GROWING FOOD IS WORK: A SPATIAL AND SOCIAL ANALYSIS OF URBAN AGRICULTURE IN HOUSTON

A Thesis

by

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ABSTRACT

Increasing interest and awareness of urban agriculture's contribution to food access, healthy eating, and community interaction have influenced activists and city officials to re-evaluate this activity's role in sustainable city planning. While information regarding the spatial extent and socio-economic context of urban agriculture (UA) would be beneficial to city planners and policymakers as well as local communities, these data do not currently exist for most North American cities; moreover, the characteristics of UA sites, such as production practices and management strategies, are virtually unknown.

This research addresses this gap through a systems-based approach to urban socio-natural landscapes, where UA sites are viewed as a system composed of three main components: spatial form, social process, and material metabolism. Spatial form was determined through a geospatial analysis of UA distribution within the socio-economic context of Houston, Texas. Both social process and material metabolism were discovered through surveys and semi-structured interviews regarding management strategies and food production practices for 31 UA sites. Qualitative data were analyzed in terms of UA site objectives, access rules, decision making, labor, harvest destination, and challenges. The interconnectedness between UA site objectives and site access was found to influence decision-making strategies, division of labor, and destination of the harvest. Variations in these characteristics indicate numerous circumstances in which UA sites produce food. All UA sites surveyed face challenges such as access to consistent and committed participants, an affordable water source, a safe and secure site, and funding.

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NOMENCLATURE

HDHHS	Houston Department of Health and Human Services
UA	urban agriculture
UPE	Urban Political Ecology

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CHAPTER I

INTRODUCTION AND LITERATURE REVIEW

This thesis advances the knowledge and understanding of production practices and management strategies of urban agriculture. The findings presented in this thesis have promoted learning at the undergraduate level by supporting a module on urban agriculture sector that includes a field study guide and worksheet regarding for an Introduction to Human Geography (Geography 201) field trip to Houston. I also will provide the participants in my research with a synthesis of the results and conclusions. This chapter states the research question as "what factors determine the spatial patterns, management, and production practices of urban agriculture sites within Houston, Texas?" and outlines the two research objectives. The chapter then reviews the literature that informs the research question. Chapters III and IV returns to this literature from the perspective of the research findings.

1.1 Introduction

Producing food in and around a city is an effective and widely used global strategy for urban food access. Along with providing additional security to a population otherwise separated from its food source, urban agriculture (UA) has been found to provide intangible benefits. Scholars have established that UA participation is associated with a healthy change in eating patterns and perspectives. Participants also perceive that UA positively influences community dynamics, connections, and development. As a result of this growing list of benefits, activists and city officials are re-examining urban forms of agriculture as a part of long-term "greener" city planning. While information regarding the spatial extent and social

context of UA would be beneficial to city planners and policymakers as well as local communities, these data do not currently exist for most North American cities; moreover, the characteristics of UA sites, such as production practices and management strategies, are virtually unknown. This thesis research addresses this gap through a systems-based approach to urban socio-natural landscapes, in which UA sites in Houston were viewed as dynamic systems composed of three main components: spatial form, social process, and material metabolism. I organized the research activities into two objectives:

Objective 1: Determine spatial patterns of UA sites. I determined the spatial form of UA sites through a geospatial analysis of UA distribution within the socio-economic context of Houston, TX. Following the methods in Taylor and Lovell (2012), I mapped urban agriculture sites initially using data from Urban Harvest, a Houston-based charitable organization that promotes and supports a network of urban agriculture throughout the city. I then added demographic datasets from the US Census Bureau and the Food Access Research Atlas data file from the USDA Economic Research Service and performed spatial tests described in Chapter II and analyzed in Chapter III.

Objective 2: Determine UA management and production practices. Both social process and material metabolism were addressed by conducting surveys and in-depth semi-structured interviews with UA organizers regarding management strategies and food production practices for 31 UA sites. Organizers were selected from a list of 79 Urban Harvest-affiliated gardens within Harris County. All interviews were audio-recorded and transcribed for later

analysis and coding. These methods are described in Chapter II and the data are analyzed in Chapter IV.

1.2 Literature review

Cities are born out of agriculture, sustained by agriculture, and they maintain agriculture within their ever expanding domain. Even as late as the early 20th century New York and Paris were supplied by produce harvested from neighboring market gardens, largely fertilized by abundant urban organic waste (Mumford 1956). While some growing metropolises may find scarce agricultural land outcompeted by high rent industries, urban forms of agriculture persist. Food production in the city remains as a way for citizens to promote community development, combat urban disinvestment and environmental degradation, and provide alternatives to those facing urban food insecurity and food welfare reductions. This potential for empowering minority citizens and improving both material and social conditions has contributed to the legacy of urban agriculture around the world (Ghose and Pettygrove 2014; Obosu-Mensah 1999; Pudup 2008).

Urban agriculture (UA) is often functionally defined as food production within an urban setting (Mougeot 2000, Taylor and Lovell 2012, Thibert 2012). A broader definition includes any activities related to food production, processing, distribution, and composting that takes place within or on the fringe of an urban area and also responds to recreational, economic, social, environmental, and nutritional needs, and is organized as a private or community-based enterprise (Thibert 2012).

1.2.1 Urban political ecology

This thesis studies urban agriculture from an urban political ecology (UPE) perspective. Scholars have defined UPE as a focused question that asks "who produces what kind of socio-ecological configurations for whom," and is especially interested in "formulating political projects that are radically democratic in terms of the organization of the processes through which the environments that we (humans and non-humans) inhabit become produced" (Heynen et al. 2006, 2). A produced environment, for these authors, is nature that is a social construction; it is not and never has been pristine or separate from the cultural landscape. This concept applies to the process of urbanization: "cities are built out of natural resources, through socially mediated natural processes" (Heynen et al. 2006, 4).

Accepting that urban areas are fashioned from cultural history, through disparate social relations, clears the path for "understanding the politicized and uneven nature" which is physically manifested in cities (Heynen et al. 2006, 5). Obviously processes such as gravity or photosynthesis cannot be socially produced. However, these processes are harnessed by a changing network of social power. This network is composed of unstable economic, political, and social relations, which ultimately contribute to uneven development and environmental change. Capitalist power networks are especially susceptible to this because they employ socio-natural metabolism. In other words, capitalism transforms or "metabolizes" nature through control, ownership, and appropriation, and then it mobilizes both nature and labor in order to produce commodities which can ultimately be exchanged for capital (Heynen et al. 2006, 7). Capital, then, is the combined "value in motion" of the metabolic transformation of socio-natural forms. Studying the manner in which nature is transformed is central to the political ecology framework. It is through this lens that scholars

can better understand the social power relations which drive such transformations. As a theoretical platform, urban political ecology, can begin to "disentangle the interwoven knots of *social process, material metabolism,* and *spatial form"* that mold our modern cityscapes (Heynen et al. 2006, 8, emphasis added).

When empirically applied, this UPE framework distills urban agriculture into a system as shown in Figure 1. This system produces nature as an output and when examined in terms of social process, material metabolism, and spatial form the following questions can be asked: Who is producing UA, where is it being produced, and how is the production accomplished? These three questions have framed my research and analysis of UA in Houston and contributed to the formation of my two research objectives which are outlined in Chapter II.

Figure 1: UPE frames UA as a system with inputs and outputs composed of three variables: social process, material metabolism, and spatial form

Political ecology asks diagnostic questions that probe for veiled power relations, which are inevitably structuring or influencing our socio-ecological configurations. Humans

produce our own environments, and understanding how these cultural landscapes are fashioned is crucial if we ever hope to aspire to a more just future. Political ecology provides the conceptual tool kit with which this can be accomplished. By critically examining the power struggles that transform our environment, we can begin to identify methods for a more ethical and fair distribution of social power—giving more people a voice in the process of nature production. Only through a symmetrical attention of these issues through a political ecology framework can we achieve the transformative goals to which these varying alternative food movements aspire.

UPE frames urban agriculture as a system that produces nature in cities. This systemic approach clarifies the three variables essential to understanding the components of urban agriculture: social process, material metabolism, and spatial form. While scholars have called for the use of political ecology in respect to UA, this remains an under researched area in the literature (Page 2002; Heynen et al. 2006; Moore 2006; Pudup 2008; Guitart et al. 2012; Sharzer 2012).

1.2.2 Urban agriculture

Urban agriculture has been utilized to engage the dilemmas inherent to modern food systems and draw critical scrutiny to social justice issues, such as food justice and sovereignty. However, when viewed through the lens of urban political ecology, the power structure enclosing these issues comes into focus. UPE lends perspective to the examination of the neoliberal markets and trade dynamics which have contributed to urban inequality.

Neoliberal socio-metabolism has produced a global market surplus of agricultural commodities, driving down prices and facilitating the use of these commodities in processed

food. Food processors then take advantage of the surplus of raw commodities, along with a cheap labor force, to churn out inexpensive food products (Guthman 2011). While not all food is stripped of nutrients during processing, the problem is that manufacturers prioritize profits over healthy products. More nutritious food is, paradoxically, more expensive and more difficult to access, especially in cities where food deserts have been steadily expanding in low-income areas (Bedore 2010; Guthman 2011; Block et al. 2012; Childs 2012; Heynen, Kurtz and Trauger 2012). The term "food desert" was first used in the early 1990's to describe a "deprived neighborhood where food was expensive and relatively unavailable" (Cummins and MacIntyre 2002: 2,115). Although scholars have varied the term's use over time, I have utilized the USDA's original measure of a food deserts as "a low-income area where a significant number or share of residents is far from a supermarket, where "far" is more than 1 mile in urban areas and more than 10 miles in rural areas." City dwellers living outside this threshold distance were determined to have reduced access to healthier food options, like fruits and vegetables, which are not usually found in appropriate quantity, quality, or a price range that is socially acceptable in convenience or fast food stores (ERS 2013). In this way, poverty creates physical and economic barriers to accessing healthy food, which leads to a problem of food insecurity. When neoliberal food systems are combined with capitalist food distribution, the resulting malnutrition and chronic health problems are disproportionately felt among vulnerable populations, such as the urban poor.

These conditions have become normalized within our modern food culture. However, UPE scholars claim that the inherent organizational tendencies of urban agriculture sites foster a connection between democracy and an effort to "strive for a model of community food security and food sovereignty" (Heynen, Kurtz and Trauger 2012, 308).

This urban method of food production allows the consumer to become a co-producer and develop a deeper connection to the place where the food is grown as well as to the place where it is consumed (Gottlieb and Joshi 2010). These connections often inspire a change in the pattern and perspective of eating in addition to forging strong community ties. Although it is often tiring and tedious, farm labor can be compensated by the "psychologically satisfying" harvest of high quality, fresh food shared with friends and family (Page 2002, 49; Kortright and Wakefield 2011). In addition, minimizing the geographic separation between food producers and consumers allows the "means of production to be more transparent as opposed to obscured by the exchange of money" (Heynen, Kurtz and Trauger 2012, 307). Some take this food de-commodification a step further and view urban agriculture as a "deliberately political act of direct action and a way to reclaim spaces that have become dominated through the interests of capital and other corrupting social power relations" (Heynen, Kurtz and Trauger 2012, 308). Despite this sentiment, the majority of alternative food systems, including urban agriculture, continue to focus on food instead of the structural problems that create an environment rife with systemic poverty, and the disinvestment and city planning which has facilitated the migration of supermarkets out of lower-income areas.

Page (2002), through his case study of urban farming in Cameroon, argues that "agriculture crosses boundaries between what is economic, ecological, political and cultural" with the result that when politics and agriculture tangle, it is consistently represented in "cultural terms" rather than in the context of underlying political structures (52). De-politicizing development projects, like alternative food initiatives, creates a "tendency to ignore the political outcomes associated with an expansion of urban farming" (Page 2002, 51). Some political outcomes can be referred to as "instrument effects," (Foucault, 1979) or

outcomes that "look like unintended side effects," but are actually veiled instruments of power (Page 2002, 51). For example, in the context of urban agriculture, a community could initiate a garden in order to reduce their food bill or increase their access to fresh produce, but may end up diffusing the social discontent associated with deflating wages and job security. Similar instrument effects were felt in Cameroon, as uncovered by Page (2002). It originated through a series of reflexive and opportunistic policy decisions by the elite, which depressed income, but allowed urban farming to expand. As a coping strategy, people set out to feed themselves with their gardens, and unintentionally reaffirmed the power of the elite. This a-political problem framing is a sleight of hand. Alternative food systems are unintentionally distracting popular public attention with promises of food security, good health, and social justice, while simultaneously validating an unjust market-based power structure.

Despite the criticism, there is nothing congenitally wrong with food system alternatives, such as urban agriculture. In fact, they are producing several different positive models for change. The underlying problem is that they have diverted much needed attention from other social movement options which confront harmful practices and demand changes. It is easy to see why the "alternatives" path is so favored; many are dependent on nonprofit agencies and donations and their non-threatening goals and visible results make for excellent funding candidates. Funders hope that the sustainable practices espoused by alternative movements "will induce voluntary change without the political conflicts that environmental regulation gives rise to" (Allen et al. 2003, 74). Legal battles can be quite messy and expensive, but through voluntary governmentality, these conflicts can be easily avoided. An additional advantage of these model institutions is that they are easier to mobilize, and much

more appealing to short-term volunteers like school groups, boy scouts, and churches who want to participate in development projects and have a "learning experience."

Other approaches succeed in targeting systemic issues, and certain social movements employ more confrontational tactics than their alternative brethren, all of which can make progress slow and difficult. By challenging the political power-structure and corporate practices, these aggressive social movements also face barriers to sources of funding and support. It is clear how these endemic structural limitations have facilitated a focus on growing and eating better food rather than the collective action needed to eliminate harmful food production, processing, and distribution practices (Guthman 2011). Understanding the process in which this power structure operates within the city is a critical step in re-evaluating the food system and any future efforts of change. One method for gaining this understanding is to use an urban political ecology framework to re-conceptualize the urban food landscape and urban agriculture in particular.

UPE scholars have used this framework to examine the underlying social and political factors which influence the modern incarnation of urban agriculture. These studies show that UA can promote democratic decision-making, urban land reclamation, and community empowerment through efforts toward healthy food access. However, this UPE research has focused primarily on how many aspects of urban agriculture and other alternative food systems have reaffirmed the existing power structures rather than challenging the structural problems that have facilitated the growing need for alternatives in the urban foodscape (Ghose and Pettygrove 2014; Moore 2006; Page 2002; Pudup 2008; Sharzer 2012). While an understanding of how UA is situated within the broader political system is necessary, these

scholars tend to either ignore or skim over the influences that urban spatial relations and production practices have on the urban agriculture system.

1.2.3 Mapping urban agriculture

Regardless of how it is defined, urban agriculture and, more broadly, the analysis of food systems, is often the subject of mapping activities (Kremer and DeLiberty 2011; Taylor and Lovell 2012). Galt (2011, 138) stated that "knowledge of numbers of farms and their location is a necessary building block for mapping [alternative food production], pursuing future qualitative and quantitative research, and spreading a promising movement." Spatial knowledge of urban agriculture is useful to city planners, government officials and advocates alike. In the interest of improving urban food access, health, and community interaction, and to better meet the needs of participants, more comprehensive strategies for urban agriculture establishment should be developed (Longcore et al. 2011; Taylor and Lovell 2012). In addition, mapping the extent of UA can increase awareness of its widespread and productive use of urban land.

Advocacy groups have recognized the numerous advantages to mapping sites of urban agriculture. Mapping efforts of cities like Chicago, New York, Philadelphia and others have relied on the voluntary identification of publicly accessible sites of urban food production as a primary means of documentation (Taylor and Lovell 2012). NGOs and public agencies have been especially active in the compilation of lists of urban agriculture sites through this act of self-reporting. For example, in 2005 a Chicago-based agency, Green-Net, created a map of 600 community gardens exclusively from self-reported lists (Taylor and Lovell 2012). Similarly, Urban Harvest, a Houston-based charitable organization that

promotes and supports a network of urban agriculture throughout the city, listed 83 affiliated sites available on their website along with an interactive map using a Google Maps interface. Even the U.S. Forest Service has implemented this participatory technique in New York and Chicago with their urban agriculture mapping projects called STEW-MAP (Taylor and Lovell 2012). These publicly accessible resources are designed to facilitate interaction and communication between interested groups, but the quality and accuracy of these maps may suffer due to their reliance on participants who must not only be aware of this resource, but who must also remain actively engaged. According to Taylor and Lovell (2012: 58), relying on secondary data sources can lead to "significant under-coverage of even the limited range of sites they seek to inventory." Galt (2011) also recognized this limitation while working with self-reported counts of community supported agriculture (CSA). In his paper on counting and mapping CSA, he relied on secondary data sources such as the Census Bureau, the USDA, and NGO's to make his choropleth and dot density maps. He also acknowledged the importance of controlling for underlying patterns which strongly affect spatial distribution of data such as population, education, income, and race/ethnicity. Galt also recommended the use of political economy and cultural variations to explain distribution patterns. He suggested that future work could incorporate an analysis of CSA with existing demographic data (population, education, income, race/ethnicity, probably obtained from the US Census). This method could identify underlying patterns that influence the spatial distribution of alternative agriculture.

An alternative method to relying on secondary, voluntary reported data sources is to map urban agriculture using "manual or automated classification of aerial or satellite images" (Taylor and Lovell 2012, 58). This strategy utilizes primary data collection to overcome

limitations such as sites being under-reported or excluded. Scholars have either identified agricultural sites in cityscapes of the developing world and in Chicago, Detroit, Los Angeles, Toronto, and Philadelphia with the purpose of mapping potential sites for urban agriculture expansion (Taylor and Lovell 2012; Kremer and DeLiberty2011; Longcore, Lam, Seymour, and Bokde, 2011; Colasanti and Hamm 2010). The accuracy of this method is limited by classification method and study site variables such as plot size, and regional satellite resolution. One study used remote sensing through Quickbird high spatial resolution satellite data to collect land use land cover change in Hanoi, Vietnam. The object-oriented classification of small-scale urban and peri-urban agriculture sites had accuracy of 67%, deemed promising for monitoring land use diversity (Forster et al. 2009). In Lisbon, Portugal, Freire et al. (2009) also used satellite imagery to identify and characterize urban agriculture throughout the city. The overall accuracy of their methods using the VHR QuickBird image was 52%. The authors admitted that semi-automated extraction of urban agriculture is complicated by the diversity of plot types, vegetation, and composition.

High resolution satellite imagery is not available in all geographic locations. As an alternative to creating a semi-automated classification or extraction method for identifying features through remote sensing, a systematic survey can be compiled through the manual interpretation of relatively high-resolution black-and-white analog aerial images, as was conducted in Dar es Salaam, Tanzania. Although the study did not include accuracy assessment, extracted sites were verified through ground-truthing and subsequently digitized and visualized in GIS for further analysis (Dongus and Drescher 2006).

The results of these more exploratory remote sensing studies reveal that obtaining accurate classification and automated or semi-automated extraction methods is a challenge

given the complex, fluctuating, and heterogeneous nature of urban cultivation. In addition, satellite imagery with a high enough resolution to discern distinctions in plot type may not be available in certain urban areas. This lack of resolution can make accurate automated classification impossible (Forster et al. 2009). Given such limitations in precision, clarity, and definition, manual interpretation and extraction methods, though tedious, is a more advantageous method for mapping urban agriculture sites (Brookover et al. 2013; Taylor and Lovell 2012). Taylor and Lovell (2012) mapped urban agriculture in Chicago by utilizing the free, high quality, orthorectified aerial images available online through Google Earth. The simple and intuitive interface offered through Google Earth makes it an ideal resource for "individuals with minimal training in GIS or other techniques of spatial analysis" (57). Their strategy was to combine data sources from secondary respondent-based lists with primary data gathered from a manual analysis of Google Earth aerial images. These data were then used to create a final dataset of points and polygons which were later imported into ArcMap 10. The results of their visual analysis were then joined with socio-demographic census tract shapefiles for the city, enabling the authors to "assess the implications of the extent, character, and distribution of existing sites for food systems planning" (Taylor and Lovell 2012, 59). They found that urban cultivation is an extensive and widely distributed land use in the city.

Following Taylor and Lovell's research design closely, a team from the University of California Cooperative Extension-Los Angeles created a mapping project to inventory the extent of urban agriculture in Los Angeles County (Brookover et al. 2013). In addition to utilizing both primary and secondary data sources for the extraction of urban agriculture sites, the team also applied Taylor and Lovell's methods for spatial analysis with GIS. They

created an agricultural density index and compared it to the demographic variables of population density, median household income, and race/ethnicity, then the trends and relationships between the variables were analyzed. Results revealed that there was no discernible relationship between income and race/ethnicity with urban agriculture, but it was positively correlated with population density. The research team also observed that UA is dynamic and constantly changing, and that any static map is likely to be rapidly out of date. With that in mind, they created an interactive map that can be monitored and updated with participation and collaboration from active urban agriculture participants.

Galt (2011) suggested that more researchers should make the connection between critical cartography and GIS and alternative agrifood movements. I applied this advice and used spatial datasets as a contextual reference for the analysis of urban agriculture in Harris County. Following Taylor and Lovell (2012), the spatial analysis in this study is based on the visual analysis of aerial images of documented UA sites. Building upon their mapping techniques, this study adds to the spatial analysis of UA by examining the influences of demographic traits on the distribution of UA sites for an entire county as well as serving as a context for qualitative field work.

1.2.4 Farming systems

Little attention has been given to how urban food is produced, harvested, and eventually distributed. Urban agriculture's close proximity to dense human population tends to make it chemical free by a necessary respect for the health of neighboring dwellers and practitioners. Additionally, several authors cite a common mistrust of the conventional food system and desire among UA participants to know and control the conditions in which the food is grown

(Kortright and Wakefield 2011; Smith and Miller 2011). As informants for one study reported, "you know it's fresh, and hasn't had any pesticides on it," (Kortright and Wakefield 2011, 46). Given that these motivations for producing food are often associated with food justice issues, articles give the impression that many forms of community gardening tend towards "greener" methods, but in reality, there is much left to learn. The agricultural practices of CSAs, which are sometimes located in urban areas, are better documented than smaller vacant lot and community garden types. According to Ryan Galt (2012), CSAs favor cultivation methods that incorporate high levels of agro-biodiversity—the support of many organisms within an agricultural system. The general philosophy of these farmers was a commitment to the sustainable application of ecological principles to agriculture (agroecology). Their goal is to enhance the environment both on and off the farm, reduce resource use, and ultimately provide healthy food to their communities. The application of agroecology centers on utilizing near-farm nutrient cycles through the composting of plant matter and food waste as well as the incorporation of nutrient-rich animal manures. Another aspect of agroecology takes advantage of the many beneficial relationships between plants and animals in the form of biodiversity. Many crops have been found to be more productive when grown alongside companion crops rather than in a monoculture (Galt et al. 2012). For example, the well-known "three sisters" of legumes, squash, and corn, or growing clover in between the rows of other species helps suppress weeds and infuse the soil with nitrogen fertilizer. Conservation plantings are mainly used as habitat builders for wildlife and beneficial insects such as hedgerows and intercropping with trees, but these too have other added benefits, including wind breaks, soil conservation and enrichment. With the

incorporation of livestock and aquaculture and biodiverse and agrecological landscape can be become extremely healthy and productive.

In response to surveys and interviews, CSA farmers and many urban gardeners indicate they are conscious and conservative in the use of resources used in food production, such as fossil fuels, packing materials, and electricity and the use of rain barrels among gardeners, to increase sustainability (Galt et al. 2012, Kortright and Wakefield 2011). The use of hoop houses, rather than expensive and energy-intensive green houses, has also been documented by many different types of UA practitioners to extend the growing season in higher latitudes, and result in more intensive and productive practices (Colasanti and Hamm 2010; Gottlieb and Joshi 2010).

Forty-five percent of farmers in the Galt et al. study (2012) were certified organic through the National Organic Program (NOP), and eighty-seven percent of surveyed farmers reported meeting or exceeding these national standards. Exceeding the standards refers to the use of methods that are more true to the original sense of the term organic. The organic movement of the 1960's was propelled by the general awakening to the potentially dire consequences of "mining the soil," and the intentional and unintentional food contamination. It was fueled environmentalism and headed by the idea of sustainability and the virtues of locally grown food. "Organic" simultaneously came to mean a healthy, chemical-free food source, an agricultural method that was ecologically sound and did not rob the soil of its nutrients, as well as an alternative to industrial production (Guthman 2004).

Labor is another important input of agriculture, regardless of location, that has major implications for food justice issues (Freidberg 2009, Gottlieb and Joshi 2010, Turner and Brush 1987). Labor practices of CSAs tend to rely on skilled, longer-term appointments that

gain more benefits than seasonal workers (Galt et al. 2012, Gottlieb and Joshi 2010, Guthman 2004). Division of labor in community gardens and other forms of urban agriculture is unclear and often neglected by scholars, but likely diverse in application. Many appear to be divided into separate plots which are cared for by individuals or families in a systematic way. Early alternative food movements were motivated to change the structural relationships within industrial agriculture, and in doing so, they raised awareness of farm labor and environmental sustainability issues within food production.

Scholars are overlooking these fundamental labor issues. A study by Allen et al. (2003) found that California agrifood initiatives focused more on "questions of food access, urban community empowerment, and support for small farmers than they do to justice (a living wage, job security, recognition) for farm workers" (73). Though well-intentioned, the absence of labor from a discussion about social justice in food is indicative of a broader "struggle for labor justice and civil rights that can support and legitimate raising these questions in agriculture and food" (73). The same is true of labor in urban agriculture.

After the labor is put in to grow the food, how is it harvested and distributed? Many growers claim that being able to feed themselves and their families from the garden is a key motivation. Food can also be shared with neighbors and friends or exchanged with other gardeners for different foods (Gottlieb and Joshi 2010, Kortright and Wakefield 2011, Smith and Miller 2011). Through the sale of excess produce, agriculture sites can provide informal sources of income to households or communities (Taylor and Lovell 2012, Thibert 2012, Masson-Minock and Stockmann 2010); established growers sometimes have roadside stalls or make regular appearances at local Farmer's Markets. Church gardens in Houston donate much of the food grown to food banks, soup kitchens, or other charitable organizations

(Urban Harvest 2012). What remains to be quantified is the percentage of distribution: how much of the harvest is going where and to whom?

1.2.5 Food security

UA is promoted in food justice and sovereignty literatures as an accessible avenue to food producing resources. Thibert (2012) concluded that UA is a policy-sensitive agricultural system, and if policy and planning efforts were to support more UA initiatives, they would be important in not only enabling food sovereignty, but also causes a paradigm shift in relation to the role of agriculture within cities. Though recently incorporated into the fold of alternative food systems, urban forms of agriculture have been the necessary companion of humans since cities first began to form. Now they are promoted world-wide as a "visible response to the loss of producer and consumer agency." UA is credited with the "re-establishment of regional scale food systems" (Heynen et al. 2012, 307) and implementing food sovereignty.

The food security movement is quite similar to the alternative food movement in several ways. They are both influenced by localism, prioritize farmer income, create an uneven foodscape, and operate within the consumer-choice paradigm. In 1996 the Food and Agriculture Organization's World Food Summit defined food security broadly: "Food security exists when all people, at all times, have physical and economic access to safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life" (FAO 2013 (1996)). This subject of access is a crucial component to attaining food security. The physical and economic access must be available and socially acceptable at both a national and local scale in order to be effective. While this definition of food security

focuses predominantly on the access to food in general, it also applies to the access of affordable food (Windfuhr and Jonsén 2005). Gottlieb and Joshi (2010), in their book titled *Food Justice*, characterize food security as a system which ensures "that the benefits and risks of where, what, and how food is grown and produced, transported and distributed, and accessed and eaten are shared fairly" (6). Many alternative food system advocates emphasize "food's community value rather than its commodity value" and persist in the belief that everyone has a basic right to food (223). They believe that not only is it important to focus attention on the amount and quality of food people are able to access, but also how people access this food (Gottlieb and Joshi 2010).

Many proponents of food security believe that everyone has the right to food, and emphasize the economic access of individuals or households to food. This debate about human rights additionally highlights forms of access to income- or food-producing resources that respect human dignity. Concerning the right to food, having economic access goes beyond having the adequate means to purchase food. It also incorporates the "access to resources to feed oneself: to land, to seeds and livestock breeds, to water and fishery resources, to basic capital and credit, to skills, etc., which are needed to produce food or to gain an income with dignity" (Windfuhr and Jonsen 2005, 23). The right to food is not currently policy-dependent, but focuses on using moral obligation to influence states to allow people to use legal remedies to get their rights implemented. These states would have to guarantee the right to food but have a wide margin of discretion on how to implement it (2005). This margin of error leaves a lot of wiggle room for states to shift the burden of responsibility for these basic human needs onto the individual, a common neoliberal misdirection known as "governmentality." This burden has been unknowingly shouldered by

many alternative food movements, and through them governmentality has begun to germinate, grow, and flower. Without legal backing however, these movements struggle to bear fruit.

The majority of U.S. residents eat less than half the quantity of fruits and vegetables recommended by the U.S. Department of Agriculture dietary guidelines (Colasanti and Hamm, 2010; U.S. Department of Agriculture and U.S. Department of Health and Human Services, 2010). This discrepancy can be partially explained by the lack of access certain demographics face due to food deserts or grocery gaps (Guthman 2008; Pudup 2008; Bedore 2010; Gottlieb and Joshi 2010; Guthman 2011; Block et al. 2012; Childs 2012; Heynen et al. 2012). However, consumers cannot eat the USDA recommended servings of fruit and vegetables if they are not available, affordable, or outcompeted by fast food targeting specific populations. Such populations lack food security and often experience the paradox of being overfed but poorly nourished, a direct result of high rates of poverty (Gottlieb and Joshi 2010; Guthman 2011).

It was this emerging paradox and a growing lack of food security that propelled the community garden movement in the 1990's (Pudup 2008). As recently as 2009, a study on national household food security found that "fifteen percent of American households have been unable to acquire adequate food to meet their needs because of insufficient money or other resources for food" (Nord et al. 2009). Although urban gardens are not the most important source of food for city-dwellers, they can provide an important supplement or alternative to diets, and serve as backup supply during times of scarcity or disruption (Kortright and Wakefield 2011). Urban gardens have been included in the community food security movement, which focuses on smaller-scale, relational, and place-based institutions

such as farmer's markets, community-supported farms, and other food delivery services (Guthman 2011). This concentration is based on the idea that "bringing consumers and producers together would benefit both producers and low-income consumers" by increasing access and affordability (150). Unfortunately, increasing affordable access does not usually synchronize with fair income for farmers, at least without some assistance. Even though both alternative food and food security movements recognize this discrepancy, they maintain that those who can afford their proposed healthier, more sustainable life style should use their consumer vote and participate in the movement through their financial support. But what does this really amount to?—an increasingly small group of conscientious, privileged people, following the alternative trail of crumbs through the forest of industrial food specters, leaving the rest of the world behind to deal with the consequences? Such a market-based approach can only "accentuate class inequality rather than ameliorate it" (Guthman 2011, 152). While these models have certain benefits, the main problem with proposing alternatives is that they do not "regulate bad practices but, instead, allows them to coexist with good ones" (Guthman 2011, 152). While these harmful practices are allowed to exist, comparably cheaper, less-healthy food will continue to be circulated through the food system. Hence, creating a more just and less toxic food system requires changing the entire conversation about food, not just asking a different question about what to eat.

1.2.6 Food sovereignty

For a more precise policy on how to change this conversation, we must turn to food sovereignty, a framework that applies the rights-based approach concerning access of individuals to food-producing resources, as well as the right to food, and availability of just

markets. This framework is formulated to combine different policies regarding the right of peoples to define their own food systems. The people who produce, distribute and consume food are at the center of these decisions on food systems and policies, rather than the demands of markets and corporations that have seemingly come to dominate the global food system (Windfuhr and Jonsén 2005).

As stated in food justice and sovereignty literature, access to food producing resources is integral to maintaining human dignity. Urban agriculture is one avenue through which such access can be achieved, especially in the case of vacant lots. Thibert (2012) concluded that UA is a policy-sensitive agricultural system, and if policy and planning efforts were to support more UA initiatives, they can be important in not only enabling food sovereignty, but also in causing a paradigm shift in relation to the role of agriculture within cities. Most municipal governments and public agencies own land in North American cities. According to a GIS analysis, the city of Detroit for example owns more than 44, 000 vacant parcels, or 7.6 square miles that are publically owned non-park land, which does not include privately owned or tax-reverted (bank foreclosed) property. This city-owned land could be made available to UA on a much larger scale, and in fact, cities like Detroit, Cleveland, and Philadelphia are already formulating policy for this goal (Colasanti and Hamm 2010; Colasanti et al. 2012; Thibert 2012). As this strategy suggest, an important consideration for the establishment of long-term agricultural projects is land tenure. Short leases and adopt-a-lot borrowing methods currently employed by most cities with extensive vacant lots create a lack of stability and risk in the investment of time and energy into soil that could be taken away so easily. As long as UA is incorporated into the overall city plan, re-zoning land as "agricultural" can alleviate the risk associated with insecure land tenure (Colasanti et al.

2012; Thibert 2012). The diverse land tenure strategies employed by Community Supported Agriculture (CSA) could also be applied to an urban setting. CSA is defined by Galt as "a type of organization intended to create a relationship between farmers and consumers in which risks and bounties are shared" (Galt 2011). Aside from the 40% of CSAs, sampled in California's Central Valley and surrounding foothills, that own their land outright, others lease their land at market value, or below market value in exchange for services rendered, as well as sharecropping arrangement where a set percentage of the crop is promised to land owners (Galt et al. 2012). If policy is to be used to adapt land tenure systems to be more accessible to urban food producers, spatial patterns should be taken into account as they affect decision-making and "remain meaningful in shaping land tenure systems" and therefore local economies (King 2011, 309).

But who has the power to enact new policy concerning the food system, to alter land tenure, and to decide if and where urban agriculture should be situated? We must turn to the environmental governance literature to answer this question. This term refers to "the set of regulatory processes, mechanisms and organizations through which political actors influence environmental actions and outcomes" (Lemos and Agrawal 2006, 298). Governance is not synonymous with government, however. It includes the actions of the state as well as a host of other major actors such as international accords, national policies and legislation, local decision-making structures, transnational institutions, communities, businesses, and nonprofit organizations. Environmental governance by these actors takes the form of interventions which aim to change the incentives, knowledge, institutions, decision making, and behaviors that are related to the environment. The essential component to these different forms of environmental governance is the political economic relationships embodied by actor-

institutions and how these relationships go on to shape identities, actions, and outcomes. Due to the far reaching mechanisms through which governance is shaped, anyone concerned about environmental outcomes is influenced by it. "Environmental Governance is varied in form, critical in importance, and near ubiquitous in spread" (Lemos and Agrawal 2006, 299). A decentralized form of environmental governance can already be seen in many aspects of urban agriculture. The community-based resource management of common property, as seen in community gardens, is an alternative form of governance that emphasizes a shift towards co-management and decentralization in environmental policy (Lemos and Agrawal 2006).

1.3 Conclusion

In summary, scholars have established that UA is a far more extensive land-use type in cities than previously documented, especially when including private property (Colasanti and Hamm 2010; Kortright and Wakefield 2011; Taylor and Lovell 2012). However, UA sites that are not privately owned typically have a tenuous hold on their land through short-term leases and adopt-a-lot methods, creating a risky environment that discourages necessary long-term investments (Colasanti and Hamm 2010; Thibert 201; Colasanti et al. 2012). A way to overcome this barrier is through governance. Researchers argue that UA is a policy-sensitive agricultural system and therefore zoning, policy, and planning efforts that support UA initiatives could cause a paradigm shift in favor of the role of agriculture as an alternative land-use within cities (Colasanti and Hamm 2010; Thibert 2012).

Despite these hurdles, scholars have determined that UA, once established, provides myriad benefits to participants. Direct involvement with food production has been associated with a corresponding shift to healthier eating patterns and perspectives. In addition, UA

participants claim that the interactions related to food production and distribution provide support systems, increase environmental education, and ultimately strengthen community ties (Gottlieb and Joshi 2010; Kortright and Wakefield 2011; Smith and Miller 2011; Taylor and Lovell 2012). By creating another mode of access to healthy food, UA has been found to increase food security and contribute to creating a more just food system (Windfuhr and Jonsen 2005; Gottlieb and Joshi 2010).

A part of this food justice discourse is fair food production and distribution. Studies of community supported agriculture (CSA) and private urban gardeners reveal preference for sustainable, soil-enriching, chemical-free agricultural methods (Galt et al. 2012; Kortright and Wakefield 2011). However, little attention has been given to the production and management strategies utilized by communally-operated UA sites, including division of labor. Additionally, the food that these sites harvest and then distribute has yet to be quantified or explored in any depth. Studies have only mentioned that harvested food can be reserved for individual use, donated, or sold, depending on the goals and needs of the UA participant, which glosses over the many factors influencing this important decision-making process (Gottlieb and Joshi, 2010; Kortright and Wakefield 2011; Smith and Miller 2011; Masson-Minock and Stockman 2010; Taylor and Lovell 2012; Thibert 2012). In addition, researchers have yet to pair the spatial analysis of UA distribution with a qualitative assessment that examines socio-spatial relations. My thesis research aims to fill these gaps in the literature by exploring the system of urban agriculture management to identify who, how, and where food is being produced in Houston, Texas.

CHAPTER II

RESEARCH DESIGN, DATA, AND ANALYTICAL PROCEDURES

2.1 Introduction

This chapter first reviews the methods I used to determine spatial patterns of UA sites, and then outlines the methods I used to determine UA management and production practices. The spatial pattern approach followed the methods in Taylor and Lovell (2012) but advances the UA literature by adding other spatial datasets from the US Census Bureau and the USDA Economic Research Service; moreover, spatial tests presented here have not been carried out in the UA literature. The determination of UA management and production followed an agricultural systems approach (Turner and Brush 1987) adjusted to the particular characteristics of UA and to certain insights from the UPE literature.

2.2 Research design

2.2.1 Site selection

I selected the Houston metropolitan area for my research of urban agriculture primarily because of its convenient proximity to College Station and Texas A&M University. In addition, Houston remains unexplored in the urban agriculture literature, despite being the fourth most populous city in the nation with a total of 4 million inhabitants counted in the 2010 census, and a total land area of 1,703 square miles (Houston 2012). The Houston area can also claim the title of having the county's highest index of residential income segregation (Fry and Taylor 2012). This means that there is a distinct geographic separation between Houston's wealthy neighborhoods and its lower income communities. Houston's rise in residential segregation by income could be attributed to its rapid growth over the last 30

years. Houston's pro-growth political forces had considerable influence in shaping the city's governance. For example, these forces were able to direct the city's outward expansion, while simultaneously preserving a laissez faire market-place approach that utilized outside resources to increase private sector profit. These governance regimes stimulated urban sprawl and city expansion through annexation, and were partially aided by national programs that funded projects such as Houston's labyrinthine freeway system. Although Houston's size could have been used for large scale regional planning for social purposes, local leaders fundamentally opposed governmental interference for any reason besides increasing private sector profits (Thomas and Murray 1991). Along this vein, Houston's leaders have historically shied away from the use of zoning laws in city planning, preferring to let market forces reign, however in recent years the city has begun to adopt zoning ordinances.

Houston's population boom was fueled by three main sources: Hispanic immigrants hired for low-skill, low-wage jobs, workers hired for high-skill, high-wage jobs, and well-to-do retirees. These historical population differences in combination with local governance could have contributed to Houston's high rate of residential income and racial segregation. However, this demographic-changing population growth has also given minorities more of an influence in mayoral elections. In recent years Houston has seen increasing limitations to annexes, population growth, and changes in demographic composition which have cumulatively curbed the city's outward expansion such that local leaders are now devoting more attention to inner-city redevelopment.

The literature regarding urban forms of agriculture has been limited in geographic scope. Scholars have focused predominantly on densely populated east or west coast cities. Unlike large U.S. cities such as New York, Los Angeles, San Francisco, Chicago, and

Detroit, few scholarly works pertaining to UA exist for the southeastern U.S. region (Guitart et al. 2012). The social, environmental, and political context in which UA exists varies substantially from city to city, therefore there is a need for UA research to take place in more geographically diverse locations in order to accurately characterize the UA system.

The origin and *raison d'être* of UA in Houston currently remains poorly understood. The aim of this study is to reveal the decision-making processes of urban agriculture sites within Houston, Texas, and to describe and quantify patterns in production of food, division of labor, and distribution of harvest. The study area includes only urban agriculture sites located within Harris County because the county serves as a boundary for the Houston metropolitan area.

2.2.2 GIS mapping and spatial analysis

My aim was to construct a contextual framework for the analysis of urban agriculture sites located within Harris County and the Houston metropolitan area. In addition to providing a context for the spatial distribution of urban agriculture across the county, I also sought to characterize this distribution by examining associations with social demographic data.

My first objective was to verify and measure the production area of previously documented urban agriculture sites through the manual interpretation of high resolution imagery in Google Earth. The second was to perform statistical analysis to ascertain any spatial patterns or clustering between the distribution of urban agriculture sites and underlying census tract demographic data.

2.3 Mapping urban agriculture sites

In order to accomplish my first objective to verify and measure urban agriculture sites, my study used the strategy employed by Taylor and Lovell (2012), who visually analyzed Google Earth images. Taylor and Lovell (2012) mapped UA in Chicago; however, mapping the full extent of urban agriculture in Houston was beyond the scope of this project. Moreover, the total number of UA sites in Houston is unknown. The best proxy for total number of UA sites was to use a database of UA sites documented by Urban Harvest. At the time of this writing, Urban Harvest was affiliated with 67 UA sites in Harris County. The directory on Urban Harvest's website, which I obtained during November 2012, provided me with the necessary information to compile a preliminary list of UA sites that fell within county bounds.

I augmented the Urban Harvest database with 12 additional sites that I identified through my communications with UA organizers. The final list of 79 sites, which included addresses, was entered into an Excel spreadsheet. In order to verify which sites were actively producing food, I manually typed in each address into Google Earth. Once a site address was correctly identified, I visually scanned the property for signs of food production. I employed the same combination of indicators as was described in Taylor and Lovell (2012), which includes an "orthogonal garden layout, vegetation planted in rows or in beds separated by paths, and bare earth or mulch between individual plants or rows of plants." As a reference, I used the aerial images of sites that had been personally verified through communication with the site organizer. If food production was confirmed, I used the "dropped pin" function in Google Earth, which automatically geocodes the site's latitude and longitude. I then digitized

a polygon around the food production area, in order to estimate the total area. Both point and polygon were then saved in a folder within "My Places" in Google Earth (Figure 2).

If I could not immediately find the site in the vicinity that Google Earth directed, I would type the name of the site into Google Earth search bar. If this was unsuccessful in identifying the site, I would search for the same address and/or site name in Google Maps. If this yielded nothing, I would complete a Google search for the name of the site to determine whether an alternate address existed, or if typos were present in the originally provided address.

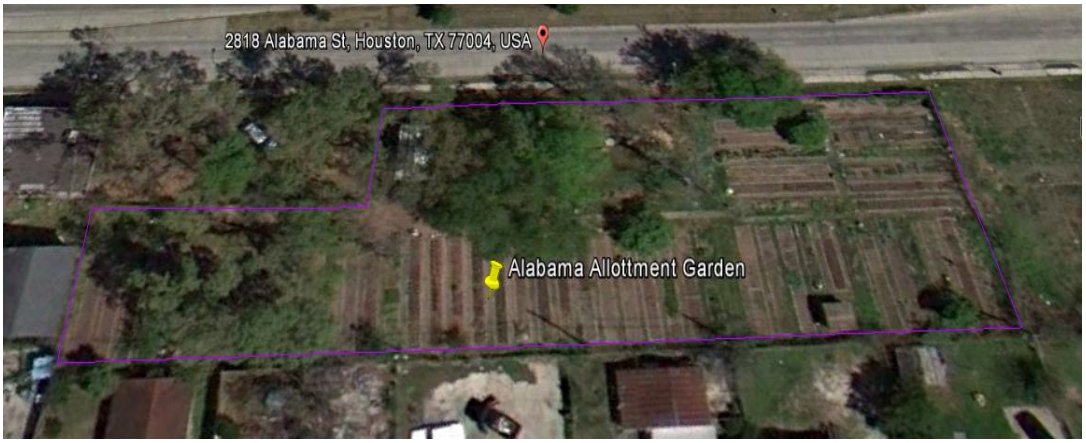

Figure 2: Example of Google Earth aerial image of UA site complete with a "pin" marking the exact coordinated and a polygon surrounding the food production area.

Seven schools that were listed as affiliates of Urban Harvest were correctly identified in a Google Earth address search, but no signs of food production were found. At the time of this analysis, one other Urban Harvest-affiliated site was correctly identified in Google Earth, but there were no signs of food production. Only one out of 79 sites was not identified in any

way. These nine sites were excluded from the rest of the data analysis process, resulting in a total sample of 70 UA sites, of which 31 were verified as food-producing through site visits. Once all 70 sites were saved in a folder inside Google Earth, I exported the KMZ file and opened it in ESRI ArcMap using the Conversion tool box, which separated points and polygons into two shapefiles. Next I projected both shapefiles so that location and polygon area could be estimated more accurately. I selected NAD 1983 Texas Statewide Mapping System as a coordinate system that was appropriate for Harris County (Table 1).

Table 1: Documented UA sites identified through the manual identification of features through the use of high-resolution Google Earth aerial imagery.

Harris County UA Sites	*n*
Urban Harvest-affiliated	67
non-Urban Harvest-affiliated	12
no confirmation of food production	8
Sites not identified	1
TOTAL included	**70**

2.4 Spatial analysis

Once projected, the shapefiles were then spatially joined with Census tract data for Harris County. I downloaded the 2007-2011 American Community Survey 5 year Estimates Data Profiles in geodatabase format, which included TIGER/Line® shapefiles pre-joined with Texas demographic data from the U.S. Census Bureau website (http://www.census.gov/geo/maps-data/data/tiger-data.html). I opened this geodatabase in ArcMap and selected the data for Harris County, and exported only the data column attributes that were applicable to my study, which improved the operating speed. The

resulting file was then spatially joined with the projected points of the urban agriculture sites in order to examine how these descriptive indicators were associated with the geographic position and the versatile role of urban agriculture across census tracts. I included demographic data including race/ethnicity, median income, population density, percent below the poverty line, and estimated value of occupied households. This information was chosen to provide a more complete picture of the community in which sites are situated, as many other scholars have done (Colasanti et al. 2012, Galt et al. 2012, King 2011, Kortright and Wakefield 2011, Mustafa and Reeder 2009, Smith and Miller 2011). King (2011, 309) concluded that mapping demographic data "assists in revealing local variations and micro-politics that reproduce and potentially rework historical spatial processes."

In addition to providing context for the spatial distribution of UA sites, I examined these relationships to identify any spatial patterns or clustering that was significant. I accomplished this by using the Spatial Statistics toolbox in ArcMap, and specifically the Analyzing Patterns and Mapping Clusters toolsets. I first used Nearest Neighbor to test my null hypothesis, which stated that the UA sites were randomly distributed. The results of the Nearest Neighbor test are a *z*-score and *p*-value which are measures of statistical significance which determine whether to reject the null hypothesis. The test also provided a Nearest Neighbor Index, expressed as a ratio. If the index is less than 1, the pattern exhibits clustering; if the index is greater than 1, the trend is toward dispersion or competition. In this case, the test returned a *p*-value less than 0.05 and an index of 0.73, therefore I could reject the null hypothesis and confirm that the UA sites are indeed clustered.

After these spatial clusters were determined significant, I wanted to know whether the UA sites were clustered according to certain demographic traits. To measure this I used the

Analyzing Patterns toolset (Moran's I) to measure spatial autocorrelation between the locations of all the UA sites and the different demographic attribute data obtained from the US Census. In this case I selected nine features to test: Estimated Median Household Income, Estimated Value of Owner Occupied Household Units, Percent below poverty, Percent White, Black, Asian, and Hispanic, and Percent Male and Female. The Spatial Autocorrelation tool was used to evaluate whether the pattern expressed between the locations of the UA sites and each census dataset was clustered, dispersed, or random. If the *p*-value indicates statistical significance ($p < 0.05$), a positive Moran's I index value indicates tendency toward clustering while a negative Moran's I index value indicates tendency toward dispersion (ArcGIS Resources 2013). For the demographic variables that were determined statistically significant ($p < 0.05$) and which also had a positive Moran's I Index value, I was able to reject the null hypothesis that the sites are dispersed, and accept that those demographic attributes were spatially autocorrelated with UA site clustering.

In order to better visualize and understand how these attributes contribute to clustering of UA sites I employed the Grouping Analysis tool without spatial constraints. This tool identifies natural clusters using the K Means algorithm, and is based on all statistically significant spatially autocorrelated attributes, which enabled me to map three statistically different groups of UA sites that were determined by their associative demographic variables.

In addition to examining spatial patterns associated with demographic data, I also identified which Harris County UA sites were located in food deserts. I accomplished this by obtaining a food desert data file online from the USDA's Economic Research Service which has a Food Access Research Atlas, formally titled Food Desert Locator (ERS 2013). I then

spatially joined the food desert data file for Harris County with the projected UA site shapefiles to determine which sites were located in food deserts. The ERS has several parameters for defining food access, the original Food Desert Locator measured low access to healthy food in urban areas as being more than one mile from a supermarket, a definition which in 2010 qualified 30% of the urban population as food desert inhabitants. For my analysis of Harris County UA sites, I also used this one mile definition to identify which sites were located in food desert census tracts.

2.5 Determining UA management and production practices

I conducted surveys and semi-structured interviews with UA organizers affiliated with the sample frame UA sites to determine their individual management and production practices. For this qualitative portion of the study I excluded all school gardens due to IRB complications regarding minors in research. The additional human subject protocols necessary to conduct research in school UA sites would have allowed access to school gardens, but the eventual findings were thought to be beyond the research aims of this project. Moreover, children do not occupy an analytical category in this research, which focuses instead on motivations for UA sites and decision-making regarding UA inputs and outputs. This resulted in 45 UA sites that qualified for recruitment into the study. I recruited participants based on the following criteria:

1. Located in Harris County;
2. Producing food at the time of my study;
3. Willing to participate.

2.5.1 Human subjects protocols

Before contacting any site managers, I completed the required modules with the Collaborative Institutional Training Initiative (CITI) which was specifically geared towards social and behavioral research investigators and key personnel. I then submitted a request form to the Texas A&M University Institutional Review Board (IRB) requesting permission to conduct my proposed research on human subjects. After making some revisions and incorporating a more vigorous strategy for data management, I received IRB approval (IRB number IRB2013-0059, approval date 02/19/2013, expiration date 01/31/2014). My rationale for conducting surveys and semi-structured interviews with UA organizers was that the organizers would be able to provide the most complete and accurate information regarding how the site is managed and how production practices are determined.

In a preliminary research phase (February 20-22, 2013) I contacted six organizers. The findings from this initial survey confirmed this rationale: UA organizers are key informants regarding the objectives and management of their individual sites. Subsequently, I discovered that the 68% of UA organizers are the site's primary decision-makers and are therefore knowledgeable about the labor and coordination required for a functioning site (see Chapter IV).

Next, I contacted the remaining 39 UA site organizers via email and telephone, and asked them to participate in the study. Urban Harvest provides contact information online for all their affiliated gardens, but some of the information was out of date or no longer accurate. If the phone or email listed was incorrect, I emailed the webmaster for Urban Harvest in an attempt to get more current information. However, from the original 45 sites which met my sampling qualifications, only 26 were currently active, could be located, and accepted

participation in the study. Through interviews with UA organizers, 12 more unaffiliated gardens were identified and contact was attempted. This resulted in 5 additional garden organizers who agreed to participate, bringing the total to 31 total UA sites identified for the management and decision-making component (Objective 2).

After establishing my participant sample, I developed a survey based on themes found in the farming systems literature and UA studies such as labor, decision-making, management strategies, and production practices (Galt et al. 2012; Gottlieb and Joshi 2010; Guthman 2004; Turner and Brush 1987), see 1.2.4. The survey focused on individual site management strategies employed regarding the production of food, division of labor, and the distribution of harvest. I selected a format that could be transmitted digitally, and straightforward questions that would facilitate a simple and rapid response. I reserved the more in depth questions for the interview process. The survey and semi-structured interview framework and questions can be found in the Appendix A.

2.5.2 Data collection procedures

Once a UA site organizer agreed to participate in the study, I emailed him or her the short survey to complete if he or she had an email account; the ten respondents lacking an email account were surveyed in person in combination with the site visit and interview. After the survey was completed and submitted to me, I then scheduled a site visit and semi-structured interview. The objective of the interview was to discuss the survey responses further, clarify responses, and receive more in depth information regarding UA site management.

Upon arrival at the garden site, I followed the following protocol. First, I asked the interviewee to read and sign the IRB consent form giving me permission to take photos and

record the interview (all participants in this study gave written consent). After placing the form inside my car for safekeeping, I walked with the organizer through the garden for a short tour, carrying a small, voice recorder, my camera, and my list of questions. Once finished with the interview questions, I asked the organizer if there were any other sites they recommend including in my study, then I would thank them for their time, and ask if they would mind me stopping by in the future. The duration of a typical interview was from 30 to 45 minutes.

During the tour, I asked questions regarding farming methods and organization, but as the tour finished, we generally found a quiet spot in the garden, sometimes a bench or a picnic table, to complete the interview. It was at this point in the interview, when the organizer felt more comfortable talking with me, that I asked more in depth questions about funding, challenges, community impact and similarly more complex questions. While I did not actively participate in any gardening during my site visits, I often tried to schedule times that coincided with participant work days so that I could observe the garden in action, and note how each organizer interacted both with established volunteers or participants, as well as inquiring passersby.

2.5.3 Data analysis

All organizer responses and participant observation data were analyzed through the procedure shown in Table 2. The first step in the data analysis process was to compile the responses from the surveys into a table in Microsoft Excel. This enabled me to organize the responses and observe patterns in responses. After the interviews were completed, I transcribed the recorded interviews into a Word document. Next I created additional columns

in the Excel file in order to incorporate the interview responses into the data table. Based on the columns in the Excel table I constructed a code list based on the categories that emerged. I used Atlas.ti to code the interview data using a list of codes I developed partly from the interview structure and partly from my initial interpretation of the interviews, formed while transcribing audio files into Word files. The codes are provided in Appendix B.

Table 2: Procedural steps of qualitative analysis.

1) Compile survey responses from respondents into an Excel table
2) Transcribe key data from recorded interviews into Word.
3) Add data from interviews to Excel table
4) Link each garden to its corresponding transcription, survey response, and any other documents (photos, brochures, business cards, etc.)
5) Conduct focused coding of data based on research observations and emerging categories
6) Conduct content analysis of coded data (compare responses to research question, then reanalyze)
7) Develop cohesive theory based on dominant categories

2.5.4 Data validity

Since I tried to schedule my site visits on garden work days, I knew most people would be dressed in old clothes, T-shirts and tennis shoes, that they would not mind getting dirty. So while I always maintained a respectable appearance, I did not want to dress "above" the organizers or participants, thereby intimidating them or making them feel uncomfortable. My general uniform for site visits and interviews was jeans, a maroon Texas A&M University Graduate Studies T-shirt, and Chacos or tennis shoes. Several of the organizers were

surprised by my young appearance, and upon my arrival at one of the gardens I had one older woman mistakenly call out "are you with the Girl Scouts?" However, they frequently expressed interest in my research, and excitement that "youngsters" are becoming interested in growing food again. I tried to position myself first as someone knowledgeable about gardens and gardening practices, that they could feel comfortable conversing with about compost and plant varieties; and second, as a researcher with an avid interest in the diverse organization and farming methods employed by each garden I visited. I endeavored to convey my familiarity with gardens by remarking on the productivity of certain plants, commiserating with the gardeners about the poor soil in Houston, and discussing different watering techniques.

The participants exhibited general warmth towards me, were forthcoming, descriptive, and detailed in their responses, frequently offered me fresh produce as a parting gift, and often encouraged me to return to see the garden "when the tomatoes are ripe." In addition to site visits, I was also able to attend Urban Harvest's annual Spring Fling, where, as one organizer put it, "all the hip, happening gardeners are [meeting]" Since the Spring Fling took place on April 6, 2013, I had already completed most of my site visits and I knew almost all of the organizers present. The Spring Fling is a social and educational gathering that endeavors to strengthen ties within the UA community in Houston. They started off the afternoon with friendly socializing at a potluck luncheon at a chosen UA site, then transitioned into a short program on cover crops and solarizing the summer garden, then ended with a raffle drawing for seeds and plants donated by Wabash Seeds. I won a bag of rye seeds in the raffle, but I gave them away to the volunteers sitting next to me to use as a summer cover crop for their bed, since I live in an apartment with no room for a garden of

my own. It was a great opportunity for me to interact with the garden organizers in a less structured setting than the interview, and observe Houston UA community dynamics first-hand. These varied interactions with the organizers and their continuously positive behavior towards me, have convinced me that the responses I received during my interviews were both accurate and honest.

2.6 Conclusion

In conclusion, this chapter describes research design I used to achieve my two objectives: determine the spatial patterns of UA sites, as well as their management and production practices. I followed the methods in Taylor and Lovell (2012) to examine the spatial form of UA sites and achieve my first objective. I advanced the UA literature by adding other spatial datasets from the US Census Bureau and the USDA Economic Research Service and performed spatial tests to identify relationships between the spatial distribution of sites and the underlying cultural landscape. To accomplish my second objective, the determination of UA management and production, I employed surveys and in depth semi-structured interviews which focused on decision-making, division of labor, cultivation practices, and distribution of harvest. I drew from the farming systems literature (Turner and Brush 1987), and then adjusted to the particular characteristics of UA, as well as certain insights from the UPE literature.

CHAPTER III

SPATIAL CONTEXT AND ANALYSIS

3.1 Introduction

This chapter presents findings regarding my first research objective which was to determine the spatial patterns of UA sites. I followed the methods of Taylor and Lovell (2012) to map all known food producing sites in Harris County, including schools (n = 70). All UA sites included in this chapter were also manually examined using high resolution aerial imagery from Google Earth to verify food production. I then spatially joined the UA sites to datasets from the US Census Bureau and the USDA Economic Research Service in order to visualize the spatial extent and distribution of UA in relation to demographic variables. Next, I performed spatial tests to determine if these relationships were statistically significant.

3.2 Extent and spatial distribution of urban agriculture sites

UA sites are more closely clustered in the south central portion of Harris County nearest to Houston inside the Interstate 610 Loop, with only seven sites (11%) outside of Beltway 8. Sites appear to be concentrated in more densely populated census tracts, with only two sites falling in the least densely populated census tracts, both near the county line, as can be seen in Figure 3 above. Because these UA sites are located mostly on land owned by schools, churches, non-profits, or public spaces like parks, it is logical that as population density increase, the concentration of these spaces also increase. This same association was also revealed in a UA study done in LA County (Brookover et al. 2013), which found a positive correlation between UA and population density. The authors posit that another reason for this pattern could be the lack of space for private backyard gardening, making shared public

space for urban food production necessary. This pattern suggests that there is considerable room for UA to grow as a land use in Harris County's less-dense areas.

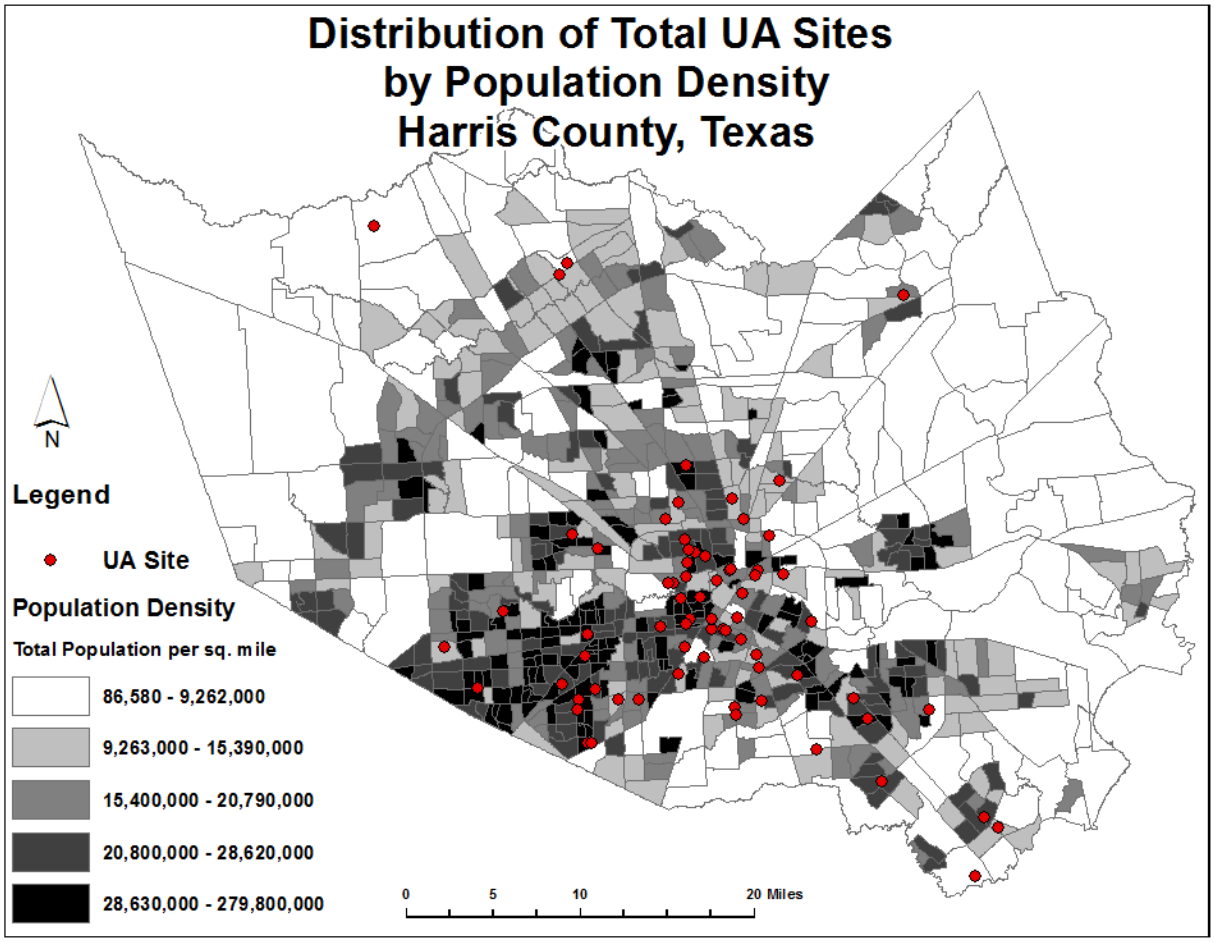

Figure 3: Distribution of all known food producing UA sites in Harris County according to population density by census tract. Lighter tracts are less densely populated than darker tracts, with black being the most densely populated and white the least.

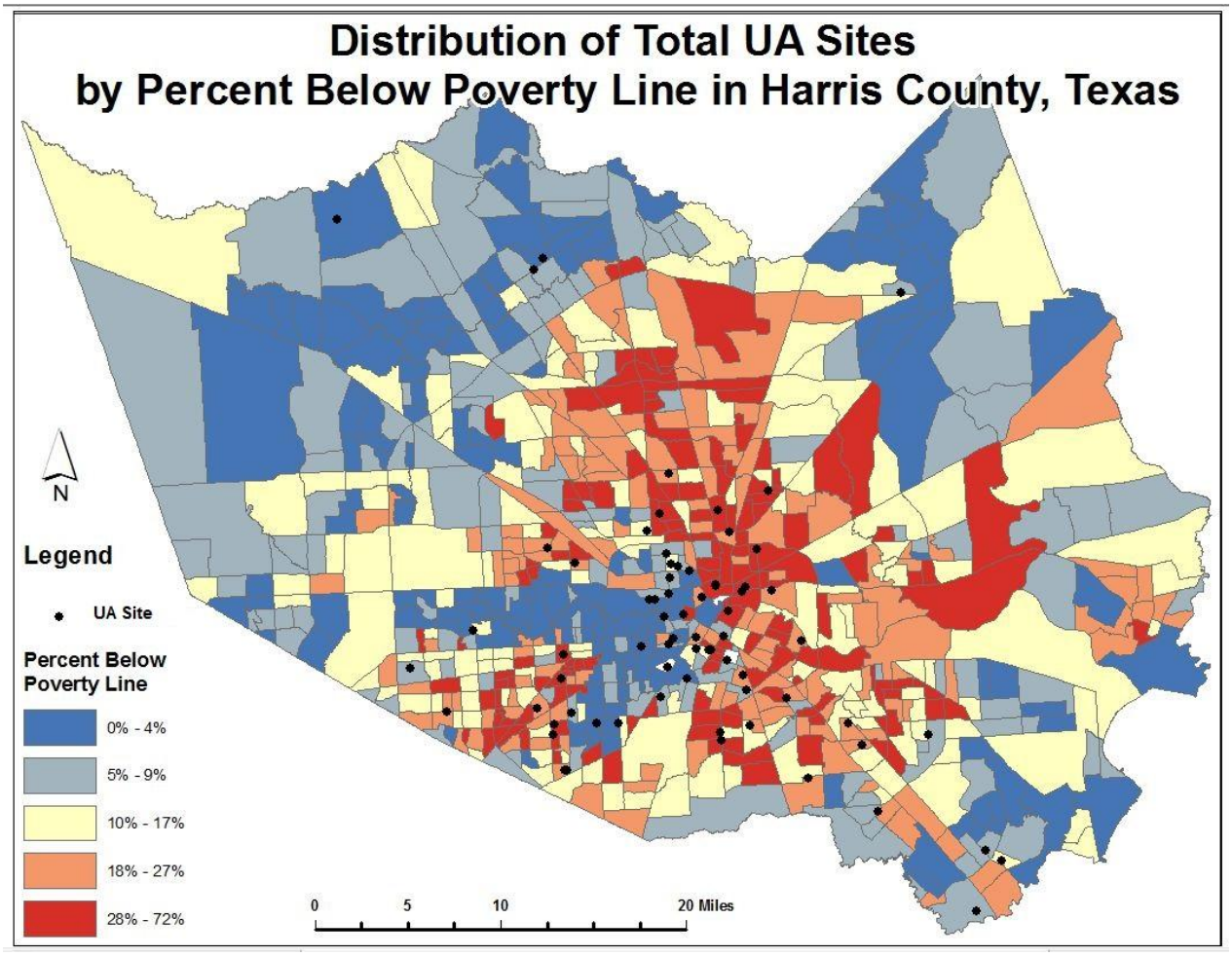

Figure 4: Distribution of UA sites in Harris County in relation to census tracts ranked according to percentage of inhabitants living below the poverty line. Blue indicates tracts with the lowest percentage and red indicates the highest.

Figure 4 illustrates the distribution of UA sites across census tracts showing percent below poverty. Almost half (47%) of all UA sites are in census tracts where at least 18% of the population are living below the poverty line. Because the UA sites tend to be concentrated nearest to Houston, they are also located in areas with a higher percentage of the population living below the poverty line. A higher percentage of poverty in cities is a well-documented trend in Urban Geography. This residential segregation has resulted due to

several reasons including "white flight," the effects of suburbanization, institutional exploitation, and economic restructuring (Pacione 2001).

Figure 5 shows a similar relationship pattern to Figure 4, where UA sites are concentrated in an area where the majority of census tracts are in the lower range for estimated median household income, where 66% are earning less than Harris County's average median household income of $57,554, and less than 30% are in locations with estimated median income greater than $63,000. This is expected because estimated median household income has a strong, negative correlation to percent below the poverty line (r = -0.69), meaning that areas that have a high percentage of people below the poverty line correspondingly have a population earning lower incomes. Table 3 shows the correlation coefficients for all of the chosen UA Census demographics.

Table 3: Correlations between census demographic variables. Highlighted cells indicate a stronger relationship.

	Median Household Income
Median Household Income	1.00
% Below Poverty Line	-0.69
Est. Value of Owner Occupied Units	0.46
% Male	0.05
% Female	-0.05
% White	0.52
% Black	-0.40
% Asian	0.23
% Hispanic	-0.52

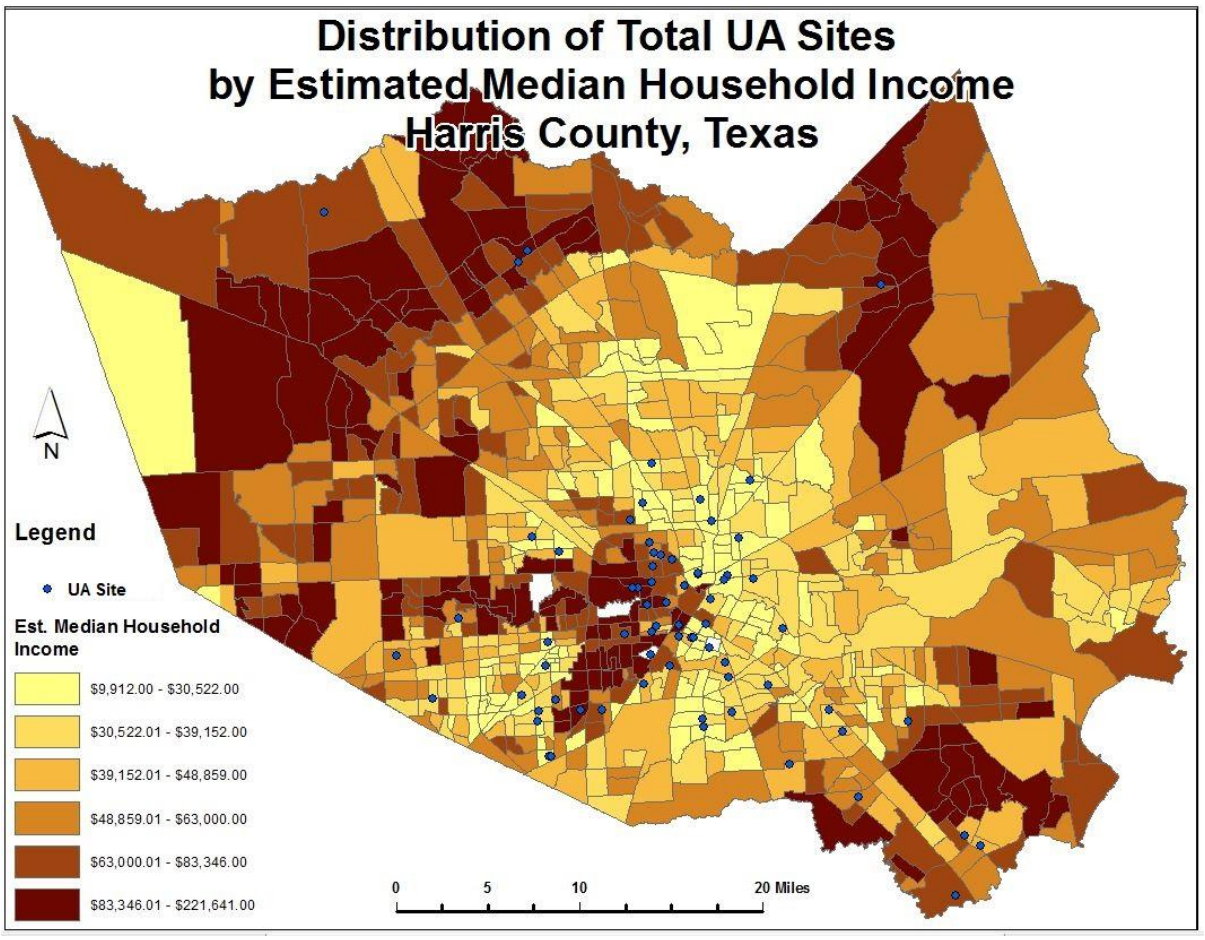

Figure 5: Distribution of UA sites in relation to estimated median household income. The color ramp indicates a range from light to dark, with the lightest census tracts having the lowest estimated incomes and the darker tracts having higher incomes.

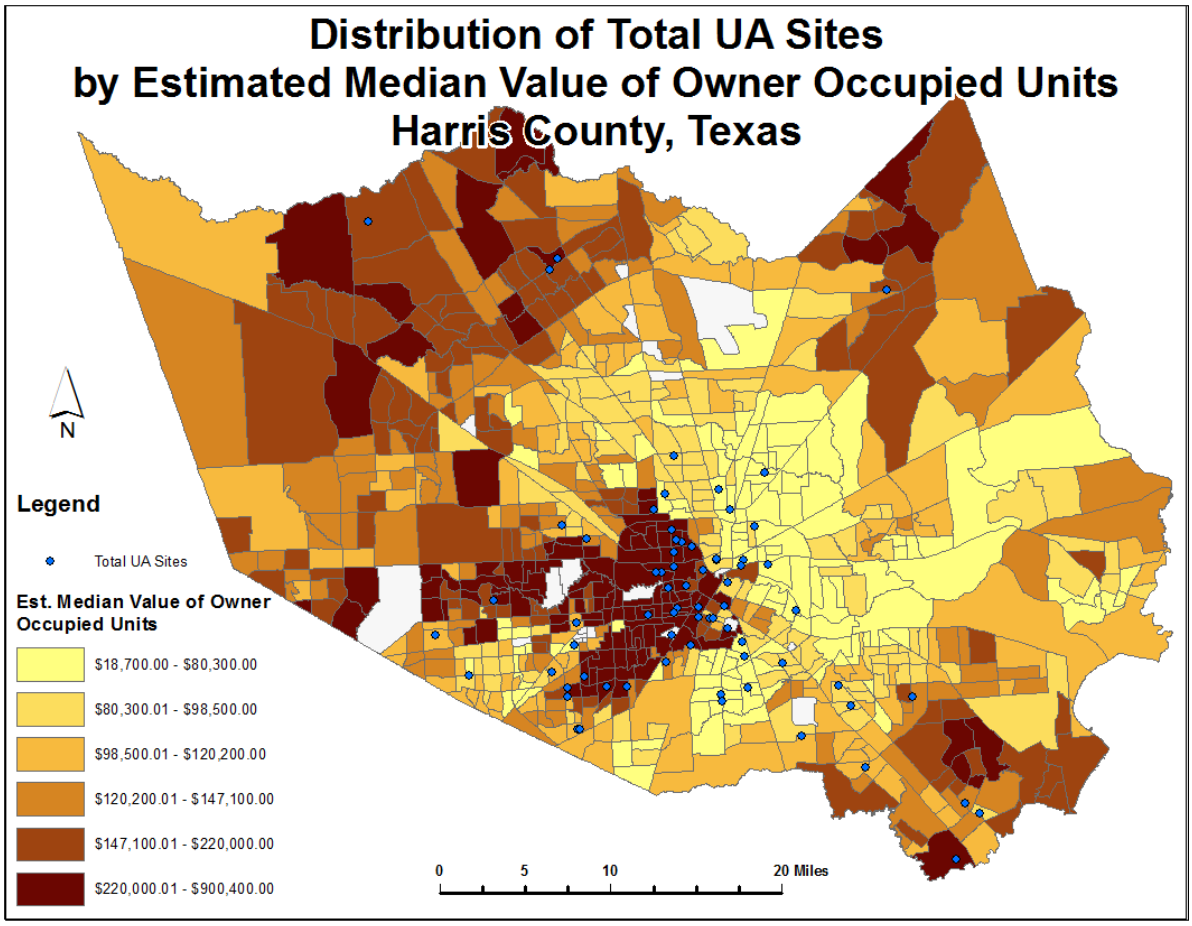

Figure 6: Distribution of UA sites in relation to estimated median value of owner occupied units, where lighter areas on the map represent lower values and darker areas represent higher values of units.

Figure 6 displays a map which shows the distribution of UA sites according to estimated median value of owner occupied units. The patterns on this map confirm those seen in Figures 4 and 5 due to the fact that estimated median value of units has a positive moderate correlation with median household income (r = 0.45) and is also negatively correlated with percent below poverty (r = -0.48). Figure 6 is effective in showing the distinct boundaries that exist between census tracts with relatively higher property values (darker colors on the map) and those with lower property values (lighter colors). High median values of occupied owner units are located on the north east periphery of Harris

County, but some of the highest value units are located in a wedge-shaped section on the south west side of the county. Census tracts on the east side of downtown, and fanning out to the north, south and east from there all have relatively lower median values. 33% of UA sites are located in census tracts where the estimated median value of owner occupied units is less than $100,000, and only 19% of sites are located in census tracts where the estimated median value of owner occupied units is greater than $200,000.

Figure 7, 8, 9, and 10 are maps showing the distribution of UA sites according to racial and ethnic populations. These maps all have color ramps which indicate the presence of lower percentages of the population with lighter colors, and census tracts with high percentages have darker colors. As Figure 7 shows, a majority of UA sites are located in census tracts where a high percent of the population is white. In fact, 69% of all UA sites are in tracts where at least half of the population is White. In contrast, only 20% of sites are in census tracts that have populations greater than 50% Black, and 12 sites are in areas with populations greater than 70% Black. Similarly, almost a quarter of UA sites (24%) are located in areas where the population is at least 50% Hispanic, and 11 sites are in areas with populations greater than 70% Hispanic. Asian populations are not as concentrated in Harris County, as are White, Black, and Hispanic populations, and only 23% of sites are located in areas where at least 10% of the population is Asian, and only one site was in a census tract that was 40% Asian.

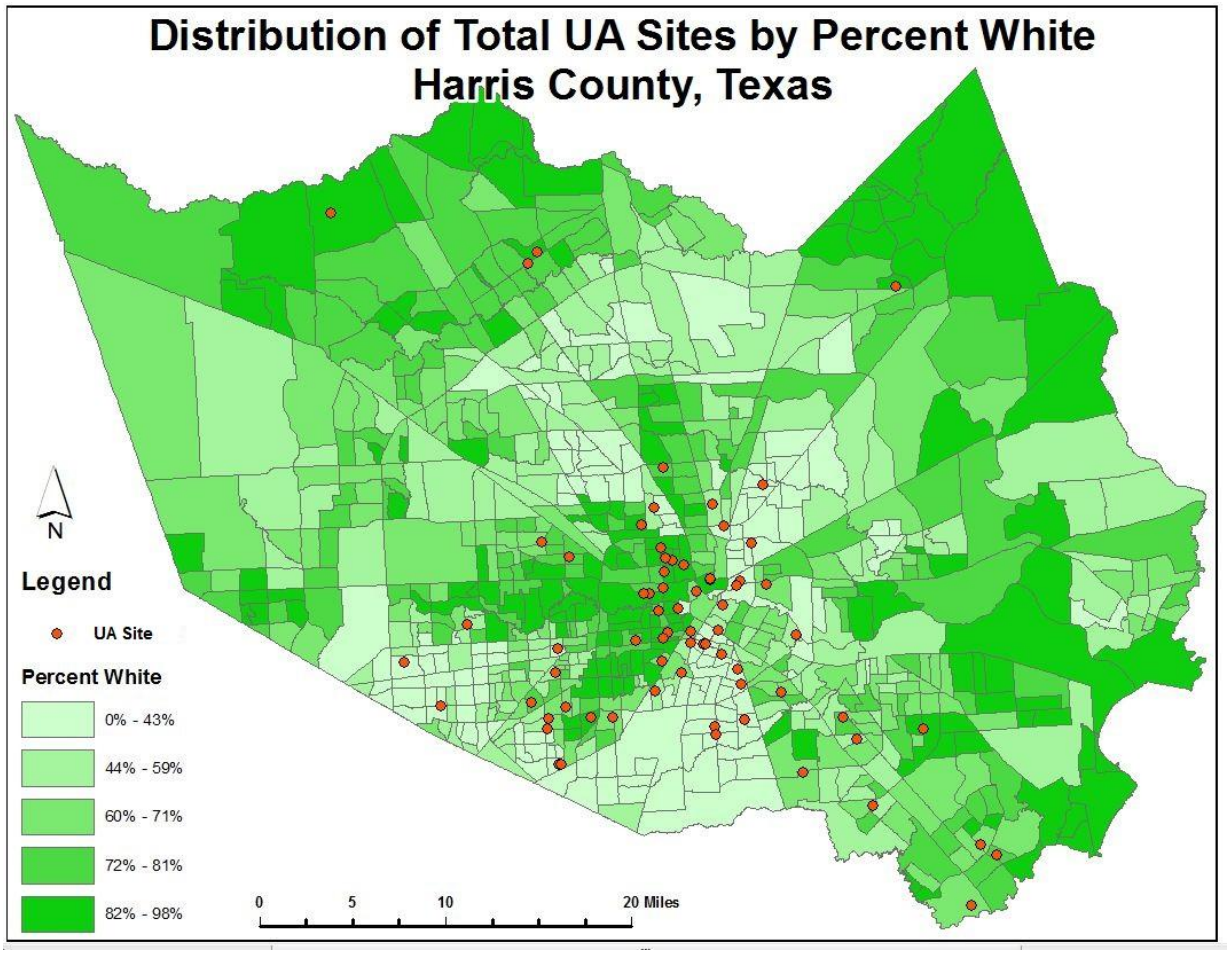

Figure 7: Distribution of UA sites according to percentages of the population who are White.

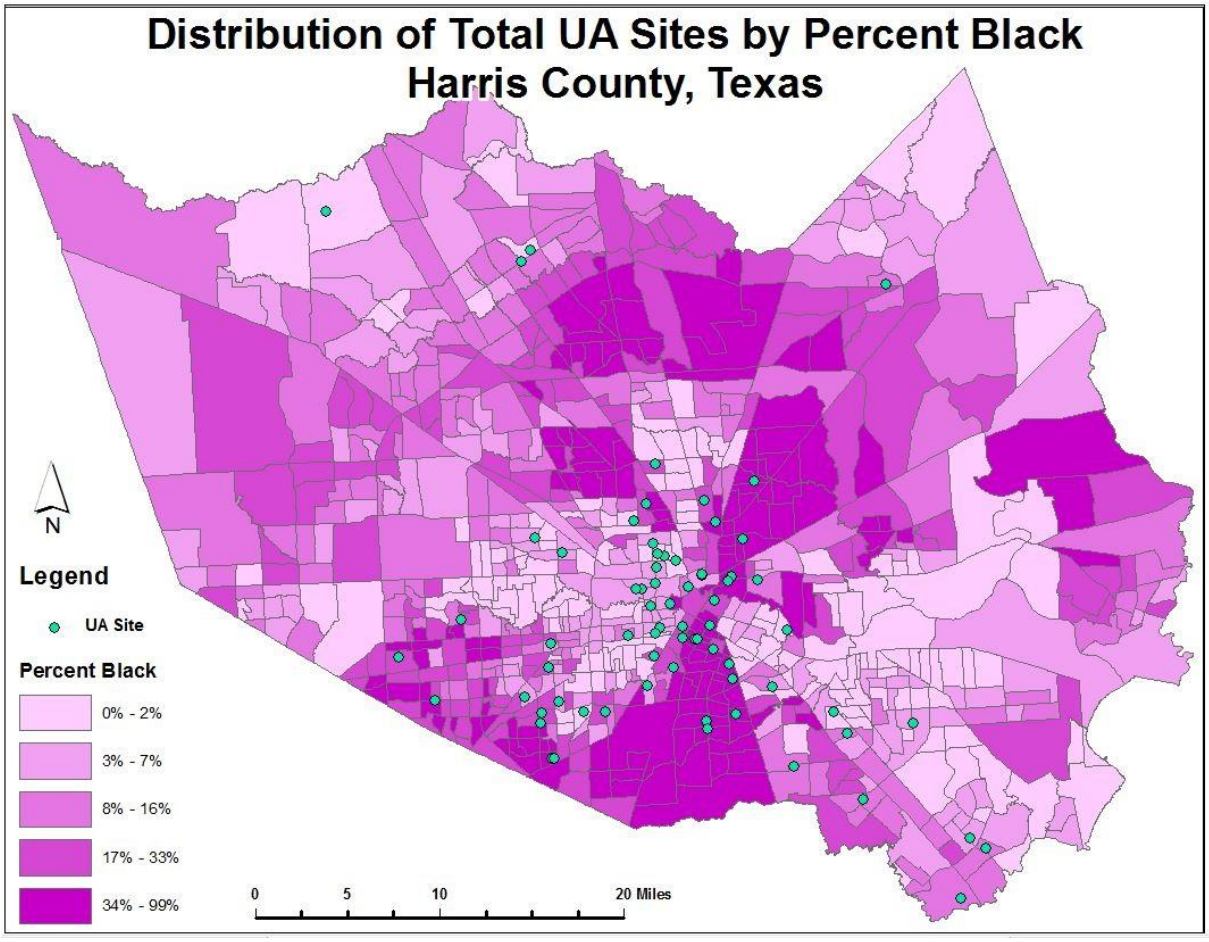

Figure 8: Distribution of UA sites according to percentages of the population who are Black.

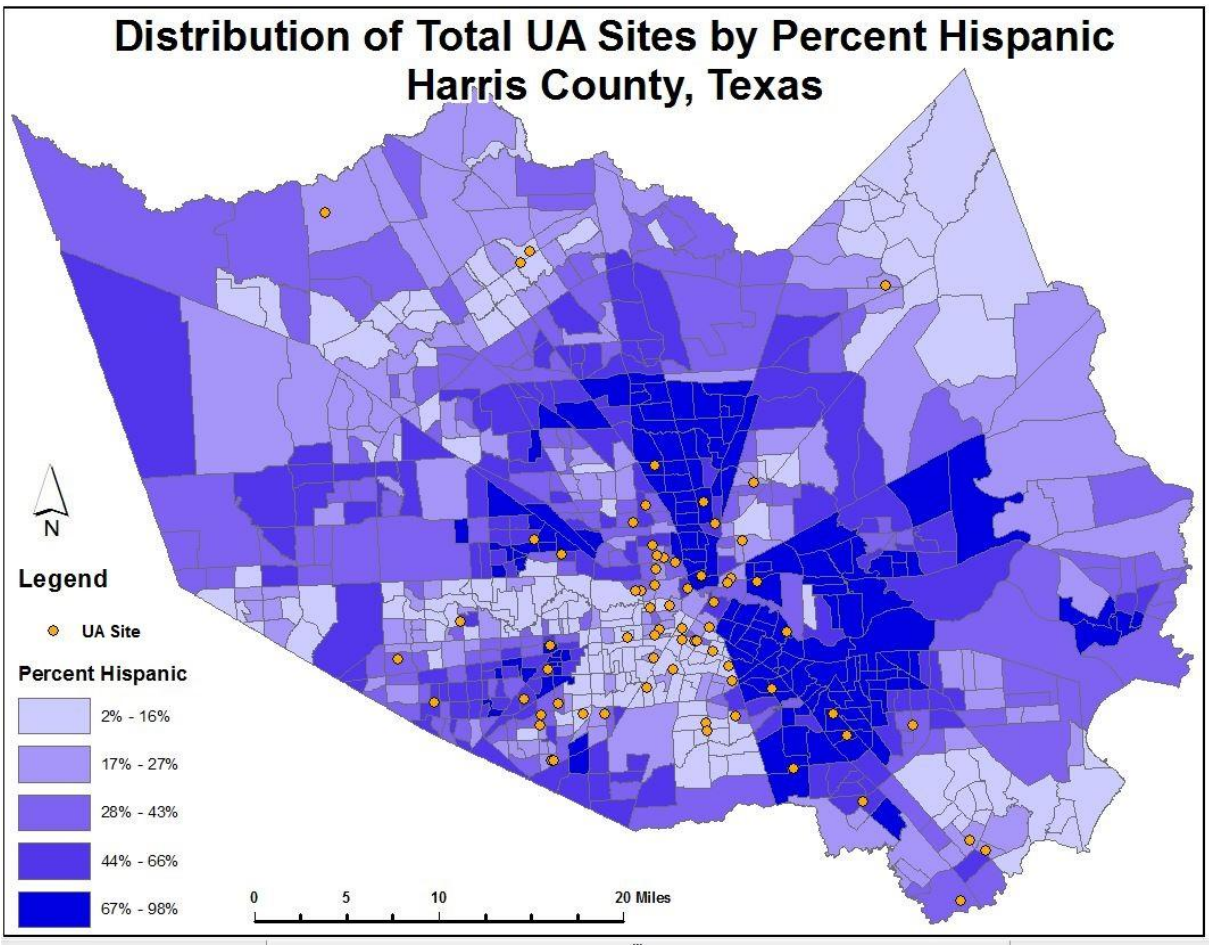

Figure 9: Distribution of UA sites according to percentages of the population who are Hispanic.

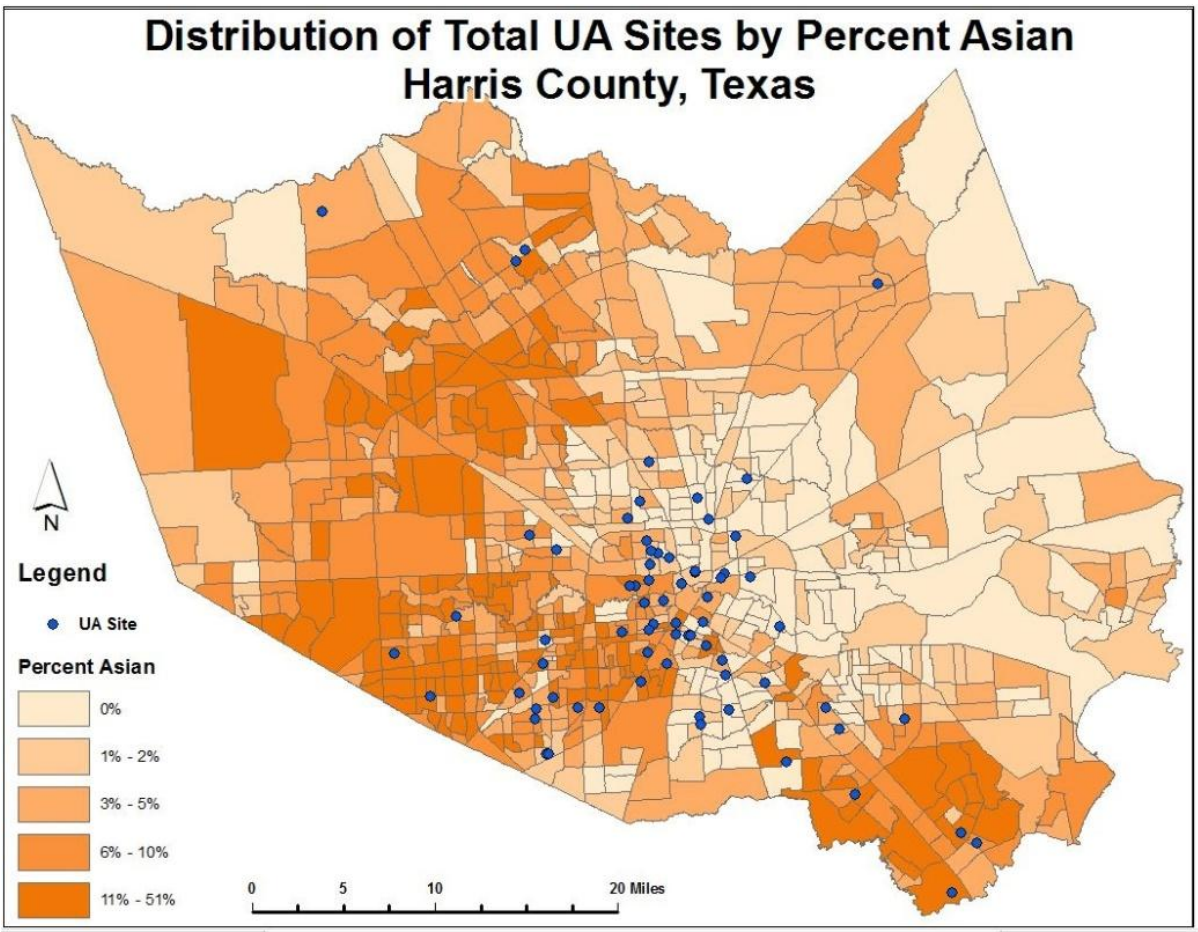

Figure 10: Distribution of UA sites according to percentages of the population who are Asian.

Figure 11 shows the distribution of UA sites that were surveyed during the qualitative analysis portion of my objective two. I mapped the locations of all the UA sites that participated in my survey process and I divided them into two categories, allotment and all-access, based on how land is divided and accessed within each site (Chapter IV). However, it does not appear as if these site-access categories influence how UA sites are spatially distributed across the county. Both allotment and all-access sites are found in census tracts which span from low to high income levels without any distinctive pattern.

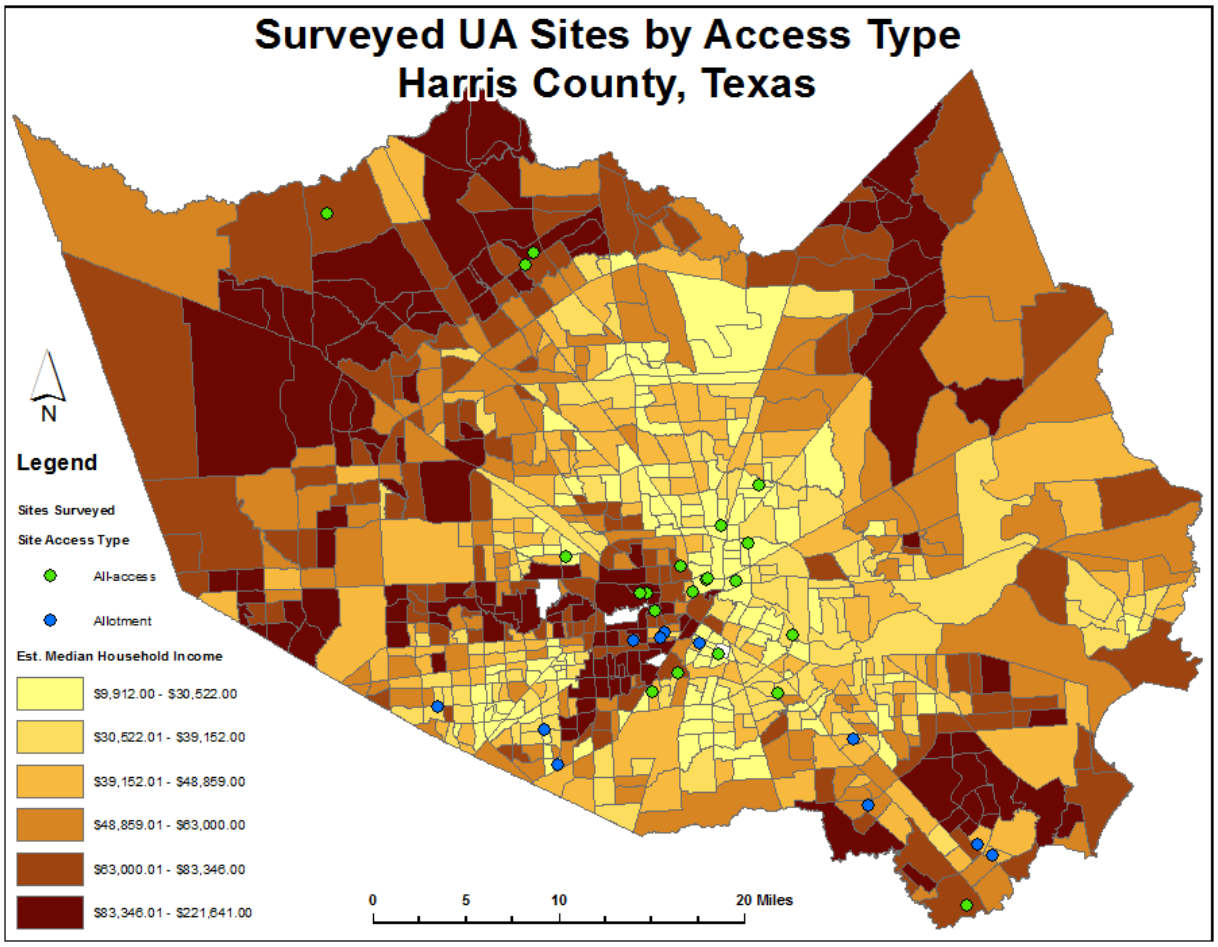

Figure 11: Distribution of surveyed UA sites according to type of site access and internal land division (allotment or all-access) in relation to Estimated Median Household Income.

3.3 Spatial analysis

3.3.1 Average nearest neighbor

The results of the Average Nearest Neighbor test yielded a very low z-score of -4.35 and a very small p-value of 0.000014, which indicates that it is unlikely that the observed spatial pattern of UA sites is the result of a random pattern. Therefore, I reject my null hypothesis and determine that the UA sites are significantly clustered (Figure 12).

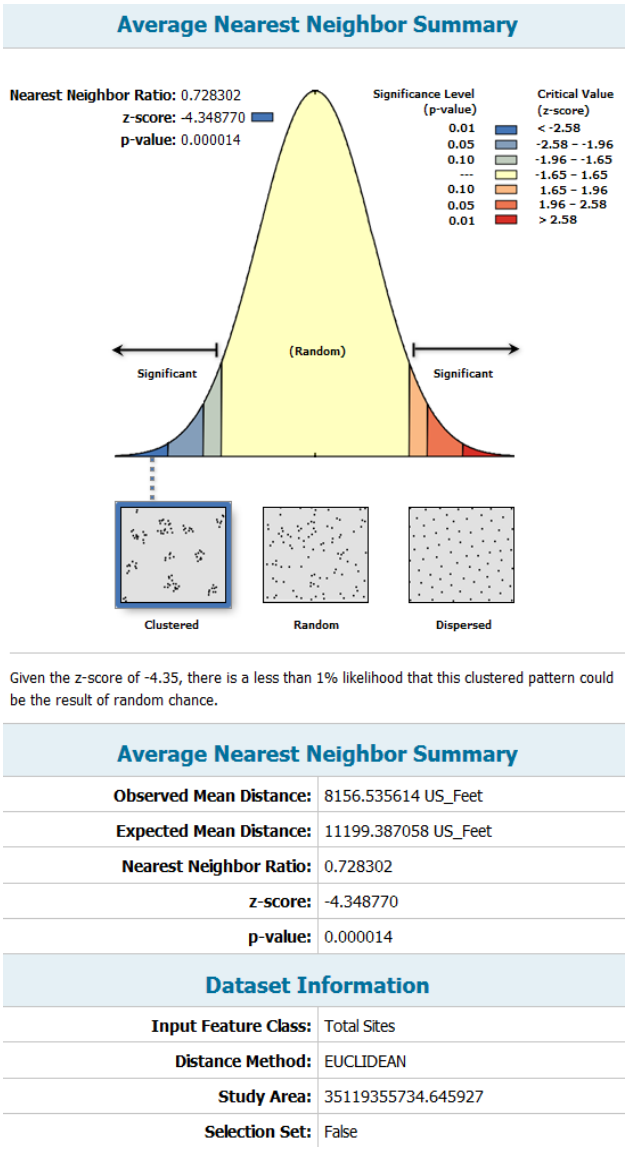

Figure 12: Average Nearest Neighbor Summary indicates less than a 1% likelihood that the cluster pattern of UA sites is the result of random chance.

3.3.2 Spatial autocorrelation

The Global Moran's I measures spatial autocorrelation based on both the locations of all the UA sites and the selected census demographic feature values simultaneously. Given the locations of the UA sites (n = 70) and an associated attribute, such as the census tract demographic variables, the Spatial Autocorrelation test evaluates whether the pattern

expressed is clustered, dispersed, or random. In other words, this test can determine whether UA sites are spatially clustered in areas with high median incomes, or else randomly distributed according to that variable.

The Spatial Autocorrelation tool calculates the Moran's I Index value and both the *z*-score and *p*-value can be used to evaluate the significance of that Index. A statistically significant *p*-value ($p < 0.05$) indicates that one can reject the null hypothesis that the spatial distribution is the result of random processes. A positive Moran's I index value indicates tendency toward clustering while a negative Moran's I index value indicates tendency toward dispersion (ArcGIS Resources 2013). For the demographic variables that were determined statistically significant and which also had a positive Moran's I Index value, I was able to reject the null hypothesis that the sites are randomly dispersed, and accept that those demographic attributes were spatially autocorrelated with UA site clustering.

As can be seen in Table 4, all of the demographic attributes had statistically significant p-values ($p < 0.05$), and positive Moran's I Index values except for Percent Male and Female. These results indicate that the locations of UA sites are significantly clustered for all selected attributes except for gender. Because Percent Male and Percent Female did not have *p*-values less than 0.05, I could not reject the null hypothesis meaning that the spatial distribution of Percent Male and Female are the result of random spatial processes.

Table 4: Spatial autocorrelation of UA sites and demographic datasets

Census Demographic Attributes	Moran's I	z-score	p-value
Est. Median Household Income	0.12054	3.1761	0.001493
Est. Value of Owner Occupied Household Units	0.1741	4.2517	0.000021
Percent Below Poverty	0.21315	5.07731	0
Percent White	0.25713	6.05951	0
Percent Black	0.22948	5.47141	0
Percent Asian	0.10619	2.91509	0.003556
Percent Hispanic	0.23472	5.57648	0
Percent Male	0.04753	1.39791	0.162141
Percent Female	0.04753	1.39791	0.162141

3.3.3 Grouping analysis

I used the Grouping Analysis tool to selectively segregate the UA sites into three distinctive categories based on all of the statistically significant spatially autocorrelated attributes (Figure 11). These groups are useful in differentiating between different UA sites according to spatial and demographic data. The statistical parameters of the three groups are described in the Parallel Box Plot (Figure 13). The groups appear to be segregated along racial/ethnic lines (Percent White, Black, and Hispanic), which are in turn correlated with variables such as Median Household Income, Percent below Poverty Line, and Estimated Value of Owner Occupied Household Units. For example, Median Household Income is positively correlated with Percent White, and negatively correlated with Percent Black and Hispanic. The correlation coefficients for each of these attributes are shown in Table 3.

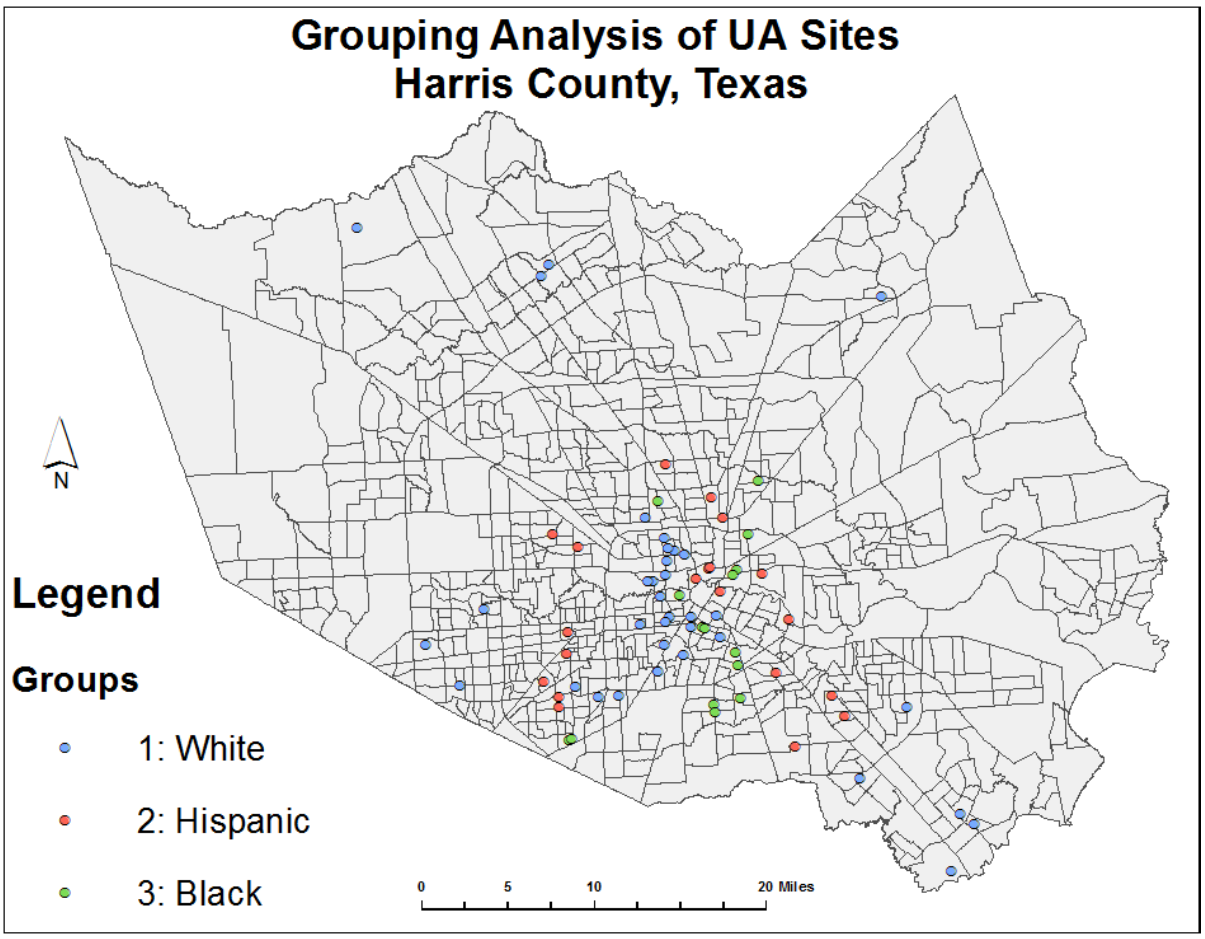

Figure 13: Distribution of UA sites categorized into three groups based on associative demographic traits.

The characteristics of each group were also confirmed during my site visits. I observed that in some cases the physical distance between sites was very minor, but the demographic makeup of the different neighborhoods was extreme. For example, when I was in Houston visiting two all-access sites inside the I-610 Loop, I observed distinct differences in the two neighborhoods that were not very far apart. One site was located in a majority White, upper class neighborhood, and 10 minutes away by car was a site located in a majority Black, low-income area. According to the Grouping analysis, the first site would be categorized as Group 1 and the second site as Group 3.

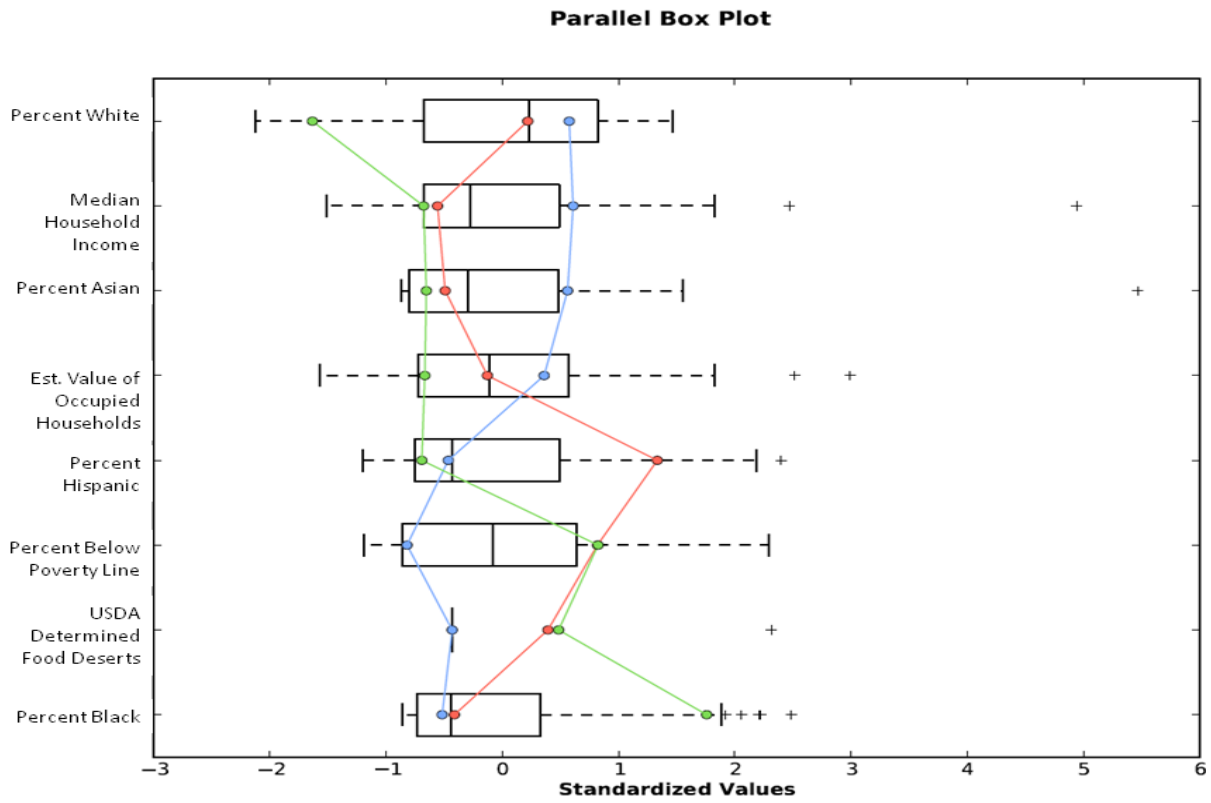

Figure 14: Distribution of results from the Grouping Analysis. Blue = Group 1; Red = Group 2; Green = Group 3.

Group 1 (Blue) applies to UA sites located in census tracts with the highest percentages of White and Asian populations. Group 1 sites are also in tracts with the highest median income, and median value of owner occupied units. Due to the fact that the afore mentioned variables are all negatively correlated with high percent below poverty, and high percent Hispanic and Black, Group 1 is found in census tracts with low percentages of those three variables, and Group 1 sites are not located in Food Deserts. The dominant trait for Group 2 (Red) UA sites is that they are found in census tracts with the highest percentages of Hispanic populations. Group 2 sites are also located in census tracts where a high percentage of the population is living below the poverty line, and living in a food desert. This group has

standardized values found in the median to lower quartile range for Percent White and Asian, estimated household income, estimated value of owner occupied units, and Percent Black. Group 3 (Green) represents UA sites that are found in census tracts with the highest percentages of Black populations. Group 3 sites are tied with Group 2 sites in terms of having the highest standardized values for percent of the population living below the poverty line, and being located in a food desert. Conversely Group 3 sites are located in census tracts that have standardized values in the lower quartile for every other demographic variable. This means that Group 3 sites are located in census tracts that have the lowest percent White, Asian, or Hispanic populations, as well the lowest median income, and lowest estimated value of owner occupied housing units.

In other words, UA sites can be statistically clustered by the racial/ethnic makeup of their corresponding census tract. Grouping Analysis takes all the demographic attributes into account and determines categories based on statistically significant auto correlation. Therefore, in comparison to the various spatial distribution maps shown at the beginning of this chapter (Figures 4-10), Grouping Analysis is a more effective way to both represent and interpret these racial and demographic patterns.

3.3.4 Food desert analysis

The USDA's Economic Research Service (ERS) has created a Food Access Research Atlas, formally titled Food Desert Locator, which is publically accessible online (ERS 2013). By using the original ERS food desert parameters, I mapped all census tracts that were in more than one mile from a supermarket. I was then able to identify which UA sites were located in census tracts with low access to healthy food (food deserts). I determined that 11 sites (16%)

were located in low access areas. UA can be used as an alternative source to fresh and healthy fruits and vegetables for people in low-access areas. However, this low percentage indicates that UA in Harris County is making a relatively small impact on food access issues considering that out of 326 USDA defined food deserts only 3% had UA. Most UA sites were not located in food deserts.

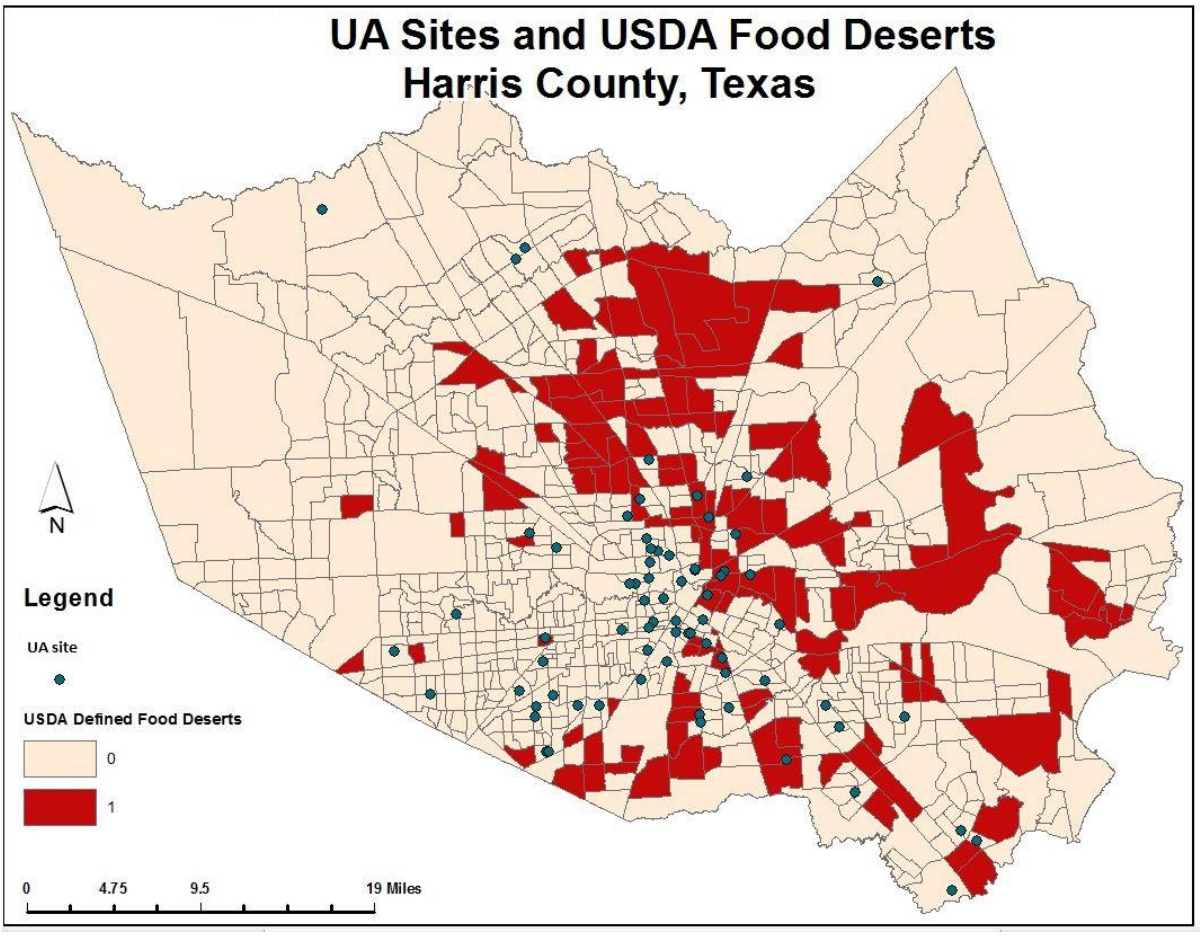

Figure 15: Distribution of total UA sites in relation to USDA defined food deserts.

3.4 Conclusion

In conclusion, I determined that the spatial pattern of UA sites in Harris County is not the result of chance; in fact, UA sites were significantly clustered according to seven demographic variables. These spatially autocorrelated clusters were then statistically grouped according to high percentages of White, Hispanic, and Black, respectively, which are in turn correlated with the remaining demographic variables such as Median Household Income, Percent below Poverty Line, and Estimated Value of Owner Occupied Household Units. Based on my site visits to surveyed sites, Grouping Analysis, rather than UA access type, or simple distribution maps, proved to be both an accurate and effective method for representing and interpreting these overlapping demographic and spacial patterns. UA only plays a minor role in addressing low food access areas, or food deserts, in Harris County. Figure 14 is demonstrates how the vast majority (84%) of all UA sites are not located in food deserts. This map also identifies the census tracts (in red) that could be targeted for future UA initiation and development in order to provide these resource poor locations with an alternative access point to fresh and healthy fruits and vegetables.

CHAPTER IV

UA MANAGEMENT AND PRODUCTION PRACTICES

4.1 Introduction

This chapter discusses how UA organizers reported their individual management strategies and production practices. Thirty-one organizers responded to both survey and interview questions regarding the primary objective, or motivation, for their UA site and how this objective has impacted decision-making, division of labor, and the destination of harvest. Some conclusions were drawn from direct prompts, and others came from commonly cited words or phrases that were categorized during the coding process. While several authors have documented the objectives of UA sites, few have investigated how these objectives systematically shape the cultural and cultivation practices of the site. This chapter addresses these gaps by using a UPE framework to explore urban agriculture as a system for the production of nature in cities. This systemic approach examines social process and material metabolism by identifying who, how, and why food is being cultivated in Houston, Texas.

4.2 UA characteristics

4.2.1 Site objective

Improving food access was a priority objective for 68% of UA coordinators. For example, organizer 44 reported, “What we try and do here in this garden is grow food that services the clientele of Houston, which is the Hispanic community. We focus on getting food to people.” 20% of sites are located in census tracts where 30% of the population are below the poverty level, as shown in the spatial analysis Chapter III, and 16% are in USDA defined food deserts (ERS 2013). In these places, UA sites may be the only cost-effective way for residents to

access fresh vegetables. UA sites in either in food deserts or in areas with at least 30% below poverty offered free plot space to those in need. Even in less impoverished locations, organizers often make up the difference out-of-pocket, or other participants pool their resources to make the site available to all. Interviewer 29 said, "Our overall purpose is to raise food, we do have people in our garden who are not working, or have trouble making it. One of them, it's a main source of her food supply. I don't push people for [the allotment fee] so some of them haven't paid, but you know, [shrugs] so what? What's 25 bucks?"

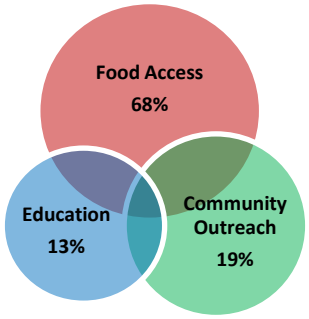

Figure 16: Primary UA site objectives defined by site organizers.

A desire to provide food to those in need is frequently the catalyst that leads to the formation of a UA site. For example, organizer 2 described the site's founder:

> His dream was to make a big garden here, across the street there at that time we had all these houses, they just tore them down a little over a year ago, all these families were in there, and what he was doing we help feed these elderly peoples, it was old people down there mostly. And that was his vision was to feed the elderly peoples.

Community members, aware of this need, try to help by growing food for their neighbors, as described by organizer 39, who told me,

> So it made perfect sense, you know living in this area there's not a lot of supermarkets and stuff, it's considered a food desert, and there was money available through grants and I talked to some of the leaders here and the pastor, and they thought it would be a great idea to use my expertise, since I'm a Master Gardener, to build a garden here.

Even though limited site production may make a difference to many participants, organizers are also aware that this effort is only a "drop in the bucket" in terms of city-wide food access goals.

> I have to say that our involvement is a very small drop in the bucket, we take sometimes 50 lbs of food, but they feed almost 300 people a day, ok I'll be real conservative and not say it's 300, that's on a special day, let's say it's 150, and the amount of food we contribute is a small amount, but it's appreciated (Organizer 50).

Organizers recognize that they are making a proportionately small contribution to the overall problem of food access, but they consider that any contribution is better than none. "This is a donation garden," said organizer 54, "and while we cannot supply all their needs, we do supplement their food with fresh produce and that's really all we hope to do here."

Many organizers acknowledge that UA can never be a solution to issues of food access, but they remain beneficial in terms of allowing the common person to make a feasible contribution to the issue and in raising awareness that the problem exists. For example, organizer 47 noted that "It's a bit of a food desert, but this [garden] is more like raising awareness within a food desert rather than solution to the problem because right now we're not growing anywhere near the amount of food that we're capable of."

Beyond contributing to food access issues, organizers report that UA sites provide other benefits to the community at large, such as strengthening community ties and educating both young and old. Organizer 50 pointed out,

> This is not about donating to people in the neighborhood; the main thing is that volunteers here understand that this is really about getting out and learning how to grow

> food and having fun, and community. And what I'd like to see more of frankly are children coming out, we have some members in the community with young children. We kind of laugh that this garden is very fertile, that many women who have come to work in this garden, have gotten pregnant and we don't quite know what that's about, but it has nothing to do with me, I assure you! But it's interesting that many of our gardeners have families now and I'm looking forward to them bringing those young ones back to the garden.

Community outreach was an objective of 55% of UA site organizers, with 19% claiming it as their *primary* objective (Figure 16). For example, organizer 3 explained how coming together in a community garden space could forge connections between diverse groups of people.

> One of the things we were trying to do is promote community harmony. This is a very, very diverse community; we're the most diverse in Houston. But we thought that this might be something to maybe promote some interaction. Because what happens in this community a lot, is that different ethnic groups tend to stay in their own communities, and they don't necessarily interact with the other communities, there's not friction, there's just not much interaction.

For UA sites affiliated with religious organizations, community outreach is often a fundamental component of their ministry. "Our main purpose," said organizer 43, "is to connect with our community by meeting both their physical and spiritual needs." However, none of the church-affiliated sites require church membership, and most favor an inclusive approach to community interaction, as described by organizer 29: "We had all of this land and it wasn't being used, so we included this garden as is a part of outreach. People are welcome to come, they don't have to come to church, we don't preach to them, none of that, they can just garden here." Often, the UA site was seen as a common thread that succeeded in joining diverse groups of people and encouraging communication and fellowship. Organizer 37 reported:

> We wanted a way to achieve community development. Our church is surrounded by apartments, and most of them are Spanish-speaking and Asian and it was another way that our church wanted to reach out. I would call it a great success… people actually use

> it to have their picnic lunches and weekends they sometimes grill out there and have the family out there, and you see them having their picnic and BBQs.

Education was the primary objective for 13% of UA organizers, while 39% included education as a secondary or tertiary goal. Many organizers reported that they enjoyed teaching others the fundamentals of food production. For them, the process offers a natural bridge to the discussion of other food-related topics, such as healthy eating practices and nutrition. "I work for the Health Department so what other better way could we talk about nutrition?" said organizer 39. "We talk about what to eat and what better way to do that than to show people how to grow their own food?" Site organizers recognized that UA cannot produce enough to fully address city-wide hunger. Instead, they aim to teach people how to grow their own food in order to provide them with additional, healthy food access options. Organizer 39 continued his explanation, "The City [Gardens] are mostly for training because you can't feed everyone in that community, but with the beds you have, you can show them how to do it, and give them the option to be a part of it." Some organizers teach participants how to grow their own to reinforce ideas such as sustainability and locally accessed food. Organizer 50 reported:

> [There is] a more sustainable way to access food, and that's growing [your] own. It doesn't have to be in a fancy garden like this, it can be in containers, or in one little plot, but we want people learning that you can in fact grow your own food. You do not have to buy it at the grocery store and what you buy at the grocery store is most likely a week old or more, and has come from 12 to 1500 miles away, and we really are trying to help people to understand that its more nutritious when you have local. And there's nothing more local than going out into your backyard.

The UA site objective is important because it relates directly to how the UA site operates. The manner in which site objectives are crafted, discussed, and negotiated is largely

determined by the site organizer and/or committed participants. The overall objective influences the most effective way to divide the site for management, how decisions about production and harvest are made and carried out, and which farming practices are implemented. How these topics are connected will be discussed further in subsequent sections. In the following section I introduce the concept of UA division types, explain the differences and advantages of each, and discuss how the division types reflect different management strategies that directly result from the site objective.

4.2.2 UA site access

Land tenure is a fundamental aspect of understanding agricultural systems, and political ecologists consider access to resources to be a major topic of study. In UA, land tenure may be understood in two ways: how the site is appropriated externally and how the site is divided internally. The first way to understand land tenure in UA is to examine the relationship between UA organizers and the owner of the land. For this type of land tenure, several methods are utilized to reserve land for UA. UA can be practiced on land owned by an individual, private entity, or organization that sponsors it, such as a church or community group. Some UA sites are located on city-owned land that may be free to use, like a city park, or else leased at a nominal fee (Table 17).

In this section I will focus on the second kind of UA land tenure, which is how organizers divide land among volunteer labor; this can be categorized as either as all-access and allotment site types. In all-access sites, labor, harvest, and decision-making are normally shared. UA organizers claim that this is a more flexible method of site management that allows for simpler management adjustments to a variety of changing circumstances, such as

the ebb and flow of volunteer or participant labor. By contrast, allotment sites are characterized by individuals who lease plots of land for which they are fully responsible for all labor and general upkeep, but they are also free to make their own decisions about what to plant and what to do with their harvest.

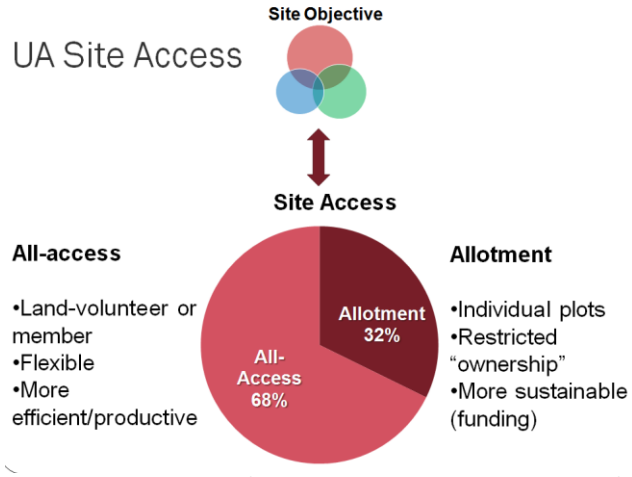

Figure 17: Site objective influences site access and site access can influence the site objective. Also enumerates the different traits associated with access type.

More than two-thirds of UA sites are all-access. UA organizers provide varied rationales for all-access tenure, but flexibility in terms of time and labor management was frequently cited as a major benefit of all-access sites. For example, UA organizer number 46 said, "I appreciate … the flexibility [of all-access division]," emphasizing that "some of the gardens operate where everybody has their own plot (allotment), so then you're pretty much committed full time." By contrast, organizer 46 emphasized that:

> With this garden, all the work is shared, all the stuff is shared; everything is shared. I do a fair amount of traveling, so if I can't make it, I don't worry about it. Most of us are on an email distribution; we try and let each other know when we're not going to be there, so we know. Not because there's any sort of accounting for the amount of time you put

> in. It's just sort of assumed you'll be there when you can be. And I really appreciate that because I'm not worried about how much stuff I'm going to have to eat and stuff I have to take care of. So it works out great.

In addition, organizers claimed that working together at the site fostered feelings of community ownership and lowered the barriers of participation for any interested. For example, organizer 57 said, "Yes, I know at some colleges they have garden where different organizations adopt a bed, but we don't really do that. We wanted everybody to get involved in it." All-access may also be a good choice for sites where committed, long-term participation is harder to obtain. Organizer 42 explained this line of reasoning:

> This is all community, no set anything, really loose, really fluid, at our old site, which we had almost a whole city block I think, you literally could do whatever you wanted because we could not use all the space. 'You want to put a bed up? Put a bed up.' Here it's slightly more organized, but still not very. We've had some interest in allotment beds, so we're thinking of doing a series of small, like 4x10 allotment beds. But, the allotment beds were kind of a failed experiment [at our old site], in the sense that we were able to rent out beds for $40/year which would pay for water and seeds, but of those 4 or 5 that rented them out, maybe one showed up really regularly, and even then, once summer hit, he stopped coming. So we ended up with these beds that we didn't really feel comfortable maintaining ourselves because they weren't really our responsibility, so [the growing space] was kind of wasted.

When discussing the level of commitment needed from participants to have a successful growing season, organizer 39 stated, "Allotment gardening, it means [the participants] really got to want to do it." Organizer 42 agreed: "We're happy to build allotment beds for them, but I've got to have good commitment." When discussing how the site was established, organizer 43 described a similar difficulty in implementing allotment-style plots:

> There used to be a building on the property where the garden is now and we were deciding what to do with the garden, and we talked to some people from the community, and they were like "Oh that's a great idea, I would love to do that," and then once we

> got the garden going and the property ready, nobody wanted to be involved. We had originally planned to have it be an allotment garden with a nominal fee of like $5 for the plot for a year, but once we did that nobody signed up for the plots, so we just went ahead and planted the garden and kept it going, and now we harvest the food and give it out in our food pantry.

Organizer 49 coordinates for an all-access site that has seen a decrease in regular participation in recent years, but describes the potential benefits of committed allotment-style sites: "Well you know, if we had a community garden where people came in from the community and got plots, then you would probably not have these up and down periods, because there's always somebody ready to step in." When discussing the challenges of plot commitment at an allotment-style UA site, organizer 48 explained one way their site has overcome this challenge:

> It takes a lot of time for a gardener to keep a plot, and they have to keep it weeded, and looking good or they have to go, according to the old-time gardeners. So some people realize they don't have time to commit [to a plot] so they show up to help the others, and you can have a leadership role without having a plot. So there are other ways to volunteer here.

Organizer 50 described the differences in site division styles and how each method is advantageous under different circumstances:

> It's a lot more hanging out [like at Alabama St. garden], and I think a lot of that has to do with their style of gardening. They're an allotment garden, and we're not that. We're meeting a different need, and it requires a little bit different structure. One of the things that we worked on at Urban Harvest is that we have gardens in the city, community gardens, that aren't being utilized, maybe half of the garden is being utilized, and to convince them to put the other beds into an allotment style that makes it more sustainable, lease those beds out, open it out. We're trying to change the model for the community garden in Houston, allotment is the model we'd like to see more, it's used all over the United States, but not here, we're behind the curve.

While the all-access or allotment types describe how volunteers are linked to UA organizers, another significant land tenure relationship exists between the UA organizers, the

volunteers, and the owner of the land being cultivated. 61% of the UA sites who participated in my survey own the land on which the UA site is located. This ownership creates a very stable, secure environment for a UA site and encourages long-term development goals and management practices. Of those, only 13 % pay property tax, whereas 87% of all sites have tax exempt status. Low property tax or exemption makes UA as a non-rent producing land use more feasible, especially for low-income participants. 26% of sites are on land owned by the city and as such as also tax exempt and may accrue other benefits such as free water supply. The remaining 13% lease their land for a nominal fee, making it "essentially free," as organizer 47 put it. Although these nominal leases are affordable, the duration of the lease and therefore the risks of land investment are highly variable. For example, organizer 59 coordinates one site with a 5-year duration, but the other site he manages has a Houston Housing Authority lease with only a 6-month vacate notice. Even though the site has been active for the past four years, they could be slapped with a notice to abandon the premises at any time.

Of the sites on privately-owned land, 68% are on land owned by a religious organization. As organizer 39 noted, "A lot of times churches got land, and they don't do anything with it. It's sitting there, and they could help their parishioners tremendously, you'd be surprised, we get tons of stuff [food] out of here."

The origin of UA sites on church land follows a similar pattern. When asked how the site was established, organizer 40 responded, "They have a lot of ground there, it's a retirement home for Catholic sisters, and they thought, 'We have this big area, why don't we do something with it?'" One limitation to having a UA site on private property may be lack of access. One organizer (#40) noted that:

> We cannot just invite people [to volunteer] because it's a private property, it's not really a community property, and it's not in a park or something. It's unfortunate because we have fruit trees that produce a lot more than we can harvest, but they cannot allow anyone to come. For me it's difficult, because you see it going to waste, but they cannot because of insurance issues and all that. In that sense, it's not the best community garden.

This question of owner liability for UA sites on privately-owned property was an issue that came up in the interview process for at least three other sites when asked about the site's land tenure, and it was noted as a hindrance in the recruitment of volunteers. Several other organizers, besides organizer 40, stated that putting unused land to productive use was a main motivation in deciding to begin urban food production. Vacant lots or even energy transmission easements are untapped resources which organizers considered as sites for urban agriculture.

For example, organizer 28 explained how their church had purchased an easement to use as a parking lot during a building expansion. After the construction was complete however, the area was not being utilized. "The area wasn't being used for anything else, and you can't build on it because [an electrical utility] has an overhead easement." In addition to making use of vacant land, the site was selected because "It's sunny, well exposed, and we had water that we could get out here relatively easy, and it's visible from the church." However, there are also limitations in using easements. Organizer 28 explained that normally one writes to the owner of the easement, such as an electrical utility firm, and inform them about a project proposed for the easement. The owner would respond with a letter of No Objection, which gives the project permission. In their case, organizer 28's church owned the easement land, but even so the utility would not give them express permission for the UA site. "We actually don't have permission from [the utility] to be here.

It's our land, we own it, and they can't tell us not to be here, but they would not give us a letter of No Objection." When I asked why, organizer 28 responded:

> They don't want to encourage activity on the easement, because they think it's a liability. They don't want people out under the power lines. So even though we own the land, and they can't tell us not to be here, they're not giving us the letter that says "We're ok with this."

This means that the utility could require that the entire site be cleared with only a few days notice. "We are operating at somewhat of a risk. So we can't put any gazebos or things that get too tall, we don't want to draw too much attention or complaints from [the utility] on anything like that." While available and open land that cannot be developed is appealing in many ways for urban agriculture, secure land tenure can be a challenge. To illustrate this, organizer 28 described the struggles of another UA site:

> We're a little bit unique because we're the fee owners of the land, but in a lot of places the transmission company owns the land. There's a [church UA site] … on a [utility firm] easement as well, but [the firm] owns that land and so they're in a constant battle over that garden that they put in, a constant struggle to use that easement space productively.

Only three sites surveyed are located on private residential property. Two are owned by individuals who have provided the land for free to use as a food production space. This gives the individuals a measure of security and control over how the land is used and by whom. While the third site is also privately owned, it is a joint ownership between community development groups. According to organizer 42, the city gave them the land because it was completely abandoned, and the neighborhood was thought undesirable even five years ago, but is now undergoing transition and some gentrification. Due to its location

outside an apartment complex, it has adopted more of a welcoming, community atmosphere, than the other two sites. However all three sites have adopted the all-access model.

Two surveyed UA sites are owned by universities, one on campus and solely for university use, while the other is used and administrated by an inner city garden organization with some of the plots reserved for students. Organizer 33 explained the origin of this symbiotic relationship:

> This land belongs to [university], so when [the founder] went over and got permission to use this land, they sent over people to help clear a lot of this land, to make his dream come true, because he explained to them what he wanted to do.

Four surveyed UA sites gained permission to use land in city owned public parks. Some benefits associated with this tenure arrangement include free water for irrigation, free land, fair amount of security, and city cooperation. As Organizer 46 explained:

> City land, city water, and no water bill. It's part of the park so it's like a service of the city. We're just responsible for everything that goes inside. They come out and inspect it every once in a while to make sure we're doing the right thing.

These benefits seem to outweigh the lack of freehold tenure; one cost of this relationship is a certain amount of insecurity, in that organizers were not sure how long their access to city land would continue. For example, organizer 36 told me how his site used to be located in a different part of a city park, but when the city wanted to move them somewhere else, the volunteers were very upset about the loss of soil and investment. Even though site participants were frustrated with the situation, they did not complain too loudly for fear of losing city benefits, such as free water for irrigation.

> When they made us move we complained; well we had already spent money building all these beds! So they provided these concrete blocks, and the original soil, but they didn't provide the labor to build the beds. It took close to a hundred yards to fill all these beds

> originally. We had to flatten it out, put newspaper down as a weed block, put sand down as the first couple inches, and then fill up the rest with good soil. Now since then they haven't provided anything but the water, but we are very thankful for the water so we don't say anything.

Organizer 46 added that while they were happy that the city provided the raw materials, the "expense" in terms of labor, time, and the loss of years of organic soil was not factored in to the city's decision making. In this sense, organizers of sites with risky tenure resemble sharecroppers or tenant farmers who have weak incentives to invest in expensive land-related improvements, such as fertilizer application, because they might be displaced before obtaining returns on their investments.

Despite minor issues like this, all four surveyed sites located in city parks benefit from a good relationship with the city and are allowed to remain autonomous in the management of their sites. In addition to providing land and water free of charge to the sites above, the city has founded and currently manages a network of twelve different community urban agriculture sites. The Houston Department of Health and Human Services has developed a gardening program "in the effort to teach people the importance of proper nutrition and exercise in preventing and managing chronic disease" (HDHHS Community Garden toolkit). Participants are encouraged to share not only produce, but knowledge of food production, healthy cooking and eating, access to opportunities for safe and social physical activities, as well as an increase in community awareness and partnerships. Most of these sites are located at community Multi-Service Centers in lower income areas, where efforts are focused towards vulnerable populations such as the elderly and school-aged children. Two surveyed HDHHS sites were also located outside Health Department offices to give the same opportunities and benefits to interested city employees.

Four UA sites lease their land from the city for a yearly nominal fee. Organizer 47 explained that the city-owned lease was "for a nominal fee of like a dollar for five years. It's essentially free." Organizer 59 has a similar arrangement for the three different sites he coordinates:

> "Land is leased by both locations of [UA NGO] with at least 5 years duration. The fee varies, but it is always a very small fee; just enough to make it legal. [Community Garden group] leases its land from the Houston Housing Authority for a small yearly fee, with only a 6-month vacate notice."

The other site is on school district land and since the site encourages extracurricular student participation, the school district has agreed to make the lease only one dollar per year.

4.2.3 Decision-making process

The decision-making process determines not only which crops are planted and how they are cultivated, but also where the harvest ends up and how it is distributed. This important process is influenced by site access, as Table 5 demonstrates. The plot-owners have almost complete control over their plots in 70% of allotment sites. Organizer 2 explained, "Everybody here has their own plots, you grow what you want to grow and the way you want to grow it." The other 30% of allotment sites also allow individual plot-owners to decide what is done in their plot, but they also have a committee to create or enforce site rules, or make decisions about common areas, that will affect the site as whole, such as general maintenance, communal tools, or water use. Organizer 59 illustrates this method:

> The garden is an allotment with an individual or family or a couple of families sharing a plot. Gardeners can plant anything except illegal plants and mint. Gardeners make their own decisions on where produce goes. The garden board makes decisions on what products can be used in the garden. We are strictly organic. The garden board makes decisions about how gardeners must take care of their beds and the rest of the garden

(aisles, common areas). The garden purchases all organic products including fertilizer and doles it out as needed.

Table 5: Site access influences and distinguishes the decision-making process for UA sites.

Allotment	*n*	%
Plot-owner	7	70
Plot-owner+committee	3	30
All-access	***n***	**%**
Organizer Only	13	62
Organizer+members	7	33
Committee	1	5

All-access sites have a more variable decision-making structure. 62% of sites have organizers that make the bulk of management decisions, 33% rely on a mixture of input from both the organizer and committed participants. As organizer 46 described, "There's an incredible culture of mutual decision-making. It's just a wonderful group of people a culture of mutual respect and working together." Only 4% use a formal committee.

4.2.4 Organizer characteristics

UA organizers are not novices, as 71% reported extensive cultivation experience. Some grew up in rural areas where farming was a way of life. For example, when asked if participating at the site was his first experience with food production, organizer 33 responded, "Oh no, I'm a country boy from Yoakum, TX, I've been gardening all my life." Similarly, organizer 46 claimed, "I was born in the garden." I asked if he was a Cabbage Patch Kid, but I do not think he realized I was not being serious:

> Yah, I just said that as a joke. I grew up and I spent all my life on the farm, my father learned me at an early age how to grow my own foods. And that was the only way of surviving, really, back in the day when I was born.

Many others "grew up gardening" in their backyards, learning from generations past, as organizer 49 remembers, "I grew up on organic produce, and my father, since he was a boy, was interested in growing things… Our ancestors, as far back as I can go, were farmers. Actually if you look at it, we're all descended from farmers."

Table 6: Organizer characteristics in terms of years of experience with food cultivation practices, residential proximity to UA site, and gender.

Organizer Cultivation Experience	*n*	%
extensive	22	71
limited	9	29
Organizer Proximity to UA site	***n***	**%**
< 3 miles	15	48
> 3 miles	16	52
Organizer Gender	***n***	**%**
male	15	48
female	16	52

Despite previous years of cultivation experience, for 45%, the management of their current site was a novel foray into community urban agriculture. Organizer 37 said, "I'm an avid gardener, but I've never been in a community garden before or understood them before." Organizer 50 had a similar story, "I have actually been a backyard gardener more than I've been a community gardener, and for probably 25-30 years. I only started participating at the community site about 8 years ago." Likewise from organizer 55:

> I don't have any formal experience teaching gardening skills to the community, but my husband and I have been gardening for probably 6 or 7 years now and we have a homestead going with fruit trees and chickens and all that, so it was a perfect fit for me.

These converts have diverse stories explaining the motivation behind their involvement in urban agriculture. One indicative story relates serendipitous events that somehow led to deep personal involvement in UA. Organizer 54 related:

> I grew up in Nebraska, so I guess you could say I've been gardening my whole life. We first got involved because our temple wanted to do a Mitzvah day…Temples usually have one day a year where they go out and do good things in the community. The rabbi was familiar with the Turning Point Center, and so he said, "Well, you're a Master Gardener, why don't you go see what kind of help the garden needs." And so I came up here and I looked it over and I went back and told the rabbi that whatever we did, it would be a mitzvah [because it really needed help]. And so we came up with a group of people from the temple in December of 2005 and we prepared about 6 beds. We weeded them, and tilled the soil and put in some compost and fertilizer and then we all went home feeling like we'd really had a good day. I went to bed that night and then the next morning I was thinking, "Now what?" You know, we had done all this work, but unless somebody planted something there, it was all wasted. And so I came up and met with [the Center's manager] and I asked her how she got started with the Center and she said that she had visited India and seen all the poor people. And when she was growing up (she was one of 14 children) her mother used to cook all day long and when a meal was over, if there was any food left she used to take it out into the street and feed the poor. And so Isha just grew up with that idea and she told me, "I just wanted to do what I could for the poor, to feed the hungry, and help people in Houston." She sold everything she owned and bought the Turning Point Center. I asked her about the garden, she told me it was maintained through volunteer groups since her mother couldn't take care of it anymore. I asked her if there was any kind of plan, and she said, "No, not really." I asked her if she *wanted* there to be a plan, and she said, "That would be nice." So, that's why I'm here.

Each organizer had a similarly unique tale to tell. Rarely did any one set out with the intention to become invested in urban agriculture. Rather, it often started with something small, and their efforts continued to grow over time, as exemplified by organizer 30:

> My daughter went to St. Pious High School and every year they do a food and clothing drive for Casa Juan Diego. So I came here and I met the people who run it, and was totally taken that they have been doing this for 35 plus years. They've taken vows of poverty, they have not made a dime in 35 years; all they do is run this place. I was inspired by them, and started as their weekend handyman and somehow or another this garden landed in my lap. Well there were two women back then, who were Catholic workers, who lived here full time, and part of the catholic worker movement is self-sufficiency. So together we transformed this rock-strewn empty lot that had a driveway

> running through it. We dug up the driveway, and said, "Well, let's put a garden here." None of us knew what we were doing. Then, where it had been the three of us, they moved on and so it was just me. I just kept plugging away and this is what we have now.

Four organizers found themselves with some extra time after retirement and specifically mentioned in their interviews that they wanted to put that time to good use by growing food and helping people. They needed a "retirement project," as organizer 54 described, or organizer 29 who said, "I wasn't working anymore; I needed something to do, so I said why not." Ten began as participants but later stepped into a management role when help was needed. Like organizer 28, "I got involved because I was already maintaining the [church] grounds, and I know something about this kind of thing…My original commitment was 6 months, but then [the previous organizer] left, so now I'm the project coordinator."

During interviews with UA organizers I asked what they learned in their role as organizer, and whether their views about managing urban agriculture have changed in the time spent as a UA coordinator. Since the majority of organizers (71%) have extensive experience with cultivation, there is not a lot about food production that was new or unexpected. Responses were highly varied, but most organizers mentioned that managing a UA site is about more than raising food, and they are always learning something new. For those not native to Houston, there was a steep learning curve to food production. Organizer 40 explained the initial struggle:

> I was trying to grow stuff because in my country, you just have it in your backyard, it's just kind of ingrained, but nothing was growing, and it was terrible. And I thought I need to do something, I need to go somewhere to learn because clearly this weather is nothing like our weather. It is very different, but once you know what you're doing it's so much easier. Right now, there is good and bad, the good is that during the winter we get all the awesome stuff that everyone loves and no one else can have during the winter up north, and that's great, but during the summer we try and keep it as simple as

> possible, because the heat is unbearable. We do okra because they like okra at the pantry, and we do eggplants until they shut down and tomatoes until they shut down, but we try to keep it simple.

Even though organizer 43 was only in her second year as site coordinator, she grew up with a big garden in the backyard. However, that was not in Texas, and Houston's unique growing conditions are still proving difficult for her to manage. "My mom gardened a lot, but it looked easier when my mom did it, then us having our garden. Things that I think should grow easily, don't, and then things that I think shouldn't grow, grow, Houston's just weird."

> Learning new things is a never ending process, even for experienced Houstonians. Organizer 53, who has been gardening in the city of Houston since he was eight years old, thought he knew everything there was to know about growing food in the area. It was with strong skepticism that he followed the direction of an Urban Harvest consultant who told him that the soil in Houston was "no good," and that he should instead buy better soil to use at the site.
> I'm thinking I've been growing stuff in the dirt in Houston since I was 8, don't tell me I can't. That's baloney. We spent around $300, and I'm thinking, 'What a waste of money,' but by the end of the season, I was saying, "What a brilliant idea!" I was wrong, and he was right. Growing better, bigger plants, better yield, and so much easier to maintain.

Finding methods to make a site easier to maintain or lessen the work load is a huge benefit to these organizers. One suggestion offered by organizer 59 is to better disseminate this useful information to the community.

> Farming is hard work, requires long hours, physical labor, dedication, and seven days a week attention. I still firmly believe we need to have local production of food, and that we can. It would be very helpful to have a committee or group of farmers who could be called upon to give advice to start up urban farms.

Creating a deep reservoir of knowledge that can be easily accessible would be the first step in assisting those wishing to improve or create new urban agriculture sites.

If learning the optimal methods for food cultivation in Houston is foundational for UA organizers, then increased awareness and education about the nutritional value of food is the framework. This may be taken for granted today, as common knowledge, but until you see the inequality for yourself, it can be hard to imagine. As organizer 44 described:

> I think what has most changed my perceptions [about food security] is working with the food pantries. I had no idea of the lack of fresh food for the people here in Houston. So that is really my biggest concern now. The food pantries get a lot of cakes and cookies, and you know the day old bakery stuff, but they don't get a lot of fresh fruit and vegetables. And I think the overall health of people in general suffers, you know the obesity rates here in Houston are so high. I've realized how important a good diet is. Also the problem is fruit and vegetables are expensive in the market, you know?

When I asked whether this organizer was aware of this unevenness before she started gardening, she responded:

> Not really, no. I think it was when I was delivering the food to the pantries; I started becoming more aware, just aware that they really do need this, and that's why we decided to plant 28 beds. It's like if we have an empty bed, we're putting food in it, or I mean we're planting it. So it's been more of my interest to maximize yield, and try to get as much fresh produce as we can to the pantries. I'm to the point where I'm not so much interested in following a protocol where you leave a bed dormant; I think we should focus on getting food to people.

As noted, "Getting food to people" is important to every organizer, but some have learned over time that some vegetables are more nutritionally rich than others. This realization has motivated many to encourage the incorporation of these sometimes foreign foods into the diet of soup kitchen or food pantry clients. Organizer 50 explained this process:

> I've realized not just how many different varieties of food you can grow, but the nutritional aspects of them. There's a real difference between growing food just to grow it, and learning what food is nutritionally better for you than other food. For example, kale is such a strong and powerful green, but getting the folks at [the soup kitchen] to realize that it is probably the best green that you can put in your body has been a bit of a

> struggle. But our experience has been that once it's in a soup pot, it looks pretty much about that same as mustard greens or collards.

This knowledge and awareness not only helps the clients, it has also changed the perspective of some organizers as well. For example, organizer 52 said:

> It's educational for us too, because we get the entire cycle. First the seed, and then the plant, and then we get to see the fruit. I'm eating more green. More fresh produce. And you notice the difference between the grocery store and what we have. I never really knew before, but now I know the difference.

Beyond educating clients and participants about food, many organizers advocate involving children in the food growing process. This involvement is often illuminating for organizers and useful in reminding them of the importance of passing on this knowledge to new generations. As organizer 43 described:

> The first year we did it, it didn't really change my view on food at all, but then we had the kids come and plant and water and watch [the plants] grow, and that was fun to talk to them about where food comes from. Because in their minds it just comes from the grocery store. So it was cool to talk to them about that and teach them how things grow.

Organizer 45 expressed how working at the urban agriculture site has given her confidence to share the growing process with her daughter at home. "Now it's something I do with my daughter also. It gives us something to go outside for and get excited about. And when we pull the vegetables it's exciting." Organizer 51 shares this passion for using urban agriculture sites as educational tools. He stated:

> We need to use gardens as a community tool, particularly for children. My friend brings his little daughters to my personal garden at home and its magic for the kids. And I think we need to put [gardens] in the schools, in the community. So that's how my perceptions have changed. I'm convinced that if you put a little garden anywhere, kids are going to watch this garden grow, they're going to want to be involved, they're not going to destroy it, they're nurturing it, and they're impressed by the, you know, the "it used to be a seed, and now look at it!"

It is not only the children who experience this magic, according to organizer 51:

> I tell you what, it's also fun to see the adults come out, especially on planting day, because some have never planted anything in their life, and we're talking about people who are much older than I am, and they've never planted anything. They have no idea what they're doing, they have a shovel in their hands, like, "What do I do? What do I do? Why are you doing that?" It's interesting, and it gives me a lot of satisfaction, because I enjoy teaching. I enjoy showing them that this is why you do this, and we learn from each other. And I've been gardening since I was a kid, since 12, but I still learn from other people, you know do this, do that, this is what you don't do with peppers, some people can identify the bugs and what to do, like oh, I put cinnamon on it, or whatever. So we learn little things from each other, but it gives me great joy to see people who have never gardened before ever to come out here.

It is one level of difficulty to manage a teaching site with a revolving door of participants, but it is much more difficult to build a sense of place and community into a UA site. Realizing the difficulty involved in attaining such a site identity was a commonly stated paradigm shift for organizers. Some, like organizer 28, had visited other sites as research before attempting create their own, and had witnessed a sense of a tight-knit community that proved difficult to imitate at their own sites.

> One of my perceptions was, we'll have this garden, and we'll have a bunch of people come out and be the garden community, but we don't really have that garden community yet. I'm not necessarily a team building people person, so we need to find someone who is good at letting the happen or encouraging that growth, facilitating that growth, rather than sitting back and waiting for that to happen, which is sort of what we're in right now.

Similarly, organizer 57 felt ill-equipped personally for the task of community building that would help to ensure the longevity of her site. She suggested that what would really help her site is "some sort of business director." She elaborated:

> We need someone who would be in charge of promoting the garden, who would send out emails and notices, do all kinds of publicity, and connect with some possible groups that I could speak to. We need a business manager, I can do the gardening, but at the

> moment I'm doing it all and it's a bit daunting. And I'm actually not that good at promoting the garden.

This promotional aspect of being a site coordinator was cited as an often overlooked, but crucial component to managing a thriving site. Organizer 42 reflected on the changes in perception that he has experienced in this regard:

> In terms of volunteers and things, I may have naively assumed that given the opportunity to garden, people would. The thing I struggle with is that the people who could benefit most from the garden aren't necessarily the ones who participate. I think the outreach part is harder than I anticipated. There's more to it, there's that educational or explanatory aspect of it that I really underestimated. The outreach part is a ton harder than I ever thought, and I underestimated how much time people would have [to garden]. A lot of people work Saturdays, when our site meets, and a lot of people have a lot going on in their life. We're still working on how to get the most benefit for the most people in the garden.

4.2.5 Participant characteristics

According to site organizers, UA participants are drawn to UA sites for a variety of reasons which include the desire to grow food either for themselves or for others, and because of personal enjoyment. The majority of participants have some knowledge of cultivation before they volunteer at an urban agriculture site, yet there is a surprising number with no experience at all. Organizer 54 commented on this trend:

> We've had Sunday school groups come and work in the garden and I'm amazed at what they don't know about the things they eat. But I also work at the farmer's market and I see people becoming more concerned about the food they are eating, than they have been in the past. And I think that's probably because of the food scares we've had in the past, and people are becoming more critical of the food they buy.

Table 7: Three primary motivations for participation in UA sites, according to site organizers.

Primary Participant Motivation	*n*	%
Food access	14	45
Community service	10	32
Education	7	23

Regardless of their knowledge before joining the site, 45% of site organizers said that their participants are motivated primarily to increase their access to fresh produce, but only half of these sites have a majority of participants who actually rely on the site to grow food that would otherwise be out of reach on cost criterion. The other half consume most of what they grow, but are motivated less out of need and more out of a desire for organically grown, local produce. Some of these participants are also motivated to improve the food access of others by donating a portion of their harvest to those less fortunate. Taking this idea a step further, 32% of all sites have participants who are motivated by a sense of community service and donate the entire harvest and keep none for themselves. Another 23% of sites are mainly educational and therefore have participants who are there to learn or else to assist in teaching others. The nature of this dynamic creates a high participant turnover rate, which can put added strain on the organizer and the few consistent participants (Table 7).

Despite their initial motivation in seeking out an urban agriculture site, most participants choose sites on the basis of ease of access. Four surveyed sites have waiting lists, and one in particular has participants commute from more than 20 minutes away, but these are exceptions to the rule. Ease of access to the site appears to be very important in terms of obtaining consistent participation, and physical proximity is one way to achieve that. Organizer 59 manages a site that is exclusively reserved for its surrounding residents. This organizer explained how he had wanted to create a site for years, but waited until there was

strong community interest and support, which he claimed was essential for site sustainability because, "people won't come regularly if it's not convenient." His site is now so popular that it has a waiting list for plot space.

71% of site organizers agree with organizer 59 and indicate that they drew participants from within a "convenient" radius—convenient because they live nearby or because their work or place of worship brings them to the UA site on a regular basis. The rest of the sites may lack community access or awareness and therefore rely on participants from Urban Harvest or other service oriented organizations such as the Boy Scouts or church groups. This type of participation is a more transient and unreliable labor force that tends to focus on large project participation and less on everyday and essential tasks such as irrigation and weeding.

Table 8: Average number of participants at UA sites.

Number of Participants	*n*	%
1--5	8	26
6--10	10	32
11--25	8	26
> 30	5	16

4.2.6 Participant recruitment strategies

32 % of organizers mentioned that Urban Harvest is "a big supporter," as organizer 30 said, in terms of recruiting participants, and 19% of all organizers relied primarily on Urban Harvest to raise awareness of their site and gain new volunteers. As organizer 54 stated, "I go through Urban Harvest if we need volunteers." Urban Harvest puts interested volunteers in touch with organizers in need workers or sometimes eager volunteers contact site organizers

directly by using Urban Harvest's online database. Organizer 54 explained, "We get queries from people through Urban Harvest who want to work in a community garden." 29% did little to no recruitment, and half of these organizers explained that recruitment was unnecessary due to waiting lists and a lack of space for any new volunteers. 23% relied on community service organizations such as civic councils, PTA, garden clubs, etc. to get the word out. For example, organizer 42 reflected, "the [Civic Counsel] gets that message out, they help us publicize our projects and raise awareness." Only 13% primarily used some form of visual advertisements such as newsletters, church brochures, flyers, or websites.

Table 9: Five primary strategies employed by UA site organizers in order to recruit participants.

Primary participant recruitment strategy	*n*	%
N/A	9	29
word of mouth	5	16
visual advertisement	4	13
Urban Harvest	6	19
community service organizations	7	23

Another 16% of site organizers, like 39, said that word of mouth was their primary means of obtaining participants: "most [participants] live in the neighborhood, so it's word of mouth." Due to the changing needs of a site, organizers sometimes employ a variety of tactics to get the necessary labor. Organizer 57 has a low-profile UA site. Her site is farther away from the most densely populated areas, can only be accessed by car, and is not visible from the road. These situational disadvantages have prompted organizer 57 to adopt several methods of participant recruitment: "We publicize in different ways, we put it in our church newsletter, I will mention the garden when I speak at different gardening groups, our local

garden club is also a great supporter, and I always have a little brochure for the garden at my booth at the farmers market."

4.2.7 Development goals

68% of site organizers stated that there were no immediate development goals for the site, and only basic maintenance was needed. "I almost wish I did [have development goals]," said organizer 54, "because I keep getting volunteer groups wanting to come out and do something. But, all we do is pretty much maintenance, you know planting, harvesting." The most commonly stated reason, as organizer 2 explained, was that there is no land available for expansion: "We can't expand anymore, we've grown as far as we can grow with the land that we have." 23% have plans for site improvement projects, like organizer 44 who said "We are reconstructing our beds, building them up." Or, like organizer 41 who plans on "putting in a trailer…so the women would have a [restroom] facility."

Table 10: Four most commonly stated goals by UA organizers; some indicated they had more than one goal.

Development goals	*n*	%
Maintain	21	68
Expand cultivation	3	10
Site improvement	7	23
Increase community impact	6	19

Other organizers, like 28, want to improve and beautify their site by planting "a community orchard," and other flowering plants that will help "maintain beneficial insects." Only 9% of organizers stated clear goals to expand cultivation at their site. Aside from physical change to the site, 19% of all organizers plan to actively increase community

interaction and participation at the site by coordinating events, creating social spaces, or improving outreach to local households. Organizers, like 47, aim to improve the overall community benefit from and connection with the site so that it can become "more than a garden, like a social outlet with a nice atmosphere, while raising awareness of the garden."

4.2.8 Funding

Almost half (45%) of sites rely primarily on financial support from a charitable or non-profit organization such as a church, civic council, or some other benefactor. This is the case for organizer 29 who explained, "The church supports it, they pay the water bill, and we had a lot of help getting started from [church-member donations], and if we get into trouble again, people would probably donate again…their hearts are really in service." 16% of the remaining sites receive funding from non-profits as a secondary source of financial aid. 39% of sites are funded primarily by members. This can be accomplished either through allotment plot fees or through members actively contributing to community needs. As organizer 46 described, "we're on our own, member-funded. If we need something we just contribute. We just decided to change the irrigation system and [site member] went out and bought the stuff and rigged it up."

Table 11: Primary sources of funding for UA sites, as well as the additional sources needed for financial support of the site.

Primary sources of funding	*n*	%	Additional sources of funding	*n* 2	%2
Members	12	**39**	Donations and grants	25	**81**
Non-profit organization	14	**45**	Non-profit organization	5	**16**
Organizer	5	**16**	Organizer	5	**16**

16% of organizers mentioned that they assist in funding the site, but another 16% said that they bear the majority of the financial burden of their site. When asked how the site obtained funding, organizer 39 responded, "Basically I spend a lot of money." Similarly organizer 30 took full responsibility by saying "I fund the garden." Over 80% of all sites count on donations and grants to make ends meet, and depend on multiple sources of funding to cover costs. This multi-pronged approach is exemplified through organizer 44's response:

> I'd say that the church meets about half of the operating costs, and the other half comes from volunteers just buying things. It's varied, since the economy is a little rough recently, [the church] hasn't give us as much recently, but every year they give us an operating budget of between $500-1000, that pays just for basics. there is a garden club in Houston that will donate a couple hundred dollars, people in the garden donate money… I have applied for grant money before, but I haven't gotten any.

4.2.9 Production practices

81% of all sites are strictly all organic, probably because all surveyed sites but one are affiliated with Urban Harvest in some way, and Urban Harvest is a strong supporter of organic principles. To illustrate this influence on production practices, organizer 46 described:

> We're part of the Urban Harvest group so we follow their rules, the only pesticides are the organic approved all natural pesticides that you can buy at [local garden supply] and we check that pretty carefully if we're going to put like an insecticidal soap on or something or like what I'm going to mix to kill those ants is orange oil and molasses. We don't use any fertilizers except what comes out of [the compost] or organics, like Microlife for example.

Table 12: Number of UA sites which follow strictly organic cultivation principles, as well as those that do not enforce any one principle and allow individual participants to decide.

Cultivation principles	*n*	%
strictly all organic	25	81
individual choice	6	19

The other 19% of organizers explained that organic principles are encouraged at their sites, but not enforced. They leave the choice up to individual participants. Some organizers, like 36, manage an all-organic site even while they remain ambivalent to the concept:

> Some of the gardeners were adamant about it, and they're adamant that the produce tastes better. It certainly tastes better than what you buy in the store, but I can't tell the difference between organic and regular gardening, but they swear that you can, and I'm certainly going to go along with it. So we've stayed pretty much organic from the start.

Others recommend a mostly organic regimen, but refrain from making it a site rule, as organizer 28 explained:

> We want to use organic principles as best we can, but it's a recommendation. What we say about herbicides is they should be regulated and seldom used. If we need to go in and do Roundup areas, we would rather it be a group decision, rather than someone just coming out and spraying their plot and letting it drift. I would be very hard pressed to come up with a reason for anyone to come out with pesticides at all. But none of that's written in stone, that's sort of the recommendation, if we're going to use herbicides let's be careful, thoughtful and limited in use, and as for pesticides, we should just find a better way.

Some allotment sites try to remain organic, but recognize that there may be some plot-owners who do not follow those guidelines. Many organizers take a pragmatic approach, especially when it comes to pests, like organizer 47:

> We mostly are [organic]. We haven't used any pesticides yet, but I'm for a balanced approach. I think organic is fine and all, but if we need to get rid of certain kind of bug without hurting anyone or causing cancer than so be it. But the site members will decide all that.

At least three other organizers were of the same opinion, at least where fire ants are concerned. For example, organizer 30 said, "We've experimented around with organic fire ant deterrents like citrus oil, but it's totally useless. But [the vegetable beds are] totally organic." And organizer 53 as well:

> The only insecticide that's [non organic] is the fire ant killer, because we have fire ants scattered around. If you won't tell the ladies, I have used it in my bed. I'm not as organic as everyone else is, or at least I'm not as picky about it.

Keeping the site weeded and looking tidy is a common rule or expectation, as explained by organizer 48: "They have to keep it weeded and looking good or they have to go, according to the old-time gardeners." Allotment sites can delegate this responsibility to plot-owners, but even there and especially in all-access sites; it usually falls to the site coordinator to enforce maintenance policies. Organizer 3 recounted, "I have to be the garden cop (laughs), and I send nasty letters or emails."

Site maintenance goes beyond weeding; it applies to all common resources, such as water, and for many sites, tools. Organizer 37 listed some of these site rules: "Tools must be put back where they should belong, and we must be mindful of our water use. Every now and then a plot-owner will leave a faucet on or something and we get a flood, and we get into trouble for it." Every allotment UA site mandates that plot-owners must respect other people's plots. Organizer 2 explained:

> One of our strictest rules is you can't go into someone else's plot. Whatever you plant in your plot is yours, no one can go into your plot and take anything out, because we don't know if you already made plans to give food away to certain people and then someone else comes into your plot and takes it, and when you come back it's not there.

Likewise, organizer 58 elaborated, "Everyone has their own plot, but we share each others' gardens too. If we're out here together they'll say, 'You can have some of this.' But you never take it; unless they're there to say that you can."

UA organizers make substantial time commitments to managerial duties, site maintenance, cultivation and harvest. 32% of site organizers devote an average of three to four hours per week, but 16% say they spend more than 10 hours a week (Table 13).

Table 13: Time (in hours per week) that a UA site organizer expends on managing the site both in terms of cultivation, harvest and coordinating labor.

Hours /week of work	*n*	%
1--2	6	19
3--4	10	32
5--6	4	13
7--8	2	7
9--10	5	16
>10	4	13

Site access type influences how labor is divided among participants, as Figure 18 illustrates. Cultivation labor includes soil preparation (tillage and amendments), planting, weeding, and irrigation. In allotment sites, plot-owners are solely responsible for cultivation and harvest labor in their own plots. All-access sites try to spread the work evenly between organizers, committed members, and transient volunteers. When asked about how the labor is divided, typical phrases for all-access site organizers include "We work as a team and harvest as a team" or "All the work is shared, all the stuff is shared." The labor required to maintain an urban agriculture site is not confined to cultivation and harvest. Mowing, mulching paths,

turning compost, and picking up trash are some examples of tasks that (ideally) are shared equally across all site members for both allotment and all-access sites.

Figure 18: Differences in division of labor according to the needs of each site access type.

Depending on the size of the site (or available funds), preparing the soil for planting may be completed either by manually tilling the soil and incorporating amendments or else mechanically through the use of a tiller. Only two sites stated that they employ a "no till" method. Since most of the sites surveyed are affiliated with Urban Harvest, most adhere to Urban Harvest's recommended guidelines for soil preparation and cultivation. Some benefits of Urban Harvest affiliation include free or discounted seeds, discounted training classes, and lower prices for supplies and amendments at local nurseries and businesses. According to organizer 39, "by being a member of Urban Harvest we get a 10% discount on tools and

seeds at certain places. We pay $40 a year to be a member and you get things like that." Commonly used methods, products, or vendors are often attributed to these benefits. When asked which products they used, organizer 43 responded, "Whichever Urban Harvest recommends." While this relationship strongly influences site cultivation methods, organizers and Urban Harvest alike understand that not all sites are the same, and as a result, each one favors a particular "recipe" of soil amendments (Table 14).

Table 14: Combinations of soil amendments that UA organizers apply. The most popular additive cited was organic fertilizer and the least mentioned were mulch and manure.

Soil amendments	*n*	%
Nature's Way	6	19
organic fertilizer	15	48
MicroLife	6	19
compost	12	39
manure	4	13
mulch	3	10

19 % of organizers stated that they used Nature's Way and MicroLife at their site. Nature's Way Resources is a local business that provides organic supplies for gardeners and landscapers, and they are also an Urban Harvest partner which means they give special rates to affiliated sites on products such as soil, mulch, compost, and fertilizers including the MicroLife brand. Some sites stated they used "Nature's Way" and "MicroLife" to prepare the soil. It is unclear exactly which products they used since Nature's Way provides a myriad of options.

Interviews revealed that what goes into the soil varies from year to year and depends largely on trial and error, available funding, and organizer preference. Table 14 shows these

ingredients. Compost, either bought or made (or both) is used by 39% of all sites, and some type of organic fertilizer is utilized by 48% of sites. Only 10% of organizers stated that they use mulch, and 13% mentioned the use of manure for soil enrichment. Three sites have either a member or an organizer who is knowledgeable about soil science and skilled enough to perform periodic soil analysis, which aids in the decision-making process. Regardless of what formula they use, all organizers understand how essential soil amendments are to vegetable production. As organizer 50 stated, "I'm a firm believer that soil amendments are critical to the life of a garden, and we're always growing compost, and worms too, and we use the vermiculture compost from that as well."

Despite how cultivation methods have since diverged, all surveyed sites began cultivation the same way. All sites employ raised bed cultivation following methods espoused by Urban Harvest, and by those who recognize the poor quality of Houston's often waterlogged clay soils. They all used a layer of newspaper as a foundation to deter weeds, then filled in the rest with organically enriched soil. Aside from being nutrient rich, adding this soil makes planting and weeding, two tasks that are done manually by all sites, a much less labor intensive process since the loose soil is easier to work with.

Decisions about crops planted in UA sites vary according to access type (Table 5). Allotment style sites let individual plot-owners decide—according to most organizers, "as long as it's legal" and not invasive. Some allotment sites ask that plot-owners not plant anything "permanent" like shrubs or trees in their plots; these plants have space in the common spaces such as along a fence or to create a living boundary for the site. All-access sites rely on input directly from the organizer and site members. For both allotment and all-access sites, however, vegetables are a priority. Although some sites experiment with exotic

varieties of asparagus or pumpkin, when food production is a key objective, sites tend to be risk-averse and are more likely to stick with what works best for them. For example, when asked if they experiment with vegetable cultivars, organizer 44 responded:

> Well we do actually, even with our tomatoes, you know the tried and true varieties in this area are Celebrity, Big Boy, Early Girl, and every once in a while we will try something new, maybe some heirloom type variety, but when it comes down to it, the three that I mentioned always do the best. We like to try it, but it doesn't always pan out.

Sites that donate most or all of their harvest often allow "client preferences" to influence what they cultivate. Organizer 50 stated, "I think the most important thing, as we're a donation garden, is to know and to learn what food the people we're giving the food to want, and it doesn't make a lot of sense to grow something they won't eat." Even though what is commonly planted varies a bit from site to site depending on preference and site objective, one thing that every organizer was familiar with is what is known as the "bible" of Houston urban agriculture, a planting guide authored by Dr. Bob Randall, one of Urban Harvest's founders. His book, *Year Round Vegetables, Fruits and Flowers for Metro-Houston: A Natural Organic Approach Using Ecology* is based on years of his own organic horticulture research and it is conveniently organized by the different geographical sections of metro Houston so that each site can follow guidelines. Organizers and participants emphasized how this book is an essential component of their site management strategies. This is especially, but not exclusively, true for those who are new to Houston or new to urban agriculture. When asked how she makes decisions about what to plant, organizer 42 said:

> We follow Bob Randall and we have crop rotation. And we figure out what's in season, what we favor, and what works in the garden best. And we keep a Google doc of what we've planted in each bed so we can keep track of the crop rotation.

While visiting a UA site to complete an interview I observed a meeting during which members and organizer discussed the crops they would plant the following week. Every person had a copy of Randall's book, which they consulted frequently throughout the discussion. Although most UA sites (84%) rely on city water for irrigation, only a few (15%) get this water free of charge. Only 6% use rain catchment devices to lessen their dependence on city water. 6% have access to well water on their site (Table 15).

Table 15: Sources of irrigation water for UA sites. The majority of sites rely primarily on city water, but two sites employ rain catchments to lower their use of city water and the associative cost.

Water source	*n*	%
city water	27	87
well water	2	6
rain catchments + city water	2	6

Water access is important because 65% of sites rely completely on a hose to irrigate their crops. Although high reliance on Urban Harvest is present in other aspects of UA, only 16% of UA sites use the Urban Harvest recommended method of low-flow drip irrigation. Reasons for not using low-flow drip irrigation include the cost, difficulty of installation, and maintenance. Organizer 54 said, "Originally we had an on-the-ground, low-volume drip system, but … volunteers get out there and chop those tubes up something terrible."

Table 16: Methods for UA irrigation. Most sites use only one method, but 16% use some combination of the three.

Irrigation type	*n*	%
Low-flow Drip	5	16
Hose	20	65
Sprinkler	1	3
Combination	5	16

16% of UA sites use some combination of hose, sprinkler, and drip irrigation. As organizer 46 explained, "Over time we noticed it [drip irrigation] wasn't too effective, so we've added little surface sprinklers as well, and it's made a huge difference in terms of productivity, and the drip just wasn't enough, for the newer plants in particular, they couldn't develop adequately" (Table 16).

4.2.10 Harvest destination

Harvest destination is determined by both site access and objective. These paths are shown in Figure 19. For example, organizer 42 coordinates an all-access site whose main objective is increasing food access for its participants as well as for the larger community. He described where their harvest goes:

> We don't sell produce. The way the garden's set up it's for the neighborhood. For the people who work here as well as for people in the neighborhood who I know could use it. I make bags for them and just go and hang it on their door. But we also donate to various food banks and things depending on if we have extra, but we don't like to sell food.

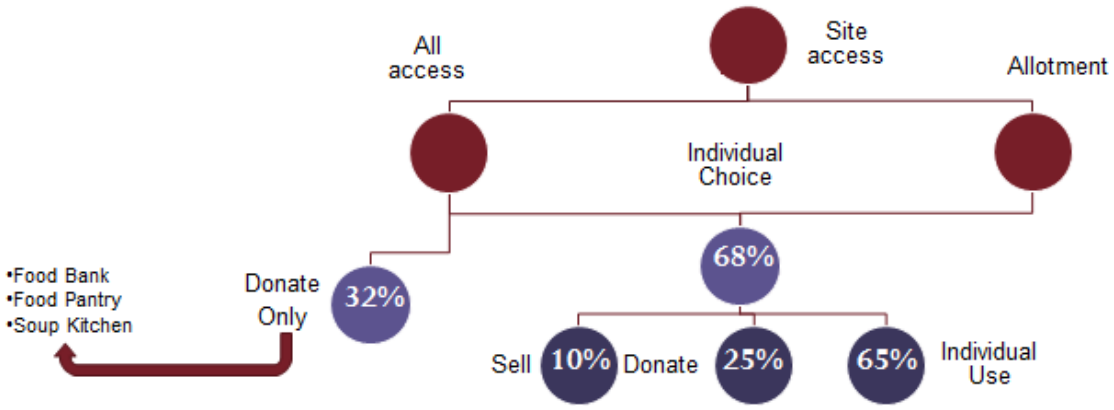

Figure 19: Destination of harvest is determined according to site access type.

Organizer 42 is not alone in refusing to sell food from his site. Only two surveyed sites sell their produce at farmer's markets. 32% of sites, all of which are all-access, do not grow the food for their own consumption, but instead donate the entire harvest to food banks, food pantries, and soup kitchens. The majority of sites, 68%, leave the destination to individual participants to decide. Of these, 65% of participants reserve the harvest for their own use or to share with family and friends, and 25% choose to donate either all or a portion of their harvest to food banks, food pantries, and soup kitchens. This is illustrated by a organizer 2 who explained how the harvest is distributed at his site: "You grow the food in your plots to feed your family…but every Monday we'll say whatever you want to donate to [local food pantry] out of your plot, put on the table, then we take everybody's and donate it."

4.3 Common challenges

Aside from questions regarding site organization and decision making, I also asked UA organizers about the main challenges that they faced. The main challenge was securing labor supply. An overwhelming majority of UA site organizers (84%) indicated that their biggest and sometimes only challenge is obtaining committed participants. The most commonly cited reason for the lack of interested volunteers was summarized by organizer 50 who said "growing food is work. Everybody likes the sound of growing their own food, or joining a community site, but after a week or two in the dirt and the heat and the bugs, a lot of people just give up." Seventeen UA organizers spoke on related topics to the theme of agriculture as hard work. For example, organizer 50 commented:

> One of the challenges I've found is that people really like the convenience of being able to go to a store, if they have one, or to a fast food restaurant, which is most likely what

> they're going to do. Growing food is work. It is not easy, and it requires time, and it requires resources, and requires a lot of blood, sweat, and tears.

Organizer 52 had a similar observation when asked about the biggest challenge facing UA:

> It's the labor, that's the problem, the labor. Everybody loves to reap that benefit, it's the labor. Because the labor is not easy, you come out here and you sweat, it's not easy. People don't want to do the labor, but like if you say come we got to pick something, you get a whole slew of people. But if you say we got do this, plant that, everybody busy. But if it's time to pick the fruit, now, ok you got a lot of volunteers.

Organizer 39 repeated this theme, noting:

> A lot of people build a garden and think people will come, but it ain't like that, you can build a community garden, but people just don't like to do work, they want the harvest, but they don't want to come out here and do the Monday, Wednesday, Friday. You reap what you sow; you got to do the labor.

For organizer 54, the specific challenge was the continuity of a labor force:

> I've had people come, and they'll maybe come for a week, and you know it sounds like such a wonderful thing to do, growing food for the poor, and they find out that it's not all fun, you know it's hard work. And so they don't stay long, unfortunately.

Organizer 36 had a similar claim: "we'll get people that'll come and they'll try for a while then give up. People who will come on a fairly frequent basis, that's hard to find. We'll get some people who come for 2-3 weeks, and then they're done." For organizer 44, obtaining volunteers was "the hardest thing—to get people committed on a regular basis. I've invested in the materials to have a year round garden, if I could have volunteers I would personally fund the operating cost myself, if I just had people doing it." For this organizer, group coordination was not a problem; rather, "It's the day-to-day, the week-to-week, the ongoing, the weeding, the things that people don't like to do." Organizer 28 claimed that at the early stage of the UA site, "We had a lot of people interested at the very beginning,

people who donated time and money to be out here. But, finding people to pull weeds, or lay mulch, or something like that, that's a little more difficult."

Some organizers suggested that the heat of Houston summers made it especially difficult to find volunteers. For example, organizer 46 noted that "it is hard, especially in the summers for people to be motivated, you know to come out, because there's not a lot to harvest, but there is still a lot to do, like mow." Organizer 51 made a similar argument:

> Most people, I used to bring people out, convinced them to come out and garden, but they quit, they quit because they don't like the bugs. "I'm itching; you cannot make me go out there again!" [Spring] is nice, but in the summer time, it's horrible, bugs everywhere, mosquitoes, ants, it's combat.

Besides some personal discomfort from the work involved, or the hot, buggy conditions, there are other, more impenetrable barriers to participation, such as available time and physical ability. Organizer 50 claimed that:

> In underserved neighborhoods you see two other types of personal barriers: older folks, who can only do so much, in many cases. The bottom line, however, is that they are available, and they are typically retired and they have time. Time is not the issue—it's physical capability. And the second thing is you've got people who have the physical ability but they're working two and three jobs a week or even day and they just don't have the time.

Ensuring an even distribution of labor was another concern that 23% of UA organizers specifically raised. For example, organizer 48 said "a lot of times in a community garden you have a few people doing most of the work," and compared running an urban agriculture site to running a business, a field in which she gained ample experience before retiring. Even for her, though, coordinating people with differing ideas and personalities can still be a challenge:

> Major challenges are keeping the group together as a team to participate, a lot of times in a community garden you have a few people doing most of the work, and then people just want to keep their own garden. So I'd like to see 20 people over here working on this compost, because everyone uses it, but nobody wants to work it. Everyone does a great job of taking care of their own bed, and we have a great group who makes sure everything gets plenty of water, but when it comes to cleaning out the shed or turning the compost.

As organizer 3 said, "It's difficult trying to get the gardeners to do their fair share." One way to accomplish a more fair management of labor is to encourage leadership roles among participants. This in fact is a goal for several organizers, such as organizer 47, who not only needs to find committed participants, but participants who are willing to share the burden and responsibility of running the site. "My goal is to find enough people interested in gardening, but also people who are interested in leadership. [The functionality of the site] can't depend on whether I'm out there calling everyone or not. Because if I fall out, the garden shouldn't." Organizers are not always sure how to meet this challenge and help participants to begin taking ownership and responsibility for the site, as organizer 28 pointed out:

> For the garden to really evolve, its needs to become *the garden*, not "[the organizer] sent out an email saying we need to pull weeds," or "[the organizer] needs help pulling carrots this week." I'd rather have people say, "What can we do in the garden this week?" Rather than just responding to a request. So that's the next step that I would like to see happen, but I don't know how to get it there.

Table 17: UA site land tenure.

Land tenure	*n*	%
owner	18	58
lessee	5	16
free-use	8	26
Land owner	***n***	**%**
School	3	10
Religious organization	13	42
Private	4	13
City of Houston	11	35

Land tenure in Houston is another challenge cited by 19% of interviewed UA organizers. UA organizers must navigate considerable transaction costs (e.g., the costs of seeking land and negotiating contracts) to obtain land for agriculture in Houston. UA organizers must find out who owns unused land suitable for UA, how can a UA site get permission to use the land and obtain access to water. After these issues are identified and resolved, the remaining problem is risk inherent to UA. For example, without secure tenure, the landowner could force the UA site to leave with little or no notice, meaning that substantial investments of labor and capital in soil preparation are lost. Organizer 28, for example, related how his UA site was located on an electricity transmission easement. Even though the site is on privately-owned land, the energy company retains the right to tell them to "clear out" without warning. Gaining lawful access to some of these unused sites is a major challenge. According to organizer 50, access is the highest hurdle to creating a new UA site, especially in low-income areas where a site could bring much needed access to fresh produce.

> It's more than just access to food, its access to land that you can build a garden on, and have a long enough tenure, you know, the period of time which you can use the land, that's important. In underserved neighborhoods access to land is a critical item.

> Ultimately the real gain that you have is community, but you got to have the garden first, and access to land is the barrier.

In low-income, "underserved neighborhoods," UA organizers could transform unused lots into UA sites. However, as organizer 41 related, city officials are not always cooperative. At the time of the interview, this organizer was operating on a privately owned site in a residential area that had, according to him, an aging population and was being steadily depopulated. When he first took over the site it was surrounded by abandoned houses at the end of a street. He described the scene thus:

> When I first came to the garden, it was so grassy and growed up, it was almost taller than the house! Wasn't nobody keepin' that yard clean, and these people were afraid to live down here in they own house, cause they didn't know if there was somebody down in here [the overgrown site]. All them other little houses were fallin' down, and it took me a whole year, fightin' with the city to get them to tear 'em down, to get 'em down from around those poor peoples livin' down here alone by themselves. We threatened [the city council] that we'd bring the cameras out here, had to keep remindin' them, because it's been years, the houses, they've been asking them to be torn down for years. I made threats that I was gonna bring news cameras out here and let them see what was goin' on out here. And the city don't like to be bothered with those news cameras.

Once they were finally able to get city workers to demolish the dilapidated houses, and the site was in working condition, this organizer was interested in expanding production into the neighboring, now vacant lots. However, identifying land tenure, and obtaining permission to use the land is becoming more of a struggle than he anticipated. This organizer related how he called a city councilman "several times" but his calls were never returned.

> I wanted to know, does that city own that land? Because [the city] had red-tagged that land. I told [city councilman] I want to discuss with him that lot next door to the garden because I would like to expand to that lot there. We wanted to do some more fruit trees on that lot there. I keep callin', and nobody never returns my call.

At the time of this interview, the struggle of organizer 41 to obtain tenure for the additional lots was ongoing. However, his trials with city officials continued on the existing UA site. As of April 2013, the site had to use one hose to irrigate 21,262 square feet by dragging the hose from the house that is adjacent to the property, while the site has direct access to the water main—but the organizer cannot get the city to activate access.

> We goin' through hell with the city, believe it or not, trying to get this water turned on, they'll tell us one thing, we get it done, then they come back and tell us we can't turn it on until we do this and do that, and we just fightin' with the city for over a year trying to get the water turned on.

Some organizers are aware of possible changes to Texas law that would lower transaction costs and risks of UA. For example, during the interview, organizer 50 referred to a proposed bill at the time (HB 1306), which would make it easier for urban community gardens to access the agricultural valuation of property. This bill did not pass the 83rd legislature of Texas. For organizer 50, HB 1306 would have helped UA by lowering a major transaction cost. He personally owns the land on which the site is located, land that is currently assessed for tax purposes at $202,000. Even though the land is being put to agricultural rather than residential use, he is still required to pay hefty taxes as if it were residential. He supports this recent effort to amend the method of land valuation for UA sites so that it would be based on production rather than market value. This change in value would automatically lower the rate at which UA sites would be taxed. "It would mean we could perhaps bring some other programs in, maybe some teaching programs for kids, we could do more things." Organizer 50 recognized that this measure would also be beneficial for land owners who don't necessarily want to be involved in UA directly, but would like their land to be used in this way for taxation purposes. Vacant land is an expense for land owners who are

required to pay taxes for land on which they are not collecting rent. However, if there was a reduction in taxes for urban land under cultivation, then there would be more incentive for this type of UA land-use.

Securing funding to cover production costs is another concern of 23% of UA organizers. Since 23% of sites depend on funds coming from their organizer, this can be a large burden for site coordinators. Even for allotment style sites where members pay a monthly or yearly fee, almost half (40%) of allotment organizers found this source of funding to be insufficient to cover all costs. For example, organizer 3 said that member fees did not "even cover the watering." This organizer claimed to be "pretty good at finding the money pots" such as donations and grants.

Maintaining a site once it is already established is one thing, but according to organizer 50, just financing the creation of a site can be the biggest challenge.

> Money is always a problem if they don't have the financial resources to build a garden. We spent almost $30,000 building this garden, and the land was free. But when you have to clear the trees, and when you have to level the land and build a fence, because that's what [sites] want. Then you set the blocks in, and get the soil, and even though you have volunteers doing all of that, it's big dollars. And it doesn't have to be that way, but a lot of times it can be very expensive. And in Houston we have to use the raised bed concept, because the soil has way too much clay in it, so that's just the way that works.

29% of organizers cited that the physical ability required to complete the manual labor was a challenge for their UA site. When asked whether her site had plans to expand the food production area, organizer 37 replied, "we're all older and we can't do the physical work now." The realistic solution to this problem was stated matter-of-factly by organizer 39, "To keep a community garden going you need to bring new people in to take over, like we're all senior citizens now, we're not going to be able to do this forever."

4.4 Community impact

Most of this chapter has summarized findings on UA access, tenure, cultivation, and challenges. A less tangible, but no less important, aspect is how all UA organizers perceived the role of UA in the notion of "community impact." Organizers understood this theme in terms of the process of increasing community awareness of UA and increasing community interactions.

For UA organizers, site visibility is an important to component to increasing community awareness and access to the site. Organizer 56 described the change that her site has encountered since becoming more visible to the student community. Initially, the site had poor "visual view… so it was a little dead for a while," but after a sidewalk was installed and foot-traffic by the site increased, there was a noticeable change. "The school is really trying to show that it's here, and I feel like people are more aware of it, since they have to walk by it every day, so I feel like this semester it has become more popular." Sidewalk traffic is the main way that organizer 46 said the community has discovered his park-side site:

> The garden itself attracts people, and the park gets a lot of use. Especially people with kids, and they see the garden, you know even people who aren't interested in the garden, they know about it and I think they appreciate it and if they get interested we tell then all about it and explain it to them, and if they're not, that's ok, they just say hi, admire the garden, and move along.

Likewise, organizer 60 manages a site that is beneficial to the larger community more from an aesthetic perspective than actually increasing community interaction.

> Since it's an allotment garden where individuals rent a plot, it has not had a big community impact, but it does get neighborhood visitors and some from the medical center where it can be seen from the high rises. Visitors who find it enjoy it very much.

Although organizer 47 manages a site that is not as high-profile, knowledge of the site is spreading through word of mouth and at least the immediate neighbors are benefiting from it.

> [The neighbors] like that it's not just two abandoned lots anymore where people just hang out and do nefarious things, at least that is what has been expressed to me. But the garden isn't on a busy street so a lot of people don't realize it's there.

Similarly, organizer 41 said about community awareness and benefits:

> Yes, [the community is] becoming more aware. It's comin', it's comin' slowly because a lot of people in the community are like, "Oh I didn't know this garden was here," but once they see it, we get repeat customers. And the seniors enjoy the vegetables, and enjoy that it came from [the UA site], they are the ones that really appreciate it. That's what keeps me motivated, to see them happier, that what motivates me, and makes me want to do more.

It is not always the immediate, geographical community that is aware and supportive of an urban agriculture site. In the case of organizer 30, it's the greater religious community of Houston that has come together at his UA site. This organizer claims that the site attracts support from Catholics since the site is on the property of a Catholic house of hospitality, but also "with the Lutherans, and the Methodists, and the Presbyterians, and the Jewish community, so it's very ecumenical."

Many sites encourage increased community interaction through the site by incorporating social gatherings such as picnics and BBQs. Strengthening community ties may even be one of the site's primary objectives, as it is for organizer 42 who said:

> We host movies in the garden as a way of making the space open to the community. We don't have a park on this side of town, we have vacant lots that work ok for running the dog around, but we don't have a park space. So we try to stress to people that we want the garden to function not only as a garden but also as a community space.

Even for sites that are located on church property, as is the case of organizer 39, social interaction is encouraged by community participation:

> We just want to keep [the site] going, and give our parishioners, and the others in the community things to do other than to come to church on Sundays and then we don't see each other until next week. It's a really nice social event, we get out here and fellowship, and it's something that I look forward to. We get out here and have fun.

One of the Health Department urban agriculture sites is fenced-in behind their office building, and so is not designed for community use. However, since becoming involved at the site, organizer 52, who works in the office building, remarked on the changes she has experienced in the office community, and how she has observed the strengthening of interdepartmental ties:

> We have different conversations, instead of just talking about that city work, we now have our city garden. Like, "do you know if somebody watered today?" And it's relaxing [to work at the site], and then people come out and check it out. We [the volunteers] are all in different departments, and we used to not talk much, you know, but now we talk a whole lot more since becoming involved with the garden. It's pulled us together because we're talking about the garden.

4.5 Conclusion

This chapter summarizes findings on the primary site objectives and characteristics of UA organizers and how these influence their management strategies and production practices. "Getting food to people" and improving healthy food access were priority objectives for the majority of UA coordinators, which they said contributed to their decision to follow organic principles. This objective was also frequently cited as a catalyst for UA site initiation. Despite this dominant motivation, many organizers acknowledge that UA is not a panacea for food access issues, but maintain that UA is a feasible method for contributing to the issue and

in raising awareness that the problem exists. Beyond contributing to food access issues, organizers report that UA sites provide other benefits to the community at large, such as strengthening community ties and educating both young and old.

The UA site objective is also important because it relates directly to how the UA site operates. The overall objective influences the most effective way to divide site accessibility for management, how decisions are made and carried out, and which farming practices are implemented. This site access is influential to the decision-making process which determines not only which crops are planted and how they are cultivated, but also the harvest destination and distribution. For example, all-access sites, labor, harvest, and decision-making are normally shared, which leads to a simple, flexible method of site management. By contrast, allotment sites are characterized by individuals who lease plots of land for which they maintain full responsibility and autonomy.

The majority of the UA sites participating in my survey own the land on which the UA site is located. This ownership creates a stable, secure environment for a UA site and encourages long-term development goals and management practices.

UA organizers proved to be key components to the operation of a site and used their extensive cultivation experience to guide their management decisions. Even so, many admitted that creating a common resource of cultivation and nutrition information would be critical step towards assisting those wishing to improve or create new urban agriculture sites.

Almost half of all surveyed sites rely primarily on financial support from a charitable or non-profit organization such as a church, civic council, or some other benefactor. For the other half, member-support was the dominant source of funding. No matter what the primary

financial source, over 80% of all sites count on donations and grants to make ends meet, and depend on multiple strategies for obtaining sources of funding to cover costs.

According to site organizers, UA participants are drawn to UA sites for a variety of reasons which include the desire to grow food either for themselves or for others, and because of personal enjoyment. However, in order to maintain consistent participation, physical proximity and ease of access appears to be very important. Even when a site is conveniently located near a source of interested participants, obtaining committed members is the biggest challenge for a majority of UA organizers. "Growing food is work," and after a short time at a site, many participants prefer to get their food using easier means. Even though it is challenging, recruiting and retaining members is a crucial, though often overlooked, component to managing a thriving site.

Managing a UA site is about more than raising food, even though this is a critical component. All site organizers emphasized the importance of the UA system to increasing community awareness of healthy food options and nutrition, as well as increasing positive community interactions that benefit more than individual site members.

CHAPTER V

DISCUSSION

5.1 Introduction

This chapter is a discussion of how my Grouping Analysis (3.2.4) can be used to better connect my two objectives of UA spatial analysis and qualitative analysis of UA characteristics and production practices. This type of analysis has not been performed in the published UA literature. The results of my Grouping Analysis divided UA sites into three groups based on race/ethnicity and their correlated demographic traits. Group 1 UA sites are located in census tracts that have a White majority population, whereas Group 2 has the highest percentage of Hispanic residents, and Group 3 has a Black majority population. The highest percent income and highest value of owner occupied units are correlated with Group 1, Group 2 falls into the median category for both of these variables, and Group 3 ranks lowest for both. Group 2 and 3 both have equally percentages of residents living below the poverty line and living in food deserts, whereas Group 1 has the lowest percentages for both variables.

5.2 UA characteristics

5.2.1 Site objective

There is no discernible difference between groups according to primary site objective. Food Access was a priority for all three Groups, followed by community outreach, and education.

Table 18: Primary UA site objective by group.

Primary Objective	Group 1	Group 2	Group 3
Food Access	12	6	3
Community Outreach	3	2	1
Education	2	1	1

5.2.2 UA Site access

Site access also does not appear to be differentiated by Group. The majority of sites in each Group maintain an all-access internal land tenure division, although Group 3 appears to have a more even split between all-access and allotment than either Group 1 or 2.

Table 19: UA Site Access by group.

Site Access	Group 1	Group 2	Group 3
All-access	11	7	3
Allotment	6	2	2

5.2.3 Decision-making process

Group 1 all-access sites are almost evenly divided between an organizer-lead decision-making process and one where the organizer and the site members are more collaborative. This is contrasted with all-access sites for both Groups 2 and 3 whose decision-making processes are almost exclusively lead by the site organizer. For the majority of allotment sites in Groups 1 and 2, the plot-owner is the key decision-maker. Only two sites in Group 3 use individual allotments, and one relies exclusively on the plot-owner, while the other utilizes a committee to make decisions.

Table 20: Decision-making process according to site access, by group.

Decsion Making by Site Access	Group 1	Group 2	Group 3
All-access			
Organizer Only	6	5	2
Organizer+members	5	1	1
Committee	0	1	0
Allotment			
Plot-owner	4	2	1
Plot-owner+committee	2	0	1

5.2.4 Organizer characteristics

Group 1 has a majority of organizers with extensive cultivation experience. Groups 2 and 3 are almost evenly split in terms of number of sites who have experienced or less-experienced organizers, and Group 2 actually has a majority of sites with organizers who have more limited cultivation experience.

Table 21: UA site organizer's cultivation experience by group.

Organizer's Experience	Group 1	Group 2	Group 3
Extensive	15	4	3
Limited	2	5	2

A slight majority of sites in Groups 1 and 3 have organizers who live within 3 miles of the site they manage, whereas Group 2 is dominated by sites with organizers who live further away.

Table 22: UA site organizer's residential proximity to UA site by group.

Organizer's proximity to site	Group 1	Group 2	Group 3
Lives within 3 miles	9	3	3
Lives more than 3 mi away	8	6	2

The majority of sites in Group 1 have female organizers, whereas Group 3 has almost exclusively male organizers. Group 2 is almost evenly divided between the genders, with a slight majority of female organizers.

Table 23: UA site organizer's gender by group.

Organizer's Gender	Group 1	Group 2	Group 3
Male	7	4	4
Female	10	5	1

Interestingly, the race/ethnicity of site organizers most closely matches up with the Groupings. Group 1 sites all have white organizers except one; likewise Group 3 has all black organizers. Contrary to Group 1 and 3, Group 2 sites have more diverse organizers. Even though Group 2 sites are located in census tracts with the highest percentage of Hispanic residents, the majority of sites have white organizers, and the other half of sites either have a Hispanic or Black organizer.

Table 24: UA site organizer's race/ethnicity by group.

Organizer Race/Ethnicity	Group 1	Group 2	Group 3
White	16	4	0
Black	0	2	4
Hispanic	1	2	0
N/A	0	1	1

5.2.5 Participant characteristics

The average number of participants does not appear to be influenced by a site's group. The number of participants seems to be fairly evenly distributed between all three groups. Group 1 has a slight majority of sites in the middle range of six to ten participants on average. The majority Group 2 sites have between one and five participants, but an almost equal number also have between eleven and twenty-five.

The majority of Group 3 sites are evenly split between the highest and lowest range for number of participants.

Table 25: Average number of UA site participants by group.

Avg. Number of Participants	Group 1	Group 2	Group 3
1--5	2	4	2
6--10	7	2	1
11--25	5	3	0
>30	3	0	2

According to site organizers the primary motivations for participants in all three groups mostly mimic that of the primary site objective. For Group 1 the majority of sites have participant motivations evenly divided between food access and community outreach even though Group 1 sites had an overwhelming majority of sites with food access as the primary objective. Participants of sites in Groups 2 and 3 also show more diversity of motivation with respect to the site's primary objective, while maintain a majority that aligns with the site's food access objective.

Table 26: Primary motivation for UA site participant by group.

Participant Primary Motivation	Group 1	Group 2	Group 3
Food Access	8	4	3
Community Outreach	8	2	0
Education	1	3	2

5.2.6 Participant recruitment strategies

All three groups display the use of at least two different strategies for recruiting participants, with Groups 1 and 2 showing the use of all five strategies. Five sites in Group 1 do not need to perform any recruitment at all to obtain the necessary labor requirements, compared with two sites in both Groups 2 and 3. Unlike Group 2, the most common recruitment strategy for UA sites in Group 1 the use of community service organizations, followed by Urban Harvest and visual advertisements. Only two sites in Group 1 used word of mouth as the primary recruitment strategy, whereas that was most commonly employed for Group 2 sites, and Group 3 sites do not rely on word of mouth at all. Like Group 1, Group 3 most commonly recruits participants through community service organizations.

Table 27: Primary UA site participant recruitment strategies by group.

Primary Participant Recruitment Strategy	Group 1	Group 2	Group 3
N/A	5	2	2
word of mouth	2	3	0
visual advertisement	3	1	0
Urban Harvest	3	2	1
community service organizations	4	1	2

5.2.7 Development goals

The majority of sites in Groups 1 and 3 are well established and do not have any plans to develop their site further, such that their only goal is to maintain the site's productivity. No Group 1 sites had goals to expand cultivation. Group 2 sites show a more diverse range of goals. The most common goal for Group 2 sites is a tie between site maintenance, and increasing community impact, followed closely by improving the site in some way, and lastly to expand cultivation.

Table 28: UA site development goals by group (some sites listed as having more than one goal).

Development Goals	Group 1	Group 2	Group 3
Maintain	14	4	3
Expand Cultivation	0	2	1
Site Improvement	3	3	1
Increase Community Impact	2	4	0

5.2.8 Funding

The most common sources of funding for both Groups 1 and 3 are an almost even split between site members and a non-profit organization. Only two sites in Group 1 had the organizer as their primary source and no sites in Group 3 did. Most Group 2 sites rely on non-profit organizations, with only 1 site getting funding from members, followed by 3 sites that depend on their organizer for funding.

Table 29: Primary source of funding for UA site by group.

Primary Source of Funding	Group 1	Group 2	Group 3
Members	8	1	3
Non-profit organization	7	5	2
Organizer	2	3	0

5.2.9 Production practices

The majority of sites in Groups 1 and 2 are in the smallest plot size range of less than 5,000 square feet. Group 3, however has an even number of sites in the smallest range as well as in the largest range with plots greater than 20,000 square feet.

Table 30: Total plot size of UA site in square feet by group.

Plot size (square feet)	Group 1	Group 2	Group 3
> 5,000	9	5	2
5,000-10,000	5	1	0
10,000-20,000	2	1	1
>20,000	1	2	2

The overwhelming majority of site in both Groups 2 and 3 use a hose for irrigation purposes. Group 1 sites utilized more of a variety of irrigation methods. Like the other two groups, Group 1 also employed hoses most commonly, but many sites also used a combination of irrigation types, or else low flow drip irrigation. The majority of sites in all three groups heavily rely on city water as a source for irrigation, but once again Group 1 displayed more diverse methods for sourcing irrigation water such as well water and rain water collected in barrels or catchments. Group 1 sites also displayed more variety in their methods for soil enrichment, with compost being the most commonly applied amendment closely followed by organic fertilizer. Groups 2 and 3 also commonly use organic fertilizer as

a soil amendment, but unlike Group 1, they do not often employ the use of manure, mulch, or MicroLife. Almost half of sites in Group 2 use compost, but compost is the only commonly used amendment behind organic fertilizer for the group. Group 3 sites rely on organic fertilizer, followed by Nature's Way.

All three groups use manual weed extraction methods only, and are dominated by strictly organic cultivation principles, with Group 3 being exclusively so. Labor sources are not influenced by group at all, and are instead dependent on site access, where all-access sites rely on voluntary participant labor and allotment sites depend on plot-owners (see 5.2.2). Organizers work a large range of hours in each group. Group 1 organizers most commonly work between three and six hours per week, whereas Group 2 organizers often work slightly less, between one and four. Group 2 organizers are almost evenly split between working between three and four hours, or between nine and ten hours a week.

Table 31: UA site production practices by group.

Production Practices			
Irrigation Type	**Group 1**	**Group 2**	**Group 3**
Low-flow Drip	4	1	0
Hose	8	7	5
Sprinkler	0	1	0
Combination	5	0	0
Water Source	**Group 1**	**Group 2**	**Group 3**
city water	14	8	5
well water	2	1	0
rain catchments + city water	1	0	0
Soil Amendments	**Group 1**	**Group 2**	**Group 3**
Nature's Way	2	2	2
organic fertilizer	6	6	3
MicroLife	5	1	0
compost	7	4	1
manure	3	1	0
mulch	3	0	0
Weed Management	**Group 1**	**Group 2**	**Group 3**
Manual	17	9	5
Cultivation Principles	**Group 1**	**Group 2**	**Group 3**
strictly all organic	14	6	5
individual choice	3	3	0
Primary Labor Source	**Group 1**	**Group 2**	**Group 3**
participants	11	5	3
plot owner	6	2	2
Hours /week of work	**Group 1**	**Group 2**	**Group 3**
1--2	2	4	0
3--4	5	3	2
5--6	4	0	0
7--8	2	0	0
9--10	2	1	2
>10	2	1	1

5.2.10 Harvest destination

No site in Group 1 and only one site in Group 2 are located in a food desert. Group 3 has two of its five sites located in a USDA defined food desert census tract. When compared with the organizer's perception of food access in the neighborhood near their site, Groups 1 and 3

match exactly with the USDA food desert classification. Even though only one site in Group 2 is in a census tract classified as a food desert, five site organizers believe inhabitants of the neighborhood surrounding the UA site are limited in their access to fresh food.

Table 32: UA site location in census tract defined as a food desert by the USDA by group.

Site located in Food Desert	Group 1	Group 2	Group 3
Yes	0	1	2
No	17	8	3

Table 33: UA site organizer's perception of food access for neighborhood surrounding UA site by group.

Perceived Food Access	Group 1	Group 2	Group 3
Easy access	17	4	2
Limited access	0	5	3

An almost even number of Group 1 sites donate 100% of their produce as leave the destination of harvest up to the individual choice (IC) of the site participant. Of those sites which allow the individual to choose, an even number both donate a portion of their harvest, as well as keep a portion for their personal use. The majority of Group 2 sites leave the destination of harvest up to the individual choice of site participants, and of these an even number both donate a portion and keep a portion of the harvest for individual use. Group 3 does not have any sites that require 100% donation, and instead all sites allow the participants to decide what to do with the harvest. Like Group 1, all IC Group 3 sites donate portions of the harvest to others while also reserving harvest produce for individual use. Only 2 sites in Group 1 and one site in Group 2 sell any of their produce, and zero sites in Group 3 sell a portion of their harvest.

Table 34: Destination of harvest for UA site by group.

Harvest Destination	Group 1	Group 2	Group 3
Donation Only	8	2	0
Individual Choice (IC)	9	7	5
(IC) Donate	9	6	5
(IC) Sell	2	1	0
(IC) Individual Use	9	6	5

5.3 Challenges

The majority of sites in Groups 1 and 2 own the land which they cultivate for UA purposes. Groups 1 and 2 have similar proportions of sites on free-use land, whereas half the sites in Group 3 are on free-use land and the other half are land owners.

Table 35: UA site land tenure status by group.

Land tenure	Group 1	Group 2	Group 3
owner	11	6	2
lessee	2	1	1
free-use	4	2	2

The majority of sites in Group 1 are on land owned by a religious organization, whereas the same is true for only about half of all Group 2 sites, and zero sites in Group 3. The most common land owner for Group 3 sites is the City of Houston, and the city is the next most common land owner for Group 2.

Table 36: UA site land owner by group.

Land owner	Group 1	Group 2	Group 3
School	2	0	1
Religious organization	9	4	0
Private	1	2	1
City of Houston	5	3	3

The majority of sites in each group are on located on tax exempt property.

Table 37: Property tax status of UA site by group.

Tax status	Group 1	Group 2	Group 3
exempt	16	7	4
non-exempt	1	2	1

Group divisions do not seem to influence the challenge of recruiting and retaining committed participants for UA sites, since the majority of sites in all three groups face this challenge. One-third of all sites in Groups 1 and 2 lack secure land tenure and more than half of Group 3 sites are insecure. Proportionately, all three groups have about the same amount of sites that do not have a reliable source of funding to cover production and maintenance costs. The same is true for physical ability, although Groups 1 and 2 have slightly more sites than Group 3 where the physical ability necessary to accomplish many cultivation tasks of a UA site is a challenge.

Table 38: UA site challenges by group.

Challenges	Group 1	Group 2	Group 3
Recruiting and Retaining Committed Participants	14	8	4
N/A	3	1	1
Secure land tenure	6	3	3
N/A (land owner)	11	6	2
Reliable funding source	4	2	1
N/A	13	7	4
Physical ability	5	3	1
N/A	12	6	4

5.4 Conclusion

No clear pattern is visible between the statistically determined groups and site objective or site access. UA site goals and management cannot be inferred from certain easily obtained variables from US Census data; this finding reinforces the importance of understanding UA sites as responding to processes (motivation of organizer; labor availability; plot tenure) that may have weak relationship to the immediate social and economic context of the UA site. Group 1 sites employ more collaborative methods for decision-making than either Groups 2 or 3, where in those groups decision-making is lead by the organizer in all-access sites or else the plot-owner in allotment sites. Group 1 is distinct from Groups 2 and 3 in that a much larger proportion of organizers in Group 1 have more extensive experience than organizers in the other two groups. Groups 1 and 3 have more organizers living less than three miles from the sites than does Group 2. Groups 1 and 2 have a fairly even ratio of male-to-female organizers, whereas Group 3 has a male majority. The race/ethnicity of site organizers in Groups 1 and 3 reflect the racial majorities of the census tracts on which the groups are based. Group 2, however is more racially diverse and has a slight majority of White organizers rather than Hispanic.

Grouping does not appear to influence participant characteristics or recruitment strategies. The majority of Group 1 and 3 sites indicate site maintenance as a future goal, whereas Group 2 has more variety in terms of site development goals, which in addition to site maintenance includes increasing community impact and site improvement. UA sites in Groups 1 and 3 rely evenly on both site members and nonprofit organizations for funding sources, and even though Group 2 sites also rely on nonprofit funding assistance, these sites depend more on site organizers for funds than site members.

Group 1 sites exhibit the most variety of methods for obtaining sources of water, irrigation type, and soil enriching amendments. However, groupings appear to have no relation to plot size, weed management, strictly organic cultivation principles, primary labor source, or the number of organizer work hours per week. Group 2 is the only group where the organizer's perception of food access for the neighborhood did not match the USDA's access meter, that of presence or absence of a food desert. The majority of Group 1 sites are located on church-owned land, and Group 1 also has the largest proportion of sites designated as "Donation Only" in terms of harvest destination. Group 2 sites are mostly located on land owned by either a religious organization or the City of Houston. The majority of Group 3 sites are located on land owned by the City of Houston, where they are either using the land for free or else paying a nominal fee as a lessee.

Both Groups 2 and 3 rely on individual choice to determine the destination of harvest for their sites. All Groups face the challenge of recruiting and retaining committed participants in similar amounts. Group 3 has a proportionately higher amount of sites that lack secure land tenure when compared to Group 1 or 2. Grouping does not appear to offer

insight into how sites experience the challenge of obtaining secure and reliable funding sources or the challenge of lacking physical ability to complete basic cultivation tasks.

CHAPTER VI

CONCLUSION

6.1 Introduction

Few scholars have devoted attention to the production and management strategies utilized by communally-operated UA sites, including decision-making process and division of labor. In addition, the distribution and destination of harvest has yet to be documented with any precision (Galt et al. 2012; Gottlieb and Joshi, 2010; Kortright and Wakefield 2011; Smith and Miller 2011; Masson-Minock and Stockman 2010; Taylor and Lovell 2012; Thibert 2012). In addition, researchers have yet to pair the spatial analysis of UA distribution with a qualitative assessment that examines socio-spatial relations (Kremer and DeLiberty 2011; Taylor and Lovell 2012).

UPE frames urban agriculture as a system for the production of nature in cities. Although scholars have examined urban agriculture from an urban political ecology perspective, they did not use this systemic approach to clarify the three variables essential to understanding the components of urban agriculture: social process, material metabolism, and spatial form (Pudup 2008; Ghose and Pettygrove 2014). This thesis sought to fill these gaps in the literature by using an urban political ecology framework to determine the spatial patterns, strategic management, and production practices in order to identify who, how, and where food is being produced in Houston, Texas.

A key finding of this thesis is that UA sites were significantly clustered into three groups according to race and the demographic attributes correlated with race. These include Median Household Income, Percent below Poverty Line, and Estimated Value of Owner Occupied Household Units. This grouping analysis, rather than UA access type, or simple

distribution maps, proved to be both an accurate and effective method for representing and interpreting these overlapping demographic and spacial patterns. I also ascertained that UA is currently a minute factor in addressing low food access areas, or food deserts, in Harris County.

In relation to UA management, key findings are that site objective influenced site access, which in turn was crucial to determining management strategies such as decision-making, cultivation practices, and harvest destination. Transaction costs for UA sites were identified by organizers as "challenges" to establishing a food producing site, for example, the price of leasing or owning the site property, and access to and cost of water for irrigation. Owner-occupied sites enjoyed a stable, secure environment which encouraged long-term development goals. Even though obtaining funding to cover all production costs was difficult for some sites, the greatest challenge to managing a sustainable site was recruiting and retaining committed participants. Although the majority of organizers argued that providing food is a priority goal for their site, all organizers emphasized the importance of using the system of UA to educate people about healthy food options and nutrition, and to increase the more intangible—but no less important—benefits of UA such as strengthening community ties through positive interactions.

6.2 Mapping methodology

UA mapping procedures, like those shown in this paper, facilitate the use of a broader, contextual perspective, thus enabling planners, officials, and advocates to more accurately analyze food systems and their integral components. Mapping can identify future sites for development, outreach programs, and priorities for land conservation, as well as demonstrate

the extent of UA and its validity of land use in urban settings (Taylor and Lovell 2012). While there are several methods in remote sensing for identifying and extracting urban agriculture sites, manual interpretation of high resolution imagery has advantages in both accuracy of classification and in the precision of measuring extent.

I followed Taylor and Lovell's (2012) methods for mapping previously documented sites of UA, however, my research did not extend to performing the manual extraction of undocumented UA sites for all of Harris County. Even though I only obtained a snapshot rather than a full portrait of UA's extent in the Houston area, I was able to devote my efforts to spatial and qualitative analysis rather than the time consuming full extraction method. I determined that it was more important to situate the extent of UA within the context of underlying demographic patterns which are known to influence the spatial distribution of sites within a city (Galt 2011, Taylor and Lovell, 2012; Brookover et al. 2013). The spatial analytic approach is useful for describing how variables may or may not be correlated, but this method cannot be used to determine causal relationships. Qualitative field work is needed to understand the underlying influences that determine human behavior.

In addition, not all UA sites maintain longevity due to changing participant habits and precarious land tenure situations. Even so, new sites continue to appear as the idea of cultivation in cities is becoming a more favorably viewed urban land use. For example, since completing my field work in April 2013, I learned of three new sites that would have qualified for participation in my study. Unfortunately this also means that my methods may have missed sites in lower income areas that may have been unable or unwilling to pay Urban Harvest's affiliation fee of $40 a year.

While documenting the full scope of UA in a city is useful in terms of evidence to support it as a significant urban land use that should garner policy attention, such a map would likely be out-of-date within a year. Therefore, if time and labor is limited, mapping and analyzing only previously documented sites is sufficient to gain a better understanding of UA's spatial and cultural context within the urban landscape.

6.3 Spatial distribution

In terms of urban land use, all 70 sites included in this study have a total production area of 40,515 m^2 (436, 097 ft^2). This is roughly comparable to the 160 previously documented community garden sites in Chicago that had a production area of 54,518 m^2 (Taylor and Lovell 2012). Through the manual extraction and classification of Google Earth imagery, Taylor and Lovell (2012) discovered 4,493 additional food producing sites in Chicago on both public and privately owned land, contributing to a total of 208,225m^2 of urban land use. Judging from the similarities between Chicago and Houston's previously documented and extensive UA land use, in addition to the low-density of Houston's population, it is likely that Houston may also have hundreds of additional square meters devoted to urban food production.

After mapping the previously documented UA sites across Harris County census tracts, my examination revealed that urban agriculture is unevenly distributed. The majority of urban agriculture sites in Harris County are concentrated inside Houston's Interstate 610 Loop where population density is higher compared to the rest of Harris County, possibly due to the greater concentration of schools and a need for public-use space for cultivation where space for home gardening is not available. I determined that these sites are not randomly

distributed, but in fact are clustered according to relational patterns. I then statistically categorized these patterns into groups based on racial and correlated demographic attributes such as median income and percent below poverty (Figures 13 and 14).

Like Chicago, more than half (67%) of UA sites in Houston are located in tracts with a median household income of $33,000 or more, although an almost equal number of UA sites are in census tracts where median household income is less than the county average of $57,554 (Taylor and Lovell 2012; US Census Bureau 2013). Contrary to what Kremer and DeLiberty (2011) found in Philadelphia, where 50% of urban food production takes place in tracts with a median income of less than $18,000, only 7% of previously documented sites in Houston meet that description. 15% of all study sites are in a USDA defined Food Desert (Figure 15). These low numbers could be due to the fact that UA in such economically disadvantaged locations may be taking place on vacant lots, with participants who are possibly unaware of Urban Harvest's assistance or unable to pay the affiliation fee, and therefore were not fully accounted for in my survey.

After surveying UA site organizers, I found that while over 25% considered their sites to be located in an area with limited access to fresh food, thereby justifying their Food Access objective, only three of the surveyed sites are in census tracts defined as food deserts by the USDA (Figure 15). Those three sites all recognized this need in their communities; however their participants are not those most in need. Instead, the few committed participants that they have only keep a small portion of the harvest for home consumption and share the majority with neighbors or members of the local community.

6.4 UA management

58% of surveyed UA organizers stated that their sites owned the land on which it operates. This is a significant finding when compared to the 40% ownership rate of CSAs in California's Central Valley as sampled by Galt (2011).

Managing a UA site is a multi-faceted and challenging job, for which none of the organizers I surveyed were paid. Because of this, only organizers who are internally motivated and passionate about the site's objective want to take the time and effort required to manage a site. A particular site's objective is the unifying cause that both attracts and retains organizers and participants alike. It acts like a mission statement for an organization, to give purpose and direction, in terms of management as well as how the site access, or internal land tenure, was divided among participants. Site access type (either allotment or all-access) determined how the site was managed. This is important because it strongly influenced everything from the decision-making process about what and how food was cultivated and how and where the harvest was eventually distributed to how the site was funded. Although the internal land tenure is relevant to site management practices, the external land tenure is relevant to the overall costs of maintaining a UA site. These transaction costs include negotiating the initial access to the site, the cost of purchasing or leasing the land, the associated land taxes, the price of a water source for irrigation, unused but required wastewater services, and the risks of liability if someone were to get injured on land not specifically zoned as "public," as well as the risk of eviction when operating on a limited lease or on vacant land. Three bills were heard by the Agriculture Committee during the 83rd Texas legislative session in 2013 that would have provided fair property tax treatment for UA, exemption from wastewater fees, and protection from liability suits, but

were not approved (Farm and Ranch Freedom Alliance 2013). Only three site organizers were cognizant of any city or state policies that related to UA.

When directly asked about the challenges of managing a UA site, an overwhelming majority of organizers specifically mentioned the struggle to recruit and retain committed participants, and did not mention these transaction costs at all. With a few notable exceptions, UA organizers preferred to talk about the positive aspects of UA, thus minimizing the transaction costs, even when prompted. Only questions directly related to finances were able elicit responses regarding transaction costs. In addition, not all organizers were present when the site was founded and therefore may not be fully aware of the initial start-up cost that was required.

68% of sites leave it up to individual participants to choose what is done with their share of the harvest. While organizers can provide a fairly educated guess as to whether participants are using it as a primary food source, to give to others in need, or more as a hobby, interviewing the participants themselves is the only way to accurately document how UA harvests are being used. Participant interviews would also provide insider knowledge about how UA has impacted their lifestyle in terms of eating habits and nutrition, overall heath, and as a social outlet. Similarly, interviews with the clients of food banks or pantries could be used to better measure the impact of UA donated produce on these recipients. However, for the gap I addressed with this study, UA organizers were the best equipped to provide the information regarding a site's production system.

Like most nonprofit organizations, UA sites have a defined purpose. They all have primary site objectives or mission statements, but they keep them purposefully open in order to accommodate a changing clientele or set of ideals. While having a more precise objective

may make it easier to measure success, most sites are unconcerned with such definitions and often measure success in terms of production, but not always the production of food. Instead, a site's success could be determined by asking the following questions: for food access sites, "Is the site yielding its full potential in produce?" For education sites, "Are we teaching people how to grow their own food?" And for Community impact sites, "Are we benefiting the greater community in some way?" If the answer is yes, then the site can call itself a success because it is in some way accomplishing its primary objective. In an effort to promote this self-reflection, Urban Harvest has encouraged its affiliated sites to record and report the weight and type of produce harvested each season. This strategy is likely driven by Urban Harvest's own need to prove its success to funders and supporters. Even though only 26% of site organizers claimed that community outreach as their primary objective, over half of organizers did say that is was a secondary goal. As such, creating a sense of place that benefits the community as well as site participants was an important component or intention for these sites, thought it did not replace food access in terms of significance.

It is easy to envision UA as a convenient way to use unwanted vacant land or even your own backyard to grow fresh and nutritious produce, and forget that it is work. People (scholars included) emphasize the image of "pulling carrots out of the ground" as organizer 36 said, and forget to mention that hours of weeding and watering in the heat and bugs is required before anything can be harvested. Although organizers lament this common misconception in would-be participants, while trying to come up with labor-saving strategies, this tendency is also present in the UA literature. This farming systems oversight is surprising considering that is has been almost a decade since Heynen et al. (2006) called for more research to focus on the urban political ecology of UA in order to "disentangle the

interwoven knots of social process, material metabolism, and spatial form." Six years later, in an extensive review of the community gardens literature by Guitart et al. (2012) determined that an urban political ecology lens has remained absent from most UA research frameworks. Perhaps because of this UPE oversight, Guitart et al. established that there is a substantial lack of research regarding the cultivation methods of UA practitioners (*how* people grow food).

My thesis addresses both of these gaps and contributes to the UPE literature by focusing on all three theoretical tenets of UPE, as described by Heynen et al. (2006): social process, material metabolism, and spatial form. I applied this empirically by examining where UA was being produced (spatial form- Chapter III), who was participating in the production of UA and why (social process-Chapter IV) and how UA was being produced (material metabolism-Chapter IV). Unless scholars begin to document the production practices and farming systems employed by UA sites, they will miss what organizers deem to be their greatest challenge—that growing food is work.

6.5 Future work

Due to the time limitations of a Master's thesis, I restricted the extent of this study to include only previously documented UA sites. Few cities in the US have mapped the full extent of urban agriculture. In order to fill this gap, future studies could use my dataset and methods to expand the scope of mapping urban agriculture in Houston by including both household and previously undocumented community level food production. Future studies on UA in Houston should investigate transaction costs more closely, since these can create real barriers to entry into urban food cultivation. For example, survey questions could specifically ask for

an average monthly water bill and property taxes (even if paid by a supporting organization). In addition, key actors in public office, city planning, and UA advocates in non-profit organizations should be sought out based on their alignment or exposure to UA activities in Houston. These actors may be more likely to provide information about public policy as it applies to UA transaction costs.

These research findings will be shared with Urban Harvest and participating site organizers to help identify ways to further improve interaction and communication among UA sites, as well as site expansion and new site development strategies. My UA shapefiles and census and food desert spatial datasets will also be developed into web GIS module used to educate high school and university students about practical uses of GIS technology and UA as an urban food production system.

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APPENDIX A

A.1 Survey and Interview Questions for UA Organizers

General- giving *Context*
1. How long has the garden been active?
…since (year)
…established by (individual or organization)
…established because (reasons)
2. How long have you been a participant in UA?
…at this site?
…in UA anywhere
…for which reasons
3. How much time do you spend in the garden?
…actually gardening
…recruiting volunteers
…distributing/ selling harvest
…per week/month
4. Have your perceptions about food and gardening changed?
...No: explain
…Yes: how so
5. What is the purpose or objective of this UA site?
…improve local food supply
…provide youth after-school activities
…strengthen community ties
…provide revenue to organization
6. Do you live in the same neighborhood as the garden?
…If not, where? How far away?
Participants (Labor)
9. Are there common qualities/characteristics of people who participate in this garden?
…No: why not?
…Yes: describe
10. How many people currently volunteer or work here?
…paid workers in peak season (#, when)
…volunteers in peak season (#, when)

…paid workers in off season (#, when)
…volunteers in off season (#, when)
11. How do you think participation affects participants or the community?
…improved health
…sense of connectedness
…contributing to others
…food security
Crop management (Food Production and Harvest Distribution)
12. In the past 12 months, describe:
…how much area was planted?
…which crops were planted?
13. How is the garden divided?
…individual plots
…all-access
14. Who makes decisions?
…about what is planted
…about how crops are managed
…about where harvest is donated or sold
15. How does your garden do the following:
…soil preparation
…planting
…fertilizer application (organic; chemical; frequency)
…weed management (organic; chemical; manual)
…irrigation (type)
…harvest (how, by whom)
16. What is the destination of the harvest? And how far away is it?
…food pantries
…church groups
…intermediaries
…shared with friends, co-workers
…individual/family use
…farmer's market
17. How is the harvest distribution decided?
18. Are seeds saved for planting next year?
Challenges and goals
19. Does your garden have development plans or goals?

20. Do policies (federal, state, local) affect your plans or goals?
21. Do you have any problems with security?
22. What are some challenges you face as garden organizer?
Concluding questions
23. Is there anything else you would like to tell me about your organization?
24. Can you recommend any other UA sites that I should included in my study?
25. Can I observe UA here?

A.2 List of Codes used in Qualitative Data Analysis

I. Farming Practices
   a. Decision making process
   b. Labor
      i. Planting
      ii. Watering
      iii. Weeding
      iv. Harvest
      v. land maintenance
   c. Destination of harvest
      i. Houston food bank
      ii. Food pantry
      iii. Participant-choice
      iv. church
   d. Garden rules
      i. All-organic
      ii. organic-encouraged
      iii. bed maintenance
      iv. consent
   e. Time spent

II. Garden Characteristics
   a. Garden Objective
   b. Organizer's Motivation
   c. Organizer's gardening background
      i. Long experience
      ii. Newcomer
   d. Garden Division
      i. Allotment
      ii. All-access
   e. Garden Size (use GIS and satellite imagery to estimate land area for gardens, since bed size is harder to compare)
      i. Small
      ii. Medium
      iii. Large
   f. Neighborhood's access to fresh food
      i. Limited
      ii. No issue
   g. Participant characteristics
      i. Gender
      ii. Age
      iii. Affiliation
      iv. Proximity to garden
   h. Security
      i. Fence
      ii. Police patrol
      iii. No issue
   i. Affect of policy
      i. No issue
      ii. Aware of potential benefits
   j. Land Tenure
      i. Church-owned
      ii. City-owned
      iii. Private-owned
   k. Development goals
      i. Expand
      ii. Maintain
      iii. Increase community interaction

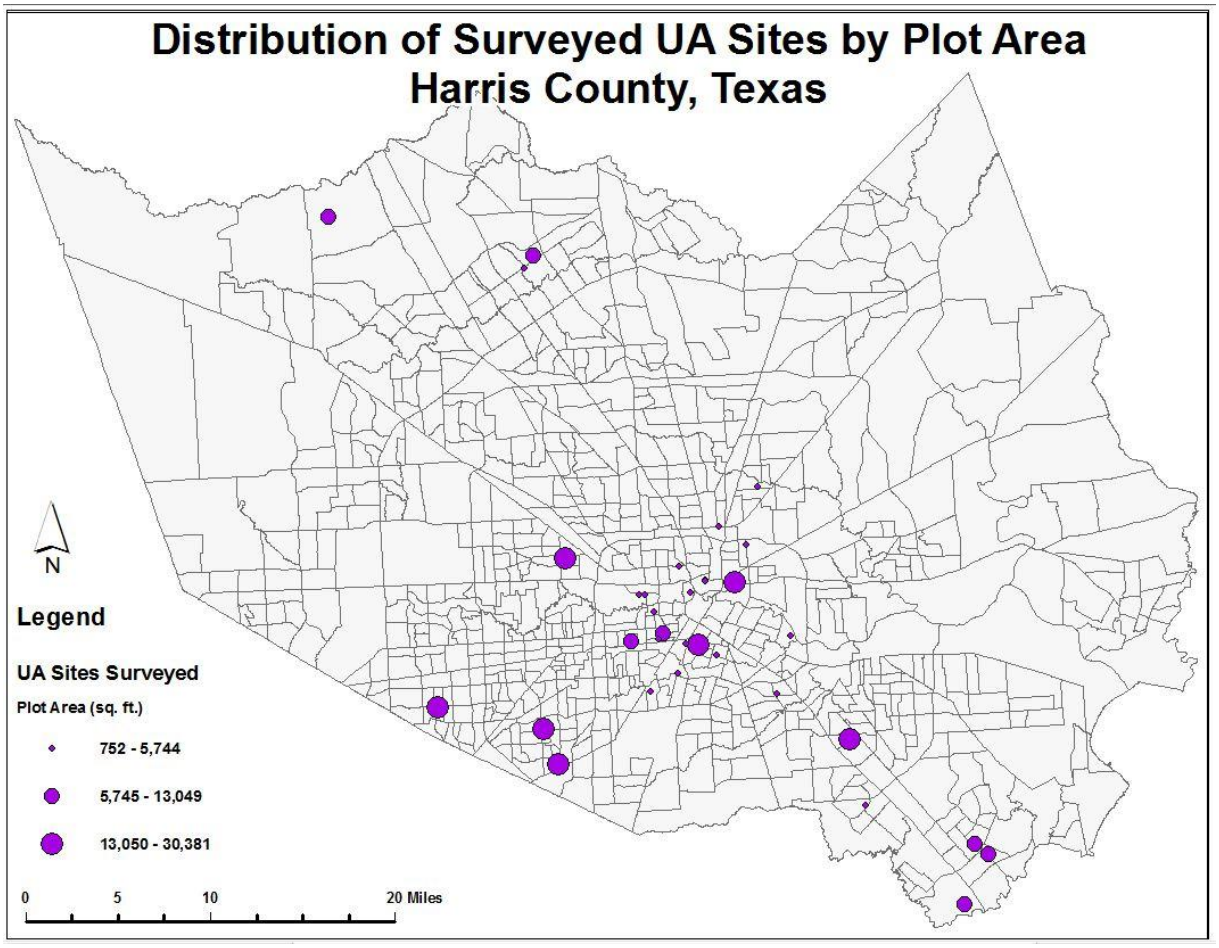
III. Garden Impact
   a. Community Awareness of Garden
   b. Recruiting participants
      i. Urban Harvest
      ii. Word of mouth
      iii. Flyers, newsletters, etc.
      iv. none
   c. Community impact

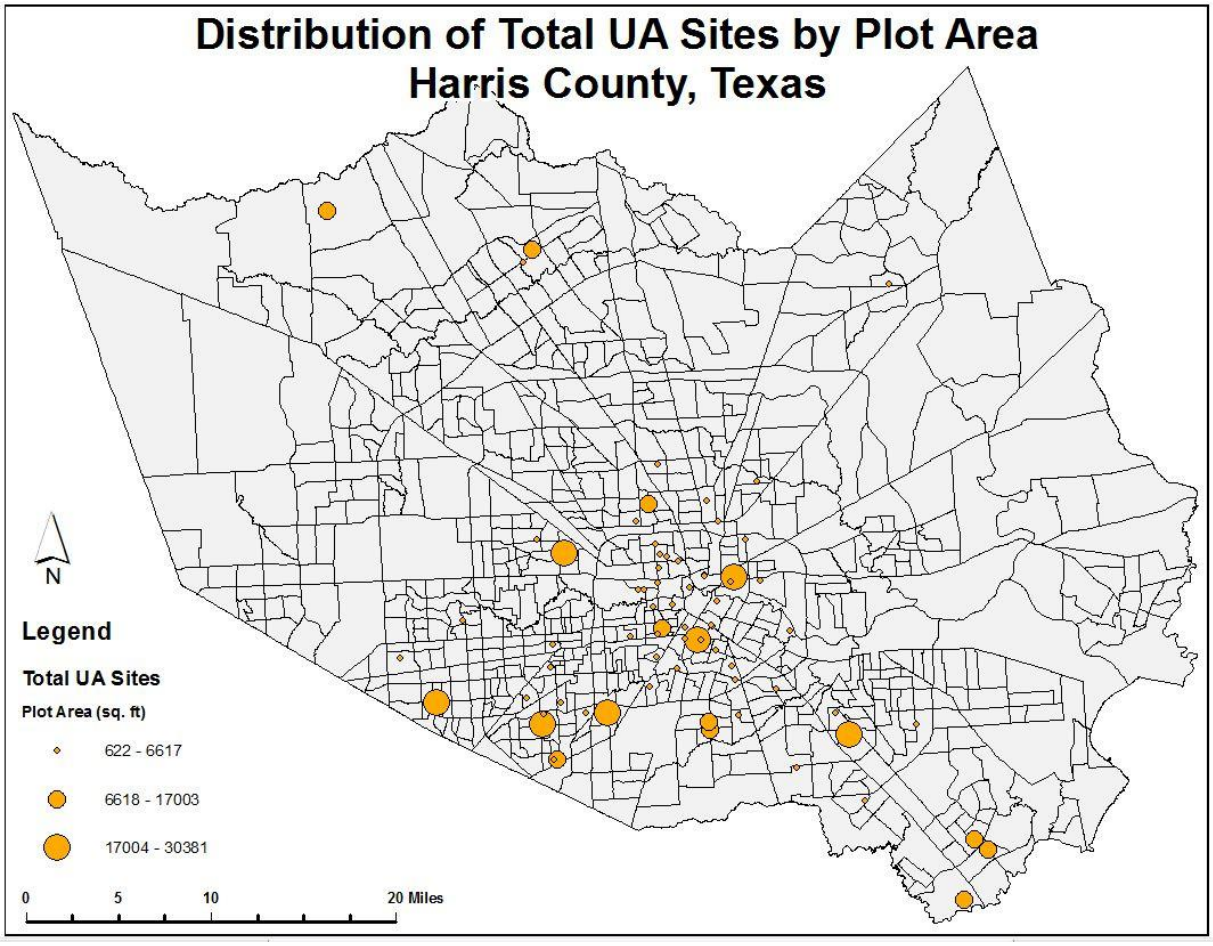
d. Organizer's Changed Perceptions

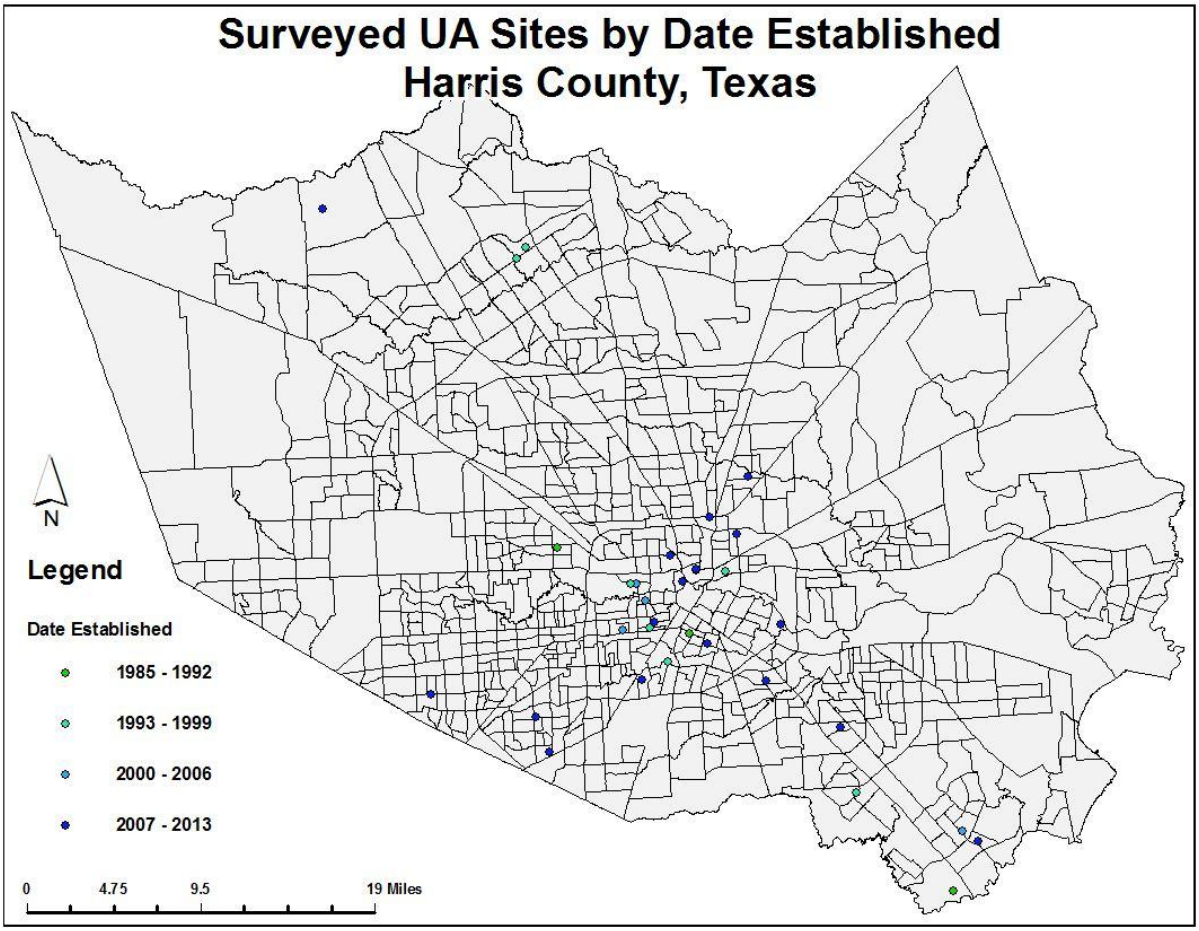
IV. Challenges
   a. Pests
   b. Animals
   c. Committed participants
   d. Security
   e. Funding
   f. Tenure

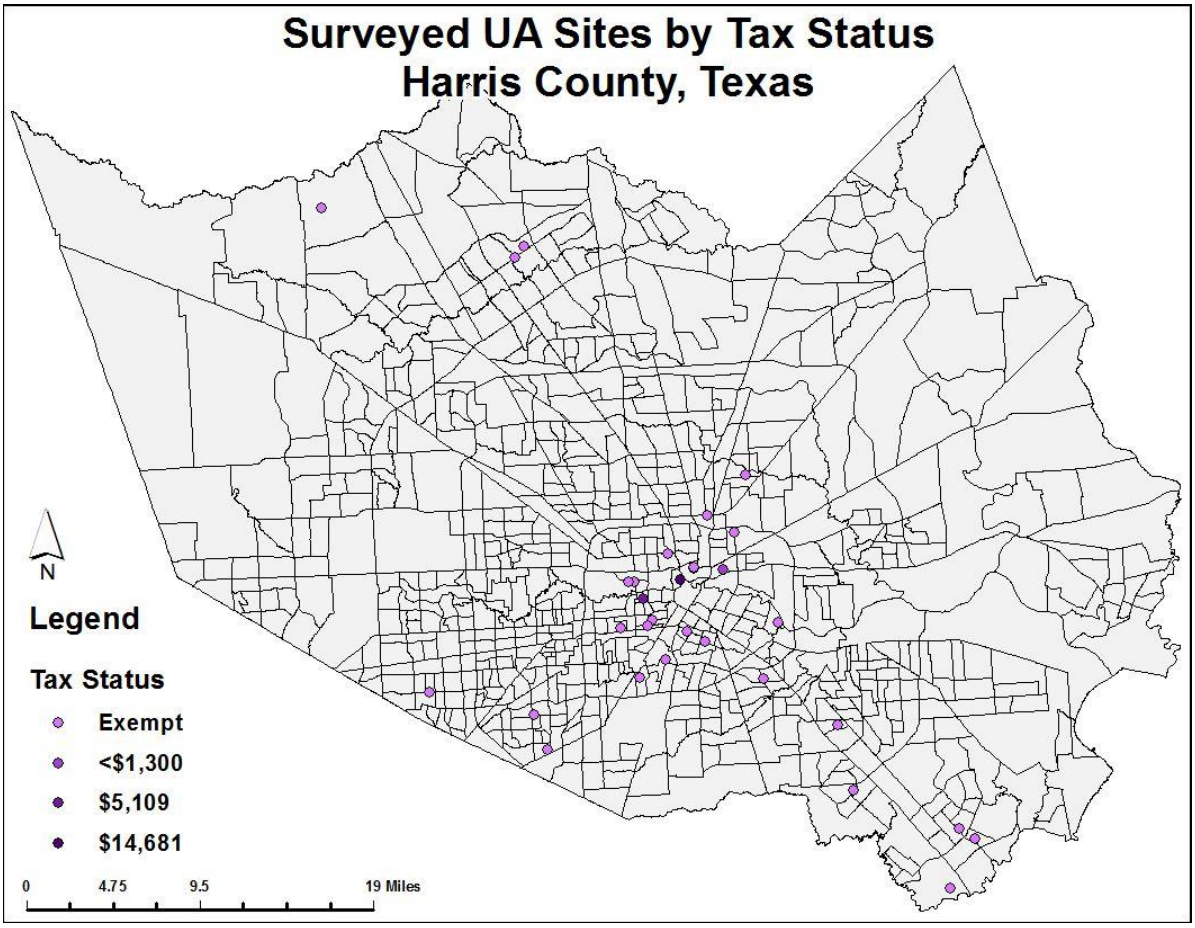
V. Funding
   a. Donations
   b. Church-supported
   c. Grants
   d. Fundraisers
   e. Out of pocket

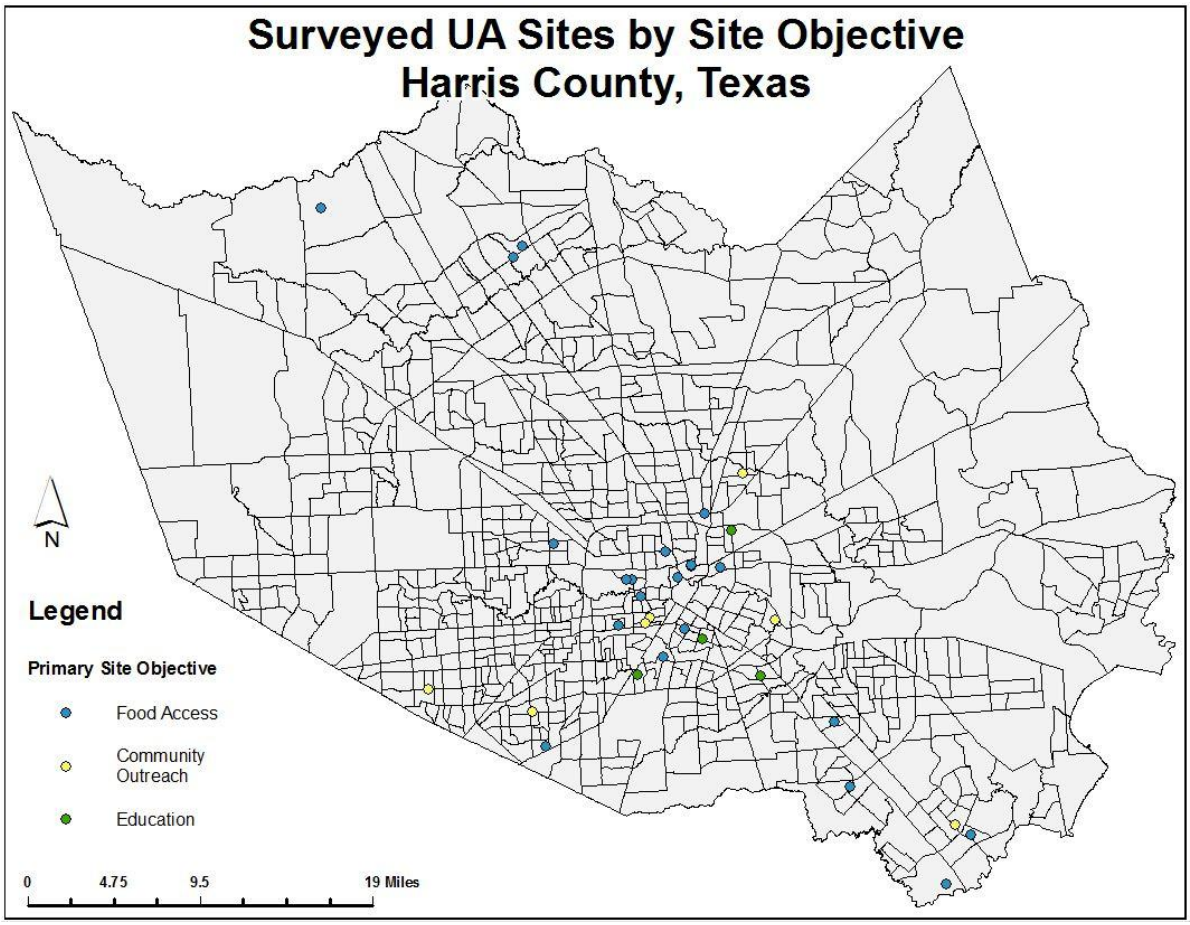
A.3 List of Additional Maps of UA site distributions.




Distribution of Total UA Sites by Plot Area
Harris County, Texas
N
Legend
Total UA Sites
Plot Area (sq. ft)
622 - 6617
6618 - 17003
17004 - 30381
0
5
10
20 Miles


Surveyed UA Sites by Date Established
Harris County, Texas
N
Legend
Date Established
1985 - 1992
1993 - 1999
2000 - 2006
2007 - 2013
0
4.75
9.5
19 Miles


Surveyed UA Sites by Tax Status
Harris County, Texas
N
Legend
Tax Status
Exempt
<$1,300
$5,109
$14,681
0
4.75
9.5
19 Miles


Surveyed UA Sites by Site Objective
Harris County, Texas
N
Legend
Primary Site Objective
Food Access
Community Outreach
Education
0
4.75
9.5
19 Miles