guptill, 2004). Some forms of civic agriculture significantly improve real estate values, especially in disadvantaged neighborhoods (Okvat & Zautra, 2011).

The literature supports the importance of having strong social, human, and economic capital for the resilience of communities, and smaller-scale studies indicate that civic agriculture may positively influence each of these. In summary, civic-agricultural initiatives increase community ties (social capital; Poulsen et al., 2014), and enhance community knowledge and skills for local food production, thereby increasing food security (human capital; Meenar, 2015), as well as, support entrepreneurship and encourage local circulation of currency (economic capital; Kiptot & Franzel, 2013). This study will use a quantitative methodology and provide a national-scale study to test for a positive relationship between civic agriculture and increased social, human, and economic capital. The next chapter will explain the data sources, hypotheses, research model, and methodology for the study.

CHAPTER 3

Data and Methods

The overarching research question for this proposal is, "Does civic agriculture increase three domains of community resilience including social capital, human capital, and economic capital?" Civic-agriculture initiatives are small-scale with a local, place-based orientation (Lyson & Guptill, 2004). Manifestations of civic agriculture include community gardens as well as multiple forms of direct-to-consumer (DTC) marketing including farmers' markets, CSA initiatives, pick-your-own farms, and roadside stands. DTC marketing is an established form of civic agriculture because it occurs locally; generally, the farms are small-scale, evidenced by lower annual sales than commodity-agriculture farms. Lyson and Guptill (2004) measured civic agriculture by the number of farms using DTC marketing with sales data of less than $250,000 annually (an indicator of small-scale) using 1992 and 1997 USDA Census of Agriculture data.

This study, however, will measure civic agriculture by deriving an entirely new indicator. This derived indicator is a measure of CAA. The data necessary for CAA accrue from the USDA 2012 Agricultural Census and the 2012 U.S. Census Bureau population estimates. The unit of analysis is the counties in the conterminous United States. This study is a quantitative, cross-sectional examination of the relationships between the new CAA measure and measures of social, human, and economic capitals. Theoretically, time matters in civic agriculture in a community, meaning that the longer civic agriculture has operated in a community, the more likely positive community-capital outcomes would also be present.

For the purposes of this study, community is defined as social interactions in a defined geographic boundary. Community boundaries used in the study are the county or county-equivalent boundaries. The county boundary is used because counties, while primarily

administrative units, also encompass social and economic interactions. This study will also examine where CAA exists in terms of rurality using the USDA Rural-Urban Continuum Codes, which use the county unit of analysis. The USDA Rural-Urban Continuum Codes ranks counties on a continuum of 1 to 9 with 1 being the most urban and 9 being the most rural (USDA, 2013). National data at the county unit of analysis is expected to remain available in the future, allowing future studies to examine change over time. The study includes 3,107 counties in the contiguous United States, subtracting Alaska and Hawaii county equivalents because of missing data , as well as, Broomfield, Colorado (Cutter et al., 2014) and Kenedy County, Texas, also due to a lack of data.

Measuring Civic-Agriculture Access

A metric was developed to measure levels of CAA. The CAA score is a summative index of civic-agriculture initiatives expressed as a population-adjusted metric for each county. Thus, the CAA measure borrows from common measures in sociology, epidemiology, and public health methods of measuring a population's access to community services by summing the number of a particular service or practitioner available in a geographic area, but given as a population-adjusted rate. The calculation for the CAA is a sum of the civic-agriculture initiatives in a county divided by the county's 2012 population and expressed as a population adjusted rate, as illustrated by this formula:

$$CAA = \frac{\varepsilon\ Civic\ Agriculture\ Initiatives}{County\ Population} \times 100{,}000$$

Data and sources for the independent variable. The USDA 2012 Census of Agriculture includes the number of farms per county selling agricultural products for human consumption directly to consumers (USDA, 2012). Farms selling directly to consumers include

sales at roadside stands, farmers' markets, pick-your-own sites, and CSA arrangements. According to the USDA *Trends in US Local and Regional Food Systems* report to Congress (Low et al., 2015), 74% of local food farms with gross cash farm income of less than $75,000 used DTC marketing channels only. Thus, data on smaller farms using DTC marketing channels will capture a large portion of the civic agriculture in a community. Consequently, the 2012 Census of Agriculture was used, which includes the number of farms selling DTC, from the USDA National Agricultural Statistics Service and developed county-level CAA scores. An additional advantage of using this data was to establish a baseline CAA, applicable to show change over time in CAA outcomes with future releases of USDA Census of Agriculture surveys.

Data pertinent to the development of a more comprehensive CAA score would include community gardens, urban farms, and school and church garden initiatives. The American Community Gardening Association has records of at least 8,550 of these across all U.S. states and territories and eight Canadian provinces (Lawson et al., 2013). However, these data were not available at the county unit of analysis at the time of this dissertation. Therefore, community gardens will not be included as part of CAA scores at this time. CAA is the independent variable in this study. Explanation of the dependent variables measuring social, human, and economic capitals are presented next.

Data sources to measure the dependent variables. Social capital involves community trust, reciprocity, collective identity, working together, and a sense of a shared future (Flora et al., 2016, p. 16) and is identified as an integral component of community resilience (Aldrich & Meyer, 2014; Federal Emergency Management Agency, 2011; Institute of Medicine, 2015; B. Pfefferbaum et al., 2015; Plough et al., 2013). Multiple smaller scale studies showed that civic-agriculture initiatives generate social capital in communities (Draper & Freedman, 2010; Furman

et al., 2013; Kiptot & Franzel, 2013; Marquis, 2013; Poulsen et al., 2014), but none had national scope.

Social capital. The BRIC Community Capital subindex scores (Cutter et al., 2014; Hazards and Vulnerability Research Institute, 2014) were used as the dependent variable to measure social capital in this study. The BRIC is an "empirically-based resilience metric" (Cutter et al., 2014, p. 65) that measures domains or capitals of community resilience using data from public and other accessible data sources. Community Capital subindex scores are available at the county level and represent a suitable proxy for social-capital measurement (Cutter et al., 2014). The BRIC Community-Capital subindex aims to capture three aspects of social capital including sense of community, place attachment, and citizen participation, identified as important to community resilience (Cutter et al., 2014; Norris et al., 2007; Sherrieb, Norris, & Galea, 2010). Cutter et al. (2014) constructed the subindex using

> percent of the population not foreign-born immigrating in the prior five years; percent population born in the state of residence; percent of the voting age population that vote in presidential elections; persons affiliated with a religious organization per 10,000 persons; civic organizations per 10,000 persons; Red Cross volunteers per 10,000 persons; and Red Cross training workshop participants per 10,000 persons. (pp. 68–69)

Cutter et al. (2010) constructed BRIC subindex scores using min–max scaling for normalization so indicators were on a similar scale. Each variable in the subindex is set in a range between zero and 1. Zero scores indicate none of the value being measured and 1 indicates most of the value. For example, a community-capital score of 0.85 would indicate more social capital in a county than a county with a score of 0.65.

Human capital. Human capital represents the capabilities of individuals in a community, including educational attainment and skills as well as physical and mental health (Flora et al., 2016, p. 16). This research used county-level food-security estimates as a proxy for this domain.

Food security is an apt measure of human capital because it reveals a community's ability to exercise knowledge and skills for personal and household provisions and maintain good nutritional status, which is imperative for the prevention of chronic disease (physical health). Furthermore, food insecurity undermines human capital, evidenced by its impact on children (Hickson, Ettinger de Cuba, Weiss, Donofrio, & Cook, 2012). Food insecurity during childhood aligns with developmental delays, decreased educational attainment, and poorer physical and mental health in adulthood (Hickson et al., 2012). Food-insecurity data are available at the county level from Feeding America, a nongovernmental network of food-bank organizations.

Feeding America used measures from state-level data from the Current Population Survey and U.S. Census county data, identified as determinants to calculate food-insecurity estimates at the county level using multivariate regression analysis (Gundersen, Satoh, Dewey, Kato, & Engelhard, 2015). The Feeding America Food Insecurity rates were preprocessed so that the orientation of the variable will correspond with the hypothesis. That is, food-insecurity rates were converted to food-security rates at the county level. In this way, higher CAA scores will align with higher food security rates (a measure of human capital) compared to counties with lower CAA scores. The county food-security estimates used in this study are calculated by subtracting food-insecurity estimates from 1. For example, a food-insecurity rate of 0.15 results in a food security rate of 0.85 (1–0.15).

Economic capital. Economic capital includes savings and income generation assessed by changes in poverty, firm efficiency, and increased assets of local people (Flora et al., 2016, p. 16). Economic capital is well supported in the literature as a community resilience domain (Norris et al., 2007; Ostadtaghizadeh et al., 2015; Renschler et al., 2010). This study used the number of retail trade establishments per county as the dependent variable for economic capital. Generally,

a diversified economy is a more resilient economy following disaster because communities depend less on a single or a few sectors for employment (Rose & Krausman, 2013). The sheer number of businesses can be a positive indicator of macroeconomic health if considered a proxy for diversification, allowing for more provision of a variety of goods and services (Rose & Krausman, 2013). The retail sector includes large retail stores with outside ownership as well as independent, locally owned establishments (U.S. Census Bureau, n.d.), thereby capturing two types of businesses identified as potentially important to community resilience. Higher CAA may increase disposable income and the retail-trade sector is likely more sensitive to these potential changes. Furthermore, retail trade establishments are more likely to hire less educated, lower-income segments of the population who are potentially more vulnerable following disaster, due to having less savings (Rose & Krausman, 2013).

The retail-trade sector is the "final step in the distribution of merchandise" (U.S. Census Bureau, n.d., para. 1) and includes supermarkets, pharmacies, personal-care stores, clothing stores, food service, and laundry facilities (Schuetz, Kolko, & Meltzer, 2010). The number of retail-trade establishments per county is available from the U.S. Census Bureau (2013) as part of County Business Pattern (CBP) data. Those data come from a variety of sources including the annual Company Organization Survey, the Economic Census, the Annual Survey of Manufactures, current business surveys, and other administrative record sources (U.S. Census Bureau, 2013). CBP annual statistics represent a reference year of approximately 18 months prior to data release. The CBP provides economic data at the county level and is useful for evaluating the economic activity of small areas, observing changes over time, and providing an economic benchmark between censuses. The economic capital dependent variable for this study will be converted to a population-adjusted rate, or the number of retail-trade establishments per

100,000 persons, using population estimates from the U.S. Census Bureau County Populations Estimates of 2012. Table 2 provides an efficient reference for variables, datasets, data time slices, providers, and references for justification.

Table 2
Data Sets with Sources, Variable Description and Justification

CAA score development/ Community resilience domain	Dataset/s	Time period	Data provider	Variable description	Justification
Civic agriculture access measure	USDA Census of Agriculture	2012	USDA, National Agricultural Statistics Service	Number of farms/county with direct sales for human consumption	Lyson (2004, 2005), King (2008), Santo et al. (2016)
	US Current Population Estimates (US Census, 2013)	2013	Census Bureau	Number of persons/ county	To calculate civic agriculture incidence per 100,000 persons
Social capital dependent variable: BRIC Community Capital Subindex scores.	Baseline Resilience Indicators for Communities (BRIC) Community Capital	2014 using data from 2003–2010	Hazards & Vulnerability Research Institute	Indicators for place attachment, political engagement, religious and civic engagement	Chandra et al. (2013), Cutter et al. (2014), Norris et al. (2007), B. Pfefferbaum et al., (2015), Poortinga (2012).
Human Capital dependent variable: Food Security rates from Feeding America food insecurity rates	County Food Insecurity Estimate rates	2014	Feeding America's annual Map the Meal Gap project	Proxy for human capital is county food insecurity rates	Chandra et al. (2013), Norris et al. (2007), B. Pfefferbaum et al. (2015).
Economic Capital dependent variable: County Business Pattern (CBP) Retail trade establishment rates	Number of retail trade establishments/ county	2015	County Business Pattern Data/Census Bureau	Retail trade establishments- an indicator of county economic vitality.	Rose (2004), Rose & Krausman (2013).

Data Preprocessing and Statistical Procedures

The Feeding America Food Insecurity rates were preprocessed so that the orientation of the variable will correspond with the hypothesis. That is, food-insecurity rates were converted to food-security rates at the county level. In this way, higher CAA scores will align with higher food security rates (a measure of human capital) compared to counties with lower CAA scores. The county food-security estimates used in this study are calculated by subtracting food-insecurity estimates from 1. For example, a food-insecurity rate of 0.15 results in a food security rate of 0.85 (1–0.15). The economic capital dependent variable for this study was converted to a population-adjusted rate, or the number of retail-trade establishments per 100,000 persons, using population estimates from the U.S. Census Bureau County Populations Estimates of 2012.

IBM SPSS Version 23 was used for all analyses. A standard exploratory data analyses, evaluating univariate measures of distributions of all variables was conducted. A bivariate analysis was conducted using the Pearson product-moment correlation and scatterplots to determine the nature of the relationship between CAA and BRIC community-capitals composite scores, food-security rates, and population-adjusted retail-trade-establishment rates.

Each variable was examined for spatial autocorrelation. Simply stated, spatial autocorrelation occurs when counties are more similar to their close neighbors than more distant counties. The strength of spatial autocorrelation depends on the inverse of the distance between two locations. In any analysis of areal data—which includes county-level analyses—spatial autocorrelation should be considered a possible factor (Moon & Farmer, 2001). GeoDA, a freely available software (Anselin, Syabri, & Kho, 2006), was used to obtain a Moran's *I* measure of spatial autocorrelation for each of the variables in the analysis. Spatial dependence is "the

propensity for nearby locations to influence each other and to possess similar attributes" (Goodchild, 1992, p. 33).

Queen contiguity weights the measure to identify any county as a neighbor with the county in question that shares a border, even a small border or point (Waller & Gotway, 2004). Global Moran's *I* tests for a correlation between a variable of a defined geographic area and that area's neighbors, in this case, counties. Local spatial autocorrelation allows for decomposition of this global tendency and revealed how more localized regions are contributing in global spatial dependence (Anselin, 1995). Local indicators of spatial-association statistics provide insight to local "hot spots," and allow better understanding of these hot spots' influence on global spatial dependence (Anselin, 1995). Local indicators of spatial-association statistics were used to examine CAA hot spots, areas with low CAA, and counties that are high in CAA near low CAA counties, as well as, counties that are low in CAA near areas that are high in CAA.

Hypotheses and Data Analysis

CAA scores represented the independent variable in this research study. The dependent variables were social capital, human capital, and economic capital, representing domains of community resilience. Additionally, Lyson and Guptill (2004) found that civic agriculture measured as direct-to-consumer marketing exhibited a metropolitan effect. This study will examined whether this trend has continued, which is anticipated. A one-way ANOVA was used to examine mean differences of CAA between metropolitan counties, rural counties adjacent to metropolitan counties, and strictly rural counties not adjacent to a metropolitan county, as defined by the USDA Rural-Urban Continuum Codes. The hypotheses for this study follow:

Hypothesis 1: As CAA increases, social capital increases, represented by BRIC Community Capital Subindex scores (Cutter et al., 2013).

Hypothesis 2: As CAA increases, human capital increases, represented by the Feeding America food-insecurity rate as food-security rates (Gundersen et al., 2015).

Hypothesis 3: As CAA increases, economic capital increases, represented by U.S. Census Bureau County Business Pattern retail-trade establishments (U.S. Census Bureau, 2013).

Hypothesis 4: CAA will be higher in metropolitan counties and those adjacent to metropolitan counties as compared to rural counties.

Following Creswell (2012, p. 347), a correlation coefficient of at least 0.35 or higher and the coefficient of determination (R^2) were used to determine the presence of a linear relationship. An ordinary least squares regression analysis was conducted using standardized values of each dependent variable, with standardized values of the CAA as the predictor variable. A spatial linear regression model, following the recommendations in *An Introduction to Spatial Data Analysis* (Anselin et al., 2006), was used to evaluate significant spatial autocorrelation in the variables. The significance level chosen was the standard α level of .05 as the probability of Type I errors.

USDA Rural-Urban continuum codes were used to examine the predictive power of rurality on the dependent variables as compared to CAA alone since CAA is anticipated to be higher in metropolitan counties. The USDA (2013) ERS rural–urban continuum codes were used to assess where CAA was occurring in rurality. CAA is occurring in all county types—even in rural counties not adjacent to metropolitan areas—but those counties with the highest levels of CAA are metropolitan or urban counties that are adjacent to metropolitan areas. Counties classified as (1), (2) or (3) are considered metropolitan with (1) representing counties with populations of 1 million or more, (2) representing counties with populations between 250,000

and 1 million, and (3) metropolitan areas with fewer than 250,000. The remaining rural–urban continuum codes were categorized as rural counties adjacent to metropolitan counties [codes (4), (6) and (8)] and rural, not adjacent to metropolitan counties [codes (5), (7) and (9)]. The RUCCs were recoded so that metropolitan areas were dummy variables and acted as a reference point for urban and rural counties adjacent to metropolitan areas, both coded as a (1) and rural areas that are not adjacent to a metropolitan area, which were coded as (2). This manner of coding allows higher coefficients to represent rurality.

OLS regression was conducted with each of the dependent variables separately and the highly significant spatial-autocorrelation variables. Different types of spatial autocorrelation exist and the two most common types are spatial lag and spatial error (Spatial Structures in the Social Sciences, n.d.). When spatial autocorrelation is present, the analyst must determine whether it is most likely spatial lag or spatial error. Spatial lag is an indication that occurrences in a location can predict an increase in likelihood of similar occurrences in neighboring locations, whereas spatial error is more indicative of omitted covariates from the model that are spatially correlated (Spatial Structures in the Social Sciences, n.d.). The analyst determines whether spatial autocorrelation is spatial lag or spatial error, usually based theoretically on the nature of the data, but goodness-of-fit tests also provide a quantitative indication of the likelihood between the two.

Theoretically, civic agriculture, social capital, human capital, and economic capital could exhibit spatial lag. Each of these community characteristics are social manifestations, which indicate cultural as well as ecological (natural capital) features of a geographic area; therefore spatial lag is theoretically reasonable. Either a community's traits can influence a neighboring

community or neighboring communities could have similar intrinsic features along social and ecological lines that influence the development of traits or variable indicators.

CHAPTER 4

Results

This study sought empirical evidence of a relationship between CAA and three domains of community resilience: social, human, and economic capital. None of the variables exhibited normal distribution, which was verified using the Kolmogorov–Smirnov test with Lilliefors correction and the Shapiro–Wilk test, each revealing a nonnormal distribution for each variable, evidenced by $p < .001$ from each test. Table 3 presents univariate values from an exploratory data analysis of the CAA values, the BRIC Community Capital subindex (social capital), the food-security rates derived from the Feeding America food insecurity estimates (human capital), and the population-adjusted retail-trade-establishment rates (economic capital).

The CAA data exhibited a positive skew because the majority of counties have lower levels of CAA, also exhibited by a mode of zero. The retail-trade-establishment rate data also exhibited a positive skew, as the majority of counties have lower levels of retail-trade-establishment rates and, like the CAA values, also had a mode of zero. The CAA and the retail-trade-establishment rates have high levels of dispersion, evidenced by the range, variance, and standard-deviation values. The social- and human-capital variables had negative skew, but the social-capital skew was very low, indicating that values stayed close to the center of the distribution. The negative skew of the human-capital variable indicated that the majority of the values in the distribution fell toward the higher end of the range. The social- and human-capital variables had medians closer to the mean, with social capital actually having an equivalent mean and median.

Table 3
Central tendency and dispersion of study variables (N = 3107)

Variable	Mean	Median	Standard deviation	Skewness	Kurtosis	Minimum	Maximum
CAA	250.0 Population adjusted civic agriculture access measure	147.0	333.3	4.30	31.70	0.0	4569.00
Social capital	0.548 BRIC community capital subindex score	0.548	0.094	-.023	1.27	0.0	1.0
Human capital	0.849 food security rate	0.853	0.039	-.697	1.40	0.666	0.958
Economic capital	372.2 Population adjusted retail trade establishment rate	348.0	148.051	3.06	25.164	0.0	2312.00

Note. CAA = civic agriculture access. The mode was zero for the CAA and economic capital. The modes for social capital and human capital were 0.50 and 0.86 respectively.

Cutter et al. (2014) normalized the data used to develop the subindices and BRIC index using min–max scaling, which assigns all values between 0 and 1. The social-capital minimum and maximum values revealed at least one county with no social capital, measured by the BRIC Community Capital subindex, and at least one with the highest possible value on the scale. The food-security minimum and maximum showed that no county in the United States has 100% food security and the lowest level of food security is 66.6% (or a 33.4% Feeding America food-insecurity-rate estimate).

National Distribution of Civic-Agriculture Access

The data distribution for the CAA revealed a wide range, with 112 counties having no CAA and the county with the highest CAA having a score of 4,569. The distribution of CAA revealed a high variance and a positively skewed distribution with kurtosis, which is indicative of values in the distribution significantly higher than the mean.

CAA and regional variation. The extent of CAA varies markedly throughout the nation. Other forms of noncommodity agriculture also vary in distribution throughout the nation, such as organic agriculture (Kuo, 2015). Figure 2 shows CAA measures across the conterminous U.S. using four standard-deviation levels.

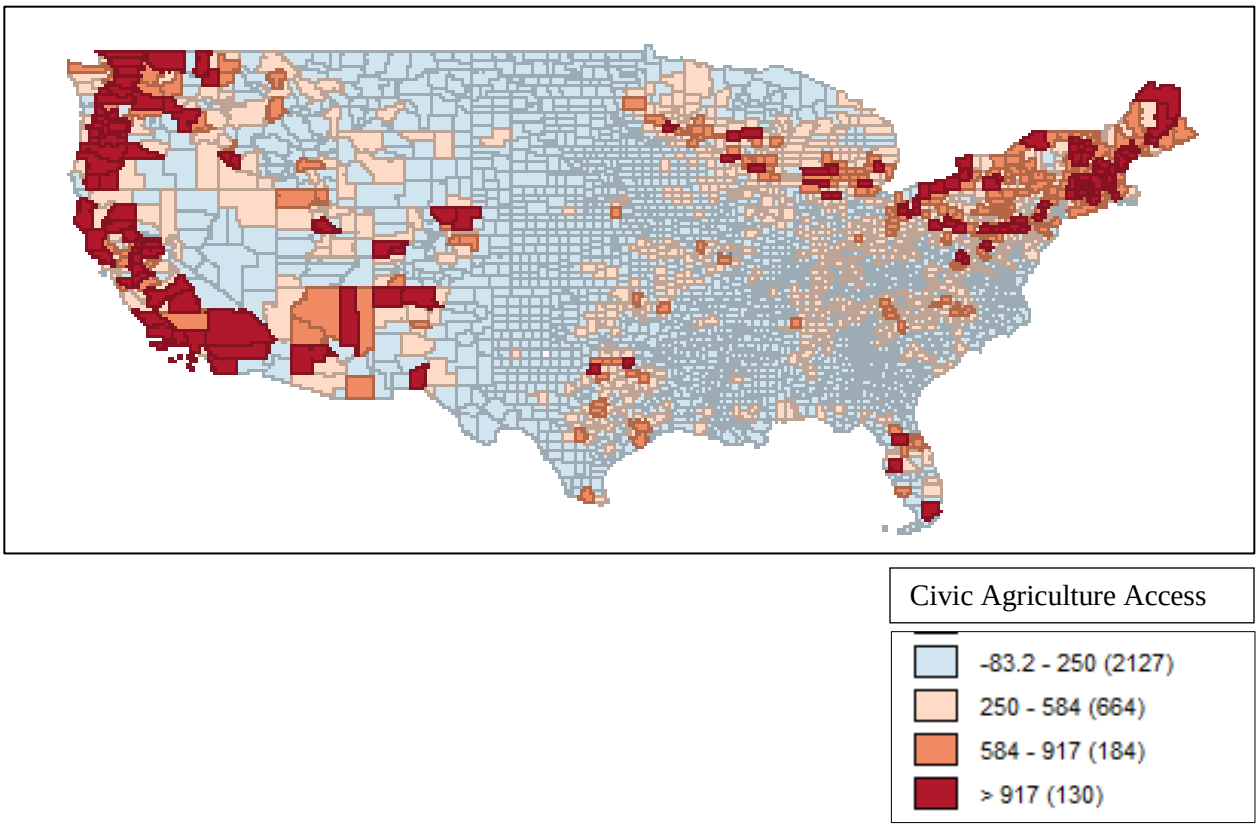

Figure 2. County civic-agriculture access values across the conterminous United States using standard deviations.

The CAA standard-deviations map shows that CAA levels are highest in certain geographic regions, particularly the Northeast and a band of counties in the West. CAA has a presence throughout portions of the South, particularly in Texas and Florida, but is mostly low in the South, particularly in the Delta and southern Georgia. A notable swath of counties in the Great Plains region, stretching from the northern border to the southwest border of Texas, appears virtually absent of CAA with a relative lack of CAA nationally. The majority of counties (68%) have CAA levels below the mean (2,127). Figure 3 shows the mean CAA values for each of the main U.S. Census Regions.

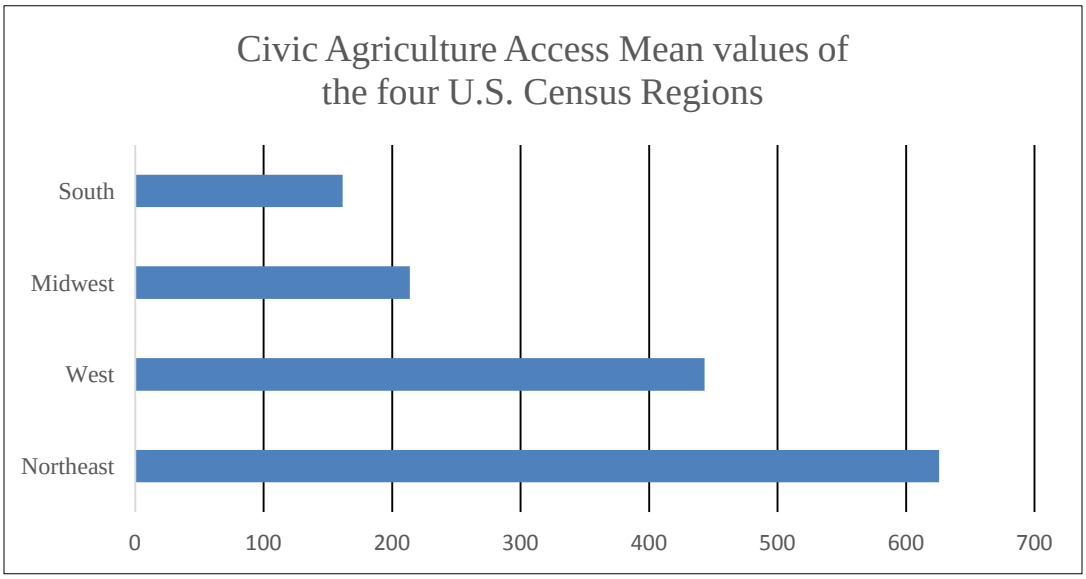

Figure 3. Civic-agriculture-access mean values for the four main U.S. census regions. The Northeast region includes the states of Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. The Western region includes Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming. The Midwest region includes Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. The South includes the states of Alabama, Arkansas, Mississippi, Delaware, the District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia.

CAA and spatial dependence. Global Moran's *I* with queen contiguity revealed that CAA exhibits a high degree of spatial dependence ($I = 0.503$) meaning that counties with high CAA tend to border other counties with high CAA and low CAA counties have a tendency to border other low CAA counties. Figure 4 shows a local-indicator-of-spatial-autocorrelation cluster map of CAA values.

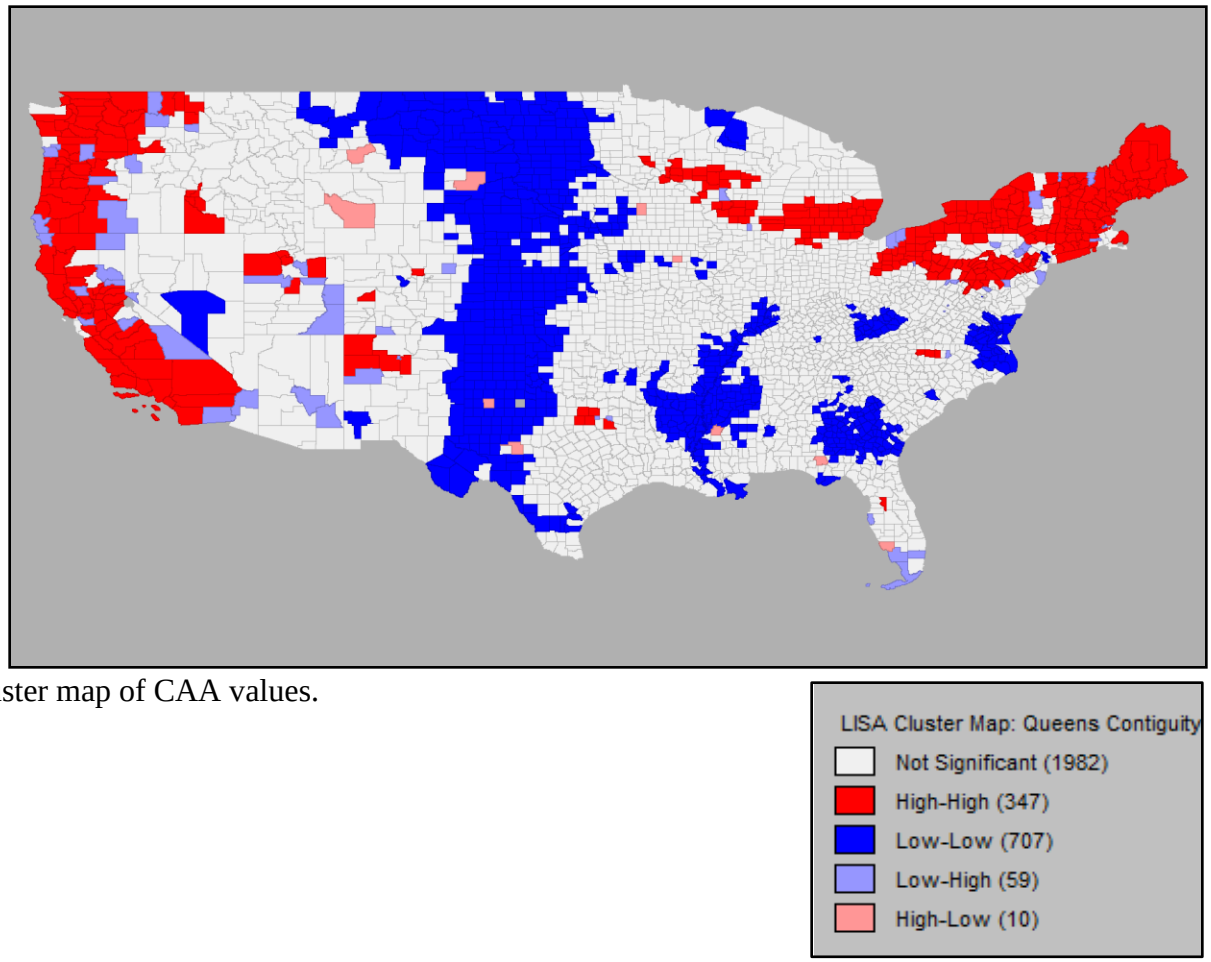

Figure 4. The local indicators on the spatial-association map shows spatially autocorrelated clusters of high civic agriculture access counties (CAA) surrounded by high CAA counties in red, and low CAA counties in blue, surrounded by low CAA counties. Low CAA counties neighboring high CAA counties are in lavender and high CAA counties neighboring low CAA counties are in pink.

CAA and the rural–urban continuum. Table 4 provides a one-way ANOVA examining mean differences of CAA between metropolitan counties, rural counties adjacent to metropolitan counties, and strictly rural counties (not adjacent to a metropolitan county) revealed that the metropolitan effect was significant on CAA. CAA had the highest mean values in counties of 250,000 to 1 million people in population, then counties with populations of 1 million or more and urban counties of 20,000 or more, adjacent to a metropolitan county was only slightly higher than counties with the highest populations.

Table 4

One-Way Analysis of Variance of CAA mean differences between metropolitan counties, rural counties adjacent to metropolitan counties and rural counties not adjacent to metropolitan counties.

County groups	*df*	*SS*	*MS*	*F*
Between groups	2	329	165	184*
Within groups	3105	2777	.895	
Total	3107			

Note. CAA = civic-agriculture access, *p = < .001

Pearson's Correlations between CAA and the Community Capitals

This study revealed virtually no correlation between standardized calculations of CAA and indicators used to measure social, human, and economic capital. Table 5 has the results of the Pearson's correlation between CAA and each of the community capitals of this model.

Table 5

Pearson's Correlations Between CAA and Dependent Variables

Measure	Social Capital	Human Capital	Economic Capital
CAA	-.16*	.14*	-.11*

Note. *$p < .001$, $r(3107)$

The CAA and social-capital-correlation results actually showed a slight negative correlation. The results for the Pearson's correlation between CAA and human capital were also low, indicating a weak but significant relationship between the variables. The results for the Pearson's correlation between CAA and economic capital negatively correlated with a weak, but significant relationship. None of the results from this model revealed a strong relationship between CAA and the development of community social, human, and economic capital at the county level of analysis.

OLS Regression of the Predictive Power of CAA on the Community Capitals

CAA did not significantly predict social capital, human capital, or economic capital using this model. This quantitative model, using county-level, publicly available data, failed to support the findings of smaller scale, predominantly qualitative studies, indicating that civic-agriculture initiatives increase social, human, and economic capital. Table 6 provides the OLS regression results for this study model.

Table 6
OLS Regression Coefficients with CAA as Independent Variable and Social, Human, and Economic Indicators as Dependent Variables (N = 3107)

Variable	Social capital		Human capital		Economic capital	
	β	*SE*	*β*	*SE*	*β*	*SE*
CAA	-.16*	.018	.14*	.018	-.11*	.018
R2	.025		.020		.012	
AIC	-5945		-11344		-19900	

F	78.6*	62.5*	37.8*

Note. CAA = civic-agriculture access, *AIC = Akaike-info-criterion*, *$p < .001$.

Spatial dependence on dependent variables. The county unit of analysis was a pragmatic boundary delineation that allowed for national-scale studies with much more specificity than state-level analysis, and provided a reasonable geographic boundary for defining community. Clearly the independent variable of the CAA exhibited highly significant spatial autocorrelation ($I = 0.503$).

A *Moran's I* with queen contiguity result revealed that the social-capital variable—the BRIC Community Capital subindex—was actually higher than the CAA spatial autocorrelation ($I = 0.532$). The human-capital variable—the food-security rates derived from the Feeding America food insecurity estimates—had the highest spatial autocorrelation ($I = 0.703$). The economic-capital variable—the population-adjusted retail-trade-establishment rates—had the lowest spatial autocorrelation of the three variables, but the result was still significant ($I = 0.280$). As indicated, local spatial-autocorrelation analysis enhances understanding of how localized regions contribute to global spatial dependence (Anselin, 1995). All variables exhibit, to varying degrees, statistical difference between U.S. regions; therefore, local spatial-dependence exploration can provide useful insights when attempting to understand why regional differences exist. Figure 5 illustrates the results of the Local Indicators of Spatial Association (LISA) test, which indicate local pockets or hot spots, and identify counties that are low in the phenomena, which are near areas that are high in the phenomena, as well as, identify counties that are high in the phenomena that are near areas that are low in the phenomena (Anselin, 1995).

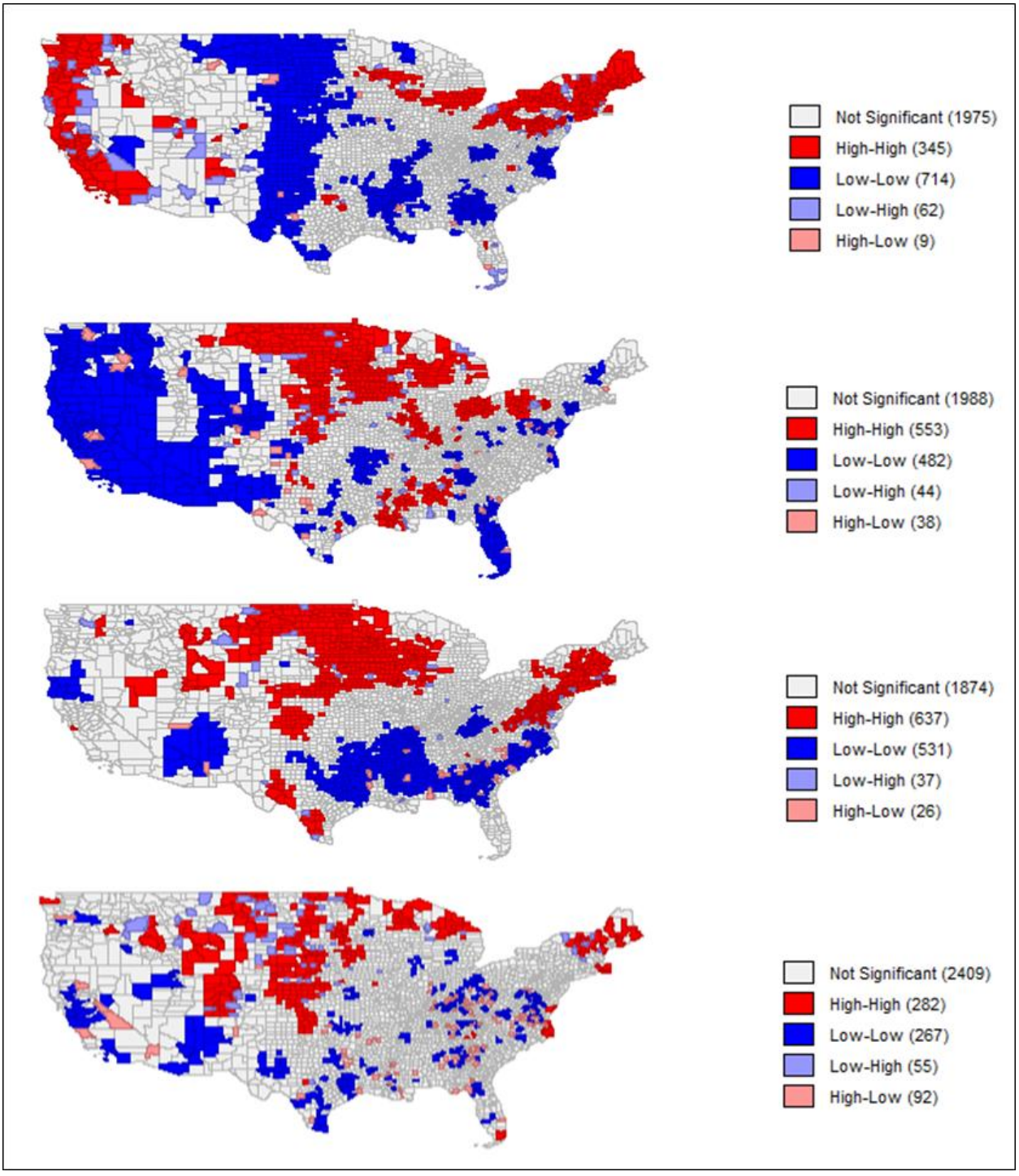

Figure 5. The top image illustrates the civic agriculture access (CAA) local indicator of spatial association test showing high CAA counties clustered with other high CAA counties in red and low CAA counties with other low CAA counties in blue. Counties low in the phenomena neighboring areas that are high are in lavender. Counties that are high in the phenomena neighboring areas that are low are in pink. The next image is the BRIC Community Capital subindex, then food security, and retail-trade-establishment rates are last.

Spatial linear regression. Goodness-of-fit tests in GeoDa revealed that spatial lag was the most likely type of spatial dependence in this model for each of the dependent variables. Spatial lag was evidenced by larger R^2 values for social (0.470) and economic capital (0.193), larger *log likelihood* values for each of the variables and smaller *Akaike-information-criterion* values for each of the variables, compared to spatial error (Spatial Structure in the Social Sciences, n.d.). The R^2 value for human capital with spatial lag (0.6693) was almost the same as with spatial error (0.6694), only slightly smaller, but the *log likelihood* and *Akaike-information-criterion* values showed that spatial lag was still the better fit for human capital as well. Table 7 provides spatial linear regression results with this model when including the spatial-lag variable.

Table 7

Spatial Linear Regression Coefficients with CAA as the Independent Variable and Social (Model 1), Human (Model 2), and Economic (Model 3) Capital Indicators as Dependent Variables (N = 3,107) With the Spatial Lag Variable Added to the Model

	Model 1 (Social)		Model 2 (Human)		Model 3 (Economic)	
Variable	*β*	*SE*	*β*	*SE*	*β*	*SE*
Spatial lag	.71*	.016	.82*	.012	.50*	.022
CAA	.06*	.013	.06*	.010	-.07*	.016
R^2	.47		.67		.19	
AIC	-7458		-14185		-19664	-19664

Note. CAA = civil-agriculture access, *AIC = Akaike-information-criterion*, *$p < .001$.

The spatial linear regression model with spatial lag was the better fit model for each of the dependent variables as compared to the OLS regression without spatial lag, which was evidenced by the lower *Akaike-information-criterion* values. CAA was minimally more predictive of social and economic capital with the inclusion of spatial lag. CAA was slightly less predictive of the human-capital variable—food security—when spatial lag was included, indicating that the CAA coefficient (.14) was likely inflated in the original model.

In summary, the R^2 values of the two regression models revealed that the inclusion of spatial lag explained much more of the variance of the dependent values than CAA alone, which explained very little. The predictive power of CAA increased slightly with the inclusion of spatial lag for social capital and economic capital, but CAA's effect was still minimal on both. Both dependent variables were much more influenced by spatial lag. The CAA impact on the human-capital variable—food security—was positive but weak. The inclusion of spatial lag resulted in a weaker predictive relationship between CAA and food security, indicating that the lack of spatial lag in the original model made the predictive power of CAA on food security appear higher than it actually was. When comparing Lyson & Guptill's (2004) results to civic agriculture outcomes in this study, civic agriculture has continued as mostly a metropolitan and peri-urban trend and continues to be most prevalent in the Northeast and the West.

CHAPTER 5

Discussion

This dissertation predominantly drew on two bodies of literature: civic agriculture and community resilience. The Community Capitals framework (Flora et al., 2016) provided an apt theoretical explanation for the link between civic agriculture and community resilience. In short, the civic-agriculture scholarship espouses social contributions in the form of community capitals (Draper & Freedman, 2010; Kiptot & Franzel, 2013; Santo et al., 2016) also identified in the community-resilience literature as pertinent for community resilience to disasters (Chandra et al., 2013; Norris et al., 2007; B. Pfefferbaum et al., 2015; Renschler et al., 2010; Twigg, 2009), but insufficient research explicitly examined empirical relationships.

This study included a new, population-adjusted measure for civic agriculture, CAA, using the number of farms per county selling directly to consumers through roadside stands, farmers markets, pick-your-own operations, door-to-door sales, and CSA initiatives (USDA, 2012). Secondary data from multiple sources were used to explore the empirical relationship between civic agriculture and three community capitals relevant to community resilience using counties as the unit of analysis. The dependent variables were social, human, and economic capital, measured by the BRIC community capital subindex (Cutter et al., 2014), food-security rates derived from the Feeding America food-insecurity-rate estimates (Gundersen et al., 2015), and population-adjusted retail-trade-establishment rates (U.S. Census Bureau, 2013), respectively. The empirical analysis of the model revealed that CAA did not correlate strongly with or predict the indicators used to measure social, human, and economic capitals.

Nevertheless, this study contributed to our understanding of the civic-agriculture phenomenon, as well as considerations for how to measure civic agriculture and the social

phenomena it may influence. This study found wide variability in CAA throughout the United States including 52 of 3,107 counties having CAA levels more than three standard deviations above the mean. However, most U.S. counties have relatively very little or no CAA. This work establishes a CAA baseline, which may prove useful for future research including the examination of change over time.

Geographic Distribution

Civic agriculture is characterized by local, small-scale agriculture initiatives bound to the social and economic development of a community of place (Lyson & Guptill, 2004) that includes, but is not limited to farmers' markets, community gardens, and CSA (Lyson & Guptill, 2004). This study showed that the geographic distribution of civic agriculture, as well as the dependent variables used to measure social, human, and economic capital, exhibited spatial autocorrelation, albeit to varying degrees. Civic agriculture and the dependent-variable measures are largely distributed in different regions of the country. Civic agriculture was greater in the Northeast and the West, whereas social capital was greater in the Midwest. Economic capital was highest in the West, while differences between the West, Midwest, and Northeast were minimal. Human capital, measured as food security, was highest in the Northeast and the Midwest. Civic agriculture exhibited as a more metropolitan phenomenon, whereas social and economic capitals were more rural. Human capital did not exhibit a metropolitan or rural effect.

Other factors potentially influencing the geographic distribution of CAA likely include ecological parameters favorable to crop production, which vary regionally and influence the development of farming initiatives and agriculture production rates (Lyson, 2004). For instance, USDA-certified organic agriculture is more prevalent in counties with colder winters, milder summers, hillier landscapes, and natural hydrologic amenities (Kuo, 2015). Furthermore,

agriculture that is less mechanized than commodity agriculture, such as many organic agriculture initiatives, are more sensitive to natural capital variability (Kuo, 2015). Some spatial dependence correlation emerged between geographic locations of organic-agriculture and direct-to-consumer sales. Kuo's (2015) findings suggested a likely correlation between ecological factors influencing organic-agriculture production and civic agriculture.

Civic-agriculture demographics and market drivers. The USDA recently released the results of its *Local Food Marketing Practices Survey* (USDA, Census of Agriculture, 2016a), which revealed that direct-to-consumer operations, like the ones used to develop the CAA metric in this study, accounted for 35% of the direct farm sales. "Direct farm sales" is a term used by the USDA National Agricultural Statistics Service, which includes direct-to-consumer sales, direct-to-retail sales, and direct-to-institutions or intermediary sales (USDA, 2016b, p. 1). The LFMPS study (USDA, 2016a) found that direct-to-consumer operations, like those used to develop the CAA, had $3 billion in sales in 2015, which is a 445% increase since 1997 sales used in Lyson and Guptill's (2004) study of civic agriculture. Direct-to-consumer operations are representative of civic agriculture (Lyson, 2004) as they tend to be smaller operations than the other types of direct-marketing operators, with sales in grocery stores (retailers), schools, and hospitals (institutions and intermediary; USDA, 2016b). Direct-to-consumer sales are mostly fresh produce, but also comprise value-added products like milk, cheese, jam or cider (USDA, 2016b).

The geographic distribution of CAA values is consistent with direct-farm-sales data from the LFMPS study (USDA, 2016b), which reflects similar regional patterns and variability. The LFMPS study revealed that four Northeastern states account for 22% of the U.S. total direct-farm sales (USDA, 2016b). The LFMPS study found that California had the highest sales from direct-

to-consumer operations and Pennsylvania had the most actual direct-to-consumer farms (USDA, 2016b), which is indicative of the findings of this study showing the West and the Northeast with the most civic agriculture. The LFMPS study revealed that farms using direct marketing made more than 80% of sales within 100 miles of the farm, which further validates these type of initiatives as local and indicative of civic agriculture. Although direct-to-consumer farms comprised most farms using direct marketing, they did not have the majority of sales, which were operators selling directly to institutions and intermediates such as hospitals and schools (USDA, 2016b).

This study indicated that the metropolitan trend has continued for civic agriculture (Lyson & Guptill, 2004) and is less likely to occur in counties that are rural. This finding is also consistent with the LFMPS study findings that the majority of farms using direct marketing were in metropolitan counties (USDA, 2016b). Direct-to-consumer farms made the majority of their sales from on-farm stores (USDA, 2016b). Agriculture producers, regardless of type, are motivated to maximize profit (Halloran & Archer, 2008; Kuo, 2015) so situating these civic-agriculture farms near metropolitan areas is logical for sufficient clientele within a reasonable driving distance. The next highest venue for sales directly to consumers is farmers' markets, then roadside stands and CSAs (USDA, 2016b). Other venues used to a lesser degree were online sales, pick-your-own farms, and mobile markets (USDA, 2016b). These marketing venues are likely to find a stronger customer base in metropolitan areas.

Civic-agriculture farms provide food value to consumers by growing locally and remaining small in scale. Civic-agriculture farms do not maximize profits through production as do commodity-agriculture farms. Instead, civic-agriculture farms add value to their products by being local. They also add value with the suggestion, if not an explicit certification, of using

ecologically sustainable and cultivation practices that customers perceive as healthier due to freshness, nutrient loads, and minimal chemical inputs. As Lyson and Guptill (2004) indicated, the *experience* of buying directly from a local farmer is partially what direct-to-consumer farmers are selling. Some direct-to-consumer products sell at a premium and may be better supported by wealthier clientele, more indicative of metropolitan and periurban communities (Lyson & Guptill, 2004).

CAA exhibited a metropolitan effect and, although one reason for this is likely market related, another may be cultural. Rural counties may exhibit cultural characteristics that make civic-agriculture entrepreneurship a rare consideration. Social relationships, especially in rural places, often reflect entrenched political economies that persist over time through tradition and reputation (Duncan, 1996). Classism and power dynamics that translate into lived, economic experience can be difficult to change and have a tendency to continue through generations. Rural communities can maintain a sense of place, rooted in long-held beliefs about family lines and what they represent, which become social norms and perpetuate the status quo (Duncan, 1996). Rural counties, perhaps especially those with persistent poverty, may lack entrepreneurial social infrastructure (ESI), which could limit the initiation of civic-agriculture entrepreneurial ventures.

Places with ESI can translate social capital into organization and collective action and are more open to change (Flora, Sharp, Flora, & Newlon,1997). This consideration also fits with theories about civic-agriculture initiatives, which may express community agency and problem solving (Lyson, 2005). Civic agriculture may, in part, be a response to collective concerns about decreasing levels of local economic control, environmental degradation from commodity agriculture, and health impacts of a globalized, industrial food-system (Allen, 2004). Rural communities that have a tendency toward cultural characteristics that resist change (Duncan,

1996) may not be the most likely places for civic agriculture to develop. Communities with the cultural attributes to develop civic agriculture may be those with ESI or, as Lyson et al. (2001) suggested, a civically engaged middle class. These communities may be more likely in metropolitan areas or those close to metropolitan areas where communities have more diverse networks linking them to outside resources, a quality of ESI (Flora, 1997).

Civic agriculture, homophily, and social contagion. Homophily and social contagion may influence civic-agriculture development patterns geographically, reflected in the spatial autocorrelation results of this study. This study showed that direct-marketing forms of civic agriculture exhibit wide variability in degree of CAA, but also wide geographic dispersion with high levels in the Northeast and the West. Most counties with high levels of CAA also exhibited spatial autocorrelation. Community perceptions and norms vary with demographic and cultural characteristics. People with the same socioeconomic characteristics and ideological leanings often live in close proximity and even cluster (Howe, Mildenberger, Marlon, & Leiserowitz, 2015), a phenomenon dubbed homophily (Christakis & Fowler, 2012). Still another reason maybe social contagion and although the two are often difficult to empirically distinguish (Marsden, 1998), they are not mutually exclusive. Social-contagion theory simply postulates that social and cultural ideas, attitudes, and behaviors spread through geographic regions through social networks (Marsden, 1998). Regional social networks may highly influence the dissemination of civic agriculture.

Recent social-contagion research used social-network data from the long-running Framingham Heart Study to reveal a strong contagion effect within three degrees of separation (Christakis & Fowler, 2012). That is friends, friends of friends, and friends of friends' friends show significant association and predictive responses with variables of physical and mental

health and behavior. Network permutation analysis showed that health variables like obesity, smoking, and alcohol consumption, as well as emotional states like happiness and depression (Christakis & Fowler, 2012) exhibit significant association between two and four degrees of separation. If such cognitive, affective, and behavioral associations occur along the communication linkages of social networks, it is easy to understand that civic-agriculture development behaviors may also exhibit association with social networks and their geographic distribution. Furthermore, the dependent variables are also social phenomena that are not static, meaning that the existence and concentration of these variables can also change over time and be influenced by social contagion and homophily as well.

Dependent variables. No correlation or predictive response emerged between civic agriculture and social, human, or economic capital measured in this model. The variables in this study showed variation from each other in national distribution. Civic agriculture exists, to an appreciable degree, in relatively few counties nationally, compared with the other variables in this model. This study does not negate the possibility that CAA positively contributes to these community capitals at other units of analysis or even by measuring these variables with different indicators. That is, civic agriculture may encourage the development of community capitals in smaller pockets of community than the county level and may not directly influence the proxy measurements used for social, human, and economic capital in this model. CAA may need to exist for a longer period before impacts are measurable at the county level. Nevertheless, this study revealed that civic agriculture does not increase social, human, or economic capital to any appreciable degree at the county level, using the dependent-variable indicators of this model.

Social capital. Social capital was measured in this study using BRIC Community Capital subindex scores at the county unit of analysis. The BRIC Community Capital subindex was

designed to numerically capture three dimensions of social capital including sense of community, place attachment, and citizen participation (Cutter et al., 2010). Population-adjusted proxies included associational membership measures of religious adherents, the number of civic and social advocacy organizations, and percent of voter participation. Place attachment was measured using the percent population born in the state that still reside in the state and net international migration, which is considered negative to social capital. This study showed that these measures did not correlate with civic agriculture nationally, nor was civic agriculture predictive of this measure of social capital.

This study indicated that civic agriculture is highest in the Northeast and the West, whereas, social capital was highest in the Midwest. The Northeast had the second highest levels of social capital, where civic agriculture is the highest. Still, civic agriculture is high in the West where social capital indexes measure social capital as low, due to decreased associational membership. The West may not be as low in social capital as association membership indexes show. Social capital in the West may generate through means outside of associational membership, not captured in typical social-capital-index measures. Net international migration is used in the index as an indicator of reduced social capital, which may also lead to deflated social capital measurement in the West.

The BRIC Community Capital subindex indicates that social capital is highest in Minnesota, Iowa, and the Dakotas, as well as Northern Ohio, Mississippi, Alabama, and Louisiana (Cutter et al., 2014), where this study showed civic-agriculture levels are relatively low. Higher levels of social capital in these areas are explained due to higher participation in religious groups, numbers of people born where they reside, and higher percent population not foreign-born who came to the United States in the previous 5 years; these are considered

measures of place attachment (Cutter et al., 2014). The BRIC Community Capital subindex then indicates that social capital is lowest in Washington, Oregon, California, Nevada, New Mexico and Florida, which are places with higher immigration rates and perhaps lower levels of religiosity. Interestingly, many of these locations are places where natural amenities (USDA, Economic Research Service, 1999) *and* civic-agriculture levels tend to be higher. The possibility remains that social capital may exist in the West and Florida, but in social groups not detected with county-level data. Instead, social capital may exist in closely knit social groups bound by heritage and culture, as well as groups bound through the enjoyment of natural amenities.

No relationship emerged between civic agriculture and social capital with the variable indicators of this study. These findings were not consistent with numerous studies examining smaller scale civic-agriculture operations and the generation of social capital (Draper & Freedman, 2010; Santo et al., 2016). Nor were they consistent with findings of Kuo (2015) who found a significant association between organic agriculture and direct-to-consumer farms (civic agriculture) and a significant association between high-intensity organic-agriculture counties and social capital. Organic agriculture and direct-to-consumer civic agriculture are not the same measure and are not proxies for each other. Still, a highly significant association emerged between them in county location nationally. Kuo (2015) found strong association between counties with high-intensity organic agriculture and a different measure of social capital (Rupasingha, Goetz, & Freshwater, 2006) than the BRIC Community Capital subindex.

Rupasingha et al. (2006) used associational density measures at the county unit of analysis, like the BRIC Community Capital subindex. However, these researchers also differentiated civic-engagement associations into professional associations and those that "involved social interaction that promotes trust and cooperation" (Rupasingha et al., 2006, p. 89).

The authors also used an ethnic fractionalization index to account for the theoretical negative impact of ethnic division, finding that counties high in manufacturing and agriculture, fishing, and forestry occupations had a positive association with social capital, compared to models that did not distinguish between types of civic-engagement associations and did not use an ethnic-fractionalization index. These findings suggested that distinguishing between the types of civic engagement may be important to the accuracy of a social-capital county index. Populations with more manufacturing, agriculture, fishing, and forestry may generate social capital through other means than those counties with more professional organizations, sometimes called rent-seeking associations (Rupasingha et al., 2006). Ultimately, researchers measure social capital in a variety of ways including individual interviews, surveys, and varying types of associational density indices, each with strengths and limitations.

Another possibility for the difference between social-capital findings is that Kuo's (2015) use of logistic regression produced different outcomes from this study's use of ordinary least squares regression. Logistic regression predicts the probability of attributes more accurately in some studies comparing the two methodologies (Pohlmann & Leitner, 2003). Still, the majority of studies demonstrating a positive relationship between civic agriculture and social capital were small-scale, mostly qualitative studies. Civic agriculture may generate social capital among those engaged in a particular initiative, but not at scales discernable at the level of county data. Civic agriculture may not impact the indicators used to measure social capital in this study. The BRIC Community Capital subindex is a reasonable measure of extant social capital, but was not likely to capture social capital generated through neighborhood civic-agriculture initiatives.

Human capital. Human capital entails knowledge, skills, physical and mental health, and the capacity to work (Flora et al., 2016). Human capital allows people to reach their livelihood

goals, engage more effectively in community problem solving, and contribute more to economic and social capital in community, which all enhance a community's resilience (Chandra et al., 2011, 2013; Mayunga, 2009). Civic agriculture, especially in the form of community gardens, positively contributes to physical and mental health (Draper & Freedman, 2010; Greenleaf et al., 2014) and provides opportunities to increase community knowledge and skills in cultivation, nutrition, and sustainability (Meenar, 2015; Santo et al., 2016) .

This study used food-security rates as a proxy for human capital because food security is an indicator of a community's capability and ingenuity to provide basic needs. Furthermore, low food security or high food insecurity links to childhood educational deficits and subsequent lower levels of educational attainment (Hickson et al., 2012). Furthermore, food security is a priority issue for a community's resilience to disaster (Barthel & Isendahl, 2012; Barthel, Parker, & Ernston, 2013; Frankenberger, Mueller, Spangler, & Alexander, 2013; Santo et al., 2016). Communities that invest in civic agriculture often do so to increase food security (Santo et al., 2016). Some small scale, qualitative studies have shown that civic-agriculture initiatives can improve the food security of families and others directly participating in civic-agriculture initiatives. Civic agriculture often results in families and volunteers supplementing household food budgets with produce from the initiatives, but this food is a supplement, not a replacement for retail, commodity agriculture (Santo et al., 2016). Minimal evidence suggests that civic agriculture increases food security at levels of scale, such as for an entire city or county (Draper & Freedman, 2010; Santo et al., 2016) and the results of this study were no exception.

This study examined whether a correlation exists between civic agriculture and food security, derived from the Feeding America food-insecurity estimate rates, and found only a weak positive correlation. OLS regression with CAA as the independent variable and food

security as the dependent variable revealed no predictive relationship between CAA and food security at the county unit of analysis. Food security was highest in portions of the Northeast, Midwest, and Great Plains and, apart from many of the Gulf coast counties, was lowest throughout the South. Food security was also low in Arizona and in Northwest New Mexico. Low food security (or high food insecurity) positively correlates with unemployment and poverty (Gundersen et al., 2015).

This study found that rurality had no predictive power on food security. These findings are consistent with a study conducted by the USDA (Mabli, 2014), which found that, when percentages are regression-adjusted for demographic, economic, and household characteristics, living in an urban area was not associated with food insecurity. Percentage-point differences of food insecurity were not statistically significant between urban and rural areas (Mabli, 2014).

Civic agriculture may not exist to the extent or for an adequate period to raise food security appreciably at the county level of analysis. Civic agriculture may only improve food-security rates for specific volunteers who are involved in civic-agriculture initiatives, as other studies have shown (Draper & Freedman, 2010; Santo et al., 2016), with only a limited spill over impact for the broader community. This study only considered direct-to-consumer operations as a measure of CAA; other forms of civic agriculture, such as community gardens, may have a greater impact on food security. This study did not measure the impact of more comprehensive local food systems, which would likely include a mix of civic-agriculture types such as community gardens, direct-to-consumer farms, farmers' markets that accept SNAP benefits, food processing, and aggregated distribution centers for local foods or food hubs. The presence of direct-to-consumer farms may have a more limited impact when not integrated as part of a local food system.

Feeding America food-insecurity estimates develop through analysis of food-insecurity indicators including poverty, unemployment, and homeownership (Feed America, 2014), as well as food-budget-shortfall averages derived from the Current Population Survey. These county-level estimates may not capture smaller scale food-security increases such as in neighborhoods or among participants in civic-agriculture initiatives.

Economic capital. Researchers widely accept the notion that economic capital is a critical domain of community resilience (Alcantara-Ayala et al., 2015; Juneja, 2009; Lal et al., 2009; Mayunga, 2007) and, likewise, many have expressed the likelihood that community support for civic agriculture benefits local economies (Garrett & Leeds, 2014; Kiptot & Franzel, 2013; Lyson, 2005; Macias, 2008; Meenar, 2015; Okvat & Zautra, 2001). Civic-agriculture ventures are a growing segment of the economy, evidenced by increasing numbers of small-scale farms and sales (USDA, 2016b). A relationship also seems to exist between economic downturns and increased civic-agriculture initiatives. Examples include the victory gardens of World War II (Ferris et al., 2001; Schmelzkopf, 1995), increased community gardening after the 1973 oil embargo (Ferris et al., 2001), and the 2009-recession garden spike (McIlvaine-Newsad & Porter, 2013).

However, a literature review for this study and Santo et al. (2016) found that an empirical link between civic agriculture and economic capital is the least researched of positive claims made about civic agriculture. In the foundational Goldschmidt study of two California agriculture communities that led to Lyson's (2004) theory of civic agriculture, Goldschmidt found that Dinuba, the community with smaller scale agriculture, had a higher volume of local retail trade. Goldschmidt, a renowned anthropologist, used a type of critical ethnography including eight months of field research, collecting data through observation, and interviews, and

though widely respected, has also been criticized for a lack of objectivity (Emerson & Vertrees, 1979). This study, used quantitative data and specifically the population-adjusted, county retail trade rate, and did not find a correlation or predictive relationship between civic agriculture and economic capital. CAA may need to exist for a longer period to have a discernable effect on county-level, retail-trade-establishment rate.

Future studies exploring a positive relationship between civic agriculture and economic capital may consider other measures, such as a multiplier effect of currency retained locally through community, especially choosing to buy locally grown food. Another way to assess benefits of civic agriculture on economic capital is through input–output analysis, which measures the economic impact of buying locally (McFadden et al., 2016). Such a study would not be national in scope, due to lack of available data at that scale. However, the CAA rate could be used to examine change over time in a city, county or other community-level unit of analysis.

Forms of Civic Agriculture

Direct-to-consumer farm operations have been used as a measure of civic agriculture before this study (Lyson & Guptill, 2004). Direct-to-consumer farm operations are a reasonable measure of civic agriculture because the USDA definition captures many of the localized, small-scale forms that civic agriculture is known to take. However, one form of civic agriculture identified in the literature, not captured with this measure, is community gardens.

Theoretically, roadside stands, farmers markets, pick-your-own operations, door-to-door sales, CSA initiatives, *and* community gardens lead to increased community capital (Delind, 2002; Lyson & Guptill, 2004; Lyson, 2005; Lyson et al., 2001). Direct-to-consumer operations and community gardens may both increase social interaction in a community, but they are largely researched as separate phenomena through different research methods. Civic agriculture

research falls into mostly two camps: (a) large-scale quantitative analysis using aggregate county data of direct-to-consumer farm operations (Lyson & Guptill, 2004), and (b) smaller scale, qualitative, and mixed-method studies of community gardens (Draper & Freedman, 2010; Kiptot & Franzel, 2013; Migliore, Caracciolo, Lombardi, Schifani, & Cembalo, 2014; Okvat & Zautra, 2011; Santo et al., 2016). Some smaller-scale, qualitative, and mixed-method research also found that direct-marketing operations, such as community-supported agriculture and direct-to-consumer farms, increase social, human (Furman et al., 2013; Macias, 2008), and economic capital (Santo et al., 2016). However, the majority of research indicating that civic agriculture can lead to the development of community capitals specifically addresses community gardens (Draper & Freedman, 2010; Santos et al., 2016).

This study did not include community gardens in the development of the CAA due to a lack of community-garden data at the county unit of analysis. Therefore, the possibility remains that community gardens result in different community-capital outcomes than direct-marketing forms of civic agriculture. Community-garden research generally lacks national scope. One exception is a study (Lawson et al., 2013) published by the American Community Gardening Association, in which researchers surveyed community-garden organizations nationally and examined such factors as garden growth and loss, types of land used for community gardens, and types of community gardens. Lawson et al., (2013) found that community gardens appear to be growing in number nationally and may be doing so with proportionality to the population (Lawson et al., 2013). Additional research is needed to determine to what extent community gardens and direct-marketing forms of civic agriculture coexist in communities and especially how they differ in community-capital impact.

Unit of Analysis Considerations

Large-scale, quantitative studies using county-level data explicitly examining a relationship between direct-to-consumer marketing and community capitals did not exist prior to this study, but ample theoretical support does exist for the model used (Delind, 2002; Lyson, 2004; Lyson & Guptill, 2004). Lyson and Guptill (2004) used a similar methodology, which used direct-to-consumer farms as a measure of civic agriculture, and examined demographic differences between counties high in civic-agriculture and counties high in commodity-agriculture counties. Although Lyson and Guptill (2004) provided strong theoretical support for civic agriculture as a means of social, human, and economic capital in communities, their study did not explicitly examine these variables, as this study did.

Lyson and Guptill's (2004) 1992 and 1997 findings on civic agriculture, measured by direct-to-consumer operations, were consistent with many of the findings of this study. Like this study, Lyson and Guptill found that civic agriculture exists predominantly in metropolitan areas and counties adjacent to metropolitan areas. They found that civic agriculture is most common in the Northeast and the West, and this study shows that trend has continued. Lyson and Guptill's study looked at change over time from 1992 to 1997, which showed an 8.1% rate of growth in direct-to-consumer farms during that time. This study showed that Lyson & Guptill (2004) were correct in their estimation that the growth trend of direct-to-consumer farms had not peaked. Although Lyson and Guptill used a slightly different county set than this study, an approximate 53% rate of growth in direct-to-consumer farms accrued from the time of the 1997 (93,000 farms) data of their study and the 2012 (142,682 farms) data used in this study.

Aggregated county data does not capture every nuance in community characteristics, variables, or social phenomena. Obviously social phenomena are not evenly distributed

throughout a county, but aggregated county data gives the impression it is (Moon & Farmer, 2001). Mostly, counties and equivalents are an administrative designation for which numerous types of data accrue for analysis, but inherent challenges emerge to accuracy with regard to social phenomena that do not adhere to essentially arbitrary borders. Aggregated county data does not reflect the likely variation in the degree of a variable measured to capture a social phenomenon. Aggregate data lacks local "detail and specificity" (Moon & Farmer, 2001, p. 40). Furthermore, data used to measure the same variable can result in different research outcomes, depending on the level of aggregation (Farmer, Luloff, Ilvento, & Dixon, 1992).

Smaller scale studies found a positive link between civic agriculture and community capitals. This study shows that social, human, and economic capital outcomes from civic agriculture may be less apparent using county-level aggregate data. Individualistic and ecological fallacy (Subramanian, Jones, Kaddour, & Krieger, 2008) may be important considerations when examining social outcomes of the civic-agriculture phenomenon. Individualistic fallacy happens when researchers infer that a social phenomenon happening at the individualistic level, such as a case study of a community garden, also occur at the aggregate level. The more commonly referenced ecological fallacy is also potentially relevant to the civic-agriculture phenomenon. Ecological fallacy occurs when researchers imply or conclude, without sufficient evidence, that outcomes found at the aggregate level are also indicative of likely outcomes at the individualistic level (Subramanian et al., 2008).

Individualistic and ecological fallacy should be considered potential issues, not only for civic-agriculture measurement, but for the dependent variables in this study as well. For instance, the food-security rates used in this study were devised from the Feeding America food-insecurity-rate estimates, which used state-level data and survey results to develop estimates of

county-level food insecurity. Such methodology, while useful, does not capture food-security levels at smaller community scales like the neighborhood. County-level index tools using publicly available quantitative data provide a useful higher level first look at community capitals and vulnerabilities. For example, the BRIC Community Capital subindex uses multiple valid and reliable quantitative indicators of social capital but may not capture social capital generated at subscale levels. Community-resilience assessment is in its nascence and the BRIC was designed to provide a "broad brush" of disaster-resilience patterns (Cutter et al., 2010, p. 18). BRIC authors suggested that, after the initial analysis using the BRIC, "a more detailed analysis within jurisdictions to assess place-specific capacities" is a "second step," (Cutter et al., 2010, p. 18). The Conjoint Community Resiliency Assessment Measure (Leykin et al., 2013) and the Communities Advancing Resilience Toolkit (R. L. Pfefferbaum et al., 2013) are examples of tools that can be useful supplements to community-resilience index tools like the BRIC (Cutter et al., 2010) to assess community capitals with a finer grain.

Implications and Limitations

Cultural, socioeconomic, and ecological factors may converge in certain locations, creating ideal circumstances for the development of civic agriculture. Community-resilience leaders emphasize the importance of flexible social systems and recognition that approaches to build community resilience must be place based (Cutter et al., 2008; Krasny & Tidball, 2015). The development of localized food systems through civic-agriculture initiatives may be a collective act toward community-resilience building (Barthel, Parker, & Ernston, 2013; Wheeler & Braun, 2013). Still, research is needed to ensure these approaches are evidence-based and address assessed community needs.

From a cultural perspective, consumer motivation for choosing locally grown foods may vary by political concerns (Winter, 2003). One motivation discussed in the literature for choosing locally grown food is a desire to improve physical health, stemming from concerns about the safety of foods produced in the globalized food system (Allen, 2004). Another concern is environmental degradation caused by large-scale farming practices, which includes transportation-associated pollution. Yet another motivation is a desire to strengthen one's local economy and improve local systems to enhance community food security. Although these are distinct motivations, they may reflect an overarching concern about global capitalism (Allen, 2004). Civic agriculture may be one of many complex responses to disenchantment with modernity or more precisely, a manifestation of reflexive modernization. The theory of reflexive modernization postulates a discontent with modernity, particularly the operating assumption of unlimited resources (Beck, Bonss, & Lau, 2003). Reflexive-modernization theorists indicate that transformative social change is currently underway with the growing recognition that ecological resources are limited and a global, ecological, and economic crisis is escalating (Beck et al., 2003).

A quantitative research methodology produces reliable data with outcomes that are usually generalizable, but often has the drawback of not capturing more specific "knowledge, attitudes, and behaviors" (Steckler, McLeroy, Goodman, Bird, & McCormick, 1992, p. 3). Thus, one limitation of this study is the use of only quantitative methods and aggregate data at the county unit of analysis. Civic agriculture and community resilience research may be areas in which an integration of qualitative and quantitative methods provide the best insights on the phenomena. Quantitative and qualitative methods used conjunctively can cross-validate findings (Steckler et al., 1992) and provide better understanding than one research method alone. When

results between qualitative and quantitative methods do not suggest the same outcomes or conclusions, researchers and practitioners must evaluate why and determine which results are most valid (Steckler et al., 1992). Thus, more research is warranted at more localized units of analysis to examine civic agriculture's impact on community-resilience domains.

Communities attempting to assess baseline community-resilience levels or areas of community vulnerability should assess community capitals at ground level and not only rely on aggregated county metrics. For instance, communities may have pockets of social capital, generated through social networks from public schools, nonprofit groups, county extension programs, or civic-agriculture initiatives. Social capital from sources that cannot be measured by aggregate county data could still be useful community assets during community-resilience planning or disaster response. Likewise, a county may appear high in social capital using county-level association-density indices, but finer localized assessment should also be employed to ensure the planning process addresses neighborhood-level vulnerability (McEntire, 2005).

Future Research

Future studies looking for an empirical link between civic agriculture and community resilience could examine how well communities recovered after disaster, whether CAA in those communities positively impacted postdisaster outcomes and, if so, how. Studies of this nature should seek differences between community-capital outcomes based on civic-agriculture type and should cross-validate county-level indices with qualitative measures. Civic agriculture is gaining attention as a means to build community resilience (Barthel & Isendahl, 2012; Barthel, Parker, & Ernston, 2013; Koc et al., 1999; Krasny & Tidball, 2015; Newman, Beatley, & Boyer, 2009), especially with regard to increasing food security. Research is needed to develop valid

and reliable instruments for objective measurement of outcomes for community-resilience-building approaches, including civic-agriculture initiatives designed for that purpose.

Research examining the factors influencing the development of civic agriculture should explore the demographic qualities of civic-agriculture farmers, questioning age, race, and gender to answer questions about what might influence future civic-agriculture trends. For instance, Is the current surge in civic agriculture likely to drop as communities age? and When is such a drop likely to occur? The USDA LFMPS (2016) report, which includes direct-to-consumer operations, but in a broader category of operations with direct sales through other channels, provides some suggestion of the demography of the civic-agriculture farmer. For instance, although some millennials may participate, a large generation born between 1981 and 1997 (Pew Research Center, 2015), the vast majority of farmers (91%) participating in direct marketing were over the age of 35 (USDA, 2016b).

Cultural factors influencing the development of civic agriculture should also be further investigated to better understand the phenomenon and the implications for community outcomes. Do civic-agriculture farmers as a group have unique cultural and ideological values indicative of the theory of reflexive modernization, when compared to other farmers? Do their concerns include climate change? Different communities and even regions in the United States likely have varied levels of concern regarding a planet with finite resources, suggested in the geographic dispersion of climate-change opinions (Howe et al., 2015). Future research may explore a link between civic-agriculture dispersion and climate-change concern.

Future studies in this area may do well to employ a mixed-methods approach for a deeper exploration of community attitudes. In the manner of Goldschmidt, a community high in civic agriculture could be compared with a community low in civic agriculture and high in commodity

agriculture. In addition to community-capital comparisons, community cultural and political attitudinal differences could be explored relative to food security, economy, and the environment. Clearly, this study illustrated the potential effect of spatial autocorrelation on geographic variables, and future studies of this nature should include spatial-autocorrelation measures.

This study did not include an examination of natural capital, but some indication exists that civic agriculture may conserve natural capital (Santo et al., 2016). The claim that civic agriculture can preserve or increase natural capital, perhaps through storm-water runoff mitigation or the preservation of green spaces, deserves impartial scrutiny. Also, some forms of civic agriculture may be more beneficial in addressing particular community needs and goals. More research is needed to discern differences in community outcomes from different forms of civic agriculture, especially between community gardens and direct-to-consumer marketing.

Conclusion

The Community Capitals Framework is a useful paradigm for understanding the facets of community across capital domains, not only for community development, but also for community resilience. Civic-agriculture access was introduced as a new measure in this study, emphasizing the potential social benefits of local, small-scale agriculture. This measure is simple and adaptable to different units of measure of civic agriculture and different forms of civic agriculture can be added to the measure as data availability allows. The results of this study revealed that civic agriculture, at least in the form of direct-to-consumer farms, does not appreciably increase county-level social, human, or economic capital. Civic agriculture may encourage the development of community capitals at finer scales and still not necessarily influence the proxy measures used for social, human, and economic capital in this model.

This study added to the growing body of food-geography literature, of which the geography of local food systems, including civic agriculture, is becoming a subfield (Gatrell, Reid, & Ross, 2011). If the assertion that civic agriculture is a sociological response to economic and ecological concern is true (Allen, 2004; Lyson, 2004), this study suggests that the degree to which these concerns exist varies regionally. Direct-to-consumer civic agriculture, as measured in this study, has risen since at least 1997 compared to Lyson and Guptill's (2004) outcomes, and has remained concentrated in the Northeast and the West. Regional distribution of civic agriculture may, in part, reflect geographic hotspots of converging social movements, namely sustainable agriculture and community food security (Allen, 2004).

Local-level measurement tools are needed to objectively assess social, human, and economic capital outcomes of community-resilience-building approaches, including civic-agriculture initiatives. Objective measurement is needed to verify if civic-agriculture initiatives actually improve the community capitals that civic-agriculture advocates claim, which may increase resilience in some communities. The need for field-based measurement makes scientist partnerships imperative (Krasny & Tidball, 2015) so strategies can be adapted, as needed, to ensure effectiveness. Thus, community leaders should encourage partnerships between managers of community-resilience initiatives and applied scientists so that limited community capitals can efficiently *spiral up*.

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