I, Thomas Wadkins, hereby submit this original work as part of the requirements for the degree of Master of Architecture in Architecture (Master of).

It is entitled:
Bringing Urban Agriculture to the University of Cincinnati

Student's name: Thomas Wadkins

This work and its defense approved by:

Committee chair: Jeffrey Tilman, PhD

Committee member: John Eliot Hancock, MARCH
Bringing Urban Agriculture
to the University of Cincinnati

A thesis submitted to the
Graduate School
of the University of Cincinnati
in partial fulfillment of the
requirements for the degree of

Master of Architecture

in the School of Architecture and
Interior Design of the College
of Design, Architecture, Art and
Planning
By

Thomas Wadkins
Spring 2012
Bachelor of Science in Architecture,
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Committee Chair:
Jeffrey Tilman, Ph.D.
Committee Members:
John Eliot Hancock, MARCH
Virginia L. Russell, FASLA
Abstract

Food and shelter are two of the most fundamental aspects of daily human life. With the global population growing at an exponential rate and the distribution of that population rapidly shifting to urban centers these basic needs are becoming more pressing. The paradigm of rural, monoculture agriculture has developed many systemic problems, several of which will only worsen as oil resources become limited. Additionally, as urbanization trends continue transporting food great distances will result in excessive food prices. All of these issues provide strong reasons to plan for urban food production.

This thesis investigates how agriculture can be urbanized on multiple scales and how this will change the culture of a community. The university provides an excellent location to investigate a varied implementation of agriculture in a dense urban setting as well a large population of interested and open-minded individuals. The end result of the thesis will be a design for a dormitory where students live with and care for their food, resulting in a better-informed and healthier community.
All of the original thought, images, diagrams, proposals, and design work in this thesis and the associated design presentations are the exclusive intellectual property of the author, Thomas Wadkins. Feel free to use this copyrighted work for educational purposes, but contact Thomas before using it for any commercial or construction related purposes.
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Thesis
History, Current Paradigm, and New Ideas

Bringing Urban Agriculture to the University of Cincinnati
Thomas Wadkins  Thesis  2012
Food and shelter are two of the most fundamental needs of human life. The experiences and technologies that make up these topics are a part of daily life and their necessity makes these issues truly important. However, their ubiquity results in a perceived mundane quality leaving much of the public unaware of or uninterested in how architecture and agriculture meet their needs. The complexity of these subjects prevents a concise analysis of both simultaneously, which is why this document will focus on presenting the background information for the evolution of food culture in the United States and some discourse from around the world. A few examples of architecture and installations designed in conjunction with or in support of common crops and small food animals will be provided to help illustrate the connections between the topics and serve as precedents for design. The final combination of these ideas will be presented later in the design work for easier visual communication.

Growing up in Minnesota, I had an early exposure to the basics of modern agriculture. I rode past fields of corn, wheat, and alfalfa on a near daily basis, visited with friends on their family’s land in the midst of such farms, and stopped at farmer’s markets and fruit stands by the side of the highway during summer with my mother. I took all this for granted at the time. I understood that some people did not have these experiences, but didn’t really appreciate this fact until later. Once I moved to the University of Cincinnati I had to make my own food choices: first at the dining hall, and then later in the kitchen when I moved off campus. I had to learn to judge food quality for myself, and could easily see the difference between the quality and culture of the grocery store and farmer’s market. I also was exposed to ideas of sustainability and ecology through classes and student groups that rapidly expanded my perception of food issues to include history, finance, diet, and region based differences. Even still, Ohio was not that much different from Minnesota. It took a few more minutes to get out of the city and into farmland, but the crops and most of the experiences were nearly the same.

As I traveled more broadly and saw places where this wasn’t the case the ideas from school really rooted and I began to understand an overlooked experience from my childhood. The family dinner was something we enjoyed regularly when I was in elementary school and when we visited my grandparents in Idaho, another state known for agriculture. As my brother and I grew up the whole family took on more activities and it became increasingly difficult for us to have home cooked dinners. We still ate together most of the time, but the food increasingly came from restaurants that were on my mother’s way home from work. This trend continued with my family even after I left for school and I had my own version in Cincinnati involving many ready to make items and simple foods like peanut butter. Realizing this connected me with many of the books I was reading about food and food culture and gave real power to their ideas. All of the trends and debates were experiences I had lived through and could imagine so many others sharing. This realization shaped the goal for this research: to provide a sense of food literacy, both for the audience and myself. As an extension of that idea the design process will produce a facility that promotes the healthy integration of agriculture and human habitation in an urban environment to show the viability and sustainability of such a project, while also increasing food literacy in a larger community.
A Cultural Shift

There has been a long-term shift in the structure of society that has come to define Americans’ relationship with their food. A very simplified history summarized from university courses and pages 19 and 20 of Cradle to Cradle explains this shift. At the beginning of the industrial revolution in England there were many full-time farmers and cottage industries where people would produce goods and grow a portion of their food while guilds would handle much of the product distribution. With mechanization of production many cottage workers moved into factory production and as speed and quantities increased in exponential leaps other industries adapted to provide greater distribution for these products. These advances in transportation and the possibility of higher direct wages led many people to move towards the factories or towns generating or distributing goods, which led to significant urbanization. Mechanization also worked its way into farming resulting in more migration to the cities and the evolution of industrialized agriculture. In part because of their rapid growth early city plans were often centered on industry and housing leaving little or no space for gardens or even public parks. This was especially pronounced in poorer areas where many factory workers were concentrated into row or tenement houses. This resulted in a range of health and life safety issues that influenced the architectural profession through the creation of planning boards and building codes, but it also had less articulated consequences.

Subsequent generations of urban dwellers were being cut off from their rural roots and forgetting their food culture in favor of one that fit neatly in to the type of city they lived and worked in. Because there was no space to grow food in the city, the same trains that shipped products out delivered produce into the urban masses. While the meals cooked were probably similar to those in the countryside the method of procuring food and the variety available was certainly different. This began a shift in culture separating urban and rural ideas of food. While the Arts and Crafts movement pushed back against this change in England, it mainly focused on production values, and only indirectly advertised for a revival of country lifestyles derived from cottage industry memories. This reflex did not last long or not slow the repetition of the industrialization pattern during the early history of the United States. Readers might be familiar with the work of Upton Sinclair and others as one of the earliest serious critique of some of the safety issues in the industrialized food system.

Around the time the muckrakers were investigating a series of particularly interesting changes began to occur. In Quantifying the American eater: USDA nutrition guidance and a language of numbers Jessica Mudry discusses the contributions of Wilbur Atwater, nutritional chemist for the United States Department of Agriculture (USDA), and of the organization as a whole in changing the diet of the average American. Researching in the 1890s Atwater sought to define foods as “healthful” and “economical” through the use of calorimeter data to judge nutrient quantity versus cost. In 1914 the Smith Lever Act tasked the USDA with advising Americans on what to eat. Following this in 1917 the USDA published their first food-buying guide, which set up food groups and discussed how to select foods for the “needs” of the household rather than appetite or satisfaction (Mudry, p244). This philosophy on food selection comes directly from Atwater’s article in the 1894 Yearbook of Agriculture, “We need to observe our diet and its effects more carefully, and regulate appetite by reason” (Atwater 368). The guide also referenced the “American House” propagandizing food choices as a way to fit in (Mudry 244). This bias in the book was a result of the Progressive Reform movement spanning roughly from 1880-1920, which promoted a middle class aesthetic of efficiency, cleanliness, rationality, and patriotism as morally good American values. This thinking was geared towards making a wave of new immigrants assimilate into the Progressive idea of
American culture. With this goal in mind the food-buying guide became a metric for Reformist social workers tasked to newly immigrated families. They noted dietary choices with distinct heritage linked to a family’s home countries as signs of those families being “not fully assimilated” (Mudry 248).

This standardization of the American diet privileged certain basic foods like milk and particularly cereal grains, which occupied a main position in USDA recommendations until recently (see appendix A; figures 1, 2). It also opened the door for major promotion of processed foods by companies looking to take advantage of transcontinental shipping lines. “By the late 1920s, a new ideal of modernity had gained powerful cachet in society... the uniform and hygienic trumped the flavorful and distinctive... homemakers learned to rely more and more on advertisements and outside experts... American shoppers of every class and gender would experience this transformation in one way or another” (Vileisis 7). The evolution of the American cookbook provides another means of tracking the level of food knowledge through this period.

The offering of standardized products available nationwide and diets averaged to fit the nation set the stage for the next major change in American agriculture. While the Industrial Revolution had provided tools and machines to allow farmers to work more land and send their harvest to far off consumers, an even greater phase of industrialization and consolidation was about to occur. World War II pulled men off the land across the country and a government campaign was formulated to promote Victory Gardens in order to ease the strain on the system trying to feed those at home and abroad, allies included, with less available labor. The result by 1944 was an estimated 20 million gardens producing eight million tons, or 40 percent, of the nation’s vegetables (Nordahl 136). However, after the war the massive increase in manufacturing capability and a shortage of farmers returning to their land resulted in new mechanization of agriculture. The capabilities of new farm machines also led to consolidation of jobs, pushing many returning men to look for jobs in cities. The modern agriculture I saw growing up was born during the post-war period of the 1940s and 1950s. Small farms were consolidated to the point that the largest 10 percent of farms went from producing 10 percent of total farm production in 1948 to 48 percent in 1964 (Shover 6-7). This was made possible by larger equipment and the use of more fuel, pesticides, synthetic fertilizer, irrigation, and antibiotics for use in meat production (Vileisis 8).

The USDA records this shift in its Agriculture Fact Book 2002, “The number of farms fell dramatically after its peak of nearly 7 million in 1935, with most of the decline occurring during the 1940s, 1950s, and 1960s... By 1997, about 1.9 million farms remained... the remaining farms have a larger average acreage.” To put this in greater perspective, the population of the United States in 1935 was recorded at 127, 250,232 yielding about 18.2 people for every farm in the country. Compare this to 1997 with a population of 267,743,595 individuals or 140.9 people per farm (population figures from U.S. Census Bureau). The same USDA report states, “Production is concentrated among large family farms, very large family farms, and nonfamily farms.” As documented in the film Food, Inc. many of the large farms still owned by families are heavily in debt or are locked in to corporate contracts to the point where they are family owned only in name. USDA data (see appendix A) from 2007 paints an interesting picture of the American agricultural landscape. Many small family farmers do not list their primary occupation as farming (figures 3,4) while the breadbasket region of the country along the Mississippi basin and into the Great Plains, is dominated by leased farmlands (figure 5). This strip of commercialized farms includes many of the largest farms, aside from the cattle ranches in the west (figure 6), and as such roughly defines the largest total value and income figures for farms (figures 7,8). Interestingly these farms are also the most fertilized and chemically treated in the nation (figures 9-14). They also receive the
While these corporate farms receive subsidies for various reasons little of it goes to the farmers themselves. As mentioned, Food, Inc. and other food documentaries mention the financial plight of the people who actually farm the land and the USDA has also published data on this issue. Figure 16 in appendix A shows the full breakdown of how money used to purchase food is spent throughout in the supply chain, leaving just 19 cents on the dollar for the average farmer to live on. In an effort to understand what subsidies are used for the organization Kitchen Gardener’s International produced a diagram of the White House Garden (figure 17) showing how it is planted now versus how it would be planted if the area and crop type were proportional to the government subsidies for each crop. There are ten main crops being subsidized with corn receiving the largest proportion at 35 percent or $4 billion in subsidies in one year. The Corn Farmer’s Coalition uses USDA statistics to break down what American corn has been used for over the last fifty years. They show that the primary use is feed for animals followed by exports and, in recent years, ethanol production (figure 17). They also state that only 1 percent of the corn produced is the sweet corn humans eat from the cob, can, or in a frozen form and only 5 percent is used for fabric, plastic, chemical, and food ingredients. One of the major ingredients made from corn is high-fructose corn syrup, the use of which exploded in the 1980s (figure 19). The USDA noted in their Agriculture Fact Book 1998 that, “In 1996, Americans consumed 73 percent more caloric sweeteners per capita than in 1909.” They also note that sugar is the number one food additive present in a surprising array of products, including “… pizza, bread, hot dogs, boxed rice mixes, soup, crackers, spaghetti sauce, lunch meat, canned vegetables, fruit drinks, flavored yogurt, ketchup, salad dressing, mayonnaise, and some peanut butter.”

Comparing consumption habits from 1970 to 1996, the use of corn sweeteners, one of the most common sweetening agents, has quintupled. Figure 20 in appendix A has a table showing this information and other shifts in consumption habits.

The availability of cheap, subsidized ingredients and the trend of industrializing food systems affected American eating habits in another way. Corn fed beef could be produced quickly in large quantities and modernized slaughterhouses could produce identical products. Given these capabilities the McDonald brothers adapted assembly line techniques to hamburger stands in the 1940s, providing a successful model that developed into a national chain of franchises in the 1950s (Mc D’s website). The success of their business and competing variations led to a huge demand on the production techniques for specific products. This further tailored food processors to produce standardized goods. Today fast food venues such as McDonald's are ubiquitous in the contiguous United States, with no point more than 107 miles from a restaurant (figure 21). This saturation is an important factor in the loss of food knowledge in the United States. John R. Thompson in Dinnertime discourse: Convenience foods and industrial society notes that, “Fast Food then serves the purpose of articulating bodily needs to the temporal structure of the industrial system” (183). This structure of time he discusses comes from a division of the day into equal segments portioned off in to sections of “work day” and “my time.” This sets up time as a currency so “it is not passed, but spent” (Thompson 61 1967). He also quotes the work of another scholar, Kenneth Burke, who points out that, “often we must think of rhetoric not in terms of some one particular address, but as a general body of identifications that owe their convincingness much more to trivial repetition and dull daily reinforcement than to exceptional rhetorical skill” (Thompson 187 2011). Further reinforcing the paradigm of fast food in contemporary society is the fact that several generations have now grown up with the industry around them. This is very important in youth food choices as Lynn M. Walters points out, citing the research of Birch and Fisher, “Key environmental factors in dietary patterns include exposure to and accessibility of foods,
social context of food experiences, and interactions with adults” (Walters 431). In effect, each generation supports a higher saturation of fast food by observing and being subjected to the consumption habits of their parents.

**Critique of the Modern System**

This history has created a food production and processing paradigm that has developed increasingly potent and publicized problems. For example, the United States loses soil to wind and water erosion 10 times faster than it is naturally regenerated (Lang, Soil erosion threat). This loss is largely due to soil being stripped of protective cover plants and their stabilizing roots and being left bare between crop cycles. This rate of erosion has decreased significantly from the dust bowl of the Depression era. However, a corresponding decrease in production efficiency has followed the loss of soil fertility. In 1940 1 calorie of energy from fossil fuels was needed to produce and deliver 2.3 calories of food, but as the use of petroleum products increased in farm chemicals, machine requirements, processing lines and shipping that ratio has inverted. Today it takes 10 calories of fossil fuel energy to produce and deliver 1 calorie of food (Nordahl 16). Part of this cost is the shipping of products, fresh out-of-season produce in particular. To reach the supermarket shelf in the United States, an average piece of produce travels 1,500 miles (Nordahl, p6). As fuel prices rise and oil production passes its peak this system will be increasingly expensive to operate, eventually reaching a point where costs exceed what consumers are willing or even able to pay for food items. Additionally, as petroleum usage becomes prohibitive, all of the specially bred and genetically engineered crops that rely heavily on pesticides and herbicides will become too expensive for farmers to use.

In addition to these problems of process there have been significant health impacts across the United States. Films such as Fast Food Nation and Supersize Me have documented the prevalence of and problems with consuming fast food as a major portion of an individual’s diet. Morgan Spurlock, director and subject of Supersize Me, gained 24 ½ pounds, or 13 percent of his starting bodyweight, over a 30-day period during which he ate all three daily meals at McDonald’s and always replied “yes” when asked if he wanted to supersize his meal. This effort was aimed at understanding the problem of obesity in America and the power of corporate advertising, policy, and product design in contributing to that problem. It took him 14 months on a supervised vegan diet to lose that weight and correct related health concerns. This highlights the difficulty of correcting obesity, an additional problem to the one he originally set out to investigate. Comments from the Surgeon General spurred his investigation while data from the Center for Disease Control (CDC) shows just how severe the problem is. The CDC has tracked obesity in each state and found that in 1990 there were no states with an obesity rate greater than 15 percent while in 2007 only Colorado had a rate less than 20 percent. They also found on a national scale the trend of childhood obesity is reaching percentages in the upper teens and that one in three adults older than 20 are obese (Nordahl 39). The CDC also notes that being overweight or obese is a significant risk factor for coronary heart disease, type 2 diabetes, certain forms of cancer, stroke, and osteoarthritis among other conditions (Health Consequences, CDC).

Obesity rates are higher in lower income segments of the population and directly correlate with two conditions. The first is the relative cost of various food items, with processed foods being much cheaper and more filling than healthier items. In Public Produce, Darrin Nordahl compares a large, organic peach bought fresh at the farmer’s market to a McDonald’s double cheeseburger. The peach has about 73 calories and less than 1 gram of
fat, compared to the 440 calories and 23 grams of fat in the burger, yet at the time both cost one dollar (37). For people with little money to spend the burger provides more energy, but limited nutrition. In addition to economic factors affecting their decisions, these segments of the population may only have fast food establishments and convenience stores to select food from. These regions, called food deserts, exist in many cities as grocery stores move out of depressed areas leaving remaining residents with few options for obtaining healthy food. Nordahl describes this situation in Los Angeles and the Cincinnati Enquirer found seven areas in Cincinnati, including Avondale, Camp Washington, and the West End, with a similar problem (Ramsey). Michael Pollan describes this problem in In Defense of Food, “Not everyone can afford to eat high-quality food in America, and that is shameful” (184). This problem is defined by the USDA’s Economic Research Service (ERS) as “the lack of consistent access to food of sufficient quantity and quality to avoid hunger and malnutrition.” The ERS data in figures 22 shows that food insecurity has been a problem for more than a tenth of the American population for over a decade.

This on its own is a serious issue, but another type of health risk poses a food security problem even for wealthier families. Since the early 1990s the number of reported disease outbreaks from contaminated produce has risen from roughly 100 events in a year to nearly 350 events in a year in 2009 (Nordahl 148). E. Coli and Salmonella variants are the most common contaminants and resulted in two pieces of legislation in 2004 and 2006 attempting to alleviate the problem. However, as Nordahl discusses, the cases continue to happen, leaving hundreds or thousands sick with no warning and killing at risk individuals like young children and the elderly (23-25). In each of the cases Nordahl cites the source of the pathogens is traced back to one location, either a farm using untreated human or animal waste for fertilizer, or a processing plant with safety issues. However, he points out the true problem is in the organization of the system. Small problems from one farm can spread to hundreds of distribution locations when the produce from that farm is mixed with other like products, and then it becomes very difficult to track and correct resulting in national warnings and recalls. The problem is exacerbated with meat processing where that minor problem can result in mass contamination as meat juices drip and ground products are mixed. The lack of redundancy makes problems potentially catastrophic and the complexity, scale, and lack of transparency in the system only makes the Food and Drug Administration’s (FDA) task of regulating the process more difficult. The FDA has hundreds of thousands of processing, shipping, distribution, and sale locations to evaluate for safety, but visits less than 2 percent of these sites annually and inspects less than 1 percent of imported foods due to the massive logistical problem of their mandate (Nordahl 31).

**Ongoing Actions**

A variety of individuals and organizations have come together to combat these problems as well as the less quantifiable issue of cultural loss. The last decade has seen this population boom, with a number of books, articles, and interviews being published and posted for public viewing. One such voice for general sustainability is the collaboration between William McDonough and Michael Braungart in their book Cradle to Cradle. They discuss the industrialization process described earlier and the results this has had on agriculture. Predominant among these changes is the monoculture style of farming prevalent today throughout the world (33-35). By recognizing all of the required inputs, losses, and effects of this system including water loss, soil erosion, overuse of chemicals to ensure minimum saturation, chemical runoff and resulting environmental damage, soil nutrient depletion,
pest and disease susceptibility, and reliance on petroleum they reframe our understanding of industrial agriculture. Their balance sheet approach of looking at something holistically over its lifecycle demonstrates a realistic evaluation system that they suggest can be applied to any process in support of sustainability. This evaluation method shows industrial agriculture to be a deteriorating and relatively inefficient system as opposed to the thinking that built it up as the only method that could produce enough food to satisfy the global demand (35). McDonough and Braungart also note that a finished product contains an average of 5 percent of the raw material involved in making and delivering it (28). As mentioned previously 10 calories of fuel are used to bring 1 calorie of food to consumers in today’s system and after the discarded portions of crops are considered it is easy to see that 5 percent may be a generous estimate when considering the delivery efficiency of the modern food system.

Related to this discussion of monoculture is a segment from Janine Benyus’s book Biomimicry highlighting the efforts of The Land Institute to develop polycultural sets of crops for Midwestern grain farms. This effort, described in the second chapter of Benyus’s book, analyzes the existing organization and strengths of the prairie ecosystem in an effort to reproduce those characteristics for industrial scale farms. The systems The Land Institute are developing are proving to be inherently pest, weed, and drought resistant. The perennial plant species they are working with to avoid yearly tilling and planting are also naturally supportive of soil fertility. Once the institute achieves yields comparable to modern farms on a consistent basis they will work to promote this system to American farmers. Right now they only fall short in years that have favorable conditions for the monoculture crops, meaning in a normal year with variable weather the fields at The Land Institute produce nearly the same yield as a typical wheat field.

Benyus also recounts the story of Masanobu Fukuoka’s experiments on his own farm in Japan, which led to a symbiotic crop system that improved his yields and reduced his work inputs. Fukuoka had typical problems with weeds and soil fertility, but after some experimenting and relaxing the rules of traditional system he discovered a rotational mixed planting schedule in which the sequence bolsters the soil, impedes weed growth and allows several harvests a year, stabilizing his cash flow. As an added benefit, he found the system yielded up to five times the harvest for an amount of labor comparable to the old system. These are just two examples of how new thinking and experimentation can improve on the monoculture system.

In contrast to these large-scale efforts many authors have investigated or proposed individual or neighborhood scale gardens. Novella Carpenter tells the story of her urban garden in Oakland, California in her book Farm City: The Education of an Urban Farmer. Her story documents the process of growing a garden on the vacant lot next-door and caring for a hive of bees and progressively larger farm animals. This experiment integrated her into her neighborhood, area community groups, and a community of gardeners, farmers, and chefs across the region. She writes about her pride and sadness as the various projects succeeded or fell to some misfortune. She describes the relationships, happy or strange, that she developed as her experience and skills grow in conjunction with those relationships. Her story shows the reality of being an urban farmer and links the efforts to her personal heritage and a global history of urban agriculture. For example, in Cuba and Tanzania the government encourages urban agriculture with even large animals being commonly kept. In Poland 28 percent of urban families engage in agriculture and in Shanghai 85 percent of the city’s vegetable consumption is produced within the city limits (204). In her history she notes that urban agriculture has even been a major strategy in the United States during depressed eras. The dormancy in more prosperous times is the major difference from the other examples she provides that maintain a constant presence.
The sense of value Carpenter derives from her garden is echoed by Michael Pollan in The Omnivore’s Dilemma when Pollan describes a meal he provided for himself through foraging and other activities. It “gave me the opportunity, so rare in modern life to eat in full consciousness of everything involved in feeding myself” (9). This sense of value is analyzed by Barry Brummett in Hunting, gardening, and the original work of art: A homological analysis. Brummett compares the cycle of food production to the writings of Walter Benjamin on the value of unique objects as opposed to mechanical reproductions. “It is not just that this food all looks alike (in reference to supermarkets), it has the characteristic of mechanical reproduction, especially when considered in contrast to the work of art. Where did the carrot come from, what is the story of the steer that became all this meat? Where is the aura of distinctiveness or vegetable or animal such that it becomes a presence, an entity, in relationship to which we can stand?” (Brummett 261). This strongly echoes the values of the Arts and Crafts movement mentioned earlier and Brummett continues by discussing how many people lack the willingness to grow their own food and what alternatives exist for that population. “Here we find the middle ground of green politics, which in preaching the local and the healthy to people who cannot or will not get their own food must cultivate mindfulness. Surely mindfulness in food or politics is desirable, even if a more tepid version of decisiveness.” Italics by Brummett (267).

This search for self-reliance and value shows up frequently in the word and story choice of authors and in the tone and language of interview subjects. The success of groups like Growing Power on a national level, and the Urban Farming Guys in the Lykins neighborhood of Kansas City, Kansas showcases these feelings and the impacts they can have on communities. In the first two years of the Lykins neighborhood project the crime rate dropped 21 percent and local families are joining the instigators in developing gardens and an orchard and renovating a nearby school building for after-school programs. Some of the members are also testing small aquaculture systems where Tilapia and plants live in a closed nutrient cycle. The fish also provide an additional food output when their numbers are regulated to keep the systems running smoothly. This set of ethos focused on the local and personal investment uses food and the work of producing it as a powerful social tool to build communities and spread knowledge (urban farming guys).

Many of these efforts and ethos relate to the ideas of one of the largest food-centric organizations, Slow Food International, which has been advocating and organizing to improve our relationship to food since 1986. Since the organization’s philosophy applies to the spectrum of issues already discussed and was a major originating force for this thesis project it is worth covering in depth. The slow food movement began in Italy with a political bent that evolved to focus on preserving local culture and artisan foods. Carlo Petrini and the other founding members were reacting against an ongoing loss of cultural identity, related in part to the national politics of the time as well as the pressures of the industrial agricultural system. Petrini states,

In the demented drive towards a world of tomatoes that don’t go bad and strawberries with salmon genes, indigenous species and varieties selected by tradition, their flavors and the opportunity (of which we have already availed ourselves in the past) of finding varieties resistant to the attack of parasites in the far corners of the earth are all being sacrificed. (Andrews 20)

Another major point of contention for these activists was the condition of “fast life,” a sentiment that was alluded to earlier in the discussion of industrialized time structures. Folco Portinari wrote the original Slow Food Manifesto, which contained a detailed critique of “fast life” including the following passage.

The culture of our times rests on a false interpretation of industrial civilization:
in the name of dynamism and acceleration, man invents machines to find relief from work but at the same time adopts the machine as a model for how to live his life. ... Against those, and they are in the majority, who can’t see the difference between efficiency and frenzy, we propose a healthy dose of sensual pleasures to be followed up with prolonged enjoyment. (Andrews 30)

This critique and further discussion by Andrews in The Slow Food Story has strong parallels to the Arts and Crafts architectural movement. All of these discussions saw the standardization and quantity of industrial production as eroding traditional knowledge. While the Arts and Crafts movement tried to promote direct opposites to industrial production the slow food movement provides a more comprehensive approach. The idea of a slow lifestyle leading to a holistic embrace of healthy, pleasurable, sustainable culture is at the core of the movement’s ideology.

The quest for slowness, which begins as a simple rebellion against the impoverishment of taste in our lives, makes it possible to rediscover taste. By living slowly, you understand other things, too: by slowing down in comparison to the world, you soon come into contact with what the world regards as its ‘dumps’ of knowledge, which have been deemed slow and therefore marginalized. ... In coming into contact with this ‘slow’ world, you feel a new (or renewed) relish for life, you sense the potential of different methods and forms of knowledge as counterweights to the direction currently being imparted in the tiller that steers our route toward the future. (Andrews 39)

It is also important to note that this philosophy is not advocating escapism or a regression from technology and its ability to provide mobility and communication. The key to slowing down is to be able to calmly approach the rigors of modern life with the goal of finding a “meaningful, sustainable, thoughtful, and pleasurable way” to live in the present (Andrews 41). As the movement evolved this approach was codified as “good, clean, and fair,” which became the key phrase of the group’s political efforts as well as its food based initiatives. This perspective was critical in establishing the goals of this thesis project, but another section of Petrini’s writing provided the method for achieving this goal.

Gastronomy is the intelligent knowledge of whatever concerns man’s nourishment: it facilitates choice because it helps us to understand what quality is. It enables us to experience educated pleasure and to learn pleasure-loving knowledge. ... Pleasure is everybody’s right and as such must be as responsible as possible: gastronomy is a creative matter, not a destructive one. Knowledge is everybody’s right, but also a duty: gastronomy is education. (Andrews 69)

If gastronomy is education that helps us understand quality and make pleasurable choices then a gastronomy that is inherently sustainable will teach people this value through the daily act of experience and enjoyment. And if gastronomy is such an important form of knowledge, education, and civic responsibility then a university is the perfect place for people to develop their personal forms of it. Understanding this leads to the idea of a place for students to live and work where the food they eat grows into their lives and becomes a healthy resource and ritual. This idea sets the basic functional program of the project and also presents a unique challenge at an urban university, but this degree of difficulty also allows for a greater impact. A building that integrates the lives of students and plants and includes beautiful spaces for the preparation and enjoyment of food will produce generations of food-literate citizens over its lifetime. Petrini alludes to the idea of learning by proximity when he says,

The old consumer must therefore begin to feel in some way part of the production process – getting to know it, influencing it with his preferences, supporting it if it
is in difficulty, rejecting it if it is wrong or unsustainable. The old consumer, now the new gastronome, must begin to feel like a co-producer [his emphasis].

(Andrews 90)

These individuals will live in contrast to what Wendell Berry describes as “the industrial eater, ... who no longer knows or imagines the connection between eating and the land, and who is therefore necessarily passive and uncritical” (Andrews 89). Over time a population attuned to issues of eco-gastronomy, biodiversity, and sustainability will develop and support more advanced measures of sustainability. “...The co-producer, ‘educating himself, knowing products, the producers themselves, and methods for better feeding himself and polluting less ... becomes concretely and individually the engine of true change.’” (Petrini as quoted in Andrews 117). These long-term goals of sustainability and cultural change align with the ideals of the Slow Food Movement, but also with permaculture thinking.

Permaculture is the pursuit of a permanent cultural system balancing the needs of humanity with the reality of life on earth with limited resources. Bill Mollison and David Holmgren developed these ideas in the 1970s and published several volumes covering the work including Introduction to Permaculture and Permaculture: Principles and Pathways. Permaculture is slowly being integrated into disciplines such as landscape architecture and is even gaining national exposure through projects in major urban centers such as the Beacon Food Forest in Seattle. The ethical ideas of Permaculture play a significant role in this thesis and are essentially a different perspective on many of the ideas developed independently in the Slow Food Movement. For example, using single elements for multiple functions and interconnecting elements into a stable co-dependant system are key permaculture ideas that can be applied directly to architecture. A connection can also be drawn with Slow Food ideology if one thinks about the relationship individuals in the food cycle and the multifaceted impact of actions and understanding. Parallels can be drawn between all sustainability movements, but one of the most significant connections between Slow Food and Permaculture is the privileging of local cultures, economies, and networks. From The Slow Food Story, the local community is the place where traditions can be kept alive, where informed relationships between producers and consumers (or ‘co-producers’) can be developed and knowledge and experience circulated. ... Petrini was committed to a ‘new idea of economy’, one which ‘built upon agriculture ... local communities, their food, their culture, their traditions and practices and the lands in which they live’. (Andrews 115)

Compare this to permaculture design, which is inherently site-specific and aims to produce biodiverse, redundant, self-supporting systems to help individuals achieve self-sufficiency and connect with their environment and community rather than the grid. A focus on local production is advocated by Permaculturists and Slow Food activists, and is also the key principle of another young movement growing in the United States.

Locavore culture is focused on eating locally produced food, rather than items shipped long distances. While the main goals are reducing the amount of energy used to transport food and meeting a desire for fresher produce the locavore mindset naturally develops some additional preferences that align with the Slow Food and Permaculture mentalities. For example, whole, fresh foods are privileged over processed items as almost all processed items come from national distribution centers and native or naturalized crops are picked over exotic options. In the middle of the United States this might be demonstrated by choosing apples over mangoes. Additionally, because they search for local food sources locavores often shop at farmer’s markets and end up building direct relationships with food producers unknowingly paralleling Slow Food ideology. One significant benefit of locavore culture is the economic windfall seen by local farmers. When people purchase their fresh produce from national chain
supermarkets the farmer receives 18-21% of the sale price while the rest goes to marketing, distribution, and other costs (Starr). On the other hand when farmers can sell fresh produce directly in their communities they can take 90% or more of the sale price back to their farm (Spector).

All of these movements are contributing to an increase in awareness of sustainability and food choices, goals that are supported by practicing urban agriculture. There are several farming systems and individual projects that have developed recently that feed or respond to the ideas at the core of these movements. One successful model is SPIN or Small Plot INtensive farming developed by Wally Satzewich and Gail Vandersteen (Appendix B, Figure 1) in Saskatoon Saskatchewan, Canada and tested by Roxanne Christensen in Philadelphia (Figure 2) (Sullivan). The method uses small urban sites, sometimes rented backyards or vacant lots, to grow highly profitable seasonal crops. For example, Curtis Stone practices the SPIN method by growing a variety of salad greens and other profitable crops on several lots totaling ¾ of an acre in Kelowna British Columbia. As an interesting side note Curtis almost exclusively uses a bicycle to visit his plots and as a result follows permaculture principles by deciding to put his most labor-intensive crops on his home plot to reduce wasted travel. Curtis makes a comfortable living by selling his crops to local restaurants and at farmer’s markets and has rented some of his lots by paying with produce (Callahan Interview).

Growing Power, Inc. based in Milwaukee also produces food intensively in urban environments. The organization partnered with Will Allen in 1993 to provide teenagers with paid positions growing food (Figure 4) and now has sites surrounding Milwaukee and Madison and greenhouses in Milwaukee and Chicago. One of the primary greenhouses in Milwaukee is the national headquarters and hosts demonstrations as well as producing food to be sold to local restaurants and in the on-site supermarket. The two-acre site (Figure 3) hosts much more than basic salad greens, including an aquaponics systems with tilapia and perch, an apiary with 14 beehives, three laying houses for hens and ducks, a yard for turkeys and goats, and an extensive composting system utilizing yard space and over 50 bins of red wriggler worms (growingpower.org).

Other urban farming operations exist around the country, stemming from various backgrounds including students engaged in the slow food movement at Yale University (Figure 5) and a group of motivated neighbors in the Lykins neighborhood of Kansas City (Figure 6). In each instance these efforts have been quite successful and created growing networks of people around the farms. The strengthening of communities and environmental consciousness are two of the primary social benefits of these actions, but many of the people involved in these projects value the quality of food and sense of self-sufficiency they develop (yale.edu/sustainablefood) (urbanfarmingguys.com).

Experiments in urban production and self-sufficiency can take on a more architectural form as showcased by several projects. Public Farm 1, or PF1, by the architecture firm Work AC was a temporary installation for the PS1 site of MOMA in New York City. The structure was erected in the courtyard of PS1 for the summer of 2008 and contained 51 varieties of fruits, herbs, and vegetables as well as solar-powered juicing and phone charging stations, seating areas, and a water feature that stored water for irrigating the plants (PF 1, work.ac). The project also included a storage shed that doubled as a chicken coop, providing eggs and pest management to go with the garden. Chickens are one of the first animals commonly selected by small scale farmers for exactly these reasons. Novella Carpenter mentioned her chickens several times in Farm City and The installation nicely meshes the needs of plants and humans to provide an environment that is attractive and healthy for both. The quality of this project was evident in its reception by the public and press. Figures 7, 8, and 9 in Appendix B show the PF1 project.
New York is also home to two successful long-term production sites, both located on rooftops. The Bell, Book & Candle restaurant in Greenwich Village uses hydroponic tower stations on the roof (Figure 10) to grow 60 percent of the herbs and vegetables used in the restaurant’s kitchen (Toth, urbangardensweb.com). Around 60 towers, each about five feet tall (Figure 11), are placed on the roof and the produce is lowered daily to the kitchen below by a pulley system. The menu shifts seasonally as the various species ripen and the owner and chef Jeff Mooney may shift the menu based on what is freshest on a given day.

Counterpointing this example is the massive rooftop operation of the Brooklyn Grange, which occupies the entire 40,000 square foot rooftop of a warehouse in Queens, New York (Figure 12). While confusing, the company is named for their original location, not the current one. Their produce is grown organically in 7.5-inch beds of rooflite soil for a total load of 1.3 million pounds spread across the rooftop. The operation started in 2010 selling produce to local restaurants and residents, and at area farmer’s markets (Dailey, inhabitat.com). Both the Grange farm and the Bell, Book & Candle rooftop system have been producing successfully for a few years in the very dynamic New York City climate and are providing exciting case studies for urban designers.

Conclusions

Looking back over the history of modern agriculture in the United States, the statistics concerning food production and access, the philosophy of several food-focused sustainability movements, and some current examples of urban food production has provided a broad understanding of the potential challenges and benefits this thesis may discover. By synthesizing this information, particularly the motivating ideas of the Slow Food and Permaculture movements and the built examples, a set of guiding principles can be developed for designing a university based approach to urban agriculture.

First, take in the sun. It is the most critical factor in the growth of food crops and the design of an energy-efficient building. Access to and control of the sun’s energy input will be the primary influence on decisions regarding all spaces inhabited by people and plants. The project should provide natural light for all human spaces occupied on a daily basis for more than half an hour. All plant spaces should maximize their potential for sunlight and then control devices can be applied to zones in danger of overheating.

Second, all the available space must be used. Plants will spread to absorb as many nutrients and as much sun as possible so in this sense the building will mimic its occupants. Additionally, land is a precious finite resource, especially in an urban setting like the University of Cincinnati’s campus, and as such the space should be fully utilized in a positive way. Maximizing the university’s resources will make the project more feasible as well as increasing the impact on campus sustainability.

Next, functions must be layered literally and figuratively. This adapts the idea of multi-functional elements from permaculture design to an urban setting. Single elements can still serve multiple purposes, effectively layering uses into a space, but program elements should also be stacked as much as possible. This is a key feature of all urban spaces and is also easily visible in stable, old growth forest ecosystems, which are the stable end goal of permaculture design. By layering functions over each other, whether within one space, or by stacking vertically on the site, the project can achieve an extreme efficiency in the use of limited land resources and also maximize solar exposure. High-density land uses such as tower-form buildings also tend to be more energy-efficient than sprawling projects as they have a high ratio of volume to surface area.
Finally, people and plants should be as proximate to each other as possible. This adapts the Slow Food goal of bringing producers and consumers together in an effort to create co-producers. Students will naturally gain a strong working knowledge of how food is grown and which plants provide certain types of foods, oils, or fibers through the daily exposure to and tending of those species. Additionally, by having access to fresh, high quality food at a moment’s notice students’ dietary choices should improve and their health will follow. The large and dispersed body of plant life will provide additional health benefits related to air quality and biophilia. These topics are not fully understood, but are gaining attention and supporting data from studies by firms like McDonough and Partners. This proximity will be developed by physical adjacency as well as visual connections for maximum exposure. Another benefit of this will be the increased chance of cross-pollination between different disciplines and their research efforts resulting in more innovation and better holistic design.

These design goals will provide a strong base for developing a project that can achieve the goals of food literacy and advocacy. While the preceding discussion shows the social, political, and environmental needs for such a dramatic promotion of these issues, additional information is necessary to prove that the project can and should be located at the University of Cincinnati. The following chapters will evaluate the university as a client and site for the project as well as the functional needs the building will have to address.
Client
Institution and Cultural Situation
Part 1: Connecting Client to Building Type

The University of Cincinnati is a major public university in the United States, with many of its programs ranking in the top 50 in the country. The university is focused on improving its academic and research rankings and enrollment by focusing on the academic master plan until 2019. This effort by the new president, Dr. Gregory H. Williams, and the university provost, Dr. Santa J. Ono, follows on the heels of a major facilities master plan originating in 1989 that led to the construction and renovation of much of the main, or uptown, campus. The importance of these two plans cannot be understated considering how they will shape the culture of the university and its view of and need for quality architecture.

The university began in 1819 as a number of schools scattered around the city. Because of economic conditions the Cincinnati Board of Education combined with the McMicken Endowment in 1870 to charter the University with a campus in the northern part of Over-the-Rhine. By 1889 the university had expanded and negotiated with the city to move to a larger and more attractive area at the south end of Burnet Woods, the current site of the main campus. The next 60 years saw the university grow significantly with many of the notable buildings on the west half of the campus being constructed and the stadium location set. Following World War II the demand on the campus grew rapidly and the university gained state funding in 1967. During the 1960’s the northern and eastern portions of the campus saw development, including the “Three Sisters” dormitory buildings roughly defining the north-eastern corner of the university “superblock”. By 1977 the university became a full state institution, but lacked funding for new major construction projects.

In 1984 Joseph A. Steger became the university president and dissatisfied with the current campus set about finding a suitable master plan. Landscape architect George Hargreaves was selected and developed a plan that organized and connected the main and medical campuses. The plan replaced the parking lots at the center of campus, left from a commuter college history, with green space designed to link the buildings to the landscape. Through the efforts of Jay Chatterjee it was decided that “signature” architects would design the new buildings in the plan. By 2006 the university was transformed, with green space and buildings unifying the uptown campus into a walkable site with impressive focal points and a distinct urban atmosphere. Each of the buildings and the master plan project as a whole received significant media attention resulting in a great deal of exposure and praise for the university.
After spending nearly $2 billion on these projects the university has spent the last several years focusing on the academic improvement of the institution. Some of the goals included increasing research funding and its utilization, expanding the international and co-operative education programs, and improving all of the standard academic measures as well as community engagement of the students. The result of these efforts and the increased publicity and improved aesthetics of campus have led to an increase in student population over the last seven years. The enrollment for the fall of 2011 reached 42,750 students on all campuses as compared to 2003 enrollment of 33,823.

The vast majority of these students attend the main campus, but only 4,000 students are housed on campus this year. While Morgens and Scioto Hall would add 1,000 beds, they are closed for renovations until at least 2013. At least two near campus housing projects are under development by various groups, but even after the completion of projects to the south and north of campus the university can still expect to be under pressure to house all of its students requesting such services. Leasing space in outside developments is also at best a net zero transaction for the university and reduces the engagement of students with campus life. These factors suggest the university should consider the construction of a new on-campus dormitory.

A new residence hall would allow for the reutilization of the space where Sawyer Hall once stood. This space is wasted currently, occupying a strange zone between the landscaping of Campus Green, the barren concrete of University Avenue Garage, and old and new residence halls to the north and south. On a daily basis people pass by and across this site without a second glance. A new facility at this location could extend the work of the Hargreaves master plan to provide to activate an otherwise derelict space on campus. A new dormitory would contribute to the university’s housing needs as well as provide an opportunity to advance several other goals of the university.

In addition to the two previously stated master plans which set forth academic and architectural imperatives for the university, there are also several areas that the university focuses on. The annual President’s Report Card highlights a number of areas for student engagement, both on campus and with the larger community. Historically, the university has had strong ties to the Cincinnati community through community service and the co-op program. Incoming freshman tend to be the most involved with community service due to scholarship requirements, opportunities through honors seminars, and the desire to explore the city and meet other students. This group is also one of the largest groups interested in on campus housing. By living on campus...
freshmen become more integrated with the campus community and also have greater access and exposure to university efforts, such as increasing community engagement. A new dormitory incorporating urban agriculture programming could provide volunteer opportunities for students and community members as well as hosting agricultural expertise for distribution to low income areas. The incorporation of agriculture into blighted urban areas has been shown to have many positive effects as documented by Sucheta Bal in his thesis “Urban Agriculture/Community Gardening: Starting and Maintaining Successful Programs.” This presents an opportunity to develop an expertise and facility that can have a significant positive community outreach component.

Urban agriculture and dense housing will also contribute to sustainability efforts, which are a more recent commitment of the university that now features in the President’s Report Card. Former university president Nancy Zimpher signed on to American College & University President’s Climate Commitment and each year the university receives a letter ranking of their performance in “The College Sustainability Report Card.” Since the first report card in 2007 the University of Cincinnati has steadily improved to a grade of B+ in 2011. The three lowest categories in that year were Food & Recycling with a C, Student Involvement with a B, and Shareholder Engagement with an F. An agricultural urban residence hall could directly contribute to the first two weak points, while also helping to maintain A grades in the Climate Change & Energy and Green Building categories.

For example, a residence hall incorporating agriculture could collect rain water for grey water systems such as toilet flushing, chilled water cooling, and produce irrigation. Additionally, grey water from human uses could be used to irrigate non-edible plantings to further reduce water demand while taking extra health precautions. This is currently illegal in Cincinnati due to a law put in place 80 years ago to ensure the fledgeling sewer system had enough input to work properly. Showing through measurable methods the advantages and safety of water reuse would provide an immediate contribution to the university partnership with the Environmental Protection Agency concerning water research and education, as well as benefit future university projects and the region as a whole.

Several universities around the United States have implemented urban farms or other food related sustainability efforts quite successfully. The Yale Sustainable Food Project has nearly a decade of well documented successful experience to serve as an example of the integration of urban agriculture with university culture. The project and related urban farm are extremely popular with the students, of whom over 1000 volunteered on the farm in 2009. The food from the farm is sold
to local businesses and residents in addition to supplementing the produce purchased for the dining halls. Many of the students see the experience as great learning experience for their program of study or as a rewarding way to engage the community physically and find fulfillment from producing their own food.

As seen at Yale, students from related majors can use university supported agricultural projects as an excellent learning tool. This use could be maximized through a combination of class visits, guest and community lectures, and internships. Research could be conducted on a variety of agricultural and dietary issues as well as systems development and testing by the engineering college. This would provide a way for the university to expand its research and patent development efforts, both goals stated in the President’s Report Card. Also, area students of all levels could visit, effectively turning the building into a learning facility for a larger population as well as a recruiting tool.

As shown there are significant reasons for the university to support urban agriculture in the culture of the institution and there is a distinct need for additional student housing on campus. Understanding how the combination of these programs is greater than the either separately and why the university should bring agriculture into the heart of campus is another issue. This is because the most important reason for the university to utilize urban agriculture is a social one.

By committing to maintaining an urban agricultural system on campus the university will promote food literacy within a significant population. This will lead to widespread and long-term shifts in the thinking of the local area community and the transient student body. By seeing and engaging in food production people reconnect with part of our common heritage as well as discovering the rich benefits and character of local foods. Food literacy for such a large group of people will contribute to better individual nutrition and health, stronger community food systems and related economies, and a reduction in the environmental impact of industrial farming. The university has a combined population of students, faculty, and staff over 52,000 and this group grows each year. With roughly half of the universities alumni moving away from Cincinnati after graduation a shift in food literacy starting at the uptown campus will extend beyond even the regional population.

Seeing how all of these reasons align with the current goals and culture of the university it becomes clear that a seemingly radical addition to the main campus is actually a logical, if divergent, adaptation. A new building integrating student life with agriculture will provide another physical symbol of the University of Cincinnati’s commitment to excellence in academics, design, community, and sustainability.
Part 2 : History of Residence Halls

The idea of a university evolved from the cathedral and monastic schools of 6th century Europe. The chartered form more recognizable today began as sites were recognized for primarily providing higher education. Some of the earliest schools were in Bologna, Paris, and Oxford in 1066, 1150, and 1167 respectively. Oxford is particularly influential in the modern American university system for its arrangement of subject specific colleges and on campus residences. Student housing was provided in the 13th century by various christian sects and eventually grew into a variety of housing, both near campus and in the colleges themselves. It is also notable that the university had a number of kitchen gardens that provided some of the produce for campus.

The original plan and early life of the Academic Village at the University of Virginia combined these ideas of on campus, subject specific housing and dedicated food production. The village consists of ten pavilions providing classrooms and professors residences for a variety of subjects with student housing between pavilions and in long buildings separated from the pavilions by gardens. These hidden buildings also house dining facilities which were provided with produce from the gardens. This provided much of the food for the original group of 125 students, but now that the university has grown the gardens serve as attractive rest areas.

The University of Virginia in Charlottesville is an iconic American university. Many of the ideas present in the Academic Village are visible in the campuses of other universities. A basic plan can be seen below.
The older portions of the University of Cincinnati campus have a notable arrangement of buildings surrounding green space to form a quadrangle lawn. This arrangement is carried over from earlier American Universities such as Harvard, or the University of Virginia. Cincinnati’s campus has undergone major renovations in recent years so the quadrangle in front of Mcmicken Hall has lost some of its definition. The university has used quadrangular or village style planning in some of its newer elements.

The Stratford Heights student housing development was completed in 2005. Shown below is an overhead view of Stratford Heights, note the relationship to the main campus with McMicken Hall visible at the right edge of the image. The Stratford development consists of 19 houses each accommodating up to 36 students as well as some space for the offices of some university functions such as the Center for Community Engagement. The development has a distinct quadrangle arrangement although the grade change moving away from campus breaks up the first lawn into nearly unusable triangles.

Other universities are opting for similar designs with their new housing projects, focusing on quality and aesthetics, and referencing traditional university planning. Compare the lower right image of the Mclaughlin Housing Cluster completed in 2006 at Dartmouth University to the Stratford Heights development. They have very similar planning principles, vertical scale, and material palate (as seen on the following page). However the Mclaughlin Cluster is far more efficient as it houses over twice as many students.

In contrast to these apartment village scale developments are the housing towers constructed by many large universities to house their massive student populations. The University of Cincinnati has most of their student housing in this form due to the urban nature of the campus.
The previously mentioned eleven story housing blocks of Morgens, Scioto, and Sawyer hall on Cincinnati’s campus are just a few examples comparable to the mega-dormitory Watterson Towers at Illinois State University. The 28 story tower complex houses over 2,200 students in an ultra dense fashion when compared to the village style developments. As the University of Cincinnati’s dorm stock ages they will continually need to look at new housing options. This sort of structure allows an urban university to maximize it’s space utilization and provide for growing student populations.

Part 3 : Client Goals

The University’s mission statement from the website of the office of the university president reads,

The University of Cincinnati serves the people of Ohio, the nation, and the world as a premier, public, urban research university dedicated to undergraduate, graduate, and professional education, experience-based learning, and research. We are committed to excellence and diversity in our students, faculty, staff, and all of our activities. We provide an inclusive environment where innovation and freedom of intellectual inquiry flourish. Through scholarship, service, partnerships, and leadership, we create opportunity, develop educated and engaged citizens, enhance the economy and enrich our university, city, state and global community.

As expected from a large, public university the statement cannot and does not go into specifics, but a few key points can be pulled out. The university is promoting itself as an urban research center with a particular focus on community engagement and partnered learning. These statements align with the key metrics measured on the annual President’s Report Card and also tie to a key feature of Cincinnati’s culture, the co-operative education program (commonly referred to as Co-op).

Dean Herman Schneider originated the idea of co-operative education in 1906 making the University of Cincinnati the first school to have such a program. The program started with students working for local companies and today over 5,500 students engage in the program working all over the United States and internationally. Local companies are still heavily involved in the Co-op program with a majority of students working in Ohio for at least one of their internships.

This strong history of community engagement is not limited to Co-op, but also includes a substantial amount of student community service. The President’s Report Card reported over 11,000 students participating in volunteer activities in 2011. The university maintains...
several means for students to engage in community service and hosts or organizes certain large scale volunteer
donation drives each year including Relay for Live and blood drives.

In addition to these community related efforts the university prides itself on being a research university.
Again, the President’s Report Card has a series of metrics measuring the growth of the universities research
divisions. Cincinnati also has a significant history contributing motivation to its research efforts. Most notably,
Albert Sabin developed his oral polio vaccine during his time associated with the university and Cincinnati
Children’s Hospital.

Given this strong history of research and community engagement and the key word “urban” as a
defining the university physically, a tight set of goals for future development can be determined. Any housing or
other building project addressing campus infrastructure should incorporate into its design spaces that encourage
and support a variety of community and research activities and should do so in a dense, efficient fashion related
to the urban qualities of the campus.

Part 4 : Political and Constituent Influences

There are several significant groups involved in the planning and use of a university residence
hall, among them the board of trustees and other university leadership, the university architect,
facilities management, housing and dining services, students, and outside community. The
board and other primary leadership have the most power over the design process as they secure
funding, initiate the search and bidding process, and review the design. This gives them great
political and financial decision making powers over a building that they may never even enter.

Given the history of the university masterplan and signature architect building campaign
the university should be well prepared for the design process, but having design advocates
will be necessary for any new work. The significant cost, both in time and money, as well as
disruption on the campus may cause unprepared political powerhouses to stall or misdirect
design efforts, ultimately leading to a more costly and less effective product. The inclusion of
knowledgable faculty and other staff will help convey the thinking to those less familiar with
architecture and design.

The university architect, facilities management, and housing and dining services should
at least have representatives on review committees to ensure the building is easy to operate,
maintain, and upgrade to meet future needs. Their involvement will alleviate some of the
leadership’s concerns as well as providing the most economically efficient investment for the
university. If the university continues to outsource their housing needs due to enrollment
exceeding capacity at best they can only achieve a revenue neutral solution. Conversely a well
designed and desirable dormitory can return its initial investment and more over the life of the
building.

The students are the major end user of such a facility, but are rarely represented directly
in the design process. Polls and public presentations can provide some direct input, but take
additional time the funders may not want to pay for. However, as the ultimate success of the
building and the university is dependent on student engagement, productivity, and opinion a
significant effort should be made to address these topics.

The University of Cincinnati is a public institution so there is pressure from the state and
city governments potentially involved in funding and certainly involved in code compliance and
other issues. However the actual community these governments represent is frequently divorced
from university projects and processes. Given the university’s stated commitment to this
larger community public presentations and other publicity should be utilized to engage nearby
residents and build awareness, support, and long term engagement with the university.
Site
Context and Influences
Part 1 : Identifying the Physical Site

The location of the demolished Sawyer Hall presents an ideal location for a new residence facility. The site has historically been housing, it is already leveled from the demolition process, it is near the center of campus, and it is in a section of the campus not yet matched to the Hargreaves masterplan. A portion of the masterplan showing the main campus and the connection to the medical campus is shown below. The site sits in the northeast corner of the main campus putting it right next to the connection to the east campus.

Additionally, the location has advantages for any agricultural efforts. It has a strong southern exposure with minimal shade throughout the year and there are less deer and other crop eating animals in the urban environment. The urban nature of UC's campus also produces a minor heat island effect reducing diurnal temperature swings and raising temperatures slightly compared to rural areas. Environmental factors will be detailed later.

The actual site is roughly 90 feet west to east at the northern edge, 65 feet at the southern edge, and 225 feet long at the western edge. This gives an area of roughly 17,400 square feet. It is very close to level, but the topography surrounding it slopes. The campus green has internal variations, but as a whole is about six feet lower than the site at the bottom of a downward slope running west from the Corryville neighborhood east of campus. This contributes runoff moving towards the Campus Green, however there is substantial drainage along the paths and roadways reducing the potential of the lawn flooding. This general slope also affects views which will be documented in part three of this report.

Notice that in the USGS map on the following page the area of campus surrounding the site is indicated in red, meaning at the time the map was completed that region was still a residential neighborhood abutting the campus. Also note that the contour lines on that map are spaced at ten foot intervals, showing only the general slope of the neighborhood.
2.3 An east to west site section looking north

2.4 A north to south site section looking east

The following two pages display photographic documentation of the site with a very tight surrounding context. This provides some information about how the site is used now and the conditions relating to any new construction. Some caged utility connections are visible in the first photograph as well as the concrete pad that dominates the site. This pad roughly corresponds with the footprint of the demolished Sawyer Hall. The second and third photograph show the limited green space and small deciduous trees planted on the site. The uniform size and shape of the trees indicates that they were probably all put in as transplants shortly after the demolition meaning the trees may only have been on site for as little as seven years. It is clear from these images that while the site enjoys a proximity to well planned green spaces it is definitely in an urban context. All of the horizons except the north are defined by building rooftops and the northern horizon only has a small portion defined by the tree tops of Burnet Woods.

2.5 USGS map near UC
Part 2 : Climate Condition

Cincinnati lies right on the border of climate zones three and nine as defined by Norbert Lechner in *Heating, Cooling, Lighting*. Climate zone three covers most of Indiana and Ohio and has an average winter temperature range from 15 to 50 degrees, resulting in a fairly mild winter. The winter is made less hospitable by winds and regular rainfall, the clouds for which drop the percent of sunshine during daylight hours down to 40% in some cases. The humidity and rain are pervasive into the summer resulting in a short period where it is very difficult to naturally cool buildings.

Climate zone nine covers the lower portion of Indiana and all of Kentucky and is described as a temperate zone with somewhat severe winter and summer months. The winter temperature range is from 30 to 60 degrees although the upper end of that range is rare. This zone recieves more sunshine as a percent of daylight hours throughout the year, however the winter lows are still in the 45% range.

Overall, Cincinnati has a problem with winter sunlight, high humidity year round, and a winter winds. The area also has a large annual temperature range that tends to be too cold for comfort. Only about 13% of days per year will fall within the human comfort range for temperature and humidity, so building design will have to carefully account for this. The ideal environment for plant growth will be another important factor to look at in building design, however selecting native species and successful window plants will make this requirement much easier to meet.

On the following pages are several psychrometric charts from a Climate Consultant 4 run detailing the climate of Cincinnati and some design strategies that might be appropriate for that climate. The data points were collected near Lunken Airport, which is just to the southeast of downtown Cincinnati and within five miles of the University of Cincinnati’s main campus. The charts each show a three month period, January through March is the first chart for example, to better understand the seasonal shift of weather in Cincinnati. The information from these charts reinforces the information from Lechner and once again presents a set of difficult questions for design. Cincinnati is a difficult city to passively design for because of the wide range of conditions across a year. Also, the high humidity and valley location of the city contribute to some odd weather phenomena. In part the city is sheltered from severe weather, but at the same time day to day and week to week weather trends can vary widely.

The key passive strategies as detailed in the psychrometric charts and Lechner’s analysis are solar shading from late spring to early fall, solar gain from late fall to early spring, natural ventilation in the summer, and protection from the winds in the winter. However, ideal use of these strategies only provides for comfort about 50% of the time due to the odd transitional nature of Cincinnati’s climate. Rather than compensate with mechanical heating and cooling more complex and contemporary passive or low energy techniques should be investigated. Night flush cooling, adaptive shading, liquid dessicant humidity control, and heat recovery systems might all be options. Also, the inclusion of plants and soil into the building program presents some interesting possibilities.

Plants transpire moisture naturally and can make use of stored rain water for irrigation, this might provide needed winter humidification. Their soil and planters can also act as heat reservoirs absorbing the sun’s energy during the day and releasing it during winter nights. Finally, while not strictly environmental control, the inclusion of plants in living spaces and views to greenspace have been shown to improve worker productivity at the Ford plant designed by McDonough + Partners. This positive emotional/mental response may compensate for the depressingly low amount of winter sunlight to some extent.
2.9 Climate Consultant data Jan-Mar

2.10 Climate Consultant data Apr-Jun
As previously mentioned, Cincinnati’s climate is quite variable due to city’s location in a transition zone between climate zones and unique geography. This variation is visualized on the chart below describing the monthly diurnal averages. This means it is describing the daily average temperature range for each month. The incident solar radiation is also charted, so the link between the two set of data can be loosely correlated. In essence, less sun in winter leads to lower temperatures and less diurnal temperature swing because less energy is being absorbed and released.

The two smaller charts below show the monthly average cloud cover (left) and the annual change in ground temperature at 1.5 feet, 6.5 feet, and 13 feet of depth. These show that Cincinnati has an unusual amount of cloud cover and a fairly large annual shift in ground temperature due to incident solar energy and distinct seasons.
The preceding analysis shows the importance of solar design and the two charts on the following page provide a deeper analysis of solar angles and shading recommendations. The top chart looks at the winter and spring months, while the lower chart covers the other half of the year. It is notable that the warmer colors corresponding to times when shading is desirable begin near the solar elevation seen at noon on the equinoxes. Based on the average temperature throughout the year these shading recommendations make sense as the daily temperature approaches the comfort ranges in April, just after the March 21 equinox. The information shows shading should be provided for solar angles exceeding 57-60 degrees and certainly for west faces in the summer.

Below is a shading study using Sketchup to see the shadows cast by neighboring structures on the site, shown in light green.
2.17 Climate Consultant data winter-spring

2.18 Climate Consultant data summer-fall
The other significant factor in passive design is wind behavior. The chart below and those on the following page each depict average wind speed, direction, frequency, direction, temperature, and relative humidity. Each chart shows a three month period starting with January through March on this page and progressing in order from top to bottom on the next page. Key points to note are the relative frequency and strength of the winter winds and the prevalence of such winds from the southwest. This may be problematic as the site is most open to the south and west. Summer winds seem to be more directionally diffuse, meaning any plans for cooling should be omnidirectional. So the primary planning should be for winter winds from the south and west, with secondary consideration for passive summer ventilation. The Campus Green has sporadic, and primarily deciduous plantings that offer little protection from the winter wind. Additionally, the green space will not hold as much heat as the paved surfaces of campus so the wind will be colder than that from other directions.
2.21 Climate Consultant wind data Apr-June

2.22 Climate Consultant wind data Jul-Sep

2.23 Climate Consultant wind data Oct-Dec
Part 3: Built Context

The campus map below depicts the current built condition surrounding the site as well as documenting some basic services and proximities. One point of interest is the Central Utility Plant near the northeast corner of campus. It is designed to provide power and co-generated steam heat to much of the campus through underground utility tunnels. However, due to operation costs it has only been run sporadically for a number of years and now essentially serves no purpose. The tunnels can still provide infrastructure access for the new building with minor retrofitting. The series of images on the following two pages show the primary buildings visible from the site. The power plant is visible in the background of the first image.
2.25 Site Photo from SW

2.26 View to West of Site
The images show in order: Morgens and Scioto Hall viewed from point 1, the Alumni Center and Engineering Research Center from point 2, Schneider Hall from point 3, and the dormitory portion of the Campus Recreation Center. The campus has a fairly unified set of materials focused on a reddish beige brick, gray zinc alloy metals, and light gray concrete. Glass on campus is primarily transparent rather than reflective or colored, meaning the objective is to see people active rather than create solid architectural facades.
The map below shows the two main circulation systems providing access to the site. The pale green indicates walkways for pedestrians and cyclists while the darker green indicates automobile roadways. Only the pathways that have a direct visual connection or physical approach to the site are highlighted. The frequency of pedestrian pathways approaching the site on a diagonal is a result of the axial analysis completed in the Hargreaves master plan. These paths will provide an excellent connection to the rest of the campus as pedestrians will be able to walk very direct routes and will not feel that the building is misplaced.
The following set of diagrams examine a series of potential development strategies for the site. They range from fully urban, to fully agricultural and examine situations both feasible and unreasonable for the university's goals.

The first image shows a site developed for maximum density. This would provide the university with the greatest amount of housing to address their growing population. It would also provide opportunities for the integration of additional services, such as dining, computing, offices, research, or other needs. While this would fit in with the existing dormitories and parking structure it would probably not serve well as a new research facility as the specialization needed for that building type would take up a great deal of space. Also, the university has facilities for each of the main programs and the greatest potential for expanding the university's research capacity comes from introducing a new topic with a set of specialized facilities.

The suburban diagrams are comparisons of scale and density rather than suggestions for an appropriate university response.

The three agricultural models set up some useful comparisons. The industrial system is highly specialized, much like the purely urban scheme, but really only works with vast quantities of land, something not available in urban situations. The adaptation of these principles lies in the greenhouse or suburban agriculture models. These allow tighter and more focused growing of specific consumer crops, potentially using techniques such as spin farming to maximize yields. Greenhouses also allow climate control, extending the growing season and protecting crops from severe weather and pests. Permaculture contrasts these strategies with a low maintenance, long-term approach that can be applied at a variety of scales. Edible plantings in cities can be harvested by pedestrians, or a full permaculture rural farm can grow medicinal and edible crops most effectively harvested and distributed in a local, as needed fashion.

All of these ideas are combined in the urban agriculture diagram to provide high quality living space with a new research topic and testing site for the university, all while producing food, health, and community. Solar exposure becomes the critical variable in this model.
2.30 Density diagrams continued
Part 1: Functions

This programming investigation is focused on finding the activities and spaces most necessary or important in the creation and operation of an urban, agricultural dormitory. This is a complex, mixed use building type that will have many activities occurring within it from a variety of users. There will also be the influence of the University of Cincinnati's culture and goals affecting some of the uses and occupants. To better understand the most important activities within the building a diagram was developed as seen below. It describes each activity from the perspective of a modern student. Take for example the color coding around “Cook” as opposed to “Harvest”. Cooking is something nearly all students have done at
home before coming to the university, they all understand it as a daily activity that they must undertake or have someone do for them, and they are either planning to cook themselves or are at least open to the possibility. Contrast this with fact that very few students will have harvested their own food, so it is marked as work or research rather than a life activity, because it is perceived as something extra in a modern student’s world view. However, for every bit of food the student is used to preparing or seeing prepared for them there is someone behind the scenes harvesting and delivering that food. By integrating the harvest and preparation of an individual’s food into a location where they socialize and sleep their perception may change.

The diagram can be evaluated from the perspectives of other use groups as well, if the colors are taken to represent different groups. For example, blue would represent student activities, brown would indicate staff tasks, and red would indicate faculty or graduate student involvement.

The reasoning behind socialize being the central activity in the web is two fold. Students define their university experience more by the social activities they pursue and acquaintances they make than by the classes they take, at least during the undergraduate experience. Even with the classes that become focal points many times the relationship with the professor or other students defines an individual’s perception and chance of success in the class. Additionally, as students advance they develop peer groups of other students and faculty who share interests and learn from each other. In a real sense showing up to the lab becomes a social activity and the communication and camaraderie fostered by shared food, drink, or entertainment can make collaboration in the lab more effective.

Social interaction is also a key component of the University of Cincinnati’s Co-op program and community outreach activities. For example, a first Co-op experience is as much about learning how to act like a professional, fit into the work place, and learn the slang of the field as it is about producing work. University encouraged community service is much the same way, with students meeting their neighbors, and developing relationships with them through shared work and social experiences.

It becomes clear from these explanations that the “Socialize” hub in the diagram is as much a modifier for the other hubs as it is a distinct action. The “Socialize” hub connects all the various aspects of the program and each hub that connects to it is an opportunity to strengthen the university community and provide a successful building. In this way it becomes a design goal as much as an activity to be planned for.

A set of spaces and elements suggested by this diagram might include:

- Outdoor Garden
- Bed Garden
- Greenhouse
- Aquaponics space
- Window Gardens
- Entry Planters
- Garden Study and Dining
- Small Kitchen per floor
- Dining Hall
- Major Kitchen
- Picnic Area-Pizza Oven
- Food Storage
- Compost Bin
- Water Storage

Note that even though roughly categorized into Food, Live, and Research columns there are synergy opportunities and some things appear to be listed twice under different names.
The images on this and the following page show some of the ways in which people and plants might interact in the proposed building type. People entering the building may stop at planter boxes for dinner herbs or just enjoy the sight and smell as they walk past. Students might study with views across campus and fresh blueberries to pick when they need a snack. Faculty and students might enjoy a meal in the outdoor garden picnic area made with food harvested from the greenhouse.
3.4 Concept of outdoor space and greenhouse
Part 2 : Space Standards

The primary function of the building will be to house students so the sleeping rooms bear the most investigation. Below is the plan for Alvar Aalto’s Baker House at MIT and a photograph of one of the pie shaped single rooms. The variation in the plan allows for many room types and sizes. The rooms range in size from 105-185 square feet for singles, 300-330 square feet for doubles, and 395-445 square feet for quads. These can be compared to some of the rooms from existing University of Cincinnati dormitories. Plans for a quad room in Daniels Hall and a double room in the Campus Recreation Center are shown on the next page. The quad has only 228 square feet of living space with an additional 60 square feet of storage. The double has 484 square feet partitioned into two 126 square foot bedrooms, a 115 square foot living space and a micro-kitchen and private bathroom in the other quarter of the space. The rooms in Daniels Hall are of an older generation and are quite tight for multiple occupants. Baker House is slightly more generous, however the quads become uncomfortable for older students leading more independent lives. Daniels is traditionally used for freshman housing while the CRC and other more modern dormitories are reserved for older students or special segments of the university population such as student athletes. A new facility might utilize multiple room sizes to provide a range of price points, achieve higher efficiency than the CRC, and appeal to a wider set of the student community.
3.7 Daniels Hall average room plan

3.8 CRC average room plan
Obviously apartments for fully independent lifestyles are larger than those found in residence halls. This page shows a floor plan from the Bosco Verticale apartment tower in Milan. Each design has multiple unit plans as well as some variation between floors to provide individuality and options to residents. The smallest suites in each building have perhaps two to two and a half times as much living and sleeping space as the large singles in Baker House, but each has a dedicated kitchen and bathroom adding significant square footage. Larger units in Bosco Verticale approach 1000-1200 square feet and are designed for families. These units are actually comparable to the suite style arrangement found in Schneider Hall at the University of Cincinnati. They are designed for a similar number of people in a similar size space and arrangement and this can result in a sort of family dynamic in the Schneider suites.
Also notable is the Baker House dining room which seats around 160 people in about 2000 square feet spread between an open bottom floor and balcony upper floor. The plan and photograph on this page help to illustrate this relationship. The kitchen adds approximately another 300-500 square feet to the total area. This arrangement is best suited for small groups dining over an extended period rather than a full capacity rush. The table arrangement supports this style of dining and community interaction.

Contrasting this dedicated dining space is the Center Court dining hall in the Campus Recreation Center at the University of Cincinnati. It serves as the primary dining facility on campus for the significant freshman population. It seats 390 individuals in an area of 9000-1000 square feet with three serving areas projecting into the seating area and another 2000 square feet of kitchen and prep space hidden from the dining hall. This space has a variety of seating options from booths to long tables and the large volume is always raucus during meal times which tend to occur in two hour rushes with sporadic diners in between.

The social and organizational scale of Baker House’s dining room are more suited to the scale of dormitory being proposed on the old Sawyer Hall site. It can serve as a experiential as well as functional model due to it’s unique character and strong connection to the exterior.
The greenhouse and garden spaces in the program while critical to the purpose and success of the project have more flexibility than the dormitory and other human scale spaces. Plant volume can be maximized through the clever selection and arrangement of species to make use of vertical space or provide symbiotic companion plantings. Additionally, plants do not become uncomfortable in disproportionate spaces like humans do as long as they have access to adequate light, water, and nutrients. Effectively, the food production portions of the program take on whatever spatial arrangement best suits the needs of the dormitory and still effectively provide a good environment for plant growth. The photographs on this page document the varied conditions plants can be successfully cultivated in. With this in mind the program breakdown on the following page begins with some estimates for the dormitory functions before allotting the remainder of the site to food production and gardens.
### Square Footage Estimates

<table>
<thead>
<tr>
<th>Area</th>
<th>Square Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lobby / Reception</td>
<td>1000</td>
</tr>
<tr>
<td>Classrooms</td>
<td>3000</td>
</tr>
<tr>
<td>Communal Dining</td>
<td>2000</td>
</tr>
<tr>
<td>Large Kitchen</td>
<td>800</td>
</tr>
<tr>
<td>Cold Food Storage</td>
<td>200</td>
</tr>
<tr>
<td>Warm Food Storage</td>
<td>100</td>
</tr>
<tr>
<td>Research Bay</td>
<td>3000</td>
</tr>
<tr>
<td>Library</td>
<td>400</td>
</tr>
<tr>
<td>Elevators</td>
<td>200</td>
</tr>
<tr>
<td>Bathrooms</td>
<td>300</td>
</tr>
<tr>
<td>Laundry</td>
<td>800</td>
</tr>
<tr>
<td>Utilities</td>
<td>4200</td>
</tr>
<tr>
<td>Technology</td>
<td>500</td>
</tr>
<tr>
<td>Storage</td>
<td>1000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>11000 SF</td>
</tr>
<tr>
<td>80 Units @ 375 SF</td>
<td>30000</td>
</tr>
<tr>
<td>12 Bathrooms @ 500 SF</td>
<td>6000</td>
</tr>
<tr>
<td>12 Kitchenettes @ 200 SF</td>
<td>2400</td>
</tr>
<tr>
<td>12 Dining/Communal @ 400 SF</td>
<td>4800</td>
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<tr>
<td>12 Garden/Study @ 600 SF</td>
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<td><strong>Residential Tower Total</strong></td>
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</tr>
<tr>
<td><strong>Grossing/Mechanical Factor 30%</strong></td>
<td>20370</td>
</tr>
<tr>
<td><strong>New Total</strong></td>
<td>88270</td>
</tr>
</tbody>
</table>

Assuming ground floor program of 11000 SF gives footprint of 14300 SF  
Total site area estimated at 17400 SF  
Remaining site area of 3100 SF

<table>
<thead>
<tr>
<th>Area</th>
<th>Square Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greenhouse</td>
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</tr>
<tr>
<td>Aquaponics over</td>
<td>1000</td>
</tr>
<tr>
<td>Balcony Gardens over</td>
<td>1300</td>
</tr>
<tr>
<td>Row Crops</td>
<td>1700</td>
</tr>
<tr>
<td>Mechanical</td>
<td>70</td>
</tr>
<tr>
<td>Circulation/Grossing</td>
<td>530</td>
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<tr>
<td>Outdoor Garden</td>
<td>450</td>
</tr>
<tr>
<td>Picnic Area with Pizza Oven</td>
<td>350</td>
</tr>
<tr>
<td><strong>Total enclosed Floor Area</strong></td>
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</tr>
<tr>
<td><strong>Total Site Area</strong></td>
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<tr>
<td><strong>Total Built Site Area</strong></td>
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<tr>
<td><strong>Floor Area Ratio</strong></td>
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</tr>
<tr>
<td><strong>Tower Floor Area Ratio</strong></td>
<td>6.17</td>
</tr>
</tbody>
</table>

Parking not provided as dormitory will be in close proximity to two parking garages  
However underground parking could be provided and would yield about 50 spaces on one level
Part 3: Spatial Relationships

The diagram below, recalled from earlier, suggests some spatial adjacencies and potential synergies. By placing the activities into the program spaces on the previous page a set of rough plan adjacencies are developed as seen on the following page. These plans could be stacked to begin generating a tower layout, however the elevators do not align suggesting that some negotiation will have to occur between the adjacency diagrams to reach the final plan.
The room floor diagram at right is arranged to provide the maximum amount of natural light to the primary program spaces, keeping in mind the proximity of Scioto Hall to the North. This leads to a bilateral arrangement with a central atrium and communal spaces concentrated on the south face. The ground floor diagram directly is arranged to promote a logical flow of spaces for the typical occupant coming from the Campus Green. This results in a displaced utility core relative to the building entry promoting transit past the research bay with interior views. The diagrams above show this arrangement in three dimensions highlighting where program types are located.
Part 4 : Experience

The Dorm Room should be a desirable place to stay. It should be of a comforting, but not restrictive size and have variable lighting with natural light in the mornings. The integration of plant life into the room will provide air quality improvements, edible snacks, and a daily interaction with living things. This environment should promote general health and comfort.

Size 15x25x9 feet
Occupants 4 Permanent
Adjacent to Bathroom, Small Kitchen, Dining, and Garden Study

Lighting Sconce uplights, desk lamps, diffuse downlights, large window
Finishes Durable, comfortable materials that reduce noise ex. brick, concrete, rubber
Materials to control light or add color ex. plaster, marmoleum, wood, curtains
Furnishings Beds, desks, storage (closet, shelves, or dresser) warm, durable, modular

Services
Electric At least four outlets per resident, perhaps one switched outlet per room
Technology Room should have wireless internet access as well as one hardline location
Temperature Temperature control should be moderated by building management system to fall within a seasonal comfort range, individual room control would be poor
Humidity If a forced air system is used it will also control humidity
Ventilation Plants will improve air quality on top of hourly air change, windows will be operable to give resident’s direct comfort control, see previous two points
Water Minor water supply for window garden irrigation
Security Each room will have a locking door and individual desks will also lock

The Research Bay will need to provide assembly and testing space for agriculture related research. It should be open, flexible, and durable. The room should provide for many possibilities and display the activities within to engage the students and faculty with the efforts of their peers.

Size 32x90x12 feet
Occupants Up to 100 for demonstrations
Adjacent to Lobby, Road, Bathroom
Proximate to Utility and technology supply and management, Greenhouse

Lighting Easily adjustable track lighting and some sliding overhead spotlights, access to natural light for plant or climate studies
Finishes Durable, clean materials ex. sealed concrete, rubber, stainless steel, glass
Furnishings Modular work stations, tool kits, lab supply closet, technology cart

Services
Electric Four floor outlets every 12 1/2 feet on center, wall outlets every 8’ where able
Technology Room should have wireless internet access as well as hardline locations
Temperature The bay should have multiple control points for sectioned off experiments
Humidity Same requirements as temperature
Ventilation Bay should recieve hourly air change with separate controls for experiments
Water Wall connections for hoses, at least one sink, several floor drains
Security Entire room will be lockable with ID card access
The Dining Room should be an active space visually and physically connecting several key building elements. This role comes in part from the adjacency diagram as well as the precedent of Center Court in the CRC. That space has visual connections to the gym and the exterior resulting in visual interest for the occupants and a connection to the community.

Size: 25x90xvariable feet
Occupants: up to 150 at one time
Adjacent to: Large Kitchen, Greenhouse, Lobby, Classrooms

Lighting: Directed downlights and natural light from the greenhouse
Finishes: Interesting materials ex. stained concrete, field stone, bent wood, plaster
Furnishings: Slow food style long table breakable into small tables, chairs

Services
- Electric: Wall and floor outlets as necessary for cleaning
- Technology: Room should have wireless internet access
- Temperature: Temperature control should be moderated by building management system to fall within a seasonal comfort range
- Humidity: If a forced air system is used it will also control humidity
- Ventilation: Wall to greenhouse will be operable in part to allow summer time ventilation and olfactory interaction with garden
- Water: No direct water supply, hose hook up and sinks in kitchen
- Security: This room will be key card accessible by building residents outside normal meal times to provide communal space and access to fresh fruit

The Greenhouse will be to some extent an extension of the research bay, but with public access far beyond the visual. It will be a working production farm and enjoyable airy environment open to all visitors during daytime hours. It could pay homage to early iconic glazed structures such as the crystal palace.

Size: Site Widthx50x26 feet
Occupants: Up to 150 allowed during working hour demonstrations
Adjacent to: Dining Room, Campus Green, Outdoor Garden and Picnic Area
Proximate to: Kitchen, Cold Food Storage, Warm Food Storage, Lobby, Research Bay

Lighting: The greenhouse will be entirely naturally lit during the day, but will have LED security fixtures for night hours as well as LED grow lights for experiments and seedlings
Finishes: Durable materials ex. sealed concrete, stainless steel, glass, wrought iron
Furnishings: Modular planting stations, portable harvesting carts, equipment lockers

Services
- Electric: One sealable track of electrical supply will run the length of the house
- Technology: Wireless access will be provided for research on portable devices
- Temperature: The house will be self regulating with small, overridable sections for tests
- Humidity: Humidity will largely be a function of irrigation and temperature
- Ventilation: Automated windows will allow summer venting, a HVAC system will be available if needed for cool weather operation
- Water: Frequent connections and automated irrigation, regular floor drains
- Security: All doors will lock at set time in evening, key card access for researchers


Starr, Amory; Card, Adrian; Benepe, Carolyn; Auld, Garry; Lamm, Dennis; Smith, Ken; Wilken, Karen. Barriers and Opportunities to Local Agricultural Purchasing by Restaurants and Institutional Food Buyers. Colorado State University, Department of Sociology. April, 2002.


Appendix A
Agricultural and dietary data
Figure 1 USDA food pyramid

Figure 2 USDA alternate pyramid
Figure 3
Percent of Farms Operated by Family or Individual: 2007

Figure 4
Percent of Principal Farm Operators Reporting Primary Occupation as Other Than Farming: 2007
Figure 11

Acres Treated with Chemicals to Control Nematodes: 2007

United States Total: 7,560,158

1 Dot = 1,000 Acres

Figure 12

Acres of Crops Treated with Chemicals to Control Weeds, Grass, or Brush: 2007

United States Total: 228,293,783

1 Dot = 25,000 Acres
Figure 13

Figure 14
Figure 15

Total Received from Government Payments: 2007

United States Total
$7,983,922,000

1 Dot = $500,000

Figure 16 Break down of average food dollar

Source: USDA’s Economic Research Service
Figure 17 Subsidy diagram using White House garden
Table 1-1.

Major Foods: U.S. per capita food supply

<table>
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<tr>
<th></th>
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<tbody>
<tr>
<td>Total meats</td>
<td>177.3</td>
<td>179.6</td>
<td>191.9</td>
<td>192.0</td>
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<tr>
<td>Beef</td>
<td>79.6</td>
<td>72.1</td>
<td>65.0</td>
<td>63.8</td>
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<td>Pork</td>
<td>48.0</td>
<td>52.1</td>
<td>45.9</td>
<td>45.6</td>
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<tr>
<td>Veal</td>
<td>2.0</td>
<td>1.3</td>
<td>1.0</td>
<td>0.9</td>
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<tr>
<td>Lamb and mutton</td>
<td>2.1</td>
<td>1.0</td>
<td>0.8</td>
<td>0.8</td>
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<tr>
<td>Chicken</td>
<td>27.4</td>
<td>32.7</td>
<td>49.8</td>
<td>51.2</td>
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<td>Turkey</td>
<td>6.4</td>
<td>8.1</td>
<td>14.6</td>
<td>14.8</td>
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<td>Fish and shellfish</td>
<td>11.7</td>
<td>12.4</td>
<td>14.7</td>
<td>14.7</td>
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<tr>
<td>Eggs (number)</td>
<td>308.9</td>
<td>271.1</td>
<td>236.9</td>
<td>238.4</td>
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<tr>
<td>Cheese</td>
<td>11.4</td>
<td>17.5</td>
<td>27.7</td>
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<td>Ice cream</td>
<td>17.8</td>
<td>17.5</td>
<td>15.9</td>
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</tr>
<tr>
<td>Fluid cream products</td>
<td>5.2</td>
<td>5.6</td>
<td>8.7</td>
<td>9.1</td>
</tr>
<tr>
<td>All dairy products</td>
<td>563.8</td>
<td>543.2</td>
<td>575.6</td>
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<tr>
<td>Added fats and oils</td>
<td>52.6</td>
<td>57.2</td>
<td>65.8</td>
<td>65.6</td>
</tr>
<tr>
<td>Peanuts and tree nuts</td>
<td>7.2</td>
<td>6.6</td>
<td>7.6</td>
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<tr>
<td>Fruit and vegetables</td>
<td>564.4</td>
<td>594.4</td>
<td>695.6</td>
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<tr>
<td>Fruit</td>
<td>229.0</td>
<td>257.9</td>
<td>283.2</td>
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<td>Vegetables</td>
<td>335.4</td>
<td>336.5</td>
<td>412.4</td>
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<tr>
<td>Caloric sweeteners</td>
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<td>Sucrose</td>
<td>101.8</td>
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<td>66.2</td>
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<td>Corn sweeteners</td>
<td>16.7</td>
<td>38.2</td>
<td>84.5</td>
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<td>Grain products</td>
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<td>144.7</td>
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<tr>
<td>Wheat flour</td>
<td>110.9</td>
<td>116.9</td>
<td>148.8</td>
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<td>Rice</td>
<td>6.7</td>
<td>9.4</td>
<td>18.9</td>
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<tr>
<td>Corn products</td>
<td>11.1</td>
<td>12.9</td>
<td>22.9</td>
<td>na</td>
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<tr>
<td>Other</td>
<td>6.9</td>
<td>5.5</td>
<td>7.9</td>
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</tr>
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</table>

Approximate totals          | 1496 | 1730 |

Gallons

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<th></th>
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<td>Beverage milks</td>
<td>31.3</td>
<td>27.6</td>
<td>24.4</td>
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<tr>
<td>Whole</td>
<td>24.8</td>
<td>16.5</td>
<td>8.4</td>
<td>8.2</td>
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<tr>
<td>Lower fat and skim</td>
<td>5.8</td>
<td>10.5</td>
<td>15.7</td>
<td>15.5</td>
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<tr>
<td>Coffee</td>
<td>33.4</td>
<td>26.7</td>
<td>21.8</td>
<td>na</td>
</tr>
<tr>
<td>Tea</td>
<td>6.8</td>
<td>7.3</td>
<td>8.0</td>
<td>na</td>
</tr>
<tr>
<td>Carbonated soft drinks</td>
<td>24.3</td>
<td>35.1</td>
<td>52.0</td>
<td>na</td>
</tr>
<tr>
<td>Fruit juices</td>
<td>5.5</td>
<td>6.8</td>
<td>8.7</td>
<td>na</td>
</tr>
<tr>
<td>Bottled water</td>
<td>na</td>
<td>2.4</td>
<td>12.4</td>
<td>na</td>
</tr>
<tr>
<td>Beer</td>
<td>18.5</td>
<td>24.3</td>
<td>22.1</td>
<td>na</td>
</tr>
<tr>
<td>Wine</td>
<td>1.3</td>
<td>2.1</td>
<td>1.9</td>
<td>na</td>
</tr>
<tr>
<td>Distilled spirits</td>
<td>1.8</td>
<td>2.0</td>
<td>1.2</td>
<td>na</td>
</tr>
</tbody>
</table>

Approximate totals          | 116  | 132  |

na = not available.
1Boneless, trimmed weight. 2Excludes full-skim American, cottage, pot, and baker's cheese. 3Milk equivalent, milkfat basis. 4Shelled basis. 5Fresh-weight equivalent. 6Dry basis. Includes honey and edible syrups.
7Consumption of items at the processing level (excludes quantities used in alcoholic beverages and corn sweeteners). 8Oats, barley, and rye.

Figure 20
Figure 21 Proximity to McDonald’s

Figure 22

Trends in prevalence rates of food insecurity and very low food security in U.S. households, 1995-2010

Prevalence rates for 1996 and 1997 were adjusted for the estimated effects of differences in data collection screening protocols used in those years.

Appendix B

Precedents
Figure 1  Wally Satzewich and SPIN farm

Figure 2  Philadelphia SPIN farm
Figure 3 Growing Power main headquarters

Figure 4 Working in the Growing Power greenhouse
Figure 5  Yale urban farm

Figure 6  Lykins neighborhood garden plan
Figure 7  PF1 during PS1 party

Figure 8  PF1 side view
Figure 9  PF1 planting diagram

Figure 10  Bell, Book & Candle roof
Figure 11  Bell, Book & Candle hydroponics

Figure 12  Brooklyn Grange rooftop farm