THE ROLE OF UNIVERSITY FOOD GARDENS IN HIGHER EDUCATION SUSTAINABILITY

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Higher Education has the resources available to serve as a leader in sustainability, specifically by preparing graduates to address issues associated with global climate change through the use of interdisciplinary and hands-on learning. However, institutional barriers may limit large-scale restructuring of curriculum and institutional structures. Small initiatives and broad networking may help to provide sustainability education while also paving the way for broader curriculum and institutional adaptations. The potential of community gardens to serve as sustainability and community interventions make them a desirable study site to gain insight into the power of small initiatives, yet very few studies have assessed the role of community garden projects in campus settings. Through the use of an email survey sent to campus garden managers across the United States and Canada, the power of these initiatives to advance higher education sustainability can be better understood. The study sought to answer the following research questions: (1) What are the demographic characteristics of university food gardens?, (2) Do university gardens serve as sites for formal and informal education, (3) What obstacles and benefits occur within university food gardens, and (4) What factors affect the long-term resilience of university food garden initiatives? It was found that when institutional support, strong networking, and consistent participation are present, university food gardens enhance the overall sustainability of higher education institutions while also providing valuable sources of interdisciplinary and hands-on learning. Gardens receiving the greatest support from their

institution exhibit strong resilience and provide numerous benefits that aid increase the overall sustainability of their institution. This study asserts the power of small sustainability initiatives within higher education institutions, while also addressing key factors which ensure the long-term resilience of these valuable sites.

DEDICATION

This work is dedicated to my family and friends for their love and support. I would like to thank my sister, Joanna Klein, for her positive encouragement and wise advice throughout my time at Southern Illinois University. I would also like to thank my parents for their spiritual support and guidance, I would not be where I am today without their love and prayers.

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CHAPTER 1

INTRODUCTION

1.1 Introduction and Purpose of Study

As the climate changes, sustainable living and the adoption of these practices into institutions is growing more important. Higher education provides graduates with skills to prepare them for the workforce, however, sustainability problem solving is not traditionally taught. While research shows institutions are interested in sustainability, and are offering more courses in such a topic, their structural makeup limits the adoption of interdisciplinary sustainability education. One way to overcome this obstacle may be through hands-on learning utilizing community garden projects. Community gardens, among their other numerous benefits, serve as sites where experiential education and holistic environmental learning can occur. Gardens provide both hands-on and formal education to diverse groups of participants. They can lead to lifestyle changes, social movements, and political activism. Community gardens focused on crop production (food gardens), have direct and indirect positive environmental impacts. While providing numerous benefits, gardens may also encounter several obstacles which may limit the beneficial capability of the sites. By understanding these obstacles key factors to grow a resilient project may be derived. The benefits gardens provide and the inability of many universities to provide sustainability needs, make these initiatives a prime site for academic research.

1.2 Research Problem

While a large body of research has focused on community gardens in urban, low-income neighborhoods, not much research exists regarding community gardens in campus settings.

University food gardens have the power to bridge institutional constraints and provide a source of interdisciplinary collaboration and education, yet like any garden project they may encounter obstacles which hinder their development. It is important to understand the key factors involved with university food gardens, in order to understand how best to utilize these spaces. One initial step to elucidate this lack of knowledge is to obtain data from garden managers at existing campus gardens. Beginning with descriptive data will identify benefits and obstacles and open the doors for more detailed analysis in the future.

1.3 Research Questions

This research asks the following questions:

- 1. What are the demographic characteristics of university food gardens?
- 2. Do university gardens serve as sites for informal and formal education?
- 3. What obstacles and benefits occur within university food gardens?
- 4. What factors affect the resilience of university food garden initiatives?

Answering these research questions will shed light on the role of university food gardens within higher education institutions. An extensive literature review of both higher education sustainability and community gardens research provided the background for survey development and mixed-methods analysis of the data. The overall objective is to assess if university food gardens can bridge institutional constraints and serve as alternative sources for sustainability education.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

An extensive literature review was conducted on both higher education sustainability and community gardens. Combining these two subjects allows one to gain insight into the beneficial capabilities "community" gardens may provide in a campus setting. It is important to understand the drivers and barriers of higher education sustainability in order to assess the role campus gardens play in sustainability shifts. Community gardens can provide economic, social, environmental, health, and educational benefits. Yet few studies have assessed if these benefits are provided in a university setting. Thus previous research on higher education sustainability and community gardens provides a relevant starting point from which to frame this study.

2.2 Higher Education Sustainability

Recent research asserts it may be impossible to create a one-size fits all assessment of sustainability within higher education institutions. The difficulty lies in the fact that each institution differs in terms of their funding, size, geographical location, student body, and goals. The complexity of higher education sustainability is further enhanced by the fact that divisions exist within each discipline of a particular institution (Corcoran 2004, Elder 2008, Stephens and Graham 2010). Universities have the funding and resources available to serve as a leader in sustainability research and education (Stephens and Graham 2010, Yuan and Zuo 2012, Bidenweg 2013). Interdisciplinary and hands-on sustainability education should be a primary goal of universities (Velazquez et al. 2006, Elder 2008, Stephens and Graham 2010, Stafford 2011, Yuan and Zuo 2012, Bidenweg 2013). It has been seen that despite the desire for universities to lead sustainability education, significant barriers in the institutional structure of

higher education hinder progress. That being said, universities are actively seeking sustainable practice and education through a series of incremental steps and networking.

2.2.1 Defining "Successful" Sustainability Implementation

In order to understand the benefits of sustainability education it is important to understand what defines a "successful" sustainable university. Research shows working toward a sustainable institution requires the implementation of certain practices including: (1) Decreasing throughput, (2) pursuing incremental and systematic changes simultaneously, (3) engaging in cross-functional and cross-institutional efforts, and (4) including sustainability into education (Shriberg 2002). Universities must include sustainability into the overall mission statement of their university. Efforts to reduce resource use, create sustainability curriculum, and network with other universities should occur simultaneously and take place at both large and small scales within all processes of the university (Shriberg 2002). Since many sustainability initiatives success' are reliant on the ability of education to enhance awareness; inclusion of sustainability theory, ethics, and problem-solving into the curriculum is key to developing a sustainable institution (Shriberg 2002, Velazquez et al. 2006, Minguet et al. 2011, Shephard 2010, Bidenweg 2013, Hidalgo and Fuentes 2013, Louw 2013). Implementation will not be an immediate solution; rather a series of incremental steps at multiple scales (Velazquez et al. 2006). Incorporation of sustainability into learning is seen as one of the key solutions but may also require significant restructuring of institutional systems (Shephard 2010).

2.2.3 Incorporating Sustainability into the Curriculum

Sustainable theory should be incorporated, in conjunction with environmental understanding and ethics, into the core curricula within each discipline at the university (Shriberg 2002, Elder 2008, Stephens et al. 2008, Shepherd 2010, Minguet 2011, Bidenweg 2013).

Specifically there is a need for interdisciplinary and hands-on learning (Elder 2008, Stephens et al. 2008, Kobayashi et al. 2010, Shepherd 2010, Johnson and Castleden 2011, Minguet et al. 2011, Paraschivescu and Radu 2011, Bidenweg et al. 2013, Hidalgo and Fuentes 2013, Louw 2013, North and Jansen 2013). Education should move beyond the classroom by incorporating sustainability practice into the operations and research of the university as well as the services it provides (Shriberg 2002, Elder 2008). Hands on and interdisciplinary learning integrate students into the processes of the broader university, providing a holistic view of the benefits and processes involved with sustainability initiatives (Shriberg 2002, Kobayashi et a. 2010, Louw 2013).

Institutions should utilize interdisciplinary education as a tool to enhance student knowledge of the diverse systems incorporated into sustainability (Shriberg 2002, Elder 2008, Stephens et al. 2008, Shepherd 2010, Minguet et al. 2011, Bidenweg 2013, Hidalgo and Fuentes 2013, Louw 2013). By linking multiple disciplines students to gain skills of synthesis, integration, and systems thinking which better prepare them for the future workforce (Stephens et al. 2008). Some faculty are now incorporating sustainability into their courses, but the interdisciplinary aspect is still largely lacking (Minguet et al. 2011). Interdisciplinary learning gives a platform to change attitudes and behaviors equipping students with a holistic view of world systems (Hidalgo and Fuentes 2013). Applying learning in physical aspects of the university also gives students a firm understanding of problem solving and implementation (Shriberg 2002, Kobayashi 2010, Louw 2013) Sustainability ethics courses, when open to all disciplines, may serve as a first step towards inclusion of sustainability education (Bidenweg 2013).

One study assessing the power of a graduate level sustainability ethics course found students benefited from the learning gained from interacting with students from a variety of disciplinary backgrounds. By discovering the values and systems thinking frameworks of their peers, students gain a broader world-view and a stronger ethical understanding of sustainability (Bidenweg 2013). Broader education may lead to changes in perceptions and attitudes, leading to more sustainable behaviors (Hidalgo and Fuentes 2013). Clearly inclusion of new teaching methods and curriculum benefits both students and universities; however, current institutional structures and systems may hinder these initiatives.

2.2.4 Barriers to Higher Education Sustainability Curriculum

Some progress has been made in the operations and energy use of higher education institutions yet there is still a lack of overall change in the curriculum and culture of universities despite the numerous benefits they provide (Elder 2008). Lack of administrative support and training may be one reason sustainability curriculum is lacking (Minguet et al. 2011), but inherent institutional systems which separate disciplines may also deter collaboration among faculty and administration (Elder 2008, Stephens et al. 2008). The history of higher education has created a system with deep traditions and norms which may hinder the adoption of sustainability education, including: (1) the structure of the institution, which focuses on the division of disciplines into separate schools, (2) the traditional curriculum structure within the university environment, (3) the reward system of faculty which discourages interdisciplinary collaboration and puts a large focus on publications, (4) variations in stakeholder perceptions and implementation strategies, (5) lack of pathways for change, as well as (6) Private funding of research which is determining what is being studied, and in turn what is being taught (Stephens

et al. 2008, Stephens and Graham 2010, Minguet et al. 2011, Yuan and Zuo 2012, Wright and Horst 2013).

Traditional division of disciplines is common, as many universities practice "outcome oriented education" which allows graduates to possess certain skills and knowledge relative to their field of study. Sustainability education would require a shift from micro-focused curriculum to a broader, holistic framework of research and teaching, which some faculty feel limits their academic freedom (Shephard 2010). Faculty may also lack the time to participate in interdisciplinary networking as many universities create a reward system largely focused on publications. For this reason it has been argued that sustainability education may be better suited for vocational schools as universities' objectives are to equip students with the skills necessary for their discipline, not shape their values (Shephard 2010). Differences in stakeholders' perceptions of sustainability also serve as barriers to higher education sustainability. Students, who have a sense of urgency for change, but are limited by their time within the institution and lack of connections. Faculty possess stronger ties to the university and the knowledge to instigate change, yet many have different understandings of sustainability, or do not see the value of changing their curriculum (Wright and Horst 2013). In addition, faculty and staff may find themselves deeply entrenched in the current system (Stephens and Graham 2010) with a lack of power to initiate interdisciplinary programs (Minguet et al. 2011). Often there is a need for a key champion to begin the process of change, and a loss of this champion or a lack of pathways for change may hinder sustainability adoption (Minguet et al. 2011, Yuan and Zuo 2012). The core values of an institution may reduce the availability of resources or pathways for change (Yuan and Zuo 2012). Funding is a key factor limiting for sustainability education programs in universities (Valazquez et al. 2006, Elder 2008, Stephens et al. 2008, Stafford 2011). Funding

shapes where faculty can focus the research necessary for tenure, which in turn can shape the courses being taught in a particular discipline. Due to high enrollment and lack of government capacity to finance all research, much funding must be sourced privately. Private funding may have both positive and negative impacts. Negatively, private funding may shape where research is focused, but positively it may lead to broader interaction with outside communities (Stephens et al. 2008). It is clear that many barriers are limiting the potential of universities to become models of sustainability, however with strong champions, networking, resources, and patience there is great potential for change.

2.2.5 Overcoming Barriers

Transitioning to sustainable practice occurs in four stages (1) Pre-development, (2) Take off, (3) Breakthrough, and (4) Stabilization. No changes are made until the take off stage when initial changes are occurring but are not firmly established or supported. Breakthrough occurs when changes have successfully been initiated and are beginning to be strongly incorporated within the institution. After the initial three phases are completed stabilization occurs and a new equilibrium is reached as the changes are fully integrated into the system (Stephens and Graham 2010). The large scale restructuring of higher education will require patience, giving time for networking and the integration of small initiatives (Velazquez et al. 2006, Elder 2008).

Learning, innovation, and the collaboration between long and short-term goals guide the implementation of sustainability (Stephens and Graham 2010). Universities must participate in long-term visioning and goal setting, but this requires strong leadership and networking amongst stakeholders at the university (Stephens and Graham 2010). Networking is vital to sustainability initiatives and should occur among departments, stakeholders, and various small sustainability initiatives (Kobayashi et al 2010, North and Jansen 2013). The provision of an overseeing

sustainability organization or office aids in strengthening networks (Velazquez et al. 2006). Institutions should transition existing structures to more sustainable options, while also experimenting with new project building and implementation (Stephens and Graham 2010). With key leaders, networking, and support, sustainability may be successfully adopted into an institution. One example of this is seen in a study which discussed the process of adopting interdisciplinary sustainability curriculum into an outdoor education program. It was found that developing curriculum through incremental networking amongst a variety of stakeholders and the university community was vital to successful implementation (North and Jansen 2013). It was also noted that changes occurred slowly as networks developed and created stronger support systems within the institution (North and Jansen 2013). One type of bottom-up initiative currently growing in university settings is the addition of organic gardens and programs to provide local food for universities (Chambless et al. 2012).

2.3 Community Gardens

There is growing interest in university food gardens, yet very little research conducted on these initiatives. To gain a better understanding of a garden environment, an extensive literature review on community gardens was conducted. Because community gardens involve such a broad range of stakeholders, incorporate many different gardening strategies, and develop to specific needs of their community, it is difficult to create a one size fits all definition (Pudop 2008, Firth 2011). It is important to acknowledge the extensive variety among these types of gardens to stress that university food gardens are a form of community gardens themselves. The American Community Gardening Association provides a vague definition of community gardens, defining them as "any place where two or more people garden together" (Pudop 2008). Hale et al. (2011) define community gardens as "an environmental intervention that is

collectively created and sustained by community members" (Hale et al. 2011). This definition surely encompasses a campus food garden, as it is a group of campus community members coming together to address issues of local food supply or environmental processes and education. Though these definitions differ in their wording they clarify that community gardens are unique in their ability to bring communities together for a common cause.

2.3.1 Gardens as a Reactionary Response

In an unpublished study cited by Pudop (2008) strong gardening movements were related to periods of crisis within the United States (Pudop 2008). For example, Liberty and Victory gardens that arose during World War I and II, time periods in which food rationing led to a community collective to create a more self-sustaining country. Gardens serve as a responsive action, and many are now being implemented as mitigation techniques to improve degraded neighborhoods (Pudop 2008). Gardens may also lead to civic action within communities through the development of social capital (Larsen et al. 2004, Miller and Buys 2008, Pudop 2008, Firth 2011, Ralston 2012). Thus, the responsive nature of gardens, in a sense, relies on their ability to create networks of people with similar interest who seek change within their communities.

2.3.2 Benefits of Community Gardens

Community gardens provide benefits at the individual and community level. Community building and economic, health, environmental, sustainability, and educational benefits are all derived from the inclusion of a garden within a community.

Gardens may positively impact a community's economy. In the most obvious sense, gardens may reduce grocery costs for residents by providing healthy, low cost food (Okvat and Zautra 2011), but they also have indirect positive impacts on the surrounding community's economy. In a study conducted by Voicu and Been (2008), they found that the presence of

gardens and green space within neighborhoods increases overall property values of the surrounding community. Higher property values increase tax revenue and overall economic good in a neighborhood, but may also lead to increases in development and loss of gardening space to new housing and businesses (Schmelzkopf, 1995,Voicu and Been 2008, Eizenberg 2012).

Gardens also provide many health benefits. Physical benefits can be derived from a community garden experience. In the most general sense, gardening provides a source of fresh healthy produce and physical activity (King 2008). Many government agencies are beginning to take note of these physical health benefits when considering the inclusion of gardens into institutional settings (Twiss et al. 2003). Gardens increase mental and emotional health especially in relation to stress reduction and engaged consciousness. Gardens may improve ADHD among young children and even prevent dementia in elderly adults (King 2008), though these are just a few examples. Gardeners will often take the relaxation and life skills gained from the garden, and apply them to their everyday life creating a "holistic well being" (Hale et al. 2011). Gardens also have the power to produce individual change, as was seen in a study which found prisoners and elementary school children participating at community gardens made positive changes within their community as a result of the skills they gained (Pudop 2008).

The use of gardens for neighborhood improvement is often linked to the theory of social capital. Social capital is the theory of utilizing community ties and relationships as a resource within a community, and is created through three activities: bonding, bridging, and linking. Bonding is associated with close ties among friends, family members, and neighbors, or those from similar socio-demographic backgrounds. Bridging occurs when more distant ties are formed that create "outward looking" loose friendships among actors from a variety of socio-

demographic backgrounds. Linking involves the participation of outside members who hold politically or financially powerful positions, which may aid in the funding and sustainability of the garden initiative. Gardens create a "shared third space" which increases social cohesion in the community (Firth 2011). Social cohesion helps to create a sense of well-being and safety among members, leading to greater overall community involvement, increased volunteerism, and increased political activism (Glover 2004, Larsen et al. 2004, Miller and Buys 2008, Ohmer et al. 2009, Alaimo et al. 2010, Firth 2011, Okvat and Zautra 2011, Johnson 2012). Bonding and bridging amongst garden members can transform a space from an unused eye sore to a space representative of social and environmental ties (Schmelzkopf 1995, King 2008, Firth 2011, Okvat and Zautra 2011). Members collectively broaden their cultural, environmental, and social perceptions, resulting in overall community growth (Twiss et al. 2003, King 2008, Pudop 2008, Ohmer et al. 2009, Okvat and Zautra 2011, Chambless et al. 2012, Johnson 2012). It is the ability of the garden to shift perceptions and instigate individual change, that makes it such an important aspect to environmental and sustainability movements, as well as education.

Community gardens and conservation initiatives are becoming a common component of sustainable communities and sustainable development planning (Ohmer et al. 2009). Gardens provide both direct and indirect benefits for mitigation of global climate change impacts (Okvat and Zautra 2011). Directly gardens serve as places for carbon sequestration and reduction of runoff. The gardens also reduce overall energy use by locally sourcing portions of their food needs, thus reducing reliance on energy intensive conventional food sources and the packaging and transport associated with the system (Okvat and Zautra 2011). Gardens also close the urban resource loop by providing an outlet for composting, thus reducing overall energy use for the transport and disposal of large amounts of waste produced in urban environments (Okvat and

Zautra 2011). Indirectly, gardens lead to community sustainability by influencing individuals to adopt more sustainable and environmentally friendly lifestyle practices (Firth 2011, Okvat and Zautra 2011, Chambless 2012, Johnson 2012). Gardens have the ability to "reconnect people with people, and people with food," serving as places for "eco-literacy" where learning is a shared experience through hands on interaction with the earth (King 2008). Gardening provides both active and passive learning about ecological services, creating a space where people can reconnect with the landscape and food (Hale et al. 2011). Collectively gardens have the potential to create a large impact on urban sustainability (Okvat and Zautra 2011, Bell and Cerulli 2012).

There is much research on the use of gardens within primary education and minimal amounts of studies conducted on the role of gardens in secondary education. Students to gain connections with their environment through active participation (Johnson 2012). A study of a garden at the University of Utah shows similar results in creating students active in a sustainable food system. The garden creates an atmosphere that lends itself to open discourse on varying value systems and sustainable life-style choices, as well as the broader issues of sustainability around the globe. Students are able to learn not only from instructional courses and internships offered, but also through working amongst students from a variety of academic disciplines. Participants felt the garden created a space for hope in sustainable action while also preparing them to live sustainable lives by decreasing their footprint in the conventional food system (Chambless et al. 2012). The idea of eco-literacy created through community gardening projects make gardens a valuable resource for furthering sustainability curriculum within higher education.

The benefits of community gardens have been studied amongst a wide diversity of disciplines. Citing all the literature on community gardens goes beyond the time constraints of

this study, but it is important to note the key social, environmental, and educational benefits gardens can provide. These benefits, however, do not come without some associated obstacles that may hinder the long-term resilience or the effectiveness of the gardening initiatives as mitigation techniques within communities.

2.3.3 Obstacles of Community Gardens

The two most influential obstacles discovered are the issues of obtaining and securing land and sustaining involvement among the gardeners and surrounding community (Schmelzkopf 1995, Smith and Kurtz 2003, Twiss et al. 2003, Blake and Cloutier 2009, Ohmer et al. 2009, Millburn and Vail 2010, Hazzard et al. 2011, Eizenberg 2012). Other obstacles can arise from internal conflicts, which may lead to decreased involvement or the capacity of the garden to provide benefits to garden members and the surrounding community (Schmelzkopf 1995, Glover 2004, Alaimo 2010).

Inability to sustain interest and involvement is the leading cause of garden failure (Millburn and Vail 2010). Gardens must be accessible and perceived as public to the surrounding community. Community involvement is key to sustaining interest and increasing volunteerism at the gardens. (Schmelzkopf 1995, Glover 2004, Millburn and Vail 2010). It is important to include the entire community in the planning of the gardens as well as spread leadership roles evenly among the group (Millburn and Vail 2010). Oftentimes gardens can gain a reputation for being an exclusive club either through physical barriers of access or through management and organizational strategies (Schmelzkopf 1995, Glover 2004). Over time management of the garden may fall into the hands of one or a few individuals, leading to feelings of discontent, frustration, or exclusion among garden members (Schmelzkopf 1995). Locked gardens often lead to a feeling of discontent with non-garden members (Schmelzkopf 1995,

Glover 2004). Gardens must be within walking distance or a short bike ride to sustain involvement (Millburn and Vail 2010). Physical obstacles coupled with internal conflicts can lead to failures with the garden management (Schmelzkopf 1995, Glover 2004, Millburn and Vail 2010).

The issue of obtaining and sustaining a piece of land is common in urban community garden literature. Karen Schmelzkopf published a highly cited article on issues of land tenure for gardens in 1995 titled "Urban Community Gardens as Contested Space." This study showed the all too common problem of maintaining control over a piece of land in the face of intensified development. Schmelzkopf's study, which was conducted in the lower east side of New York City, stresses that urban gardens are often based on squatter ownership, and once they increase the quality of the neighborhood the land becomes desirable for development. There is a conflict between providing a safe, clean, green space for low-income residents to enjoy while also providing affordable housing for the same residents. In many cases, the gardens are lost to development due to the lack of political power and knowledge of the squatter gardeners (Schmelzkopf 1995). Eizenberg (2012) conducted a study in New York City assessing the role of two NGO's attempting to secure land for community gardens. Two NGO's were compared: The New York Restoration Project, which focuses on preserving undeveloped land in the city; and The Trust For Public Land, which places ownership of the space into the hands of the gardeners themselves. Findings show that outside management may lead to garden failure because it hinders feelings of ownership, a factor key for sustained involvement. On the other hand, land trusts give gardeners a feeling of ownership, but may lead to conflict by requiring gardeners to attend meetings that take away from the relaxing experience of simply gardening (Eizenberg 2012).

Other obstacles faced, specifically at educational gardens, are lack of time, lack of funds, lack of long-term volunteers, uncooperative administration, burned-out teachers, and lack of a full-time garden manager (Hazzard et al. 2011). These barriers are not dissimilar to those faced by the broader community garden culture, and can be solved with proper planning and managing of the garden.

2.3.4 Overcoming Obstacles

The many obstacles gardens face often result from a combination of factors, yet practical solutions exist so gardens can flourish and provide benefits to their community.One study provides a set of standards to follow called the four "seeds for success," which include: (1) securing land tenure, (2) sustaining involvement, (3) community development, and (4) appropriate design.

An important component to gaining benefits and sustaining a garden lies in the establishment of the garden. It is important to develop the garden in a place of need, and to involve all the members of the community within the planning (Glover 2004, Millburn and Vail et al. 2010). Land can be secured through long-term leases, land trusts, local government partners, or other partners (such as churches, schools, healthcare facilities, nonprofits, housing developments, etc.) Having a permanent location allows gardens to develop strong infrastructure and maintain a consistent volunteer base (Millburn and Vail 2010).

Relationship building should be encouraged through opportunities for social interaction among the gardeners, but there should also be a focus on building relationships with the neighborhood as well as the broader gardening community. It is vital for the garden to provide outreach for the entire community, whether through educational workshops, fundraisers, charity, or donation of a communal meeting place, etc. (Millburn and Vail 2010). A garden must be

involved with other organizations that could benefit from inclusion into the garden (Millburn and Vail 2010). Leadership roles should also be dispersed to allow for an equal sense of ownership and avoid a disjoint in garden management should the key leader leave (Millburn and Vail 2010). Broader community involvement and dispersed leadership roles increase social capital through a conjunction of diversified involvement (Alaimo et al. 2010).

Fundraising also serves as a way to increase involvement, create social capital, and raise interest within the wider community. Fees serve as a motivating factor for people to continue attending and working at the garden while also providing funds for supplies and upkeep of the garden (Millburn and Vail 2010). Lack of funding has been found to be a barrier to the long-term sustainability of school garden initiatives (Hazzard et al. 2011). In addition to involvement and fundraising gardens must promote community development by providing economic, social, and health benefits to the community (Millburn and Vail 2010).

Appropriate design of the garden is also beneficial for garden resilience. The design process should include a group of community members working to pick a proper location, design, and overall plan for future growth of the garden. Gardens should be located nearby to resources, if possible, and close to potential gardeners (Eizenberg 2012, Millburn and Vail 2010), Gardens should be no more than a quarter or a half mile from the gardener's homes (Millburn and Vail 2010). It is also important to consider all physical capabilities and ethnic backgrounds of the potential gardeners. Though garden projects may start small, it is important to put room in the design to accommodate future growth (Millburn and Vail 2010). With the appropriate factors present, community gardens can overcome obstacles to provide numerous economic, educational, social, and health benefits.

2.4 Conclusion

Universities are coming upon a period where they are being called upon to create sustainability focused institutions, yet current institutional barriers limit the success of this endeavor. Collaboration among bottom-up sustainability initiatives enhance the networking and support systems needed for sustainability adoption. Community gardens serve as bottom-up initiatives with the potential to enhance education and environmental sustainability. Few studies observe such benefits occurring at community gardens in campus settings. A study of campus food gardens may provide insight into the role of gardens within a higher education setting as well as the ability of campus gardens to provide a source of sustainability education within universities.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The purpose of this study was to create a demographic profile of university food gardens as well as to assess the benefits provided by and obstacles encountered within these initiatives. Within the community garden literature there is a lack of (1) studies focused in a university setting, as well as (2) studies with a broad geographic scale. In order to address these issues, the scale of this study covered the United States of America and Canada. The sample population consisted of garden managers at select universities. Garden managers possess a broad understanding of the issues and processes involved within the garden projects, making them appropriate candidates for study. A database of potential participants was created through the use of the Association of the Advancement of Sustainability in Higher Education (AASHE) Stars rating database.

The large sample population, as well as the desire to gather both qualitative and quantitative data, warranted the use of a mixed methods ("within-method" triangulation) emailsurvey for data collection. The process of triangulation involves the use of both qualitative and quantitative research methods (Reichardt and Rallis 1994, Creswell 2003). A "within method" approach involves the use of multiple techniques within a given method, in this case a survey tool, to collect and interpret data. This research approach allows for a more holistic portrayal of the study group, while providing the benefits associated with both qualitative and quantitative methods (Jick 1979, Reichardt and Rallis 1994). By gathering data in this way, it is possible to derive data that depicts phenomena on the individual level while also allowing for collection of generalized data on the entire population (Tashakkori and Creswell 2008). An email survey method was chosen due to the time limitations of the study and the desire for data collection on a large geographic scale. Quantitative data derived through this study allowed for the creation of a generalized demographic profile, while the qualitative data helped to gain more personal insight as well as further understanding of quantitative findings. The goal of the survey was to answer the following research questions:

(1) What are the demographic characteristics of university food gardens?

- (2) Do university gardens serve as sites for informal and formal education?
- (3) What obstacles and benefits occur within university food gardens?
- (4) What factors affect the long-term resilience of university food garden initiatives?

This chapter will discuss the research methods employed to answer the above questions. The topics covered will be the sample population, survey creation, data collection, data analysis, and validity and bias

3.2 Sample Population

The selection of the sample population was guided by the following research limitations and requirements, (1) Limited time, (2) Desire for a generalized profile of North American university food gardens, and (3) need for individual perspectives of issues associated with study sites. Based on the above guidelines, garden managers were chosen to provide the data needed to conduct this study. Garden managers possess knowledge on the inner workings of these sites and often can lend information about volunteers as well as management issues. In addition to having in depth knowledge of the sites, managers may possess longer temporal knowledge of the site including its past history and current situation. Since time was a constraint, it was not possible to include volunteer perspectives within this particular study, but it could be done for future studies of these sites.

Since no list of universities with food gardens exists, a database of potential candidates was created with the guidance of The Association for the Advancement of Sustainability in Higher Education (AASHE) Sustainability Tracking, Assessment & Rating System (STARS) database. The AASHE website provides a definition of this organization as a "diverse community engaged in sharing ideas and promising practices, AASHE provides administrators, faculty, staff and students, as well as the business that serve them, with: thought leadership and essential knowledge resources; outstanding opportunities for professional development; and a unique framework for demonstrating the value and competitive edge created by sustainability initiatives." Because this study is based on higher education sustainability, AASHE is the logical organization from which to derive the sample population.

Southern Illinois University is a member of the AASHE STARS program, and therefore has access to data provided through the association's website. A search was conducted for STARS rated universities with an organic garden on campus. This initial search provided a list of 246 schools (n=246). The AASHE site provides the name of the university contact for each institution, however no specific contact details were provided for garden managers. In order to obtain full contact information, independent searches were conducted for each university listed to locate the appropriate contact for the institution. If no contact information could be found for the individual listed on the AASHE site, a search was conducted for the email information for the university's organic garden. If no information could be found for contact, the sample was removed from the population. The result of this search left a list of 195 (n=195) potential survey participants. **Figure 3.1** shows the map chosen to define the regions for this study, and **Table 3.1** provides the total number of schools from each region of North America.



Figure 3.1 Regions of North America

Table 5.1 Regions of Fotential Survey Candidates	
REGION	NUMBER OF SURVEYS RETURNED
North East	59
South East	36
Central	36
South Central	9
North West	25
South West	30
Total Sample Size (n)	195

 Table 3.1 Regions of Potential Survey Candidates

A database was created utilizing Microsoft Excel. The database included the following information: University Name, City, State, Public/Private, Contact Name, Contact Email, and Garden Website. Schools were then placed in independent sheets based on their geographic region. This list was then used to send out an email survey to gather information about each institution's garden initiative from a manager perspective.
3.3 Survey Creation

The collection and analysis of data for this study was guided by a quantitative survey tool. A quantitative assessment tool (an email survey) was chosen since it has been stated that quantitative assessments allow for quick data collection over a large sample population (Johnson et al. 2007). The email survey was the sole method of data collection used for this study, and provided ample quantitative and qualitative data. Through the utilization of both open and closed-ended questions, as well as ranking scales, the survey served as a mixed-method tool for data collection as well as both statistical and textual analysis. The survey was created using LimeSurvey, an open-access survey creation tool provided by the Southern Illinois University library. This program was chosen for its ease of use as well as the ability to send email-based surveys. Limesurvey also compiles all returned responses into a database file to use for later analysis.

3.4 Survey Distribution and Return

The human subjects committee approved the survey on August 2, 2013. The first survey request was sent via email on August 9th, 2013. Participants were informed that completion of the survey implied consent to participate in the study. Participants were also informed that their individual name would not be included in data reporting, and would only be viewed by the researcher and her advisor. The first email resulted in 36 returned surveys (n=36). A second and final request was sent on September 9, 2013 and resulted in a total of 54 returned surveys (n=54). Two samples were removed as they were incorrectly identified and did not meet the definition of criteria. A copy of the email correspondence can be found in **Appendix A.** One of the removed surveys was for a middle school garden, and another was removed because it was not a food production garden. The email requests resulted in a 27% survey return rate, with a total sample

size of n=52. Returned surveys regions are seen in Table 2. A map of the location of survey participants is seen in **Figure 3.2**.

The survey was divided into sections to address each research question independently. The following sections will cover individual survey portions and their associated research question. A copy of the survey can be found in **Appendix B**.

0	
	NUMBER OF
	SURVEYS
REGION	RETURNED
North East	13
South East	8
Central	11
South Central	2
North West	6
South West	12
Total Sample Size (n)	52

Table 3.2 Regions of Returned Surveys



Figure 3.2 Location of Survey Participants

3.5 Research Question One

The first research question sought to create a demographic profile of university food gardens in North America. This research question was answered with the use of the following close-ended questions: length of plans established for the garden, stakeholder(s) whom initiated the garden, size (acres and/or square feet), whether permaculture was practiced, methods of season extension (if applicable), location of garden in relation to central campus, primary goal of garden, types of crops and products produced, practice of seed saving, market for produce, advertising methods, management practices, participants of garden, gardens link with other university student groups or sustainability programs, as well as major sources of funding and their perceived reliability.

3.6 Research Question Two

In order to answer research question two, a series of close-ended and open-ended questions were created. The first step was to gauge the overall sustainability of the institutions. This provides a context for the strength of the role the garden may play in sustainability education within a particular university. Participants were asked to rank their university on a scale of 1-5 (1 being not at all sustainable, and 5 being highly sustainable) for the following categories: infrastructure, food systems, education, faculty awareness, student awareness, and staff awareness. Participants were also asked if their institution provided sustainability courses, interdisciplinary education, environmental studies major/minor, sustainability major/minor, or none of the above. According to higher education sustainability literature, the above degrees and courses aid in increased sustainability awareness among university stakeholders. Accessing whether these classes and programs are offered allows one to see if the gardens are helping to fill a gap in the educational system of their institution. To gain insight into formal education

occurring within these sites, participants were asked: whether the site was used as a teaching site, which departments most utilized the space, the focus of classes linked to the garden (if applicable), if workshops were offered and to whom, and if research was conducted at the garden. To assess if informal learning occurred within these sites participants were asked about any lifestyle changes or sustainability awareness that may occur within groups participating at the garden. Participants were also asked if the garden provided tours as well as worked with other student or community groups. The last two are both examples of bridging social capital, which has been found to lead to greater informal learning and civic engagement. Other portions of the survey also served to answer research question two, particularly the benefits derived. Upon completion of qualitative coding, both formal and experiential education served as benefits at gardens.

3.7 Research Question Three

A large portion of this study sought to record any obstacles encountered and benefits derived from the gardens within this study. To prevent research influence on participant responses, this portion of the survey consisted of open-ended questions. Participants were asked to list the top three benefits and obstacles they have encountered while managing the site. Closeended questions on funding were included in the demographic portion of the survey were also utilized to answer research question three, as funding availability and reliability was foreseen to be a significant obstacle that warranted more detailed information.

3.8 Research Question Four

The fourth research question is to assess what factors are key in the long term resilience of university food garden initiatives. To answer this question participants were asked: *"In your opinion will your university garden exist for the long-term, yes/no and why?"* This response was

left open ended to prevent researcher bias. These responses were then coded and divided into two groups Yes, and Conditional Yes, No, Unsure. Other portions of the survey also served as answers to this question. Qualitative coding on the benefits and obstacles was also used to answer the fourth research question.

3.9 Data Analysis

The data analysis for this study consisted of both qualitative coding and quantitative inferential and descriptive statistics. Quantitative analysis was limited by the small sample size and this will be discussed in the validity and bias portion.

3.9.1 Qualitative Analysis

Qualitative coding was the first step completed in the mixed-methods data analysis. Data collected from open-ended questions was dissected and placed into unique groups consisting of similar themes. The process of coding helps to give "units of meaning" to data gathered during a study (Miles et al. 2014). Coding was first conducted manually and then later input into excel files. An excel sheet was created for Obstacles, Benefits, and Classes Most Utilized. Each sheet contained columns with code labels and their corresponding survey responses. Subcategories were designated within each coding section. Codes were revised twice to ensure the correct patterns were derived. The qualitative analysis of this study aided in the understanding of phenomena occurring at the study sites. The next step in analysis was to develop a demographic profile of the institutions and to validate qualitative data findings.

3.9.2 Quantitative Data Analysis

To develop a generalized demographic profile of the gardens, tables were created using the Limesurvey software and then exported to an excel database. A series of contingency tables were also constructed to try and find interrelated variables. The contingency tables were hoped

to reveal factors that influence benefits, obstacles, and longevity of initiatives. Tables with patterns indicative of correlation were then analyzed further with a test for independence (Chi-Square). Due to such a small sample size, however, the chi-square test did not serve as a valid assessment tool. Therefore, quantitative analysis was conducted in the form of descriptive and inferential statistics derived from data collection.

3.10 Validity and Bias

The validity of this study was influenced by the survey creation, sample population, and sample size. The survey creation and study were guided by an extensive literature review. To increase validity of survey responses, cognitive testing can be administered prior to distributing the survey (Sudman et al. 1996), or follow-up interviews may be conducted after surveys have been returned. Due to time constraints cognitive testing and follow-up interviews were not conducted, however the survey was analyzed by three university members with experience in managing a student garden and/or farm. The survey was also strongly supported by the literature. The utilization of a mixed-methods approach in data collection helped to increase the validity of this study. It has been found that the weaknesses of one approach can be compensated for through the use of multiple methods (Dennis and Garfield 2003). Venkatesh et al. (2013) stress that mixed-methods research provides the following benefits: complementarity, completeness, developmental, expansion, corroboration/confirmation, compensation, and diversity (Venkatesh et al. 2013). For these reasons, this study sought to provide a valid, holistic portrayal of phenomena occurring at the sites through the use of both qualitative and quantitative survey questions.

The creation of open and close ended questions aided in decreasing researcher bias on particular responses. Questions that required specific insight from the participant were left open-

ended. Close-ended questions were utilized for basic demographic data or specific questions. It has been found, however, that close-ended questions if not comprehensively created, may confine participants' responses, and therefore decrease validity (Krosnick 1999). In order to address this issue, most questions were given an "other" column, in which participants could add an answer not given by the question.

Sampling bias may also be perceived as an issue, but it has been that purposive sampling actually serves as a beneficial technique to gather meaningful data from those with first-hand experience of a particular phenomenon (Nicholls 2009). Sample size, however, did have impact on the ability to conduct statistical analysis of results. Due to the small sample size of n=52, correlation assessments or variables were not possible for quantitative analysis. Pooling cells by combining variables was attempted, but did not yield any significant results, as it decreased the degrees of freedom significantly. Lack of correlation analysis, however, did not influence the ability to use qualitative findings to compensate for deficiencies in quantitative data (Dennis and Garfield 2003). Descriptive statistics and qualitative coding yielded significant data, therefore further quantitative analysis was not warranted or suitable for this sample size.

CHAPTER FOUR

RESEARCH RESULTS

Utilization of the email-based survey returned an extensive amount of data. Through analysis, several demographic commonalities emerged, however it was found that a great diversity exists amongst the sites. Additionally key themes were found which asserted the benefits these sites provide and the obstacles that challenge garden managers. The strength of certain obstacles and the factors that aid in garden longevity were also explored.

4.1. Research Question One Findings: Characteristics

A series of close-ended survey questions were asked to define key characteristics of university food gardens. Data was analyzed and sorted into the following sections: (1) Infrastructure, (2) Administrative, (3) Markets and Advertising, and (4) Participation and Uses. Though trends were present, it was found that each garden possessed a unique profile. The results portray the variability in garden structures and management across the entire study area, while also emphasizing common practices.

4.1.1 Infrastructure Characteristics

The majority of the gardens were established between 2005-2010 (61%). Only four sites were created before 2001, and nine sites have been created since 2011 (**Figure 4.1**). Average garden size was 2.04 acres, with a maximum of sixty acres and a minimum of thirty square feet (0.0007 acres). The sixty acre site was an extreme outlier in this group, and when removed, the average size of study sites was 0.81 acres (**Table 4.1**). Twenty seven (52%) of the sites had multiple gardens and/or farms on their institution's campus. A large majority of the sites were located on the universities central campus (85%). Gardens not located on the central campus were within an average of 2.19 miles, with a maximum distance of 10 miles, and a minimum of

0.5 miles (**Table 4.2**). Of the fifty two surveyed participants, 96% practiced methods consistent with USDA organic standards (though they may not be certified), 56% practiced permaculture, and 62% practiced seed saving. By utilizing the above growing methods, the gardens were able to model sustainable agriculture principles.

Gardeners were also asked what methods, if any, they employed for season extension. The top three methods of season extension were greenhouses, low-tunnels, and hoop-houses/high tunnels. Cold-frames were also utilized by twelve participants. Seven participants listed "other" methods which included: a cold climate greenhouse for winter, shade cloth, a small greenhouse operation in the manager's office, a garden built in climate that supported year round production, and plans to construct cold frames in the fall. Twenty managers did not practice season extension currently, but nine indicated they planned to install season extension structures (**Table 4.3**). A longer growing season and increased food production result from installation of these structures.

On average, twenty four types of vegetables and ten types of fruits were grown. A large number of the gardens also grew herbs (90%), flowers (77%), and heirlooms (71%). Five sites reported producing value-added products (10%), and four reported 'other' products grown (8%), which included native plants, plants for homemade fertilizers/pesticides, hops, and tobacco and cotton (**Table 4.4**). The above results show that the initiatives not only practiced sustainable agriculture, but also increased growing capacity and created biodiversity on campus. All of these beneficial practices support greater environmental and even economic sustainability of the institutions.



Figure 4.1 Year Gardens Established

Table 4.1 Size of Garden Sites

Size of Sites (Acres)		
Average 2.04		
Maximum	60	
Minimum	0.0007	
Average without outlier	0.81	

Table 4.2 Average Distance of Non-Central Campus Sites

Site Distance from Central Campus		
1	Result	
Number of Sites	8	
Sum 17.:		
Standard deviation 3.0		
Average 2.19		
Minimum 0.5		
Maximum 10		

Methods of Season Extension				
Participants Percenta				
Green House	20	38.46%		
Do not practice season extension currently	20	38.46%		
Low-tunnels/Heavy grade row cover	16	30.77%		
Hoop House/High Tunnel	11	21.15%		
Cold-frames	12	23.08%		
Plans to install season extension structures	9	17.31%		
Other	7	13.46%		
Hot-frames	0	0.00%		

Table 4.4 Other Crops Grown

Other Crops Grown			
	Participants	Percentage	
Herbs	47	90.38%	
Flowers	40	76.92%	
Heirlooms	37	71.15%	
Plants solely for production of value-added products	5	9.62%	
Other	4	7.69%	

4.1.2 Administrative Characteristics

Administrative demographics cover the initiation of the gardens, the management schemes, funding, and length of plans established. Student interest was found to play a large role in establishment of the sites, but faculty, administration, and staff interest also had strong influence on garden initiation. Small percentages were instigated by an outside community group not associated with the university (6%) (**Table 4.5**). Volunteers were listed to manage the gardens by 48% of respondents. Additionally 42% of sites are managed by students with a faculty advisors, 39% by students alone, and 40% managed by "other" stakeholders. Managers who responded with "other" management schemes often listed staff or grounds/facilities managers as those who oversaw the gardens (**Table 4.7**). The nature of the data suggests that most gardens were initiated by a variety of stakeholders but students played a major role in garden start-up. The majority of the sites had three or less managers (8%), but four participants (8%) reported to have five or more garden managers for their site (**Table 4.8**). It was found that management of the sites was distributed amongst various stakeholders, and was quite unique to each garden.

The most common source of funding for the sites surveyed was from within the university (89%), preceded by donations (46%), and production sales (33%). Seven participants (14%) received funding from a private source. "Other" funding sources included: grant funds, club-funds and interclub council grants, membership fees, the manager's own "pocket," and in

kind from the city. Only one site reported receiving federal funding, and only two sites collected funding from their state (**Table 4.9**). Thirty six participants (69%) reported being heavily reliant on one source of funding, but twenty four of those respondents also reported to have sources of funding consistently available. Ten participants who reported being heavily reliant on funding also did not have funding consistently available (19%).

In addition to reliable funding, long term planning is important for strong garden structure. Fourteen participants (27%) had established plans for six months to a year, fifteen sites (29%) had one to two years of plans, seven sites (14%) had two to five years, and ten sites (19%) had five or more years of plans established. Only six participants (12%) stated no long term plans had been established (**Table 4.6**). The diversity within this data shows that the gardens were all at various stages of planning, and a diverse set of administrative demographics existed.

1 able 4.5	Garden	Initiators	
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Who initiated the garden? (mark all that apply)			
Participants Percent			
Student Interest	38	73.08%	
Faculty Interest	24	46.15%	
Administrative Interest	17	32.69%	
Staff Interest (Kitchen, Daycare, etc.)	15	28.85%	
Outside Community	3	5.77%	
Other	4	7.69%	

Table 4.6 Length of Plans Established

Length of Plans Established for Site			
	Participants	Percentage	
1-2 years of plans established	15	28.85%	
6 months to 1 year plans established	14	26.92%	
Greater than 5 years of plans established	10	19.23%	
2-5 years of plans established	7	13.46%	
No long term plans established	6	11.54%	
No answer	0	0.00%	

Table 4.7 Garden Management

How is the garden managed?				
Participants Percenta				
Volunteers	25	48.08%		
Students with Faculty Advisor	22	42.31%		
Other	21	40.38%		
Students	20	38.46%		
Faculty	7	13.46%		
Kitchen Staff at Dining/Residence Halls	1	1.92%		

Table 4.8 Number of Garden Managers

Number of Managers for Site				
Number of Managers	Number of Managers Participants Perce			
1	24	46.15%		
2	2 9			
3	9	17.31%		
4	3.85%			
5 or more 4				
No answer	4	7.69%		

Table 4.9 Funding Sources and Availability

Funding			
	Participants	Percentage	
Funding Sources			
Within University	46	88.46%	
Donations	24	46.15%	
Sales (produce, bake sales, plant sales, etc.)	17	32.69%	
Other	9	17.31%	
Private	7	13.46%	
State	2	3.85%	
Federal	1	1.92%	
Funding Consistency and Reliability			
Heavily reliant on one source of funds	36	69.23%	
Funds Consistently Available	31	59.62%	
Heavily Reliant/ Not Consistently Available	10	19.23%	

4.1.3 Markets and Advertising

Marketing produce and advertising allow for managers to raise awareness about their project. Markets serve as inadvertent advertising and networking while also providing income to the projects. Twenty sites (39%) sold their produce to campus dining halls, nineteen sites (37%) sold produce through on-campus farm stands/markets (37%), and eighteen sites (35%) reported

donating their produce to food banks. Produce at 31% of the sites was provided for garden volunteers and community members. Five sites (9.62%) reported to manage their own CSA (Community Supported Agriculture), and six sites (12%) participated in off-campus farmers markets. "Other" market sources reported by twelve participants (23%) included: selling produce to co-ops, restaurants, local chefs, and catering for student events. (**Table 4.10**). The diversity of markets demonstrates an interaction among a variety of stakeholders, and may help establish strong networks within the institutions.

Formal advertising also allows the initiatives to establish networks of interested stakeholders. The gardens utilized a variety of methods of advertising for their gardens. The top three methods were university websites (75%), Email lists (73%), and Facebook (69%). Flyers, fairs, university newspapers, blogs, and word of mouth, were also employed. (**Table 4.11**). Diversifying advertisement allows a wider demographic to be reached, in turn increasing campus-wide awareness of the initiatives.

Table 4.10 Markets Othizeu				
Market for Garden Produce and Products				
	Participants	Percentage		
Campus Dining Halls	20	38.46%		
On-campus farm stands and/or markets	19	36.54%		
Food Banks	18	34.62%		
Volunteers and Community Members	16	30.77%		
Other	12	23.08%		
Off-campus community farmers markets	6	11.54%		
CSA (Community Supported Agriculture)	5	9.62%		

Table 4.10 Markets Utilized

How is the garden advertised? (Mark all that apply)			
Answer	Participants	Percentage	
University Web Site	39	75.00%	
Email List	38	73.08%	
Facebook	36	69.23%	
Flyers	22	42.31%	
Fairs	19	36.54%	
Other	18	34.62%	
University Newspaper	17	32.69%	
Blog	11	21.15%	
Word of Mouth	6	11.53%	
We do not advertise	4	7.69%	

 Table 4.11 Advertising Methods

4.1.4 Participants and Uses

The stakeholders involved and the type of involvement occurring help to paint a picture of the role gardens play within their institutions. Numerous members of the university and outside community make use of these outdoor spaces. Often the goal of the sites was educational but many other goals were present. Forty four sites (85%) stated gardening and/or agricultural education to be their primary goal. Other objectives were: providing local food to campus dining halls/cafes (37%), local food banks (31%), and campus stores and/or farm stands (23%), as well as health purposes (21%), science education (21%), and youth programs and/or daycares (21%) (Table 4.12). "Other" goals had a variety of responses five of which were centered on sustainability. Sustainability focused goals included: sustainable living education, advocating for sustainable food, sustainability education, allowing students to be involved in campus sustainability projects, and student engagement and connection to the land. Additional goals noted were: food for use by students, community building and access to fresh produce, researching new technologies, anthropological projects, and raising money for a project in Rwanda. Often goals serve as the navigation of how a site will be utilized and who will participate.

A variety or stakeholders utilized the sites. Fifty one participants (98%) reported to have volunteers participating at their site. Other significant participants included: faculty (60%), outside community members (52%), and classrooms (46%). Managers also noted staff to be active at four sites (**Table 4.14**). A variety of disciplines incorporate the gardens into their departments and classes. The most active departments/classes were environmental studies and/or sciences (35%), liberal arts (33%), general sciences (33%), and health sciences (27%). In addition, applied sciences, business, education, agricultural sciences, and sustainability departments/courses made use of the gardens (**Figure 4.2**). Biology was highly cited within the general sciences as a discipline with high garden participation. Applied sciences was a unique application being utilized by several engineering classes in one university. A list of the classes associated with each discipline can be found in **Appendix D**.

Participation occurred through the use of the space for classes, research, workshops, and tours. A majority of gardens (81%) served as teaching sites. In addition to teaching, 44% of sites were utilized for academic research. Diverse participation was promoted through the use of the site for non-classroom educational experiences. Twenty seven sites (51%) offered workshops for students, twenty (38%) to faculty, twenty four (46%) to all university members, and twenty five (47%) had workshops open to the outside community. Twenty gardens (38%) did not offer workshops at the time of taking the survey. Managers noted whom noted "other" for workshops indicated the following: plans to include community members to participate in workshops in the future, workshops for anyone who used the garden, workshops for flagstaff community, and plans to offer workshops in the future (**Table 4.15**).

Networking with other groups and tours broadened participation at the gardens. Forty participants (76%) made tours available at their site. Many of the sites also expanded

participation interacting with larger initiatives or clubs. Forty gardens (77%) were part of a university wide sustainability program/goal, and twenty nine sites (56%) are part of a student club/organization. A majority of gardens coordinated with other student groups (85%) as well as outside community non-profit groups (70%). Some "other" groups coordinated with included: other community gardens, parents of garden members, k-12, and special needs high school students (**Table 4.13**).

The vast uses of university food gardens indicate they hold a large capacity for networking and knowledge sharing. The gardens coordinate with other groups or university programs to expand their networking power, while also taking advantage of institutional structures (classrooms and research) to increase diversity of participation at their sites. Workshops and tours serve as additional uses of the space which diversify the types of members active at the sites. It is clear the gardens have multiple stakeholders involved, creating unique communities for each institution.



Figure 4.2 Departments and/or Courses Active at Gardens

Table 4.12 Goals of Sites

What is the primary goal of your garden and/or farm? (Mark all that apply)			
	Participants	Percentage	
Gardening/Agricultural Education	44	84.62%	
Local Food Source for Dining Halls/Cafes	19	36.54%	
Other	17	32.69%	
Provide for Local Food Banks	16	30.77%	
Local Food Source for Campus Stores/Farmstands	12	23.08%	
Health Purposes	11	21.15%	
Science Education	11	21.15%	
Youth Programs and/or Daycares	11	21.15%	

Table 4.13 Other Groups Involved With Garden

Does the garden work with: (mark all that apply)				
Participants Percentage				
Other student groups	45	84.91%		
Outside community non-profit groups	37	69.81%		
Other	4	7.55%		

Table 4.14 Garden Participants

Stakeholders Participating at Sites			
	Participants	Percentage	
Volunteers (from student body/campus community)	51	98.08%	
Faculty	32	60.38%	
Outside Community Members	27	51.92%	
Classrooms	24	46.15%	
Paid student workers	21	40.38%	
Administration	16	30.77%	
Other	7	13.46%	

Table 4.15 Workshops Offered

Are workshops offered for: (mark all that apply)			
	Participants Percentage		
Students	27	50.94%	
Outside Community	25	47.17%	
All University Members	24	45.28%	
Faculty	20	37.74%	
We do not offer workshops	20	37.74%	
Other	4	7.69%	

4.2 Research Question Two Findings: Learning

To discover what formal and informal learning occurred at the gardens, analysis of both closed and open-ended questions was conducted. In this study, formal education is defined as classroom use of the site, garden linkage to specific courses, and workshops. Experiential education, hands-on learning, individual skill development, and tours define informal sources of education. The final objective of research question two was to assess if learning offered at these sites was unique to the institutions. This was analyzed through the creation of contingency tables to observe significant patterns.

4.2.1 Formal Education

Gardens were utilized as formal teaching sites at forty three (81%) universities. Additionally, 43% of participants conduct academic research at their garden. Managers reported numerous goals they hoped to achieve at their site, of these goals, many were academically oriented. Forty five managers (85%) found gardening/agricultural education to be an important goal, another eleven (21%) reported science education as important. "Other" goals with an instructional focus included: researching new technologies, sustainable living education, sustainability education, and anthropological projects. (**Table 4.16**).

It was found that 45% of the sites had classrooms participating at their site (**Table 4.13**), in addition to the garden serving as a formal classroom itself. Classes involved with the garden included: sustainability (66%), environmental studies (47%), education (26%), health/medicine (21%), production agriculture (19%), physical science (17%), culinary (17%), and social science (15%) (**Table 4.17**). Workshops also served as a form of formal education. Twenty four participants (45%) provided workshops for the entire campus community and twenty five (47%) additionally for the outside community (**Table 4.15**).

Qualitative coding revealed formal education to be a benefit derived from the garden as noted by twenty participants (39%) (**Table 4.23**). Specific open-ended responses can be found in

Appendix E. It is evident many of these sites were initiated with formal education as an objective, while others provided these services inadvertently by allowing various disciplines to make use of the site, as well as various stakeholders to participate in workshops. Though it is "formal" education, it goes beyond the classroom to allow for visual representation of learning. Taking this even further, many of these sites also allow for informal education to occur simply through the experience of the garden and interaction among diverse groups.

Table 4.16 Primary Goal of Sites

What is the primary goal of your garden and/or farm? (Mark all that apply)			
	Participants	Percentage	
Gardening/Agricultural Education	45	84.91%	
Local Food Source for Dining Halls	20	37.74%	
Other	17	32.08%	
Provide for Local Food Banks	16	30.19%	
Local Food Source for Campus Stores/Farm stands	12	22.64%	
Health Purposes	12	22.64%	
Youth Programs and/or Daycares	12	22.64%	
Science Education	11	20.75%	

Table 4.17 Focus of Classes Utilizing Garden

What are the focuses of classes linked to the garden? (Mark all that apply)			
Participants Percentage			
Sustainability	35	66.04%	
Environmental Studies	25	47.17%	
Education	14	26.42%	
Health/Medicine	11	20.75%	
Production Agriculture	10	18.87%	
Physical Science	9	16.98%	
Culinary	9	16.98%	
Social Science	8	15.09%	
Other	6	11.32%	

4.2.2 Informal Education

Through coordination with diverse peers or understanding of principles by connecting to the land, informal education is gained at these sites. Tours serve as informal education, as they are not set out to be a lesson plan, but may offer a vast amount of knowledge to participants. It was found that forty sites (76%) offered tours of their gardens. Managers were also asked to state informal learning students gain at the garden. Forty three managers (81%) found garden participants worked towards more sustainable lifestyles, gained broader life views from interaction with other garden participants (79%), broadened their worldview (68%), became leaders in other aspects of their lives (51%), became politically active (25%), and/or became active in other campus groups with environmental or sustainability focus (66%) (Table 4.18). The focus of informal learning/eco-literacy is that it can lead to lifestyle shifts. It is clear that managers perceive garden participants to have gained some of this knowledge. Qualitative coding validated quantitative findings. From the open-ended analysis it was discovered experiential education was reported by seventeen managers to be a benefit derived from university food gardens (33%), it was also found that individual skill building was a key benefit as reported by twenty participants (39%) (Table 4.23). For specific open-ended responses see **Appendix E.** Though all the learning may not be linked to a specific workshop or lesson plan, informal learning equips students with the ability to lead sustainable lifestyles and impact the sustainability of their institution.

As a result of participating at the garden do participants: (mark all that apply)			
	Participants	Percentage	
Work towards more sustainable lifestyles	43	81.13%	
Gain broader life-views from interaction with other garden and/or			
farm participants	42	79.25%	
Broaden their worldview	36	67.92%	
Become active in other campus groups with environmental or			
sustainability focus	35	66.04%	
Become leaders in other aspects of their lives	27	50.94%	
Become politically active	13	24.53%	
Other	7	13.21%	
None of the above	2	3.77%	

Table 4.18 Individual Change Associated with Garden Participation

4.2.3 Ability of Gardens to Provide Services Not Provided By Institution

Contingency tables were created to gain an understanding of the importance of the gardens within their institution, specifically to see if gardens provided services not offered by their university. The majority of participants' institutions offered the following: interdisciplinary education, sustainability courses, environmental studies major/minor, and sustainability major/minor (**Table 4.20**), therefore the garden learning was not found to be "unique" but instead supplemental. The greatest benefits gardens provided was community building in institutions that do not offer a sustainability major/minor (**Table 4.21**). It is found that the gardens serve as important spaces for learning; they simply exist in institutions that offer these services already.

It was also desired to note if gardens provided a source of sustainability to institutions with low sustainability rankings. For this assessment, benefits were compared to the sustainability ranking of the university, as perceived by the garden manager. A contingency table was constructed for sustainability rankings of 1 and 2 and compared to the benefits derived (**Table 4.22**). Again, no significant patterns were found within the table, suggesting that these gardens do not provide a service not found through the university, however this does not impact the numerous educational experiences provided by university food gardens.

Provision of Benefits in University Not Offering Particular Programs					
			No Env.		
	No Interdiscpl.	No Sust.	Studies	No Sust.	
Benefits	Edu	Courses	Major/Minor	Major/Minor	TOTAL
Formal Edu	1	0	1	4	6
Exp. Edu	1	0	1	3	5
Inst. Sust	1	1	0	3	5
Networking	2	1	0	2	5
Providing Food	2	1	0	4	7
Community Building	2	1	0	11	14
Individual Skills	0	0	1	1	2
TOTAL	9	4	3	28	44

Table 4.19 Contingency Table (University Offers... and Benefits)

 Table 4.20 Education Programs Offered

Does your university offer: (mark all that apply)			
	Participants	Percentage	
Environmental Studies Major/Minor	49	92.45%	
Sustainability Courses	48	90.57%	
Interdisciplinary Education	44	83.02%	
Sustainability Major/Minor	23	43.40%	
None of the Above/Unsure	2	3.77%	

Table 4.21 Contingency Table (Denents and Low Sustainability Kanked Schools)							
Providing Benefits to Schools with Low Sustainability Ranking (1-2)							
		Food			Student	Staff	
	Infrst.	System	Education	Faculty	Sust.	Sust.	
	Sust.	Sust.	Sust.	Sust.	Awarenes	Aware	
Benefits	Ranking	Ranking	Ranking	Awareness	S	ness	TOTAL
Formal Edu	2	2	1	4	3	3	15
Exp. Edu	1	2	2	3	2	3	13
Inst. Sust	0	0	0	0	0	0	0
Networking	1	2	1	1	1	1	7
Providing Food	4	8	3	3	5	6	29
Community Building	0	1	0	3	0	6	10
Individual Skills	1	3	1	3	0	2	10
TOTAL	9	18	8	17	11	21	84

4.3. Research Question Three: Obstacles and Benefits

Research question three addresses two questions (1) What obstacles are encountered at university food gardens, and (2) what benefits are derived from university food gardens. Openended questions were analyzed to find commonalities and themes. The two analyses provided valuable insight. Obstacles will be discussed first, as it was found that despite the obstacles listed below; these gardens were able to provide numerous benefits. Specific answers to these survey questions can be found in **Appendix E.**

4.3.1 Obstacles

Participants were asked to list the top three obstacles encountered while managing their site. Analysis of the obstacles revealed the following themes: infrastructure, management/ leadership, agroecological systems, lack of knowledge (inexperience), funding, institutional support, and participation (**Table 4.22**).

4.3.1.1 Infrastructure

Common obstacles reported by garden managers were related to infrastructure problems. Twenty participants (39%) cited some type of infrastructure inadequacy as a difficulty encountered. Types of issues involved were inadequate size or location of the site, structural needs (such as sheds or fences), lack of equipment, water accessibility and reliability, as well as vandalism of the sites.

4.3.1.2 Management/Leadership

Thirteen participants (25%) cited lack of a manager or leadership as a significant obstacle encountered at their site. There was a theme of a needed paid position to manage the site, but also a desire for students to take more initiative in leadership roles. Participant 51 referenced this lack of leadership when they said they had encountered "issues with student

engagement/leadership...People use the garden but few are willing to step up and take the leadership role." Along with needing an over-seeing manager as well as student leaders, there were also issues of needing a student organization linked to the site.

4.3.1.3 Agroecological Systems

Twenty one managers (40%) cited various agricultural issues at their sites. Agroecological systems included the following: general maintenance of the site, watering problems, weather and climate in the region, poor soil, as well as pest and weed control.

4.3.1.4 Lack of Knowledge (Inexperience)

Lack of knowledge or inexperience was cited by thirteen managers (25%). Inexperience with food production and local food marketing was common. Participant 18 shared how lack of knowledge limited progress in terms of "…how to build good soil and grow food successfully." Other participants noted difficulties in determining prices as well as marketing their produce. In addition to lack of gardener/production knowledge, lack of knowledge within the outside community created some complications for garden managers. Participant 12 mentioned "lack of seasonal knowledge from dining centers" to be a problem, while another Participant 8 found "general preconceptions against gardening/produce" to be an issue.

4.3.1.5 Funding

Funding posed a significant obstacle for twenty five managers (48%). Difficulties in acquiring funds and justifying costs were reported to hinder maintenance of infrastructure, provision of funds for full-time management positions, as well as support other costs. The qualitative findings were supported by the quantitative data stating that 69% of participants were heavily reliant on one source of funding, and 31% did have funding consistently available.

4.3.1.6 Institutional Support

Many managers felt their garden did not receive sufficient backing from their institution. Seventeen participants (33%) indicated that they encountered problems with lack of cooperation/coordination with faculty and administration. Many managers felt there was not enough inclusion of the garden into formal academic planning or long term plans of the university. Institutional aesthetic standards also inhibited some sites from obtaining an on campus location, one participant (20) describing their garden to be "…viewed as unattractive so has to be hidden." Participant 23 provided a great summary stating they found difficulty "securing support (financial and otherwise) from university administration."

4.3.1.7 Participation

Participation was the most significant obstacle, encountered by 62% of garden managers. Recruitment of gardeners/members, lack of volunteers, or general lack of awareness of the initiative were cited. Retention of volunteers also proved to be problematic, especially when associated with the high student turnover of a university setting as well as the lack of students during summer months. Some managers found it hard to retain students either because of gardening setbacks or the general transient nature of the population. Participant eighteen referenced this issue stating, "consistent participation (students are transient and not always committed)" as being a significant difficulty.

Obstacles Encountered at Garden Sites				
	Participants	Percentage		
Participation	32	61.54%		
Funding	25	48.08%		
Agroecological Systems	21	40.38%		
Infrastructure	20	38.46%		
Institutional Support	17	32.69%		
Management/Leadership	13	25.00%		
Lack of Knowledge (inexperience)	13	25.00%		
Total Responses	141			

Table 4.22 Obstacle Coues	Table	4.22	Obstacle	Codes
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4.3.2 Benefits

Despite the numerous obstacles encountered, these gardens were found to provide several benefits to their institution and stakeholders. Survey respondents were asked to list the top three benefits their garden provided. Qualitative analysis revealed the following themes: individual skills, formal education, experiential education, networking, community building, institutional sustainability, and providing food (**Table 4.23**).

4.3.2.1 Individual Skills

The first benefit was determined to be individual skills, and was noted by eighteen participants (35%). The gardens shaped participants at an individual level, either through change in their knowledge/awareness or through behavioral and lifestyle shifts. One participant (28) stated the garden is "changing lives of students in many ways." Individual leadership skills and empowerment were commonly cited. The gardens allow participants to apply knowledge gained through gardening to life outside of the garden or after graduation. Increased individual awareness of local food systems, seasons, and healthy food were also provided.

4.3.2.2 Formal Education

Through the use of the garden as a direct and/or supplemental classroom resource or as a research environment for the university, gardens provide formal education (as noted by 42% of managers). Themes included education, research, workshops, teaching opportunities, and use of the garden by specific classes and/or courses. The gardens were found to be beneficial supplements to traditional classroom course materials, as well as sites for conducting academic research and class instruction. In addition, the objectives of the gardens were often educationally based and were utilized by a diverse group of disciplines, classrooms, and workshop attendees (as discussed in the demographics).

4.3.2.3 Experiential Education

The third benefit provided by university food gardens was experiential education. Eighteen survey participants (34.62%) reported some form of experience based learning obtained through the actual gardening experience. Participant 9 indicated that their garden "…has provided an interactive and educating green space for students." Participant 50 regarded their garden as a "hands-on, informal sustainability learning space." Responses that included the words hands-on or interactive were included in this group. Experiential education provides beneficial learning without a lesson plan, and often is a result of interacting with the space. The provision of both formal and experiential education showed that gardens served as beneficial learning sites for their institution.

4.3.2.4 Institutional Sustainability

The gardens also allowed the university as a whole to become more progressive in terms of their economic, social, environmental, and educational sustainability. The gardens provided infrastructure or programs that improved the environment on campus, while also increasing campus sustainability awareness. Systems of urban farming, urban chickens, composting, rain catchment, etc. were demonstrated at these sites, serving as visual representations of sustainability for those passing by to observe. Participant 50 mentioned the benefits of their garden stating it was the "most visible campus sustainability initiative with multiple demonstrations (e.g. water catchment, composting, permaculture, solar power, etc.) - great tour stop!" These gardens created aesthetically pleasing sites for campus visitors to enjoy and interact with nature, one participant (27) citing their garden as a "paradise on campus."

Economically, the gardens absorb some of the financial burdens encountered when purchasing organic produce for an institutional setting as well as for college students on tight

budgets. The sites provided local, organic produce to 39% of the surveyed institutions dining halls while also influencing greater local food purchasing from other sources. Participant 25 noted that "dining services can get produce they wouldn't otherwise be able to procure due to cost." In addition, the gardens were provided affordable, healthy produce to students who may lack the resources to afford these products in a traditional supermarket. Campus markets provide local food at 37% of the universities, 31% of gardens also provide food for volunteers, and 10% offer community supported agriculture programs. Participant 9 cited this economic benefit to the campus stating "it (the garden) has provided students with healthier and cheaper food options."

In addition to environmental and economic sustainability enhancements, many participants found the garden had also increased overall campus sustainability awareness. Participant 49 noted that the garden "act(s) as (an) agent of social change within the university and city." Volunteers at the garden gain additional life skills by interacting with the earth. Participant 26 noted that "People involved with the garden have gone on to do great things in their community." It was commonly cited that the addition of the gardens to campuses increased awareness of local food, sustainability, healthy, community gardening, and organic agriculture.

4.3.2.5 Networking

Twenty participants (39%) noted that the garden has allowed for beneficial networking. The gardens provide a platform for valuable interactions within the university community as well as between the university and outside community. Participant 27 affirmed that the garden has created "better relations between the university and external community." Interaction amongst students was also increased as participant 22 stated "(the garden) provides positive social activity for student participation." The gardens allowed administration, faculty, staff, and students/student groups to work together towards a common goal. Many participants noted that

the sites allowed for interaction to occur among groups that traditionally may not work together, such as international students, or those who traditionally would not garden. Networking also occurred through support, specifically by providing food to campus and non-campus community members. Participant 35 stated that their garden was "a huge benefit to housekeepers who have received over 13,000 pounds of food." Support of university and community stakeholders creates strong relationships, strengthening these initiatives.

4.3.2.6 Community Building

Through networking and diverse use of the gardens unique communities were also created. Twenty two managers (42%) cited community building to be a benefit provided. Five participants specifically noted "community building" as an advantage of their site. Social ties were created amongst garden participants to create niche communities. The garden helped strengthen ties within the larger university as well as with non-university communities. In addition to creating social bonds, a physical, communal space for campus members to utilize was also created. These spaces helped to incorporate the broader university community and also provided a space for meetings and social gatherings, participant 30 noting their garden to be an "inviting community space."

4.3.2.7 Providing Food

The highest cited benefit of the gardens was the provision of food. Twenty four participants (46%) reported the advantage of produce sourcing from their garden. It was found, however, that it was not simply the production of food. Gardeners frequently asserted the *quality* of the food grown. Pride was taken in the production of a sustainable food for the community with emphasis placed on the taste, quality, sustainability, and health benefits of the produce grown at these sites.

Benefits Derived from Garden Sites			
	Participants	Percentage	
Providing Food	24	46.15%	
Community Building	22	42.31%	
Formal Education	22	42.31%	
Networking	20	38.46%	
Institutional Sustainability	19	36.54%	
Experiential Education	18	34.62%	
Individual Skills	18	34.62%	
Total Responses	143		

Table 4.23 Benefit Codes

4.4 Research Question Four: Long Term Resilience Factors

Participants were asked if they believe their garden will exist for the long term and to explain why or why not. From the responses three themes were discovered (**Table 4.24**). Thirty eight participants (73%) gave a certain yes answer. Twelve participants (23%) stated that they were unsure or that certain conditions were needed. Only two participants (4%) responded that no, their initiative would not exist for the long-term. Key factors found to be supportive or hindering to the long term existence of these sites will be discussed further. Specific responses to this survey question can be found in **Appendix E**.

Will Garden Exist for the Long-Term?			
	Participants	Percentage	
Yes-certain	38	73.08%	
Yes-conditional/ Unsure	12	23.08%	
No	2	3.85%	

Table 4.24 Long-Term Resilience Codes

4.4.1 Yes-Certain

The majority of participants (73%) believed their initiative would persist within their institution. In addition, many were not only confident of success, but were in the process of expansion of infrastructure and/or programming. Several factors that increased confidence in the longevity of gardens included: secured funding, secured management, significant infrastructure,

institutional support, as well as high interest/demand (Table 4.25). Securing funding or a full time manager was noted by five participants as important to long-term success. However, this was not the most important factor listed by managers. It was found that many of the sites had significant infrastructure in place that made it incomprehensible that the garden would be lost. In addition to having strong infrastructure in place, many managers noted that they had plans for expansion of current structures or plans to become more active in curricular development. The most cited factors that gave a sense of security were institutional support and high interest/demand. Institutional was cited by 32% of managers. Many felt strong administrative support was vital. Inclusion into an office of sustainability or civic engagement, backing from chancellors, or support of dining services strengthened initiatives. The incorporation of gardens into specific academic departments or for specific and/or long term teaching projects were also found to strengthen gardens. Networking through partnering with the local community around the university, having a strong student organization participation/leadership, and other partnerships strengthened the gardens. The more networks gardens create within their university, the greater the long term security. Thirteen managers (34% of yes-certain responses) stated that high interest/demand will sustain their site. Demand came from not only students, but also staff, administration, faculty, and the surrounding communities. Institutions with strong interest in local, healthy food or sustainability were also cited to create strong gardening initiatives. Participant 26 addressed this by stating:

"Yes the garden will exist for the long term because there has always been a strong student interest as well as the community. And now with local healthy food being a popular topic, I think that it will continue to grow."

It was found that managers felt strong interest as well as institutional support were vital elements to long-term existence of these sites. Those who felt uncertain of their gardens existence listed some factors that were needed and/or missing that would ensure success.

Factors Ensuring Garden Resilience				
	Participants	Percent		
High Interest/Demand	13	34.21%		
Institutional Support	12	31.58%		
Significant				
Infrastructure	8	21.05%		
Secured Funding	3	7.89%		
Secured Management	2	5.26%		

 Table 4.25 Factors Ensuring Garden Resilience

4.4.2 Yes-Conditional/Unsure

Twelve participants felt unsure that their garden would persist, or felt that certain conditions were needed. Factors influencing longevity included: need for more institutional support, secured land tenure, continued participation/interest, and need for leadership. Some managers stated that the relative newness of their sites made it difficult to perceive the long-term existence (**Table 4.26**). Often more than one condition was needed, specifically between institutional support, leadership, and secured land tenure. A need for support from upper-level systems was stressed. Institutional support was cited by five participants and included: secured funding, continued faculty involvement, and inclusion into long-term planning of the university. Another important condition was securing a permanent parcel of land. Four managers noted that the land the garden was built on had other long-term plans. Three managers felt that student, faculty, and club interest had to remain high in order for the garden to continue. A need for strong leadership was also called for, as was addressed by Participant 47 when they said: "Yes, with the proper leadership. This is key to providing the students with the materials and educational assistance they need to understand the needs and time commitment of a community garden."

Other managers found that the relative newness of their site inhibited them from making any long-term projections, but felt hopeful their initiative would become established. A good example of this was seen when Participant 18 noted:

"...We're still so new that we don't yet have a functional system in place to recruit new members, fundraise, and grow a successful garden. Nevertheless, we've had some exciting successes (fence project, additional beds, some successful crops), and I hope that the club lasts."

Conditions Causing Uncertainty in Garden Resilience				
Factor	Participants	Percent		
Need for Institutional Support	5	41.67%		
Need for Secured Land Tenure	4	33.33%		
With Continued Interest/Participation	3	25.00%		
With More Leadership	2	16.67%		
Site too new	2	16.67%		

Table 4.26 Conditions Affecting Resilience Security

4.4.3 No

Only two participants (3.85%) did not foresee their initiative remaining active. Both responses were focused around a lack of support and lack of knowledge of the importance of sustainability initiatives.

4.5 Conclusion

The data collected and analyzed during this study revealed several key commonalities occurring at university food gardens. That being said, it was also shown that these sites exhibit a

large amount of diversity in their management and funding schemes, as well as growing practices, and garden uses. It was found that though gardens may experience several set-backs due to funding, participation, etc. they are still capable of providing a plethora of benefits to their institution as well as the university and outside communities. The fact that these gardens will persevere, despite obstacles, was seen by the number of managers who reported their garden would persist for the long-term. Factors key to maintaining these sites were institutional support, secured leadership, secured funding, and continued participation and/or interest. It is unknown whether development of significant infrastructure allows for garden longevity, or if significant infrastructure is a result of the above factors being present. Collection of a larger sample may reveal even greater demographic commonalities as well as obstacles and benefits.

CHAPTER FIVE

DISCUSSION AND CONCLUSION

5.1 Introduction

The results of this study illuminate key characteristics of and factors affecting university food gardens. Variability exists among the sites, yet key themes emerged which dictate gardens' long term resilience. Gardens benefit the universities' overall economic, social, environmental, and education sustainability. Specific factors are vital to creating strong initiatives that would withstand time. The overall sustainability ranking of the university also has a role in some aspects of the gardens resilience and provision of benefits. Institutions and their various stakeholders must recognize the value of these sites should be the first step in providing the support they need from the.

5.2 Discussion of Results

Analysis of survey data indicates the key themes and characteristics of the gardens. (**Table 5.1 and Table 5.2**). Specific trends exist at the sites, despite the variability of the data.

5.2.1 Research Question One: Key Characteristics

The gardens are marked by great variability, still a few factors were found consistent and are important to note. The majority of the sites have been established from 2005-2010 and are relatively small (on average less than one acre). This, however, seems to have no effect on the significant environmental, social, economic, and educational impacts these sites have.

Both students and faculty have a large role in the initiation of these sites: 72% initiated by student interest and 46% initiated by faculty. Student volunteers are active at 98% of the gardens and faculty participates at 61% of the sites, in addition 40% of the sites employ student workers.
The management of the sites is also largely through students and faculty: 39% are student run

and 42% are managed by students under the guidance of a faculty advisor.

Table 5.1 Key Garden Characteristics

Location and Practices
Garden Located on Central Campus
Established between 2005-2010
Practice Seed Saving
Produce Herbs
Produce Flowers
Produce Heirlooms
Administrative Characteristics
Initiated by Student Interest
Initiated by Faculty Interest
Management
Managed by Volunteers
Managed by Students with Faculty Advisor
Managed by One person Top Three Funding Sources:
• Within University
Donations
Sales
Heavily Reliant on One Source of Funding
Funds Consistently Available
Top Three Advertising Methods
University Website
Email List
Facebook
Participants and Uses
Garden Used as Teaching Site
Tours Offered at Site
Ton Three Participants
• Volunteers
Faculty
Outside Community Members
Garden Part of Student Club/Organization
Garden Coordinates with Other Student Groups
Garden Coordinates with Outside Community Non-Profits
Primary Goal is Agricultural/Gardening Education
Sustainability Classes Using Garden
Environmental Studies Classes Using Garden
Individual Unanges Associated with Garden Participation
vvork towards more sustainable lifestyles Opin broader life viewe from interaction with other participante
Gain product life-views from interaction with other participants Prooden their world view
 Dioducti liteli wonu-view Recome active in other compute groups with environmental or sustainability feases
Decome active in other campus groups with environmental or sustainability locus

Table 5.2 Top Qualitative Findings

Top Obstacles					
Participation					
Funding					
Agroecological Systems					
Top Benefits					
Providing Food					
Community Building					
Formal Education					
Perception of Long-Term Resilience					
Garden will remain long-term					

There is a strong focus on sustainable growing practices and education focused on sustainability, environmental studies, and agricultural and/or gardening techniques. The sites utilize multiple methods to teach students how to produce food in a way that makes minimal environmental impact: a large number of sites demonstrate permaculture, seed-saving, and organic methods. The gardens create ecological biodiversity hotspots by growing a variety of fruits and vegetables, herbs, flowers, native plants, and heirloom varieties.

The gardens possess robust networking capabilities within the university. A diverse set of participants and disciplines utilize the space for educational, sustainability, and community building purposes. The collaboration with student groups and non-profits broadens the impact of the gardens, while also increasing participation at the sites. The gardens are resourceful in their advertising and marketing strategies. Diversifying the two systems allows for increasing awareness among a more diverse group and helps to enhance social networks within and outside the university community. The provision of food to a variety of stakeholders also strengthens the local food network of the community.

5.2.2 Research Question Two: Learning

Campus gardens enhance the education opportunities at their universities. Formal education is one of the key benefits provided at these sites, but informal education also plays a large role. Experiential education is difficult to measure as it may be hard for outside managers to understand the learning participants gain, without a formal assessment. However, managers did note that the gardens offer opportunities for informal education allowing garden stakeholders, especially students, to gain individual skills from participation.

Sustainability education is interdisciplinary and hands-on. These sites allow multiple groups to work together in both formal classroom settings as well as through volunteering. Campus gardens provide numerous opportunities for education whether it is through formal use as a classroom, a supplemental learning space for faculty, workshops, tours, or simply volunteer workdays. The gardens prepare future graduates for a sustainability focused workforce by providing experiential education related to a variety of disciplines amongst a diverse group of stakeholders. Sustainability and environmental studies courses most often use gardens for curriculum, yet most are open to any discipline. These sites are utilized by each department to allow students to gain a systems-thinking view relevant to their major. Faculty participation has a strong role at the sites, especially in the case of involving the gardens with curriculum and instruction.

In addition to systems-thinking and sustainability education, students also gain individual skills which impact their behaviors. Students apply knowledge they gain at the garden to other areas of their lives, become active in other environmentally focused groups, or become politically active. Managers note that students gain a sense of pride and empowerment from garden participation. The way the managers speak of the benefits they provide, especially when mentioning the produce they grow, provides a mirror for sources of pride for students. Students

gain leadership skills and become empowered through leadership opportunities and at some sites, the freedom of managing their own plot. It is clear that these sites provide a source of formal and informal education as well as individual growth. By providing more educational opportunities to the broader university, gardens help to strengthen increase comprehensive sustainability education within their institution.

5.2.3 Research Question Three: Benefits and Institutional Sustainability

The top three benefits provided at campus gardens are providing food, community building, and formal education. Overall, themes indicate that gardens benefit the institutional sustainability. The sites improve the universities environmental sustainability while also creating spaces for outdoor reflection. In addition the sites strengthen the social, economic, and education sustainability of their institution. The benefits are often interrelated, supporting each other to provide a strong network of resources provided at the gardens.

5.2.3.1 Environmental Sustainability Benefits

Environmental sustainability is increased both directly and indirectly through the inclusion of a food garden. Directly the gardens help reduce the carbon footprint of the universities' food systems, and provide a site for biodiversity and soil building through the utilization of sustainable growing methods. Provision of local food reduces the carbon footprint of university dining halls and cafes as well as the food purchased by students and other community members. Local food sourcing, especially when organic methods are utilized, aids in decreasing the use of fossil fuels to grow, package, and transport the produce. The majority of the sites help to reduce the environmental impact of the university by practicing organic methods which exclude the use of synthetic fertilizer, pesticides, and herbicides, while focusing on increasing biodiversity and soil building. In addition, many sites practice seed saving and

permaculture. Seed saving is an act that preserves plant heritage while also exhibiting the full cycle of a plant. Permaculture focuses on creating a holistic system which mimics nature, promoting beneficial species relationships. Gardeners planted numerous types of fruits and vegetables as well as flowers, herbs, heirlooms, native plants, and other crops. The diversity of crops promotes hotspots of soil building and a diversity of beneficial insects tucked within the institution's landscaping, which may lack ecological biodiversity.

The sites also serve as sources for indirect environmental sustainability. Participants who actively garden at these sites, or enjoy these aesthetically pleasing outdoor spaces are able to observe complex natural relationships. Gardeners gain a more holistic view of environmental systems through hands-on interaction within the space. Managers note that students were able to connect to their food and the land, or gain a better understanding of sustainability. Those passing by also gain an appreciation for plant diversity and local food systems, as was noted by numerous managers who noted the aesthetic beauty of their garden.

5.2.3.2 Educational Sustainability Benefits

The education provided by the gardens was addressed in research question two. These sites provide hands-on, interdisciplinary education, two key necessities to increase sustainability education. Universities should focus on increasing the use of the garden for both formal and informal learning in order to increase the role of the gardens within educational sustainability.

5.2.3.3 Economic Sustainability Benefits

The gardens also economically strengthen the universities. Gardens provide produce that otherwise may be too expensive, to dining halls and campus stores. The gardens also influence increased university food purchasing from other local farmers. Local, healthy food is provided to a variety of university stakeholders and outside community members through the utilization of

multiple markets. Students are able to obtain food by participating at the garden or by purchasing it on campus. Outside community members are also able to obtain local, affordable produce when the gardens participate in outside farmers markets, community supported agriculture, restaurants, catering, etc. Many of the gardens provide produce to lower-income community members by donating to local food banks, increasing access for disadvantaged community members who typically cannot afford sustainable sources of food. Since the gardens offer media attention for the universities, as well, they may increase the likelihood of a student to attend the particular institution, and therefore increase the admissions income of the university.

5.2.3.4 Social Sustainability Benefits

University food gardens create social networks within their institutions, specifically community building and networking. By increasing participation among a diverse group, the gardens are able to reach a broader demographic with their economic, environmental, and educational benefits. Gardens increase cooperation between student initiatives and administration, as well as increase the likelihood of faculty interaction outside of their particular department or discipline. The gardens act as support systems for lower-income residents by providing affordable or free produce. As the gardens increase participants' individual skills they increase the overall sustainability awareness within the university. Furthermore, students often gain empowerment to create the changes they want to see in their community. Participants often become more active in other environmental groups, spread knowledge to other students, or practice more sustainable lifestyles. The branching out of benefits leads to social change within the institution, which in turn may lead to increased desire for implementation of sustainable practices among even more stakeholders.

5.2.4 Research Question Three: Obstacles

The top three obstacles encountered are participation, agroecological systems, and funding. Some obstacles may be unavoidable in the university setting, while others may require problems solving. Participation was the number one obstacle and often relates to the transient nature of students or the lack of students during the summer months. This clearly is expected from managing a garden in a university. With any form of agriculture there will be unexpected weather and climate conditions, pests, and crop failures therefore agroecological issues are also expected. Both of these obstacles can be minimized, however, with knowledgeable and consistent management of the sites. Managers provide resources for gardeners and also help to maintain student participation and awareness of the initiative.

Funding complications are common for campus gardens: 88% of the gardens receive funding from within their institution and 69% are heavily reliant on one funding source. Donations and produce sales provide another large source of funds, yet the small nature of the sites implies that sales will not sufficiently cover costs, especially if the initiatives desire a fulltime manager or seek to make large infrastructure improvements. This obstacle is expected within an institution where funding can be tight and often does not go towards smaller projects, so managers must focus on diversifying their funding sources. Only three sites receive funding from federal and state programs, yet there are several government and non-profit grants available for sustainable and organic agricultural projects. A lack of clear guidance or time may inhibit managers from seeking non-traditional sources of funding, but may be necessary for long-term resilience of the projects.

5.2.5 Research Question Four: Resilience

The majority of participants (73%) feel their garden is resilient enough to overcome the obstacles encountered. This finding shows that the benefits provided outweigh the difficulties

encountered while managing the site, but the presence of a few factors may increase the resilience of the initiatives. The overall sustainability of the institution plays a role in various factors, indicating the importance or irrelevance of the garden being a part of a institution with strong sustainability goals and programs.

5.2.5.1 Impact of STARS Rating

The Sustainability Tracking, Assessment, and Rating System is a sustainability ranking system developed by AASHE. An institution can be scored Platinum, Gold, Silver, and Bronze. The Platinum star was developed after the collection of data, and therefore is not present in this particular study. STARS rankings are based on the number of points a particular institution is awarded based on the sustainability of their academics, engagement, operations, and planning and administration. Gold institutions must have a minimum score of sixty five, silver a minimum of forty five, and bronze a minimum of twenty five. The STARS score of each institution in this study was compared to the manager's perception of the sustainability of their institution. It was found that the perceptions and the STARS ranking were consistent (**Table 5.3**). This consistency allowed the STARS rating to serve as a variable for assessing how the overall sustainability of the institution plays a role in the benefits derived, obstacles encountered, and long-term resilience of the garden. For this study, there were a total of nine gold rated institutions, thirty one silver, and twelve platinum universities.

STARS Rating	Average Overall Perceived Institution Sustainability	Avg. Perceived Stakeholder Sustainability Awareness
Gold	3.61	3.81
Silver	3.24	3.16
Bronze	2.59	2.56

Fable 5.3. STAR	5 Rating and	Perceived	Sustainability
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5.2.5.1.1 STARS Rating and Perceived Resilience

The relationship between the STARS rating and the perceived long-term garden resilience is important to note. While Bronze institutions have the least confidence in long-term resilience, the pattern between Gold and Silver is not as expected. Silver institutions possess the greatest confidence, yet also have the greatest variability in their open-ended responses (**Table 5.4**). This unexpected trend between Gold and Silver universities may be affected by the fact that the majority of study gardens were ranked Silver, and therefore may be less affected by outliers. Bronze institutions, however, were the only sites to have the majority of responses listed as unsure, suggesting that institutional support may in fact have an effect on long-term resilience of the gardens. A closer look at the relationships between the STARS rating and the obstacles and benefits provides a framework for understanding these patterns.

Garden Perceived as Resilient Yes Unsure/No

Table. 5.4 STARS	Rating and	Perceived	Resilience
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25%

19%

56%

5.2.5.1.2 STARS Rating and Obstacles

75%

81%

44%

Gold

Silver

Bronze

To gain a better understanding of factors that may affect overall perceived resilience it is important to understand the relationship between the STARS rating and the obstacles encountered (**Table 5.5**). Bronze ranked universities have the greatest range in frequency of obstacles encountered; however they experience the greatest difficulty with infrastructure. When comparing infrastructure obstacles among the universities, Bronze institutions experience more problems with the garden being located off-campus, while the Silver and Gold institutions state they need more space or have issues with vandalism. This suggests that gardens located in more sustainable institutions may receive the necessary institutional to have a centrally located, visible site, and the ability to expand. This is further supported by the fact that as the STARS rating decreases, institutional support obstacles become more prevalent.

Factors such as participation, agroecological issues, and funding do not play as strong a role in the perceived resilience as expected. It was found that as STARS rating decreases issues of participation and agroecological systems become less prominent. This however, may simply be that these sites have not expanded to the point where they find these obstacles to be the most pressing. Silver institutions had the greatest number of funding obstacles, but also had the greatest perceived resilience. Additionally it was found that as the STARS Rating decreases, the consistency of available funding increases (**Table 5.6**). Though the majority of the sites receive the greatest amount of funding from within their university, variety of funding sources may in fact be key to reliable funding, rather than the overall sustainability ranking of the institution. This is seen by the fact that Bronze rated institutions have the greatest variability in funding sources and also note to have the most consistently available funding (**Table 5.7**).

Obstacles Encountered Based on STARS Rating									
	Agro- Lack ecological Institut. of Mgmt/								
	Funding	Systems	Partic	Support	Infstr	Know	Leadership		
Gold	Funding 14%	Systems 20%	Partic 29%	Support 6%	Infstr 11%	Know 9%	Leadership 11%		
Gold Silver	Funding 14% 27%	Systems 20% 13%	Partic 29% 22%	Support 6% 14%	Infstr 11% 11%	Know 9% 9%	Leadership 11% 4%		

Table 5.5 STARS Rating and Obstacles Encountered

Table 5.6 STARS Rating and Funding Consistency and Reliance

Funding Availability and Reliance Based on STARS Rating							
	Consistent Funding Available	`Heavily Reliant on One Funding Source					
Gold	58%	67%					
Silver	87%	71%					
Bronze	89%	67%					

	Funding Sources and Variety Based on STARS Rating								
	Total Participants	Within University	Donations	Private	Sales	Other	Percent Variety		
Gold	12	11	4	1	5	1	183%		
Silver	31	27	14	5	9	6	197%		
Bronze	9	8	6	1	3	2	222%		

Table 5.7 STARS Rating and Funding Sources

5.2.5.1.3 STARS Rating and Benefits

The STARS rating and benefits provided also exhibit some interesting patterns (**Table 5.8**). Institutions with Gold rankings provide greater experiential education and individual skills with more focus science education and production agriculture (**Table 5.9**). The greater focus on production agriculture may explain why more experiential education and individual skills are provided by Gold universities. Interestingly, Bronze institutions provide more formal education benefits with increased focus around health and medicine as well as culinary skills. All the institutions, however, have the largest focus on sustainability and environmental studies. Networking benefits were also noted more frequently by Bronze institutions. This pattern may exist because gardens at these universities are still working towards integration into the broader university, and therefore are seeing the benefits of this labor.

Benefits Derived Based on STARS Rating							
	Community Formal Indv. Inst. F						
	Building	Exp. Ed	Ed	Skills	Sust.	Networking	Food
Gold	21%	15%	12%	15%	15%	3%	21%
Silver	15%	13%	16%	14%	15%	9%	17%
Bronze	19%	8%	19%	4%	12%	19%	19%

 Table 5.8 STARS Rating and Benefits Provided

FOCUS OF CLASSES								
	Prod. Env. Phys. Social							
	Ag Studies Sci Sci. Sust. Health/Med Edu. Culinar							
Gold	25%	50%	33%	17%	67%	0%	42%	8%
Silver	23%	45%	13%	16%	61%	26%	16%	19%
Bronze	0%	56%	11%	11%	78%	33%	44%	22%

Table 5.9 STARS Rating and Focus of Classes at Garden

5.3 Recommendations

Based upon the analysis and discussion of the results several recommendations for a resilient garden project have been established. The recommendations serve as a guide to implement a strong program; however success may be highly individualistic. It was found that strong institutional support, more commonly found in universities with higher STARS ratings is key to creating a resilient project. Institutional support allows for several other obstacles to be avoided, such as issues of management and funding. Additionally creating a diverse set of participation and networks help to strengthen the sites and increase the provision of benefits.

5.3.1 Institutional Support

Gardens must have strong support from their university administration, faculty, and staff. Reliable funding, provision of a full-time manager inclusion into long-term planning, and incorporation into academic planning must be provided by the institution. Many managers express that they constantly have to justify costs or cannot depend on consistent funding. Participants experiencing problems with infrastructure and management benefit from a reliable funding source to move forward with plans. Funding obstacles were the least cited by Gold institutions, however, funding was most consistently available in Bronze institutions that sought funding from greatest variety of sources. It is important for garden projects to diversify funding in order to decrease the reliance on one source of support. Most managers are heavily reliant on one funding source, often from within the university. Diversifying funding sources helps to

decrease the heavy reliance on university funds, but also requires having a manager who is not stretched so thin that they have time to apply for grants and assistance.

The funding to provide a manager, as well as acquiring a manager with horticultural experience would help avoid some of the obstacles encountered at these sites. A manager, in addition to student and faculty participation, assists with tasks that often get ignored due to time constraints. These include academic planning, grant writing, program development, networking, and advertising. In addition, many of the agroecological obstacles encountered may be avoidable under the guidance of an experienced leader.

Inclusion of the garden into long-term plans for the university aids in supporting these initiatives. Many of the resilient gardens are incorporated into long-term plans or specific offices within the university, such as sustainability or civic engagement departments. Long-term planning allows the university to set aside the appropriate resources the garden will need to maintain itself through fluctuations in student participation and weather/climate setbacks. In addition, the gardens must be put into the long-term building plans of the institution. Many managers fear that other plans have been developed for their site. Insecurity of land tenure discourages the building of lasting infrastructure and may decrease motivation to expand the garden programs. Often these gardens serve as a way for the university to show its sustainability; therefore they should receive the adequate support.

Faculty must also support the gardens. Greater inclusion into academic planning helps broaden participation while also asserting the value of these sites. In addition, though the gardens are active within many disciplines, institutions should try and include disciplines that do not typically have an environmental, science, or horticulture focus. For comprehensive sustainability education to occur students should be given the chance to gain a holistic systems-

thinking education; this includes business, communications, etc. Broadening the academic use of the garden increases the strength of interactions and in turn, the entire garden network.

In order for gardens to take advantage of their institution's resources they must have an open dialogue with administration, faculty, and staff. The value of the site must be known in order to validate the acquisition of funds and support. Managers should record volunteer participation, pounds of food produced, environmental benefits, and the networking involved. Keeping records of garden activities provides hard-copy evidence of the sites' extensive activities.

5.3.2 Consistent Participation

Often gardens with strong programs have a group of stakeholders heavily active or interested in their initiative. A unique aspect of university food gardens is that their main participants are only at the institution for 2-4 years. Students come and go, and often are busy during the summer months. These unique situations may require managers to practice creative problem solving. Participation is key for success and can be enhanced in several ways.

Inclusion of more academic departments at the garden allows for students unlikely to approach the garden on their own to receive educational experiences. Extensive advertising targeting a variety of demographics, participating in fairs and events, and utilizing a variety of markets helps to increase awareness. In addition, including the broader community, or providing summer programs or internships may help to absorb some of the impact of transient students. The creation of a student club or linking with another student organization may provide additional participants at the gardens as well.

It was also found that students may shy away from leadership roles at the sites. Recruiting freshmen and sophomores may aid in increasing strong connections to the garden

empowering students to take the lead. Networking with a variety of groups provides a strong back-bone for the gardens so that they are better able to deal with fluctuations in participation and management changes.

5.3.3 Networking

Networking is created through diverse participation and marketing strategies. Resilient gardens exhibit strong networks within their institution and their outside community. Networking is vital to increase participation and awareness of the initiative, and strengthens the benefits provided. Incorporation of the gardens into large university programs allows for the site to be applied in numerous instances. Interacting with communities inside the university also diversifies participation and creates a strong support system. Further branching into the non-university community may provide new leadership roles or avenues for expansion. The greater the networking, the more powerful impacts the gardens can have. It is vital for managers to interact with diverse groups to develop programming as well as participate in garden events and markets. By creating a support network, the sites may receive more validation from the institution.

5.4 Future Research

This study targeted universities active in the AASHE Stars program who are already taking steps towards achieving sustainability. Future research should seek to collect a larger sample size from a diversified set of institutions, specifically universities with less sustainability focus. New research should focus on the quantifying actual practices and production at university food gardens. More quantitative analysis would provide firm numerical data of the environmental impact of these sites within their institution, while also serving to exhibit the sustainability provided at the gardens.

5.5 Conclusion

This study aids in filling a gap within the community garden and higher education literature. Few studies assess the role of small initiatives within larger universities, and campus food gardens provide a good site for analysis. This study proves that university food gardens have large impacts on their institutions. The gardens empower students by providing opportunities for leadership, learning of sustainability principles, and individual skill development. In addition, the gardens enhance the overall sustainability of their institution through provision of hands-on and interdisciplinary education, environmental and economically sustainable sources of local food, the creation of ecological biodiversity hotspots, and community support and networking. The networking occurring at these sites is vital to the success and the strength of the gardens' impacts within their university. Faculty, students, administration, staff, and the outside community are linked together to form a unique web of interactions and educational opportunities. It is vital that these benefits are realized by higher education institutions so the initiatives receive the support they need to flourish. The overall sustainability of the institution impacts the obstacles encountered and the provision of benefits at these sites. Resilient gardens were most common in Gold and Silver STARS rated institutions, and possess strong participation, institutional support, and in depth networking. The relative newness and small size of campus food gardens clarifies that even small initiatives can have a large impact in a small amount of time.

REFERENCES

- Alaimo, K., T.M. Reischl, and J. Ober. "Community Gardening, Neighborhood Meetings, and Social Capital." *Journal of Community Psychology*. 38. no. 4 (2010): (497-514).
- Bell, S., and C. Cerulli. "Emerging Community Food Production and Pathways for Urban Landscape Transitions." *E:CO*. 14. no. 1 (2012): (31-44).
- Bidenweg, K., M.C. Monroe, and A. Oxarat. "The importance of teaching ethics of sustainability." *International Journal of Sustainability in Higher Education*. 14. No. 1 (2013):(6-14).
- Blake, A., and D. Cloutier. "Backyard Bounty: Exploring the benefits and challenges of backyard garden sharing projects." *Local Environment*. 14. no. 9 (2009): (797-807).
- Chambless, R., A. Parvaz, L.A. Chesson, and J.S. Ruff. "University of Utah Campus Garden: A Living Laboratory for Sustainability." *Sustainability*. 5. No. 3 (2012): (160-164).
- Corcoran, P.B., K.E. Walkerand, and A.E.J. Wals, "Case studies, make your-case studies, and case stories: a critique of case-study methodology in sustainability in higher education." *Environmental Education Research.* 10. No. 1 (2004):(7-21).
- Creswell, J.W. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches.* Thousand Oaks: SAGE Publications, 2014.
- Dennis, A. R., Garfield, M. J. (2003). The Adoption and Use of GSS in Project Teams: Towards More Participative Processes and Outcomes. *MIS Quarterly*. 27. No. 2 (2003).
- Eizenberg, E. "The Changing Meaning of Community Space: Two Models of NGO Management of Community Gardens in New York City." *International Journal of Urban and Regional Research.* 36. no. 1 (2012): (106-120).

Elder, J.L. "Think Systemically, Act Cooperatively." Sustainability. 1. No. 5 (2008). (319-328)

- Firth, C., D. Maye, and D. Pearson. "Developing 'community' in community gardens." *Local Environment.* 16. No. 6 (2011):(555-568).
- Glover, T.D. "Social Capital in the Lived Experiences of Community Gardens." *Leisure Sciences*. 26. (2004): (143-162).
- Guitart, D., C. Pickering, and J. Byrne. "Past results and future directions in urban community gardens research." *Urban Forestry & Urban Greening*. (2012): (1-10).
- Hale, J., C. Knapp, L. Bardwell, M. Buchenau, J. Marshall, F. Sancar, and J.S. Litt. "Connecting food environments and health through the relational nature of aesthetics: Gaining insight through the community gardening experience." *Social Science and Medicine*. 72. (2011): (1853-1863).
- Hidalgo, L.A. and J.M.A. Fuentes. "The Development of Basic Competencies for Sustainability in Higher Education: An Educational Model." US-China Educational Review 3. No. 6 (2013): (447-458).
- Hazzard, E.L, E. Moreno, D.L. Deal, and S. Zidenberg-Cherr. "Best Practices for Implementing, Sustaining, and Using Instructional School Gardens in California." *Journal of Nutrition Education and Behavior.* 43. No. 5 (2011): (409-413).
- Jick, T.D. "Mixing Qualitative and Quantitative Methods: Triangulation in Action." *Administrative Science Quarterly*. no. 4 (1979): (602-611).
- Johnson, L. and H. Castleden. "Green the campus without grass: using visual methods to understand and integrate student perspectives in campus landscape development and water sustainability planning." *Area.* 43. no. 3 (2011): (353-361).
- Johnson, R.B., J. Onwuegbuzie, and L.A. Turner. "Toward a Definition of Mixed Methods Research." *Journal of Mixed Methods Research*. no. 112 (2007).

- Johnson, S. "Reconceptualising gardening to promote inclusive education for sustainable development." *International Journal of Inclusive Education*. 16. No. 5-6 (2012): (581-596).
- King. C.A. "Community Resilience and Contemporary Agri-Ecological Systems: Reconnecting People and Food, and People with People." *Systems Research and Behavioral Science*. 25. (2008): (111-124).

Krosnick, J.A. "Survey Research." Annual Review of Psychology. (1999): (537-567).

- Larsen, L., S.L. Harlan, B. Bolin, E.J. Hackett, D. Hope, A. Kirby, A.Nelson, T.R. Rex, and S.
 Wolf. "Bonding and Bridging: Understanding the Relationship between Social Capital and Civic Action." *Journal of Planning Education and Research*. 24. (2004):(64-77).
- Louw, W. "Green Curriculum: Sustainable Learning at a Higher Education Institution." *The International Review of Research in Open and Distance Learning*. 14. No. 1. (2013):(1-15).
- Miles, M.B., A.M. Huberman, and J. Saldana. *Qualitative Data Analysis 3rd Edition*. Thousand Oaks: SAGE Publications, 2014.
- Millburn, L.A.S., and B.A. Vail. "Sowing Seeds of Success: Cultivating a future for community gardens." *Landscape Journal.* 29. (2010): (1-10).
- Miller, E. and L. Buys. "The role of social capital in predicting and promoting feelings of responsibility for local environmental issues in an Australian community." *Australasian Journal of Environmental Management*. 15. No. 4 (2008):(231-240).
- Minguet, P.A., M.P. Martinez-Agut, B. Palacios, A. Pinero, and M.A. Ull. "Introducing sustainability into university curricula: an indicator and baseline survey of the views of

university teachers at the University of Valencia." *Environmental Education Research*. 17. No. 2 (2011): (145-166).

- Nicholls, D. "Qualitative research: Part three-Methods." *International Journal of Therapy and Rehabilitation*. no. 12 (2009): (638-647).
- North, C. and C.Jansen. "Holding a sustainability bearing through the cutty-grass and clearings: Implementing sustainability during disruptive organizational changes." *Australian Journal of Outdoor Education*. 16. No. 2. (2013):(2-11).
- Ohmer, M.L., P. Meadowcroft, K. Freed, and E. Lewis. "Community Gardening and Community Development: Individual, Social, and Community Benefits of a Community Conservation Program." *Journal of Community Practice*. 17. (2009): (377-399).
- Okvat, H.A., and A.J. Zautra. "Community Gardening: A Parsimonious Path to Individual, Community, and Environmental Resilience." *American Journal of Community Psychology*. 47. no. 3-4. (2011): (374-387).
- Paraschivescu, V. and C.E. Radu. "Higher education, a resource for sustainability." Economy Transdisciplinarity Cognition. XIV. No. 1. (2011): (115-120).
- Pudop, M.B. "It takes a garden: Cultivating citizen-subjects in organized garden projects." *Geoforum. 39. (2009): (1228-1240).*
- Ralston, S.J. "Educating Future Generations of Community Gardeners." *Critical Education*. 3.No. 3 (2012):(1-18).
- Reichardt, C.S., and S.F. Rallis. *The Qualitative-Quantitative Debate: New Perspectives*. San Francisco: Jossey-Bass, 1994.
- Schmelzkopf, K. "Urban Community Garden as Contested Space." *Geographical Review*. 85. no. 3 (1995): (364-381).

- Shephard, K. "Higher education's role in 'education for sustainability." *Australian Universities Review.* 52. No. 1 (2010): (13-22).
- Shriberg, M. "Institutional Assessment Tools for Sustainability in Higher Education: Strengths, Weaknesses, and Implications for Practice and Theory." *International Journal of Sustainability in Higher Education. 3. No. 3 (2002).*
- Stafford, S. "How Green is Your Campus? An Analysis of the Factors That Drive Universities to Embrace Sustainability." *Contemporary Economic Policy*. 29. no. 3 (2011): (337-356).
- Stephens, J.C. and A.C. Graham. "Toward an empirical agenda for sustainability in higher education: exploring the transition management framework." *Journal of Cleaner Production.* 18. (2010): (611-618).
- Stephens, J.C., M.E. Hernandez, M. Roman, A.C. Graham, and R.W. Scholz. "Higher education as a change agent for sustainability in different cultures and context." *International Journal of Sustainability in Higher Education.* 9. No. 3 (2008): (317-338).
- Tashakkori, A., and J.W. Creswell. "Mixed Methodology Across Disciplines." *Journal of Mixed Methods research*. no. 1 (2008): (3-6).
- Twiss, J., J. Dickinson, S. Duma, T. Kleinman, H. Paulsen, and L. Rilveria. "Community Gardens: Lessons learned from California healthy cities and communities." *American Journal of Public Health.* 93. no. 9 (2003): (1435-1438).
- Velazquez, L., N. Munguia, A. Platt, and J. Taddei. "Sustainable university: what can be the matter?." *Journal of Cleaner Production*. (2006): (1-10).
- Venkatesh, V., S.A. Brown, and H. Bala. "Bridging the Qualitative-Quantitative Divide: Guidelines For Conducting Mixed Methods Research in Information Systems." *MIS Quarterly.* 37. no. 1 (2013): (21-54).

- Voicu, I., and V. Been. "The Effect of Community Gardens on Neighboring Property Values." *Real Estate Economics. 36. no. 2 (2008): (241-283).*
- Wright, T. and N. Horst. "Exploring the ambiguity: what faculty leaders really think of sustainability in higher education." *International Journal of Sustainability in Higher Education*. 14. No. 2. (2013):(209-227).
- Yuan, X. and J. Zuo. "A critical assessment of the higher education for sustainable development students' perspectives- a Chinese study." *Journal of Cleaner Production*. (2012): (1-8).

APPENDICES

APPENDIX A:

SURVEY REQUEST EMAIL--CONSENT TO PARTICIAPTE

To Whom It May Concern,

My name is Sydney Klein I am a master's student as well as the manager of the campus organic garden at Southern Illinois University of Carbondale. I would like for you to participate in my research study. The study was driven by my own passion for local food systems as well as the lack of available information on these important initiatives occurring in university settings. Your participation would be greatly appreciated. The study will assess the role our campus gardens and farms play within environmental and sustainability education at institutions across the United States and Canada.

You have been listed as the primary contact for matters regarding the organic garden and/or farm on your campus via the AASHE Stars Rating Program list of sustainable universities. Contact information was derived from searches of individual university web-pages.

The study will consist of a survey that should take no more than thirty minutes to one hour. As a fellow gardener I understand that much time is devoted this time of year to fighting weeds, pests, and harvesting so I worked to make this survey user friendly and quick to complete. Participation is voluntary. Participants will be kept anonymous within data analysis and recording, however data will not be collected anonymously.

Should questions arise from received surveys, you may be contacted for clarification. Coding will be developed upon return of all potential surveys. The individual researcher and appropriate faculty advisors will view data. All reasonable steps to protect the identity of individual schools will be taken.

To participate please go to the following link and complete the survey. <u>http://cteapps.siu.edu/limesurvey/index.php?sid=94249&lang=en</u>

For questions concerning the research, the following may be contacted.

Sydney Klein Master's Student Department of Geography and Environmental Resources Southern Illinois University Carbondale

(828) 455-9746 kleinsk@siu.edu

Dr. Leslie A. Duram

Professor, Director of Environmental Studies Program Department of Geography and Environmental Resources Southern Illinois University Carbondale (618) 453-6084 duram@siu.edu

Thank you for participating in my research! Sydney Klein

This project has been reviewed and approved by the SIUC Human Subjects Committee. Questions concerning your rights as a participant in this research may be addressed to the Committee Chairperson, Office of Sponsored Projects Administration, Southern Illinois University, Carbondale, IL 62901-4709. Phone (618) 453-4533. E-mail siuhsc@siu.edu.

APPENDIX B:

SURVEY

- 1. Name of Garden/Farm:
- 2. Name of Survey Participant:
- 3. Role of survey participant:
- 4. Email Address:
- 5. Name of University/College:
- 6. Department (If Applicable):
- 7. What year was your garden established?
- 8. Is this one of multiple gardens and/or farms on your campus?
- 9. Have plans been established for the garden and/or farm for:
- 10. Who initiated the garden? (mark all that apply)
 - a. Faculty Interest
 - b. Student Interest
 - c. Administrative Interest
 - d. Staff Interest (Kitchen, Daycare, etc.)
 - e. Other___
- 11. What is the size of your site? (may choose acres or square feet)
- 12. Do you practice growing methods consistent with USDA organic standards?
- 13. Do you practice permaculture?
- 14. Do you practice season extension with any of the following? (mark all that apply)
 - a. Hoop House/High Tunnel
 - b. Green House
 - c. Low-tunnels/Heavy grade row cover
 - d. Hot-frames
 - e. Cold-frames
 - f. Do not practice season extension currently
 - g. Plans to install season extension structures
 - h. Other___
- 15. Is your garden located on your central campus? (y/n)
- 16. If your site is not located on the central campus, how many miles away is the site?
- 17. What is the primary goal of your garden and/or farm? (Mark all that apply)
 - a. Gardening/Agricultural Education
 - b. Local Food Source for Dining Halls
 - c. Local Food Source for Campus Stores/Farmstands
 - d. Health Purposes
 - e. Science Education
 - f. Youth Programs and/or Daycares
 - g. Provide for Local Food Banks
 - h. Other
- 18. How many types of vegetables do you grow?
- 19. How many types of fruits do you grow?
- 20. Do you also grow: (Mark all that apply)
 - a. Herbs

- b. Flowers
- c. Heirlooms
- d. Plants solely for production of value-added products
- e. Other____
- 21. Do you practice seed saving? (y/n)
- 22. What is the market for produce and/or products grown or created at the garden?
 - a. Campus dining halls
 - b. On-campus farm stands and/or markets
 - c. Off-campus community farmers markets
 - d. CSA (community supported agriculture)
 - e. Food Banks
 - f. Other__
- 23. How is the garden advertised? (Mark all that apply):
 - a. University website
 - b. Email list
 - c. Facebook
 - d. Blog
 - e. Flyers
 - f. Fairs
 - g. We do not advertise
 - h. Other___
- 24. Of these advertising methods which have been the top three most successful?
- 25. How is the garden managed? (Mark all that apply):
 - a. Faculty
 - b. Students with faculty advisor
 - c. Students
 - d. Kitchen staff at dining/residence halls
 - e. Volunteers
 - f. Other___
- 26. How many managers run the garden?
 - a. 1
 - b. 2
 - c. 3
 - d. 4
 - e. 5 or more
- 27. Who participates at the garden? (Mark all that apply):
 - a. Paid student workers
 - b. Faculty
 - c. Administration
 - d. Volunteers (from student body/campus community)
 - e. Classrooms
 - f. Outside community
 - g. Other___
- 28. Is the garden part of a student club/organization? (y/n)
- 29. Is the garden part of a university wide sustainability program/goal? (y/n)
- 30. What are the major sources of funding? (Mark all that apply):

- a. Federal
- b. State
- c. Within University
- d. Donations
- e. Private
- f. Sales (produce sales, bake sales, plant sales etc.)
- g. Other___
- 31. Of the above sources, are you heavily reliant on one source of funds? (y/n)
- 32. Do you have guaranteed sources of funding consistently available? (y/n)
- 33. Does your university offer: (mark all that apply)
 - a. Sustainability courses
 - b. Interdisciplinary education
 - c. Environmental studies major/minor
 - d. Sustainability major/minor
 - e. None of the above
- 34. On a scale of 1 to 5 (one being not at all, 5 being highly sustainable) how would you rate your university's [Food System] sustainability?
- 35. On a scale of 1 to 5 (one being not at all, 5 being highly sustainable) how would you rate your university's [Education] sustainability?
- 36. On a scale of 1 to 5 (one being not at all, 5 being highly sustainable) how would you rate your university's sustainability [Faculty Awareness]?
- 37. On a scale of 1 to 5 (one being not at all, 5 being highly sustainable) how would you rate your university's sustainability [Student Awareness]?
- 38. On a scale of 1 to 5 (one being not at all, 5 being highly sustainable) how would you rate your university's sustainability [Staff Awareness]?
- 39. On a scale of 1 to 5 (one being not at all, 5 being highly sustainable) how would you rate your university's sustainability?
- 40. Is the garden used as a teaching site? (y/n)
- 41. What departments most utilize the garden for teaching purposes/tours/etc. (If applicable)
- 42. What are the focus of classes linked to the garden? (mark all that apply)
 - a. Production agriculture
 - b. Environmental studies
 - c. Physical science
 - d. Social science
 - e. Sustainability
 - f. Health/medicine
 - g. Education
 - h. Culinary
 - i. Other_

43. Are workshops offered for: (mark all that apply)

- a. Students
- b. Faculty
- c. All University Members
- d. Outside Community
- e. We do not offer workshops
- f. Other_____

- 44. Is research conducted at the garden? (y/n)
- 45. As a result of participating at the garden do participants:
 - a. Work towards more sustainable lifestyles
 - b. Become leaders in other aspects of their lives
 - c. Become active in other campus groups with environmental sustainability focus
 - d. Become politically active
 - e. Gain broader life-views from interaction with other garden and/or farm participants
 - f. Broaden their worldview
 - g. None of the Above
 - h. Other_
- 46. Are tours offered at the garden? (y/n)
- 47. Does the garden work with: (mark all that apply):
 - a. Other student groups
 - b. Outside community non-profit groups]
 - c. None of the above
- 48. In your opinion will your university garden exist for the long-term. (Yes/No and Why)
- 49. What are the top three obstacles encountered with the garden and/or farm?"
- 50. What are the top 3 benefits the garden has provided?
- 51. On a scale of 1 to 5 (1 being not at all, 5 being very aware); How would you rate the following groups awareness of your garden?" "[Faculty]
- 52. On a scale of 1 to 5 (1 being not at all, 5 being very aware); How would you rate the following groups awareness of your garden?" "[Aministration]
- 53. On a scale of 1 to 5 (1 being not at all, 5 being very aware); How would you rate the following groups awareness of your garden?" [Staff]
- 54. On a scale of 1 to 5 (1 being not at all, 5 being very aware); How would you rate the following groups awareness of your garden?" [Outside Community]
- 55. On a scale of 1 to 5 (1 being not at all, 5 being very aware); How would you rate the following groups awareness of your garden?" "[Students]
- 56. Just for fun: Describe your garden in three words or short phrases.

APPENDIX C:

HUMAN SUBJECTS APPROVAL



Sydney Klein< kleinsk@siu.edu>

Human Subjects Revised

SIU Human Subjects Committee < siuhsc@siu.edu> To: Sydney Klein <kleinsk@siu.edu> Cc: Leslie Duram <duram@siu.edu> Fri, Aug 9, 2013 at 9:07 AM

Hi Sydney,

The HSC has approved your modification and you may proceed. The approval paperwork will be sent in the next few days.

Thanks for keeping your file up to date.

Karen

At 03:26 PM 8/6/2013, you wrote: [Quoted text hidden] Content-Type: application/vnd.openxmlformats-officedocument.wordprocessingml.document; name="final_email_format.docx" Content-Disposition: attachment; filename="final_email_format.docx" X-Attachment-Id: f_hk1ka00i0 [Quoted text hidden]

APPENDIX D:

SUBJECTS ASSOCIATED WITH DISCIPLINES

Liberal Arts:

- Architecture
- Architecture/art
- Art
- Anthropology
- Journalism
- ESL
- English
- American English and culture program
- Ethics
- Theology
- Philosophy
- History (faculty of arts)

Applied Science

- Computer science
- Software engineering
- Engineering
- Environmental engineering
- Faculty of applied science (engineering)
- Electrical engineering
- Mechanical engineering
- Engineering and management

Business

• Communications

Education

- Child development center
- Teaching school
- Faculty of education
- Education

Agricultural Science

- Plant science
- Crop and Soils
- Animal and plant science
- Urban horticulture
- Plant, Soil, and Insect science
- Entomology, plant pathology, and weed science
- Faculty of Land and food systems (all departments)
- Urban horticulture
- Extension plant sciences

Science

- Faculty of Science (biology, conservation, etc...)
- College of science
- Science
- Biology
- Biology Non-Profit leadership
- Geography
- Faculty of forestry
- Natural Resources and the environment
- Natural resources

Environmental Studies and Environmental Science

- Global Resolve
- Environmental
- Environmental and urban studies
- Environmental studies
- Environmental Science

Sustainability

- Sustainability
- School of Sustainability
- Sustainable Foods
- Sustainable Food and Farming
- Civic agriculture and food systems minor

APPENDIX E:

OPEN-ENDED SURVEY RESPONSES

Participant	Benefit 1	Benefit 2	Benefit 3	Obstacle 1	Obstacle 2	Obstacle 3
Participant 1	Increased food production	Central meeting/learning space	Awareness of local food and sustainability options	Awareness	Funding	Maintenance
Participant 2	education - engineering systems	visibility for concept	research outcomes	funding	continuity - students come and go	technical expertise of volunteers
Participant 3	community building	self selected plant options	education	maintenance	coordination	health concerns
Participant 4	Education	Awareness	Engagement	Aesthetics	Funding	Volunteers
Participant 5	Jobs for students	produce for students and community members	linkages to community	administrative neglect	lack of formal embedded academic programming	funding
Participant 6	More joy for engaged students	scholarly research	learning about and eating good food	Location	summer maintenance	
Participant 7	opportunities for student leadership	exposure to organic certification	exposure to gardening	student turnover	student turnover	student turnover
Participant 8	Community amongst students	A chance to explore interests in sustainability	Joy to students	University Cooperation	University Food Service Company	General pre- conceptions against gardening/pro duce
Participant 9	It has provided an interactive and educating green space for students.	It has allowed students to connect to their food on a personal level.	It has provided students with healthier and cheaper food options.	Lack of Volunteers	Deciding where the food goes	Publicity
Participant 10	healthy food	learning opportunities for students	campus awareness about organic ag	poor soil - it is a reclaimed site	unreliable water service	
Participant 11	hands on education	organic gardening demonstration	aesthetic beauty	location	funding	size
Participant 12	educational oppportunities	delicious & fresh food	hands on opportunity	lack of seasonal knowledge from Dining Centers	staffing/ labor during fall semester	budget
Participant 13	community	fresh produce	making unused land productive	soil quality	volunteer-run (time)	woodchucks!! !

Participant 14	brings people closer to plants who otherwise are not interested in our collections	Brings attention to the	provided a platform for our Ed Dept to teach healthy cooking	Labor demand in other areas of the	fiscal demands at other locations in the	
Participant 15	educational experiences	involving students		funding	summer workers	
Participant 16	fresh produce for food banks	fresh produce for volunteers/student s	a great community feeling	lack of volunteers	rocky soil	vandalism
Participant 17	fresh produce	support for a project in Rwanda	community building	weather - drought, floods, hail, frost	weeds	poor soil quality in parts of the garden
Participant 18	feeling of pride and community	a way to realize ideals and the knowledge they are gaining in courses (e.g., ENSTU 211)	direct connection to nature	money	deer	knowledge about how to build good soil and grow food successfully; also, consistent participation (students are transient and not always committed)
Participant 19	Hard work has a delicious payoff	Personal awareness of seasonal changes	Home grown taste better	sustained student participation	maintenance issues	vandalism
Participant 20	added revenue for the Grounds dept.			it is viewed as unattractive so has to be hidden	value of the not really recognized by the university as a whole	
Participant 21	Sense of community	Health benefits	Beautification of space	Cost	Space	Volunteers
Participant 22	provides positive social activity for student interaction	increased awareness of healthy food on campus	educational opportunities outside of the traditional classroom	funding	water access	getting people to the garden to work

Participant 23	Fresh produce	Education - the role of community gardening in sustainable living	Community outreach opportunities	Securing support (financial and otherwise) from university administration	Continuing to engage garden members in spite of gardening setbacks (pests, diseases, bad weather)	
Participant 24	Student win on campus	PR	collaboration with administration	University aesthetics standards	fluctuations in student populations	Funding
Participant 25	Garden produce has led to the college purchasing local food from other sources	Dining Services can get products they wouldn't otherwise be able to procure due to cost	Students increase knowledge of how to grow food plants and seem to sustain the interest after graduating	Management Time	Buy-in from institution	
Participant 26	People involved with the garden have gone on to do great things in their community	We have provided education on sustainable agriculture to those who may have not had the chance	We supply fresh healthy food to our local food banks	Maintaining the garden plan throughout the student turnover	We could use more space	Along with more space, we could use a year round manager position to expand the garden and the program
Participant 27	Experiental learning opportunities	better relations between university and external community	garden paradise on campus	resources to pay the proper number of staff	lack of communicatio n with the university admin for long term planning	
Participant 28	Fresh, chemical free food	Changed lives of many students in many ways	I have gained insight into the politics behind so many growing efforts.	Lack of students in our program	Justification of labor cost	Funds approval: seeds, hoses, etc.
Participant 29	Education	community	aesthetics	maintenance	accountability	proper use of produce
Participant 30	inviting community space	healthy food for all who enter	education: how to grow food organically in a challenging environment	funding	student awareness	continuity of leadership (prior to establishment of my position in 2011)

Participant 31	Popular Workshops for anyone	Building a 3- phase composting unit	Establishing a space for new growers so they can grow without the responsibility of an entire plot	Lack of institutional support, especially from faculty	apathy from current gardeners/lang uage barrier with many gardeners student	Only just recently securing a stable funding source.
Participant 32	community	autonomy	produce!	n/Regulations	visibility	retention/recr uiting
Participant 33	educational/research environment	beatifies the campus	great food production	work hours needed	replacement expenses	funding
Participant 34	Healthy fresh food	Education of students	Demonstration of Sustainability	Climate and weather	Wildlife	Limited space
Participant 35	Huge benefit to housekeepers who have received over 13,000 lbs of food	Education to University and large community	Garden has really helped to create good will.	Funding	Dealing with the University bureaucracy	Dealing with the Town of We are located within the Historic District.
Participant 36	Education	Delicious food		Recruitment	Support from higher ups	Expansion
Participant 37	Education	healthy food	local, cheap food	managing volunteers	keeping things watered	maximizing use of space
Participant 38	Community building	Interaction with international students	Great food!	Participation in summer	Volunteers	
Participant 39	stuent organization resource	urban gardening resource	urban chickens	students are not here in the summer to participate	student organization turnover	lack of planning
Participant 40				Space	Funding	Seasons
Participant 41	Education on how food scraps are an asset and composting can close the recycling loop	Education of youth on nutrition and gardening	Mixing of community members, students, faculty and youth	Need a manager	Need volunteer organization	
Participant 42	Community building	Access to fresh produce	Awareness of health	Access to water	Stealing of produce by local poachers	Bad weather
Participant 43	Great local food to the dinning halls	Student empowerment	Community building	Farming (pests, weeds, etc)	Pricing	Storage
Participant 44	Good PR	Collaboration	Student pride	Funding	Weed control	Year 'round student help
Participant 45	Local Sustainable Produce	Teaching Opportunities	New Personal Experiences for Students	Production Amounts	Outside Involvement/ Awareness	Building a lasting Infrastructure
----------------	--	--	---	---	---	---
Participant 46	Place for participants to lern how to grow food	Connection with the community	The food	Lack of institutional support	Distance from campus	Need for on campus site
Participant 47	sense of pride	learning a new skill	understanding of why sustainable practices are important	ongoing maintenance	composting success	not clearing beds out when a semester ends
Participant 48	community support	vibrant partnerships		sustainable food system	funding to support expansion	
Participant 49	A living lab for students to test their learning	Act as agent of social change within university and city	A worldwide hub for food sustainability dialogue	Financial sustainability	Staff continuity	
Participant 50	Hands-on, informal sustainability learning space	Most visible campus sustainability initiative with multiple demonstrations (e.g. water catchment, composting, permaculture, solar power, etc.) - great tour stop!	Opportunities for student leadership and empowerment	Lack of consistent management without paid staff	Lack of clear leadership and channel of communicatio n beyond small group of volunteers	Need for signage to raise awareness among general public.
Participant 51	Sense of community	Aids students under financial strain		Infrastructure - we're a quarter-acre of prairie grassland that is tilled every spring. Major issues with weeds and lack of equipment Need raised beds, a shed, fencing to keep out the wild rabbits, etc	Lack of upper- administration support	Issues with student engagement/le adership People use the garden, but few are willing to step up and take a leadership role
Participant 52	Community	Education	Local and organic food	Size	Money	Summer work

In your opinion will your garden exist for the long-term?

Absolutely. _____is a central component of the _____ campus. Additionally, we have a _____

Garden that is becoming more established. We have a Learning Garden Master Plan drafted at

Southeast Center, which will come online in 2016. Site selection for a Learning Garden at

_____ campus is underway as well.

yes, significant infrastructure already involved, would be hard to walk away from it

Yes because it is very popular and our students are looking for more space to garden.

Yes, because support and interest in the garden has been growing significantly since its beginning in 2008.

yes

We are embedded in the center for civic engagement, which strongly supports student activities at

the farm as a form of engagement

Yes. There seems to be ongoing interest in garden 1 and garden 2 is a long term teaching project

Yes. There is a long term student and organization commitment to the garden.

On the current track, no. There must be a change in how funding is viewed for organization which

runs the garden, the _____. Currently, funds and abilities are limited.

Yes. The garden has a lot of support through the Office of Sustainability. As long as there are

students that want the garden there then the program will be continued.

Maybe - depends upon continual student interest

yes

Yes - It's a win-win for Dining Services and Horticulture because of the educational and

production components.

Yes. I think there are enough interested people to sustain it and we have a pretty good infrastructure.

yes but as a dynamic, space so there will always be change

If faculty interest remains high

Yes because there is now a hired Garden Manger to maintain the garden between student interest

peaks and to direct the Garden Club when students are interested in the garden.

Yes. We've built up a sizable group of volunteers and supporters.

I'm not sure. We're still so new that we don't yet have a functional system in place to recruit new

members, fundraise, and grow a successful garden. Nevertheless, we've had some exciting

successes (fence project, additional beds, some successful crops), and I hope that the club lasts!

has been working and harvesting campus landscape date palms since 1990. We have

added all campus citrus trees, a community vegetable garden and honors college rooftop garden

yes

Yes because it is a part of the Office of campus sustainability's mandate.

Our garden is in an early developmental stage, it is difficult to determine a very long-term projection. Currently we are successfully increasing student involvement and increasing the number of academic departments and programs involved. Expanding partnerships is the primary focus of our garden sustainability plan.

Yes - the 98 available community garden plots are in high demand each spring; during our membership drive this year, we had 50 plots sell out in less than 10 minutes. We have received a great deal of publicity in campus media the last several years, and interest among university students and community members is high. The garden site is on land belonging to the campus Sustainability Institute, and we are part of their long-term site plan, so I anticipate the garden will continue to exist in the long term.

yes!,

There is significant history of student activism surrounding garden on campus and we have a faculty of agriculture

Yes. We are currently undergoing plans to erect a high tunnel for seasonal extension and are looking at making some staffing changes that would create a part-time farm manager position, along with a graduated student intern.

Yes the garden will exist for a long time because there has always been a strong student interest as well as the community. And now with local healthy food being a popular topic, I think that it will continue to grow.

Yes. There is a lot of space available on campus that will be used for other activities and there is a growing number of people - students, staff & administration - that are getting involved and being support of urban agriculture projects on campus.

No, and this is truly sad; I LOVE every microbe in my soil, and it saddens me to think that the world going on around me has lost appreciation for life outside of themselves. The short answer lies in all the red tape, the politics of it all; we currently choose economy over ecology. Society is not selfless enough yet to understand the grand importance of growing their food (medicine) much less building the soil..to say the least.

Yes. We have reliable funding and multiple staff roles

At the moment it seems stable and well-supported, but the adjacent building is scheduled to be

torn down and replaced within the next 5 yrs

Yes, as long as the club stays active.

I would like to think so, because the garden has been strictly student-run and fueled, but the garden

is currently not in the University's 10 year plan and our current site has been under consideration

since the garden's inception.

Maybe - if it continues to be used for research and education

Not sure. If we become self-supporting our chances are better. However the site we are gardening

on has other long range development plans.

I believe so. Now that my position has been given permanent funding I am feeling more secure

about our long term future. Plus, it looks like our new chancellor will be very supportive as well.

YEs

Yes. There's a high demand for it and the University is willing to support paying a garden

manager.

Yes. There is a growing interest in local food systems on campus.

Yes

Yes. Interest in participating continues to grow.

Yes

Yes, because it is a partnership with the local _____ Community.

Yes, the farm is very close to being financially self-sustaining, and everyone loves it.

I hope so, but funding for a permanent staff member is always difficult to find.

We have built our gardens as permanent structures, so as long as the buildings they are in or connected to are there and we run them; they will be there too.

Only with continued student leadership or with more involvement from the university.

Yes, with the proper leadership. This is key to providing the students with the materials and educational assistance that they need to understand teh needs and time commitment of a community garden.

Yes, because of our varied partnerships

Following a number of years of uncertainty, the ____ Farm received the official designation Green

Academic in 2011, in accordance with the _____ Farm's vision document untitled Cultivating

Place. We are now in the planning process for a new on site building to facilitate the teaching,

learning, community engagement, and agricultural practices on site.

Yes, because there is consistent, broad interest in our community in local, healthy food and urban agriculture.

We hope so - the university is planning on developing the area that the garden is presently located.

Hope to engage in talks with them to find a new, permanent location.

Yes--the garden has good infrastructure and a responsible student group caring for it. It has

consistently improved and is an important part of campus culture and dining halls.

VITA

Graduate School Southern Illinois University

Sydney K. Klein

Sydney.K.Klein@gmail.com

Appalachian State University Bachelor of Science, Geography and Planning, December 2011

Special Honors and Awards: Gamma Theta Epsilon (International Geographical Honor Society)

Thesis Title: The Role of University Food Gardens in Higher Education Sustainability

Major Professor: Dr. Leslie Duram