University of Cincinnati

Date: 4/2/2011

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

It is entitled:
From Seed to Supper:
An Urban Permaculture Garden and Community Kitchen

Student’s name: Alexandra Dahlman

This work and its defense approved by:

Committee chair: George Bible, MCivEng

Committee chair: Michael McInturf, MARCH

UNIVERSITY OF CINCINNATI
From Seed to Supper: 
An Urban Permaculture Garden and Community Kitchen

a thesis submitted to the
Division of Research and Advanced Studies
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

ALEXANDRA DAHLMAN
B.A., Mathematics, Dartmouth College, June 2006

Committee Chairs:
Michael McInturf
G. Tom Bible
Despite the many known benefits of urban agriculture that have been observed recently and over the last few decades, there is still much room for improvement. Common trends in urban food production tend to include either a reluctance, or inability, to work within a city’s bureaucratic hierarchy, or a lack of understanding and creativity to think beyond the existing, traditional farm framework.

The grassroots approach to starting and maintaining urban farms might be more appropriate for communities in the short term, but top-down design thinking has the potential to create more long-term solutions that not only incorporate architecture, but also take advantage of the inherent characteristics of urban areas. A hybrid architecture based on permacultural principles is proposed that seamlessly integrates building and landscape to optimize the functions of both.

The intended outcome will be a community kitchen and edible landscape located on a small abandoned urban lot that produces food in an ecologically sensitive and low-input process, while providing a place for the storage, cooking and consumption of food. This will result in a stronger, healthier community that has a better understanding of the whole food cycle, allowing its residents to make more informed choices and to increase their accessibility to fresh food.
fig. 1: A study of David Holmgren’s 12 Principles of Permaculture.

fig. 2: World War II Victory Garden poster.

fig. 3: Urban agriculture in Cuba.

fig. 4: Average distance food traveled to Chicago Terminal Market.

fig. 5: Community Garden started by University of Maryland Eastern Shore during economic downturn.

fig. 6: Student from Eco Youth Garden sells produce at Findlay Market.

fig. 7: Many urban farms employ the use of fences to keep out intruders.

fig. 8: Development invading urban farm -OR- architecture wants to join urban farm.

fig. 9: Pig City by MVRDV.

fig. 10: Architecture making agriculture visible.

fig. 11: Succession.

fig. 12: Stacking in a forest.

fig. 13: Scale of Permanence.

fig. 14: Stacking of program elements in PF.1.

fig. 15: Public spaces involving food tend to draw a crowd.

fig. 16: Local food network

fig. 17: The Frankfurt Kitchen

fig. 18: Cooking lessons at Huntington’s Kitchen.

fig. 19: Alice Waters teaches students how to cook.

fig. 20: Obesity map.

fig. 21: The 36-Hour Dinner Party.

fig. 22: Cellar storage.

fig. 23: Drying.

fig. 24: Fermentation.

fig. 25: Typical convenience store in Over-the-Rhine.

fig. 26: Figure-ground map showing abandonment.

fig. 27: N, E, S, W views of site.

fig. 28: Points of Interest map in Over-the-Rhine.

fig. 29: Zone and sector maps.

fig. 30: Existing water catchment potential.

fig. 31: Year-round shadows that fall on the site.

fig. 32: Schematic layout of building area and site.

fig. 33: Random assembly of program elements.

fig. 34: Interdependence of selected site forces and program elements.

fig. 35: Schematic sketches of microclimates created by buildings and growing surfaces.

fig. 36: Evolution of building and site over time.

fig. 37: Early ideas about construction and casting.

fig. 38: Developing “the hill.”

fig. 39: Volume of shadows on site.

fig. 40: Limiting factors determining new topography.

fig. 41: New topography based on various design factors.

fig. 42: Detail of topo model shows NW corner of site.

fig. 43: Overlapping floors provide vertical circulation.

fig. 44: Floor plans and relative location.

fig. 45: Stratification of program.

fig. 46: Collages in progress for final presentation.

fig. 47: Proposed Arcosanti Greenhouse/Energy Apron.

fig. 48: Water management at Sidwell Friends School.

fig. 49: Aquaponics system at Growing Power.

fig. 50: Diversity of plants and activity at PF.1.

fig. 51: Detail of the High Line.
fig. 1: Poster by author.

fig. 2: http://www.art.unt.edu/ntieva/pages/about/newsletters/vol_15/no_1/WarPosterImages.htm

fig. 3: Still from the short film “Organopónico: An Agricultural Revolution.”

fig. 4: http://www.attra.org/attra-pub/foodmiles.html

fig. 5: http://www.umes.edu/PR/Article.aspx?id=22872

fig. 6: Photo by author.

fig. 7: Photo by author.

fig. 8: Photo and sketch by author.

fig. 9: http://www.inhabitat.com

fig. 10: Sketch by author.

fig. 11: Diagram from Earth User’s Guide to Permaculture

fig. 12: Drawing by Graham Burnett.

fig. 13: Table from Edible Forest Gardens, Vol. 2

fig. 14: Diagram by author.

fig. 15: http://www.maxginsburg.com

fig. 16: Diagram by author.

fig. 17: Pictures from Architecture and Feminism.

fig. 18: http://www.chasingthenow.com/2010/08/cooking-at-huntingtons-kitchen/


fig. 20: Chart from A Cultural Feast

fig. 21: Photo by Ava Brackett for New York Times Magazine: The Food Issue

fig. 22: Photo by Jennifer May.

fig. 23: Photo by author.

fig. 24: http://raingarden.blogspot.com

fig. 25: Photo by author.

fig. 26: Diagram by author.

fig. 27: Photos taken and stitched by author.

fig. 28: Diagram by author.

fig. 29: Diagram by author.

fig. 30: Drawing by author.

fig. 31: Diagram by author.

fig. 32: Drawing by author.

fig. 33: Diagram by author.

fig. 34: Diagram by author.

fig. 35: Sketches by author.

fig. 36: Sketch by author.

fig. 37: Models by author.

fig. 38: Model by author

fig. 39: Model by author.

fig. 40: Model by author.

fig. 41: Model by author.

fig. 42: Model by author.

fig. 43: Model by author.

fig. 44: Drawings by author.

fig. 45: Model by author.

fig. 46: Collages by author.

fig. 47: Image courtesy of Arcosanti archives.

fig. 48: Image by Andropgon Associates.

fig. 49: http://www.growingpower.org/aquaponics.htm

fig. 50: Images by WORKac.

fig. 51: http://www.thehighline.org/
Urban farms have existed in various forms throughout most of history (the first farms were inherently urban in that cities were built around food). Recently there has been a shift in how people think about food and farming. The looming threat of global warming, the depletion of natural resources, and the ravaging of land to make room for more farms, malls, and housing developments, has sent up a red flag of warning that our time here on Earth might be limited if we do not change our ways. Additionally, factory farming, genetically-engineered foods and the patenting of seeds by major agribusiness corporations have caused many people to not only feel disconnected from the source of their food, but also a sense of fear about eating it.

Those who bear the privilege have been changing their diets and food practices by reducing or eliminating their consumption of meat, shopping at farmers’ markets, and participating in Community Supported Agriculture programs to support local farmers, decrease their environmental impact, and of course to eat better quality food. Not everyone has the luxury to make such choices, however, and the disparity between the healthy and unhealthy is widening in conjunction with the gap between the rich and the poor. Many low-income urban residents live in food deserts – areas with limited access to healthy, affordable food – and rely on convenience stores for their daily sustenance. Those who are lucky enough to have a proper grocery store within walking distance statistically pay higher prices than their suburban counterparts, and the items – especially produce – are generally of lower quality.

The resurgence of urban farms and community gardens has created an opportunity for city dwellers to re-engage with the food that sustains them and to improve neighborhoods and communities. But these city farms are not reaching their full potential. Urban agriculture, when combined with design thinking and ecological principles, can better serve communities over a longer period of time while gradually reintroducing a natural ecosystem to the area.
As urban agriculture rises in popularity, so too does architects’ interest in it. From high-rise pig farms, to living and growing art installations, several architecture firms are pursuing urban agriculture as the next big design opportunity. While it is encouraging that the design profession is taking on this important issue, proposals are often overreaching, or do not really consider the bigger picture. That is to say that some designs attempt to plan and control too much, when certain aspects should just be left either to nature or to the community to develop, or that grand sweeping gestures are made that do not take fundamental concepts into consideration, such as human behavior and the necessity of bio-diversity.

Alternatively, various grassroots efforts have come up with inspiring and innovative ways of growing food within cities. Although in developing countries such as Cuba, urban agriculture has become a necessity to feed the majority of the population, developed countries emphasize the social and educational benefits over food production. Community gardens have been associated with schools, hospitals, and even prisons, and have offered a range of positive outcomes including a sense of pride, horticulture therapy, greater sense of civility, and a more holistic understanding of man’s place within nature. These results are not limited to associations with the places mentioned above, but are common to almost all forms of urban agriculture and community gardening.

If there has been so much success in growing food in cities by people with little or no design training – an estimated 800 million people worldwide - then what could an architect possibly add to the situation? It is clear that an architect is not a necessary component to growing food, however, one with such training has the ability to see such projects within a greater context and to give them a more legitimate place within the city. Additionally, there is undoubtedly a role for architecture to play in the agricultural realm, not only for obvious structures such as greenhouses and storage facilities, but also for gathering spaces – inside and outside – that can make the farm more relevant in its urban context. The failure of architects so far to intervene in a fruitful way has been an insufficient understanding of natural systems and all of the factors that go into creating a healthy growing environment, as well as too much concern with making the architecture the primary focus.
In order to successfully integrate architecture with urban agriculture, the designer must take into consideration all of the needs and yields that are characteristic of each, particular to a specific location – climatic, social, and economic contexts are critical – and use that information to consciously combine them in a symbiotic relationship that actually improves the functions of both. The project proposed in this document attempts to do this through the creation of a community center that revolves around the whole food process. Located on a vacant medium-sized lot in an historic district, the qualities of the site, discussed in more detail later, make it an ideal place for a new vision of urban agriculture. The main building, which provides space for cooking, eating, and food storage, becomes an additional growing surface as it morphs into the landscape. Meanwhile, the outdoor growing area takes advantage of the three-dimensional void created by surrounding buildings to focus on optimizing plants vertically instead of just horizontally.

The result will introduce urban residents to the pleasure and positive effects of growing, cooking, and eating together, who have been deprived of access to fresh, healthy food. Because of the integrated design and innovative growing methods there is a low input to output ratio, meaning that costs could be kept low and interested community members would not need to make a huge time commitment in order to benefit from such a place. Finally, this project will help to revitalize a community by creating a street presence, engaging residents without jobs, intermingling people of different ages and backgrounds, and creating a beautiful place that restores an ecosystem while restoring a neighborhood.
can the integration of architecture and permaculture redefine how an urban community accesses food?
When planning a meal it is helpful to have a recipe to follow. Generally, a few primary ingredients are known and supporting ingredients are required to make a complete dish. There are usually several ways to combine potentially disparate elements, but a good recipe offers a set of instructions that matches the cook's skill level and produces a tasty result.

The appropriate recipe for this project were the principles of Permaculture, which acted not only as a design methodology, but also as a practice to be employed within the project itself. Additionally, the document uses the food cycle as an organizing mechanism in order to demonstrate how the project and document continually informed one another.
This thesis focuses on systems integration as a driving force in waste reduction, optimization of land use, and greater output to input ratio in relation to food production and consumption, community life, architecture, and the natural environment. Efficiency, in and of itself is not the goal, as that has resulted in a preoccupation with short-term gains over long-term benefits, as well as a tendency to dehumanize a process. A design methodology called permaculture combines the systems thinking that leads to greater efficiency and output, but does so with great concern for human and ecological health and well-being.

Permaculture originated as a form of sustainable agriculture that mimics natural systems. Although not an entirely new concept, the term itself was coined in the late 1970s by Bill Mollison, an Australian professor, and his student, David Holmgren, as a portmanteau of the words permanent and agriculture. Over time, the practice of permaculture has seeped into people's lives beyond food production and land reclamation, and has become somewhat of a life philosophy, leading to a reinterpretation of the word as permanent culture. To label permaculture as merely a form of sustainable agriculture would be inadequate at best. As Holmgren explains:

“Permaculture is not the landscape, or even the skills of organic gardening, sustainable farming, energy efficient building or eco-village development as such, but it can be used to design, establish, manage, and improve these and all other efforts made by individuals, households, and communities towards a sustainable future.”

Specific design techniques are discussed in a later chapter, but permaculture as a design methodology is defined by a framework of three core ethics and a set of design principles that clarify the goals of the process. The three ethics that are unanimously agreed upon by all who teach and practice permaculture are Earth Care, People Care, and Fair Share. Working from a broad scale inward, Earth Care concerns the husbanding and stewardship of soil, water, and trees. People Care calls for a greater degree of self-reliance and responsibility, followed by regard and concern for family and community. This ethic also emphasizes the importance of non-material well-being in order to reduce the conflict between caring for nature and caring for ourselves. Finally, Fair Share first encourages limiting consumption and reproduction, and then advises the redistribution of surplus if a proper balance is not achieved.

1. Observe and Interact
2. Catch and Store Energy
3. Obtain a Yield
4. Apply Self-Regulation and Accept Feedback
5. Use and Value Renewable Resources and Services
6. Produce No Waste
7. Design from Patterns to Details
8. Integrate Rather than Segregate
9. Use Small and Slow Solutions
10. Use and Value Diversity
11. Use Edges and Value the Marginal
12. Creatively Use and Respond to Change

PERMACULTURE
These three ethical principles create the underlying foundation for a more sustainable culture in the age of energy descent. However, they are not specific enough to guide the design of such symbiotic systems. For this reason, David Holmgren devised a set of twelve design principles to facilitate the development of all permaculture projects. The following principles are organized mostly chronologically as they would occur in the design process, but as is the nature of permaculture, no single principle can be exercised without somehow involving another.

1. Observe and Interact
2. Catch and Store Energy
3. Obtain a Yield
4. Apply Self-Regulation and Accept Feedback
5. Use and Value Renewable Resources and Services
6. Produce No Waste
7. Design from Patterns to Details
8. Integrate Rather Than Segregate
9. Use Small and Slow Solutions
10. Use and Value Diversity
11. Use Edges and Value the Marginal
12. Creatively Use and Respond to Change

Although his principles differ from those established by his colleagues, they have been chosen as the methodology for this thesis because they have a greater capacity to reach beyond the rural agricultural realm more so than the others. The practice of permaculture is continuously evolving in order to adapt to our ever-changing world. The over-consumption and -production apparent in urban areas as well as their inherent qualities of density, diversity and interdependence make the application of permaculture in such places not only necessary, but incredibly well-suited to achieving a more sustainable society. As we move into an uncertain and potentially unsettling future, we can hoard resources in fear that they will soon be gone, we can give up in apathy, or we can start creatively turning problems into solutions. This is not limited to the way we feed ourselves, but as food touches every aspect of our lives, it deserves to be the central focus.

*fig. 1* A study of David Holmgren’s 12 Principles of Permaculture.
All plants begin with a seed. The food that ends up on a plate in its final edible form might not be recognizable from its humble beginnings, but it had to start somewhere. Planting a seed, or many seeds, is the initial step in growing a garden, a field, or a forest.

The impetus for this project stems from an interest in urban agriculture as a remedy to many issues facing cities today. Although it is not assumed to be a panacea for all societal ills, it has positively contributed to the uplift of various communities, particularly in under-resourced areas. An examination of the history of urban agriculture, as well as its known benefits and areas needing improvement, will be the first step in determining how to design a better system.
Originally, most agriculture was inherently urban, as cities were formed around where people could grow and have access to food. The advent of trains and modern preservation techniques – i.e. refrigeration – has moved farming ever farther away from where the majority of the population lives, namely cities. In the time since the Industrial Revolution, urban agriculture has taken on a new meaning, and encompasses a wide range of practices on a variety of scales. According to Joe Nasr, “[u]rban agriculture defined in simple terms is the growing, processing, and distribution of food and other products through intensive plant cultivation and animal husbandry in and around cities.” It has come to include community gardens, backyard gardens, rooftop gardens, empty and abandoned lots, and farms on the edge of cities – also known as peri-urban agriculture.

Historically, urban agriculture has been employed for various reasons, but most notably due to a scarcity in resources. During World War I and II, Victory Gardens became a patriotic act for many in the United States and in Britain as leaders urged families to grow their own food, as much of the farm labor force had been drafted. These efforts were hugely successful in not only securing the food supply, but also making average citizens feel like they were doing their part. In fact, at the end of the second world war, 40 percent of the produce consumed in America had been grown in Victory Gardens. Popularity and government support decreased substantially over the next few decades but was reignited in the 1970s during the energy crisis and when many people became concerned with the quality and safety of their food. This was not an unfounded fear, considering that in an effort to reduce vulnerability in the future, the nation’s croplands were being doused in chemical fertilizers and pesticides.

A more critical example of urban agriculture emerged in Cuba in the early 1990s during what has become known as the Special Period. The collapse of the Soviet Union meant that Cuba’s oil supply was essentially cut off, and its major trading partner out of the picture. Agriculture in Cuba revolved primarily around sugar and tobacco, which were heavily dependent on petroleum-based fertilizers. This meant that

---

they not only were unable to produce their main cash crops, but also that they were growing hardly any of their own food. The problem was further amplified by the U.S. embargo, and Cubans were suddenly forced to adapt or starve to death. Any and every piece of available arable land was turned into a garden. The lack of oil required that all food be produced locally and using largely organic methods. By 2001, approximately 8,000 urban gardens, or organipónicos, in Havana were producing 60 percent of the city’s vegetables. Cuba continues to practice urban agriculture – particularly in Havana – both out of necessity, but also due to extensive research that has proven the effectiveness of organic and permacultural methods.

While the United States is not faced with such dire circumstances as the ones just described, the threat of Peak Oil, the recent economic crash, a heightened awareness of environmental degradation, and a desire for affordable, better-quality food have resulted in a renewed interest in urban agriculture. Despite the efforts of major food corporations, chemical fertilizer companies, and others who profit from conventional industrial farming practices to discourage local markets and sustainable growing methods, the future of urban agriculture appears promising as a supplement – if not an eventual replacement – to the way we feed cities.

URBAN AGRICULTURE: BENEFITS

Every year the world becomes more urban, due to both migration from rural areas, and to increased population within urban areas. The world’s population officially became equally distributed between rural and urban areas in 2008. According to the 2010 US Census Bureau 83.7% of Americans live in metropolitan areas. These percentages are expected to increase as time goes on, and yet most of our food is still produced in rural areas. Additionally, food is traveling farther than ever before to get from its source to its final destination – on average, a journey of 1,500 to 2,500 miles. For a frame of reference, this is equivalent to a trip from Cincinnati, OH to a location between Salt Lake City, UT and San Francisco, CA.

5 For more information on urban farming in Cuba, see chapters 16 and 17 in Continuous Productive Urban Landscapes, and also the film “The Power of Community.”
There was a point in time where the ability to obtain food from far away was considered a sign of prosperity – it may still be – but it comes at a large cost. The major benefits of urban agriculture derive from the fact that it is a local practice. The ultimate consumers of the food produced on urban farms and gardens are people living within the city, or even within the neighborhood where it is grown. This means that local populations are the beneficiaries of all that urban agriculture has to offer. The primary advantages include improved health, stronger communities, economic security, and ecosystem restoration.

Urban agriculture has the potential to improve people’s health in various ways. To begin with, food that is produced locally is likely to reach the consumer soon after it is harvested. Because the food does not need to travel very far, it can be picked when ready and still be fresh at the time of purchase. When produce is imported over a long distance both taste and nutrition are compromised. This is because it is generally picked before it is ripe so that it can survive the journey. Additionally, the variety of produce found in most grocery stores is limited to those foods that travel well, and that can maintain shelf life. Locally grown food does not need to deal with this problem, and is likely to encourage an even greater diversity of foods by reacting directly to local consumer demand. For those engaged in the actual process of growing the food, physical and mental health are improved as well, through the exercise, fresh air, and socialization associated with the activity.

The personal interaction that results from urban agriculture is a huge asset to any community. Often, the disenfranchised members of society are the people who have the most to offer and to gain. These people include the elderly, women and immigrants, among others. Immigrants in particular have historically played a large part in the development of urban agriculture in the United States. The mixture of people from different backgrounds, ages, income levels, and skill sets allows for a transfer of knowledge on multiple levels, giving a voice to those who otherwise feel powerless. Community ties are also strengthened through the direct relationship between producer and consumer. Trust is a key ingredient in community cohesion, and it is established when the consumer not only knows the person that grew his food, but can also see where the food itself is grown.

---

fig. 5: Community garden started by the University of Maryland Eastern Shore during economic downturn.

---

Both the community and the individual can receive the economic benefits from urban agriculture. First, food-related jobs are created – production, processing, and marketing – reducing unemployment.\(^9\) Since there are less external costs to deal with, such as distribution, packaging and middlemen, the producer keeps a greater percentage of the profit, and the consumer pays a lower price for a better product. This creates more fungible income for both parties, which they can put back into the local economy by shopping at other neighborhood stores. Under these circumstances, the overall income level of the community increases, creating more stability.

The ecological benefits from growing food locally in an urban setting are numerous. The reduced food-miles and packaging required not only decrease costs, but also energy inputs and waste. By tapping into urban waste streams, unwanted byproducts such as food leftovers and landscape clippings can be collected and turned into compost for a more fertile soil. Growing food in cities manages to turn more urban areas into green space, while reducing the need to destroy more habitat in the countryside for agricultural purposes. Other ecological benefits are addressed later in the document.

The local aspect of urban agriculture allows it to benefit the people who need it most, who can then better help themselves. By focusing food production in cities, there is less of a tax on the economy and the environment, and a healthier, happier community is bound to emerge.

URBAN AGRICULTURE: DRAWBACKS

The benefits of urban agriculture are many, but that does not mean there is no room for improvement. As it stands, all forms of urban farming and gardening have a lot of untapped potential that has remained unrealized due to either a lack of vision, or perhaps just a lack of resources. Whatever the reasons, some key issues need to be addressed before urban agriculture can become a sustainable part of the cities of tomorrow.

One of the main problems regarding city farms is that they often do not adequately fill the void that was there before they assumed the space. A formerly empty lot may have been given a new purpose, but it physically remains essentially an empty volume. This is due mostly to the fact that farming is a two-
dimensional practice, where the majority of activity occurs just a few inches above the ground. From a distance, it is only abundant signage that indicates the site is being occupied and utilized. It is also not uncommon for such lots to be surrounded by fences, instilling a “look but don’t touch” sentiment in the passerby. Although some urban farms have managed to successfully double as a community gathering space, many examples are too inward-focused to entice visitors to engage and interact with the site. This is a missed opportunity to create a vital urban space with street presence that is inviting to all members of the community. Without this, the farm is merely acting as an outdoor factory, albeit one that is well-intentioned and environmentally sound.

The farming methods employed in urban agriculture tend to be organic – including those farms that are not officially certified as such, which is a welcomed change from conventional large-scale industrial agriculture. However, a truly urban form of farming has not yet been developed, as straight rows of plants lining the ground still dominate the landscape, despite the fact that square footage is a valuable commodity in a city. Various innovative approaches have been proposed, including vertical farming towers and the conversion of bare rooftops to productive food gardens. The implications of these ideas on the social urban fabric remain to be seen.

Part of the problem of the inefficient use of space in many larger urban farms is that they are not established with long-term goals in mind. Many urban agriculture projects are taken on as temporary installations, either in a guerilla manner or with permission from the landowner with the understanding that the farmers could be asked to leave whenever the property is ready to be developed for a different purpose. This liminal state of occupation prevents real planning from occurring, since any type of permanent structure or action that does not yield immediate results run the risk of being torn down, or never fully realized. It is difficult to invest the time and energy into experimenting with new ideas and methods when the likelihood of seeing a project through is limited. Long-term planning and record keeping could revolutionize the way food is grown in cities by attempting alternative methods of growing and taking the time to research what is possible. This would undoubtedly be much easier if the project were sanctioned.

See MVRDV’s Pig City and Dick Despommier’s Vertical Farms.
by the government, and if urban farming were made an integral part of land use planning and design.\textsuperscript{13}

Permanent structures may be an anomaly on urban agriculture sites, but the infusion of architecture has the potential to create the connection to street life that is often lacking. Buildings are an inherent part of cities, and their inclusion on an urban farm could establish a sense of weight to the site, by acting as a gateway to the farm, mediating the edge between urban and pastoral. A building, or series of buildings, allows for additional programmatic elements that further the goals of urban agriculture but are not readily met by growing space alone. For example, food grown on the farm could be cooked and shared by community residents on site if a space were provided to do so.

Overall, most of the shortcomings of urban agriculture stem from its temporary nature, and lack of top-down thinking. Grassroots efforts have made many of these projects possible, but if they are to remain a sustainable asset to cities that grow and evolve, they need to be designed to create value over time, which would allow for more innovation and experimentation to take place.

Simply planting a seed does not guarantee that it will grow. Generally a plant needs to be fertilized in some way to start the process. In some cases this is a matter of ensuring that all of the nutrients necessary for growth are available in the soil. In other cases, an agent such as a bee is required to transfer pollen from one plant to another to allow fertilization.

In order to make the practice of urban agriculture more productive, various elements and processes can be added that aid not only in the growth of plants, but also in the understanding of the whole food cycle.
This thesis is not so much concerned with architecture in and of itself, but rather the role that architecture can play as a catalyst for change. In this case, it is not what the architecture is, but what it does, that counts. The building is secondary, though necessary, and needs to be judged on its ability to improve the production of food and to promote a fluid exercise of the whole food cycle. Both the building and site, which are seen as inseparable, do not intend to dictate the precise pattern of use. Instead, they create the circumstances required to make certain actions not only possible, but also favorable to perform. The Italian architect Paolo Soleri has likened his architecture to an instrument – an infrastructure of environmental resources – that allows its users to produce the music.\(^1\) In this way, he attempts to avoid planning the lives and actions of the project’s residents, while creating conditions for them to exist in a manner that is beneficial to the whole.

Many architects over time have proposed ways to improve the way we produce and distribute food, but few ideas were ever realized. One of the most well known examples was Ebenezer Howard’s *Garden Cities of To-Morrow*, which called for settlements that devoted most of their area to food production and residential plots that could provide most of the food necessary for an average family. Le Corbusier and Frank Lloyd Wright, both inspired by Howard, proposed their own visions of cities that created space for local food production, although from completely different perspectives. Le Corbusier emphasized densification as a means of freeing up green space, whereas Wright saw agriculture as something that could be interspersed among suburban lots, creating a cohesive planning strategy. More recently, the Dutch architecture firm MVRDV addressed the issue of the wasted resources apparent in the energy intensive farming of animals by proposing “Pig City” – a collection of skyscrapers that serve no other function than to raise pigs for the consumption of meat, but requiring less land and energy.\(^2\)

These examples, though inspiring, were either utopian in nature, or in the case of MVRDV, proposed somewhat in jest for the sake of being thought-provoking. It seems as though architects have had such a difficult time breaking into the realm of agriculture, specifically urban agriculture, either because they attempt to do so with such broad strokes as to be unfeasible, or because the focus is put on making

---

agriculture work with our existing architecture, instead of thinking about how to adjust our architecture to work with the way food naturally grows.

The question must be asked, what can architecture do for urban agriculture? After the successful completion of Public Farm 1, an urban farm installation for the PS1 Young Architect’s Program in 2008, WORKac principal Amale Andraos made the point that, “[a]s architects, we can make things visible, and by making them visible, we add value to something that could have functioned in the same way, but invisibly.” Even if the building itself is not what is being made visible – in the case of the WORKac project there was no building at all – it is the job of an architect to create the space in which this becomes possible.

But beyond fostering the growth of plants, the implementation of clever but appropriate architecture into the realm of urban agriculture offers many other kinds of opportunities for growth. The space created by the architecture includes both indoor and outdoor program areas. Since the outdoor space is mostly devoted to growing food, the indoor space could concern itself with lesser-addressed issues relevant to urban agriculture – primarily, what to do with the food once it has been grown. A permanent structure would provide a place to store, cook, eat, and compost food as a way to engage the community beyond the garden. By making this visible, as Andraos described, the whole food cycle is revealed to people through a heuristic learning process, and access to quality food is gradually increased.

PERMACULTURE DESIGN STRATEGIES

Permaculture has already been defined and laid out as the design methodology for this thesis project, but it serves more than just a theoretical guideline. Decades of experiments by various permaculture advocates have led to some common design strategies and tactics that produce more advantageous results when growing food. Many of these techniques are directly inspired by natural systems that have long proved themselves successful, while other methods take a broader view of the site as a whole and focus more on the presence of humans within it.

Three planting methods that mimic natural systems are that of succession, stacking and guilds.

---

When a disturbance occurs in nature, an ecosystem needs to rebuild itself, and it does so through the process of succession. The order in which plants repopulate this area is not random, but rather starts with ground cover plants like grasses, which are then followed by herbs, shrubs, small trees, and then eventually tall trees. The process cannot begin with tall trees because the nutrient levels needed to support them can only be provided by the plants that came before them, which happens along each link of the chain. Succession can be encouraged through the planting of native species, which are more resistant to outside disturbances. Eventually, the ecosystem becomes more stable as diversity increases (see Figure 11). Stacking follows along the lines of succession but assumes an already complete system. The idea is to densely pack plants such that they occupy different positions in either time or space. In other words, a particular system could include plants that blossom at different times or grow at different rates so that they are not fighting for the same resources. Similarly, when plants make up the seven layers of a forest garden they have different space requirements above and below ground and therefore do not interfere with each other. This seven-layer system (see Figure 12) is referred to as a beneficial guild. Guilds are like polycultures in that they offer biodiversity, creating a more stable ecosystem as was discussed earlier. However, guilds are unique in that the species involved are part of a symbiotic relationship where the whole is greater than the sum of its parts. By studying the different needs, yields, and behavioral characteristics of different species – both plants and animals – guilds can be intentionally designed into a garden or farm that benefit humans while simultaneously creating habitat.

Some specific examples of how to encourage plant growth include the following. Planting and digging swales along contour lines prevents erosion, slows water down, and stores minerals and nutrients. Keyhole garden beds and water features with sinuous curves capitalize on Holmgren’s eleventh principle of edge optimization. Herb spirals not only increase edge, but also use slope to create a multitude of microclimates in a small area. Finally, the inclusion of animals is crucial to lowering maintenance and creating a healthier ecosystem. Sir Albert Howard points out that “[m]other earth never attempts to farm without live stock,” and neither should we.

---

When considering the design of the overall site, it is important to think about what already exists, what changes are desired, and the effort required to implement those changes. The different elements of a site can be listed on a scale of permanence that helps to identify which elements need to be addressed first. David Jacke has assembled the most thorough Scale of Permanence list that has been adjusted from previous versions – P.J. Yeomans first established one in 1958, followed by Bill Mollison and David Holmgren in 1978 – to acknowledge more developed areas. From most permanent to least permanent the elements are: Climate, Landform, Water, Legal Issues, Access & Circulation, Vegetation & Wildlife, Microclimate, Buildings & Infrastructure, Zones of Use, Soil Fertility & Management, and Aesthetics/Experience of Place. The table in Figure 13 breaks down the specific aspects of each element that must be considered for a proper analysis.

Another means of site analysis is to determine zones, sectors, and slopes. The zones discussed here differ from the ones above, which are already established according to property lines and other civic factors. Zones in this case refer to the radial areas extending from the focal point – usually considered to be the home or primary building – that are defined by frequency of use and levels of input. Although based on existing elements, these zones are designed such that the components requiring the most attention are located nearest to the home and those that can function with little to no human input – essentially considered a wild zone – are farthest from the home. These zones generally also align with desirability and/or necessity. Sectors are external forces that act upon the site and are usually climate-related such as sun, wind, and rain, but can also include factors such as noise, views, and access points. Once a sector map is drawn, the site can be designed to block, channel, or open up the pathway of any of the forces as necessary. Finally, the slope of a site brings the design process into the third dimension. The steepness and aspect of the slope at different points on the site will determine the appropriate selection of plants and positioning of built structures. A sloped site is preferred over a flat one since gravity can be used to create a more efficient system and plants get more direct exposure to sunlight.

---

This is just a brief overview of the many ways in which permaculture design can create a higher-yield, lower-input food production system. Later sections of this document apply the principles to an urban environment, and demonstrate how the plant-focused strategies discussed here translate quite easily to a more human- and building-focused situation.

INTEGRATION AND DIVERSITY

Integration and diversity are two of the most critical principles that David Holmgren names, and sum up many of the most important themes in permaculture. Additionally, they can be understood on a multitude of levels, from plants, to humans, to buildings, to cities. So far this thesis has focused mostly on urban agriculture and the process of growing food, but the use of architecture is not at odds with this—the two need not be mutually exclusive. What this thesis attempts to prove is that they can actually be mutually beneficial. Not only that, but architectural design and permaculture design are more similar than they are different, and their combination is necessary for the project.

A good starting point for understanding the value of integration and diversity comes through an analysis of these two statements that have been central to permaculture literature:

1. Each important function is supported by many elements.
2. Each element performs many functions.

These statements emphasize the need for beneficial relationships between elements that have, and serve different needs. The success of a system can depend on relative location, variety of different components, and how effective their interaction is. Bill Mollison made a point of saying that “the importance of diversity is not so much the number of elements in a system; rather it is the number of functional connections between those elements.”

This idea is not unique to permaculture, however, as evidenced by Jane Jacob’s interest in diversity as a token to revitalizing urban areas. When naming the four necessary conditions of lively streets and districts in her 1969 book, The Death and Life of Great American Cities, the first condition reads:

These two ideas are present in every major permaculture publication, including Permaculture Designer’s Manual, Principles and Pathways, and Edible Forest Gardens.

1. The district, and indeed as many of its internal parts as possible, must serve more than one primary function; preferably more than two.\textsuperscript{11}

She goes on to speak about the importance of density, the scale of streets and city blocks, and the diversity of age and condition of surrounding buildings.

This ties directly to the processes of succession, stacking, and guild-making that were described earlier. When applied to the human realm, these processes all hold cultural significance in community building. Succession, which will be described in more detail in a later section, can be applied to the transfer of knowledge that continues to build upon itself over time. Stacking can be thought of in terms of the building’s program and the site as a whole. An urban site generally lacks a notable amount of horizontal space, but contains a fair amount of vertical space. When thought of in this way, elements and activities can be distributed sectionally instead of just in plan. This was the idea behind P.F.1, where “[t]he doubling of the space – with activity and party life below and the plants above – is essentially the kind of stacking needed to densify cities and introduce new programs.”\textsuperscript{12} A guild, which is probably already more recognizable in its human form as a group of people working together in the pursuit of a common goal, can be reconsidered from a permaculture perspective as a group of people whose combined skills and expertise can offer protection, stability, and even profit.

From a building standpoint, the literal integration of architecture and agriculture creates opportunities for both. The building benefits from the insulative properties of the soil and is able to maintain a fairly consistent year-round temperature. Along the same lines, plants can also be used as a shading device to keep glazed areas cool. The indoor air is cleaner and more oxygen is available, reducing the risks of sick building syndrome. A less quantifiable outcome is the direct access to the productive landscape, both in the availability of food and the aesthetically pleasing views.

Urban agriculture benefits from the direct integration with architecture by gaining many new surfaces to grow food on that vary in slope, aspect, and scale. Not only do the plants get varied exposure to sunlight, offering microclimates for plants with different needs, but also the thermal mass and potential reflection from the buildings creates an overall warmer system that can extend the growing system. The

\textsuperscript{12} Andraos and Wood, ed., \textit{Above the Pavement – The Farm!: Architecture and Agriculture at P.F.1}, 193.
other benefits of a sloped surface that were mentioned earlier, such as reduced energy inputs and gravity fed water, are still applicable here. The direct access that the farm has to the building creates the ability to complete the whole food cycle. This includes having a space to store food and seeds that will keep for extended periods of time if stored properly. Also, there is a greater amount of compost produced by adding cooking and eating to the program. The building has the potential to attract more people, which means that more are hands available to take care of the farm.

The ease in which permaculture principles can be applied to the social, cultural and built context in the urban realm leads one to believe that perhaps it is not an application at all, but that they are actually one in the same. The striking similarities between the requirements for a healthy food production system and a healthy urban community beg that the two be integrated for the benefit of both.
After the seeds have been planted and the soil fertilized, the plants need to be tended to in order to promote their growth and ensure their protection. The process of cultivation requires a certain degree of labor and attention that creates a relationship between the plant and the grower, similar to a child and parent, where the latter fosters the development of the former until it can function on its own.

The project serves as the cultivator with the potential to revitalize the surrounding neighborhood, as well as to establish the human's role in the development of a thriving ecosystem.
Neighborhoods that have suffered depopulation and high levels of abandonment leave behind formerly vibrant areas that are void of people and eventually buildings. In an attempt to revitalize these neighborhoods, there is a tendency to renovate and improve the remaining buildings in order to increase property values and bring in a more affluent clientele. Although this might appear as a smart economic move to a city on paper, the process of gentrification generally results in the removal of the remaining people who can no longer afford to live there, in addition to debilitating small local businesses. But this need not be the case. Changes can be implemented that directly benefit the existing population, while establishing a system that continually rewards the city as a whole over time.

In *The Social Life of Small Urban Spaces*, William H. Whyte shows how successful urban spaces are defined first and foremost by the presence of people, with other key factors including the relationship to the street, places to sit, and especially access to affordable food.¹ If a community space were created in one of these abandoned lots that fit the aforementioned description, then life could be breathed back into the area. Public spaces that revolve around food are almost always successful at drawing people. A space that encompasses the whole food cycle has the potential to attract people for a variety of reasons. First, urban farming needs community members out in the growing space to keep it functioning, making those people regularly visible and approachable. Activity focused on food for local consumption gives neighborhood residents an incentive to keep it running as it is an issue around which the community can unite. Additionally, turning a dead zone into a productive, aesthetically pleasing, vegetated space lures passersby with a verdant landscape while their noses cannot help but seek out the aromas escaping from the kitchen. Soon enough there is a critical mass of people that leads other people to join based on the perception that it is a popular, comfortable space. Once they realize that this is a place to cook and eat as well, they are more likely to return, potentially with friends. Nothing about the program is defined by age, race, or income, thus allowing each participant to be a leader and a follower, a teacher and a student, or a provider and recipient. This interchange encourages more connections among people in the neighborhood, as they suddenly realize they have something to offer each other.

¹ See *The Social Life of Small Urban Spaces* by William H. Whyte.
fig. 16: Neighborhood strengthened through establishment of local food network.
The neighborhood continues to strengthen, as the site becomes part of the local food network. Regardless of whether or not this community is located in a food desert, there is a high probability that the highest quality food to be obtained within a reasonable distance comes from a sub-standard grocery store at best, and a convenience store at worst. Where urban grocery stores do exist in low-income areas, the food is more expensive and generally of lesser quality than suburban grocery stores. A relationship could be established with the grocery store where food grown on the site could be sold to the store, therefore making fresh local produce available at a reasonable price. When community members use the site to cook and share meals together they could buy ingredients from the store that they cannot grow on the farm. Their regular patronage at the store would create a higher demand for better quality products, thereby inducing the store’s management to stock more of such products. As more people begin to realize that the grocery store is selling fresh local produce, they may start requesting other types of fruits, nuts, vegetables, and herbs that the store can then ask of the growers at the site. Finally, the growers can help the store dispose of its waste by collecting old food for use as compost. This type of synergistic relationship can exist with other food establishments as well, such as various eateries, other community gardens, and local food banks. Beyond the realm of food, further relationships can be established with other community organizations, schools, and landscape and waste management companies.

One of the reasons why Growing Power, an urban farm in Milwaukee, WI, is thought to be so successful is because its founder, Will Allen, “has combined his knowledge of farming and his understanding of the city as a series of interconnected food and ecological systems to develop an urban food production system.” The project site alone has the power to improve the local community by providing a safe, welcoming place that is geared towards positive social interaction through the growing, cooking, and sharing of food. But by addressing all parts of the food cycle, the project becomes an integral part of the greater food network, giving the neighborhood a relevance within the city necessary to its survival.

---

2 Mark Winne, *Closing the Food Gap: Resetting the Table in the Land of Plenty* (Boston: Beacon Press, 2008), 14.
As Carolyn Steel so bluntly stated in her book *Hungry City: How Food Shapes Our Lives*, “urban demand for cheap food is destroying the planet.” What she meant was that the detachment between most city dwellers and the source of their food has allowed for unscrupulous acts of agriculture to take place by major corporations that have gone largely unnoticed or unchecked. The environmental costs of such practices have been devastating on a scale that most people cannot comprehend, or have chosen not to – ignorance is bliss. Recent times have seen many of these issues come to light, and attempts are being made to mitigate the damage, the practice of urban agriculture among them.

The environmental benefits of urban agriculture that were introduced in a previous chapter give an indication of the positive impact that converting to local food production can have on a city. Additionally, many urban gardeners report little to no use of chemical fertilizers and pesticides, and the use of genetically modified seeds is practically unheard of, or at least not reported. Since maximum yields are not the primary goal of most urban farms or community gardens, the employment of organic methods is not surprising, as low input costs and healthy outputs are of greater importance. A higher consciousness of environmental consequences shared by those who work closely with the land also accounts for the organic mindset.

By turning brownfield sites into productive green spaces there is less water runoff – and that runoff will be less contaminated, the air is cleaner, the heat island effect is decreased, and biodiversity is increased. Under a permaculture model these results are amplified, because all of the systems are intentionally designed to perform in accordance with their natural rhythms, thus reducing the required amount of energy inputs. As was discussed in the last chapter, integration is a key factor in making these systems perform as effectively as they do. It would be irresponsible and shortsighted to stop this analysis at the growing space, for the integration of the architecture into the site creates the opportunity for even more ecologically sound design.

Existing buildings on site, as well as the proposed new building offer ways to capture, store, and direct rainwater, depending upon the needs of the users. Connecting the landscape to the building lessens the heating and cooling needs of the building and creates a whole new growing surface for plants made up

---

4 Steel, *Hungry City*, 42.
5 Hess, *Localist Movements*, 141.
of various different microclimates, which allows for a wider range of species to be grown. The program of the building itself – the missing links in the food cycle – conserve resources even further by adding more elements to the system that serve multiple functions in order to lengthen the path that a resource travels from source to sink. Also, the different program spaces are organized with respect to human and energy flows to optimize the inputs of both.

By encouraging people to think of themselves as part of the natural ecosystem they are more inclined to think of how they can positively impact the environment instead of trying to remove themselves from the system in an attempt to reduce any impact they may have at all. This thesis hopes to show that the production and consumption of food is not only inextricably tied to the existing ecosystem, but also, that with human help, a healthier, more vibrant ecosystem is possible. Quality, affordable food and a thriving natural environment do not need to be at odds with each other, nor should they be.
The harvest consists of the yield of crops, or the process of gathering those crops, at the end of a growing season. The amount and quality are highly dependent on the level of care put into them. A bountiful harvest generally implies that the plants were well tended to, and that negative external forces were diverted.

The harvest reveals the cause and effect relationship inherent in growing food. The recent detachment to food in our society has led to many unfortunate consequences, but they are not irreversible. By reconnecting to food on the levels of growing, cooking, and eating, the rewards for this change in behavior will become apparent. As the saying goes, “you reap what you sow.”
Cooking is an activity that is unique to the human species, and yet everything that once made it special – obtaining the ingredients, gathering around the hearth, and using creativity to combine what was available into something delicious and nourishing – has all but been abandoned. Something that was once necessary for survival became the work of servants, which eventually became the duty of the housewife, and has finally settled into the hands of the restaurant business at best, and the processed food industry at worst. This has led to a collective loss of knowledge and skills in food preparation, which leaves many Americans to depend on others to feed them. The recent deluge of television cooking shows, specialty grocery stores, and endless kitchen appliances is possibly a signal of changing times, but there is a long way to go to get people back into the kitchen.

As times were changing politically and economically in the period between the Civil War and World War II, the appearance and functions of the household changed as well. Families that at one point depended on the work of maids and servants were suddenly relying on the housewife to take on all of the responsibilities of the home, including cooking. This transition put a lot of pressure on women to create a happy home and to have that warm home-cooked meal ready for the husband and children. The kitchen that had originally been the heart of the home – and in early dwellings, the entire home itself – became a small unwelcoming place where women were quarantined from their family. The Frankfurt Kitchen, designed by Margarete Schütte-Lihotzky in 1926 (see Figure 17), epitomized this by employing Taylorist principles of efficiency. Everything was crammed into a small space requiring the least amount of steps to accomplish a given task, which was supposed to make women’s lives easier. This design very clearly defined the role of cooking as a chore that should be done as efficiently as possible, by just one person out of the presence of others, and separately from the place where people eat.

After the change in architecture came the change in food. Convenience foods were targeted at overworked mothers as a way to ease their domestic burdens. Women became convinced that they could not cook without these processed and pre-cooked meals, and eventually that they could not cook at all. The irony is that the ‘convenience’ that women were willing to spend more money on were things they

---

could very well do themselves, like mixing, rinsing, and chopping. As feminism strengthened in the 1960s to 1980s many women shunned the idea of cooking altogether both because it was demeaning to them and they just didn’t have time for it in their newly obtained jobs.

Unfortunately, this attitude about food has pervaded the urban poor, who at least used to possess the ability to cook for themselves, but now are almost entirely reliant on convenience foods. Part of this problem stems from the lack of healthy food options available in many inner-city areas such as grocery stores and farmers’ markets. But like the more advantaged women of the 20th century, many low-income individuals of the younger generations do not know how to cook and are convinced that it is just too complicated or time-consuming to bother to learn. Making fresh ingredients available to the urban poor is only half the battle. If they do not know what to do with those ingredients, then why would they bother buying them in the first place?

To be fair, many people still do know how to cook but do not have the adequate facilities to do so. In addition, experimentation with new ingredients and cooking techniques is not financially prudent since they cannot afford for a meal to go wrong. Therefore, cooking options are limited to what is available. As part of his ‘Food Revolution,’ famed British chef Jamie Oliver has attempted to instill the idea in people that cooking healthy, delicious meals can be cheap, easy, and fun. Although he has focused mostly on school lunches, he has opened several community centers in England and the United States where local residents can learn how to cook for their families on a low budget. He does not emphasize the use of organic ingredients or anything else that may be too expensive or difficult to obtain, nor does he promote any specific kind of diet such as vegetarianism. Instead, he believes that when people begin cooking, they start to value the ingredients that go into it – how much to use, where they come from, what is in them – and begin to have fun with the whole process. Once the basics are established, it becomes clear that cooking does not take long at all, and saves money. Most importantly, it offers a reason for people to gather.

A woman embarking on a similar revolution – she calls hers the 'Delicious Revolution' – is Alice Waters, the chef and founder of Chez Panisse in Berkeley, California. She has teamed up with a local middle school to create the Edible Schoolyard, which is a gardening and cooking program that promotes

---


4 Alex Witchel, “The Minister of Food: Can the British superchef Jamie Oliver remake America’s diet in one of the country’s unhealthiest towns?” *The New York Times Magazine*, October 11, 2009, 52-54.
community cohesion and multiculturalism, public health, education reform, and environmental responsibility. The students run a one-acre organic garden at the school and have a custom-built kitchen classroom. All of the students participate by harvesting, preparing, cooking, and eating together, as well as composting and deciding what gets planted. In addition to all of the traditional educational lessons that can be learned from the food cycle – chemistry, math, biology, etc., Waters stresses the importance of the conversation that inevitably occurs when preparing food for other people:

Who will be eating? When shall we eat? What shall we serve? Do we have the right ingredients? How does this taste to you? Who chops, stirs, bakes, fries? Who sets the table? Where do people sit? What are the rituals at the table? What shall we talk about?

Cooking with and for people creates an awareness of the customs and needs of the community, which can be a family, school, or neighborhood. It also creates a give and take learning environment between people of different generations and cultures where information and skills are exchanged by engaging all of the senses. People who cook are more likely to know where their food comes from and how it affects their bodies. They are more likely to interact with people in a positive social atmosphere and to think about how their food choices affect the greater community and the environment. Before kitchens disappear completely from the home or become merely a showcase, more people need to be encouraged to cook, and a supporting network created to make sure that happens.

**VALUE OF EATING TOGETHER**

As people move farther away from their families and attempt to deal with the demands of everyday life, sacrifices are often made to uphold busy schedules and one of the main sacrifices is food. Food is seen as fuel, not sustenance, and this sentiment is reinforced both by the current metrics-based work environment in this country, and also by the food industry. Offices concerned with efficiency and the amount of work done per hour tend to view lunch breaks as a necessary evil. The more people that bring their lunch to work and eat at their desks or who grab something quickly around the corner, the more time there is

---

for work to be accomplished. Individual pre-made meals that can be purchased at convenience stores or fast food restaurants are a response to this need – or possibly even the impetus for it. Not only are most people convinced that they do not have time to cook their own meals, but many also believe that they cannot take the proper amount of time to sit down and enjoy them.

Eating has been diminished to an activity that is required for survival; that should only be enjoyed and appreciated on special occasions; that will make us fat. Eating alone reinforces these ideas since meals are usually rushed and quality and portion size are not well considered. People have developed a fear of food that goes beyond tainted milk or spinach riddled with E. coli. A lack of positive food culture – or any food culture – for most Americans has resulted in them seeking advice from outside sources about what to eat, how much, and when. There is no instinct left for how to feed ourselves and it has led to such modern prolific diseases as obesity and Type-2 diabetes on the one hand, and anorexia and bulimia on the other. For Americans, eating has become, medically speaking, a dangerous activity.

A major reason for this is the disintegration of the family meal. Reports show that only 47% of Americans eat sit-down family meals every night, and this even goes so far as to include families that eat individual meals and cross paths with another family member for a few minutes. Children are not being taught how to eat and are fulfilling most of their calorie intake on the run or in front of the TV.

Beyond nutrition and body image, meals eaten in solitude have a more profound effect on an individual’s ability to function in society and on the community as a whole. Most lessons of civility and conversation are learned at the dinner table, where children are taught appreciation, sharing, and other family values. Politeness, manners, and etiquette can be thought of as divisive or elitist, but they can be used as tools of empowerment to connect people to their culture and to enable them to function comfortably within a diverse group. These social codes also often serve health-related purposes by discouraging fast-paced and excessive eating – although it should be acknowledged that this is a sign of respect in some cultures. Taking time to eat with other people allows for the contemplation of the quality of the food as well as the opportunity to inquire after others about their lives. This tends to result in individuals who have a greater awareness for their community and environment.

Most importantly, meals should be about celebration and joy. The word companion comes from the

---

7 Flammang, *Taste for Civilization*, 75.
8 Flammang, *Taste for Civilization*, 120.
latin words “cum” and “panis,” which literally translate to “together” and “bread,” respectively — ultimately meaning one who eats/breaks bread with another. When sharing a meal with another person, it is generally implied that they are either a friend, or soon to be one. It is not surprising then that most forms of diplomacy, dating, reunion, and even just casual gathering involve food, if not a prepared dish. Solitary meals are unhealthy for individuals and unhealthy for the community. The personal benefits acquired from sharing repast ripple out into society and can have profound effects on the way we treat others, the environment, and ourselves.

fig. 21: A 36-hour dinner party revolving around a communal wood-stoked oven brings friends and family together.

9 Steel, Hungry City, 212.
Regardless of the diversity of species that have been planted, it is highly unlikely that there will be food to harvest year-round. There is inevitably a period of time through the winter during which there is no food to be freshly picked, but this does not mean that healthy local food is unobtainable. A dose of creativity and foresight leads to the storage and preservation of food without resorting to processed foods, or vegetables flown in from halfway across the world. Often more food is grown than can be immediately consumed, and instead of letting it go to waste, various techniques can be employed to save the food for future use.

These same principles can be applied on a larger scale by discovering which resources can be found locally and to what extent they can be stored for use at a later date. This creates a situation where the future is more predictable and secure.
USING WHAT IS AVAILABLE

The storage and natural preservation of food are obvious ways to continue receiving benefits from something that contains embodied energy. In the case of a food center that operates year-round, this is incredibly important so as to reduce the purchases of out-of-season foods or processed foods that are high in chemical preservatives. In determining ways to reduce waste, it is best to not think of anything as being waste. The old mantra “reduce, re-use, recycle” helps to prioritize the way in which we consume resources and how to obtain the most use from them. Urban areas are full of resources that are the unwanted byproducts of various processes that can be re-purposed to fulfill different needs, thereby eliminating the need to manage what would have been waste and avoiding the need for new inputs. This section is driven primarily by three permaculture principles: Catch and Store Energy, Use and Value Renewable Resources, and Produce No Waste. Using what is available is about seeing the world with new eyes where resources are suddenly understood as abundant instead of scarce.

In the United States, where food seems to be endlessly available – that is, to some factions of the population – many do not consider all of the labor, time, and energy that goes into what they eat. Food is often overproduced, which leads to one of two results: either the food is disposed of and goes to waste, or people eat more than they should. Reports show that almost half of the edible food in this country goes to waste, which is equivalent to approximately $75 billion a year. Even if some of that food was turned into compost, all of it took an incredible amount of energy to produce, and yet most of it will pile up in a landfill.

If the overproduction of certain foods cannot be avoided, and especially if it is intended, there are many ways to keep foods for long periods of time that not only preserve their nutritional value, but also in some cases even improve them. The advent of refrigeration and canning increased the shelf-life of many foods and allowed them to be transported over long distances. However, it also created the impression that those are the only two ways to store and preserve foods. Refrigeration may delay the process of rotting, but it requires a lot of energy and is actually detrimental to many fruits and vegetables. There are three main methods to preserving food that do not involve sterilization: cellar storage, drying, and fermentation. Different fruits and vegetables respond best to one of those types, but each type treats the

---

1 Steel, *Hungry City*, 269.
food as a living organism and simply aims to prevent the multiplication of microbes instead of trying to destroy them. Most dairy products can also survive without refrigeration as long as they are not exposed to warm temperatures, or substantial temperature swings. A little bit of chemistry and creative thinking can lead to the long-term storage and preservation of many foods, reducing the amount that goes to waste, and providing a variety of healthy foods throughout the low-growth seasons.

According to Bill Mollison, “pollution is just unused waste.” In other words, it is the surplus of a system that has not found a new use. The third ethic of permaculture – Fair Share – calls for the redistribution of surplus, not because it is the nice thing to do, but because without it all of the energy that went into making something is wasted. In the case of food mentioned above, the surplus is redistributed over time. Urban neighborhoods are thought to produce a lot of waste including trash, landscape clippings, and water runoff that then need to be specially treated to be reused, or are just disposed of completely. But the act of disposing of something really just means relocating it to a place that is out of the way of the creator of the waste. The examples mentioned above would not have to be managed as waste if they were managed as resources. The trash and landscape clippings can be turned into mulch and compost to help grow plants, and the water runoff can be diverted or stored for later use as irrigation for plants.

Cities are filled with other types of resources that go to waste if they are not used. Some of these include natural resources such as sun, wind, and rain, all of which have many uses if stored or channeled properly. Unfortunately, all too often these resources are ignored in favor of artificially produced energy that create levels of pollution that are too difficult to manage at the same rate that they are produced. Additionally, when systems are not designed to creatively use renewable resources, those resources can lead to problems such as overheating, flooding, and erosion. Human-made creations can be thought of in a similar way, where abandoned buildings and vacant lots are just untapped resources that will degrade if left alone. Knowledge is a special type of resource that like sun, wind, and rain will be lost entirely if not used, but differs in that it will actually increase in value the more it is used. There is an abundance of diverse knowledge and skills among people in urban areas, that when shared becomes infinitely more valuable.

---


Another way to think of waste becoming resources is to think of the problem as the solution. An example of this that is often used in permaculture, is that if you have a slug problem, you actually just have a deficiency of ducks. Instead of applying an external input to kill the slugs – such as a harmful pesticide – while also buying feed for the ducks, placing the two together solves both problems. This goes back to the idea of the importance of relative location in properly taking advantage of resources. A system might have everything it needs to function perfectly, but if the different elements are not intentionally placed for the ideal exchange of needs and yields, then the system fails because it will constantly require outside inputs. If we start to believe that the Earth currently produces everything we need to survive, then perhaps the tendency to hoard or own things as a commodity would disappear.

PLANNING AHEAD

Planning ahead requires an understanding and acknowledgment of available resources. This relies strongly on Holmgren’s first principle of permaculture: Observe and Interact. In order to make decisions and predictions about the future, there needs to be an acute understanding of the present. Although bottom-up action is the driving force for many urban agriculture projects, it generally lacks long-term goals that could be provided by top-down thinking. It is a lack of top-down thinking that also plagues many conventional agricultural projects, due to the desire for short-term gains. By taking a step back, one can observe how a project or system will progress over time, and hence plan how to appropriately support and assist the process.

As was discussed earlier, food storage and energy storage are prime examples of how to wisely plan ahead. Preparing for the future is not akin to worrying about Armageddon, amassing everything in sight, and hiding in a bomb shelter – although living underground would require less energy. This is not a hands-off strategy. Rather, the encouraged mentality is one that considers everything as a potential resource that needs to be thoughtfully managed, and regenerated if possible. Long-term strategies help to identify how the use or abuse of resources will affect their value and availability in the future. Energy catchment and storage does not focus on photovoltaic cells and wind turbines, although that can be a part of it. When energy is thought of as more than just the means to turn the lights on or power a computer, then the conservation of energy can be understood and practiced on a level greater than switching light
bulbs. Food storage itself is a form of energy conservation, as is water storage, because they possess the ability to bring life at a later date when needed.

The best way to go about taking steps toward a more secure and predictable future is to practice the permaculture principle of Small and Slow Solutions. Holmgren was admittedly inspired by the work of E.F. Schumacher entitled Small is Beautiful, when writing this principle, but the word ‘small’ can be misleading. Paolo Soleri addresses this issue in his own work, pointing out that if this is true, then what of the universe? Is the Redwood tree less beautiful due to its massive size? What Soleri concludes – and indeed focuses his life’s work on – is that miniaturization should always be favored over gigantism, because “gigantism is poor ‘packaging’ and consequently a waste.” Holmgren also advises against gigantism, but uses the term ‘optimization’ when referring to the appropriate use of scale instead of miniaturization. This can be better explained as designing a system to suit the desired needs, by producing only what is necessary and avoiding excess.

Although this might seem at odds with storing energy and planning for the future, a system that meets the desired needs already has a long-term view in mind and has accounted for that. For example, a grove of oak trees might be planted now as an investment that can be harvested in a couple of decades as timber for the renovation or addition to a house that will be occupied by more people in the future. In the meantime, those oak trees will provide shade, wildlife habitat, and water retention. Slow solutions such as this make planning for the future a continual process that is constantly adding value. As long as predetermined goals are set, then solutions can be designed to meet multiple desired outcomes over a period of time – both short-term and long-term. Additionally, it will become easier to identify how existing parts of a system might solve an anticipated problem in the future.

The project strongly takes this into consideration by thinking about slow solutions adding value over time. The site itself will evolve over time, both due to the process of succession, but also as users adjust it to suit their needs. Specific habitats will emerge based on unique site conditions and intentionally designed features, which will allow not only for a great diversity of plants, animals, and uses, but also for a wide variety of species within each habitat so that there are many possible solutions to meet the desired outcome. The range of activities and tasks on the site ensure that there is always something to be done year-round and that people with different needs and skills can fill the positions that make the most sense.

4 Soleri, Arcosanti, 29.
for them, such as cooking versus planting. As time goes on, people’s skill sets and interest increase and the project begins to have a deeper impact on the community. Perhaps the food production is so successful that a market is opened, or some people discover their inner chef and open a café or restaurant. These things may happen on site by renovating the surrounding abandoned buildings or by starting anew in nearby locations that still serve the neighborhood. Volunteer positions become paying jobs and both food and financial security are increased as a result. Meanwhile, ecological and human health continue to improve.

The project does not attempt to solve all of the problems inherent in a run-down community, because it never could. It simply plants the seed for a community to help itself, by offering a place that is designed to evolve and improve over time. Regeneration and revitalization are prioritized over sustainability – because maintaining a steady-state condition in today’s society is, actually, not sustainable. Planning ahead means addressing the fundamental goals of permaculture to design holistic systems that continuously meet human needs while creating ecologically beneficial conditions. By considering the human as a central part of the ecosystem, particularly the urban ecosystem, this is much more likely to be achieved.
Cooking is the act of preparing food by combining and heating the ingredients to create a desired meal. Beyond mere assembly, the ingredients must be rationed in appropriate amounts, prioritizing certain textures and flavors over others. They then can be baked, boiled, roasted, or fried, resulting in an edible and hopefully delicious outcome.

This chapter looks at the site analysis as the assembly of ingredients and subsequent prioritizing of information – based on the recipe – that still need to be cooked. The program then takes the ingredients and arranges and manipulates them in such a way so as to achieve the final project.

**fig. 25:** Typical convenience store in Over-the-Rhine focusing on alcohol and cigarettes.

**fig. 26:** Figure ground map showing abandonment around the chosen site.
SITE ANALYSIS

CRITERIA

Although the idea for this thesis was not formulated with a specific site in mind, the building project has the capacity to be a beneficial asset to many different communities. The project inherently responds to its particular location, but there are certain conditions under which the project would be of greater value. The following set of criteria was devised in order to find the most appropriate site for the proposed building project in accordance with the desired program:

1.) The site is in an urban area.
   a. there is a fairly high density of buildings
   b. there is an established infrastructure

2.) The site is in an area facing depopulation.
   a. the area is facing some kind of conflict
   b. there is an abundance of vacant lots and abandoned buildings

3.) The surrounding buildings should be of medium height, no more than 4 or 5 stories.
   a. an adequate amount of sunlight reaches ground level
   b. the site is accessible at the human scale

4.) The site is within close proximity to the designer.
   a. extended site observation is possible
   b. there is greater incentive to promote a local food network

5.) The area lacks healthy, affordable food options.
   a. the area is dominated by convenience stores and unhealthy eateries
   b. a grocery store is not within walking distance or not up to par

The criteria helped to narrow down the site selection to several vacant lots in the Over-the-Rhine district of Cincinnati. From there, one site was determined to be the most suitable due to its size, relative location within the neighborhood, and greatest potential for various growing opportunities.
As was mentioned above, the site is located in Over-the-Rhine (OTR) in Cincinnati, OH – a district whose residents suffer from a lack of jobs, low wages, and food insecurity. According to city-data.com, the majority of residents in Over-the-Rhine are African-American, between the ages of 26 and 31, and many have less than a high school education. Median household income in 2008 was $13,346, more than $20,000 below the Cincinnati median. Over half of the population is below the poverty line and a quarter of the population is unemployed. The number of residents has steadily decreased over the last few decades leaving many properties vacant. In some areas, abandoned buildings that are in especially bad shape are demolished, leaving gaping voids that await new construction. The site that was chosen for this project is one such example.

The site, which is located between Mercer Street and E. Fourteenth Street, contains two abandoned buildings and is surrounded by other abandoned buildings, or recently renovated buildings, as can be see in Figure 26. It is flanked to the east and west by two alleyways, both of which are blocked off, but still used as pedestrian pathways. Cars travel east on 14th Street, and west on Mercer and major bus routes run nearby on Vine Street and Walnut Street. Observation shows that more car traffic occurs on 14th St., and more of the foot traffic occurs on Rodney Alley to the east. The site occupies three-quarters of an acre, including the two abandoned buildings, and approximately half an acre can be committed to growing space.

Informal conversations with neighborhood residents near the site revealed an interest in community gardening and general neighborhood improvement. Signs of this can already be seen in attempts at community gardening in other vacant lots. Additionally, the establishment of several new restaurants in the area shows a focus on bringing good food and local business to a neighborhood that is finally seeing a reduction in crime. However, several of these restaurants are mostly catered towards a more affluent clientele that tends to come from outside the neighborhood. While boosting the local economy is beneficial to the community at large, the neighborhood residents would be better served if they were a more active part of the system.
points of interest

urban farm

findlay market

city roots

freestore foodbank

kroger

MUCCE

community gardens

site

43
Zones

Despite these circumstances, OTR does not actually qualify as a food desert, due to various opportunities to acquire fresh, healthy food. There is a framework in place that could be incredibly beneficial to local residents if there were more ways to connect them to it. In order to make this system work more effectively, resources need to become more apparent. One way to do this is by establishing zones, as was mentioned in the section on Permaculture Design Strategies. The zones, which range in distance from the site and frequency of use, contain various resources that would aid in the development of this project. In a traditional analysis, zones are determined based on differing habitats and the amount of input that is required to keep them useful. In this urban setting, the first few zones are designed in a similar manner, as they are located within the site itself. The rest of the zones exist within the greater community, and are defined by the potential added value their individual elements can bring to the project.

As can be seen in the diagram, Zone 3 begins where the site ends. Over-the-Rhine is more fortunate than comparable struggling neighborhoods in that it still has a grocery store. One of the few remaining urban groceries, the Kroger store is located just north of the site, and is appropriately sized to fit its context. Although the selection pales in comparison to Kroger stores found in more affluent areas, it is a promising starting point. Other locations that can serve as a resource within Zone 3 include a gardening store, a hardware store, several vacant lots that have been used for small-scale gardening, the Miami University Center for Community Engagement, and Venice on Vine – a pizza place that trains and pays local residents to help them gain steady employment.

Zone 4 is slightly less accessible, due to the necessity to cross a dangerous and busy road (Liberty Street), but still offers powerful resources that the new center could tap into on a less frequent basis. The most well known resource in this zone is Findlay Market, an old but thriving indoor and outdoor market, that features a farmers’ market in the summer. There is a new urban farm that is associated with a Findlay Market program that assists urban farmers in low-income areas – proof that a local food network is emerging. Finally, there is a food bank in Zone 4 that could potentially add more fresh food to its offerings.

Zone 5 in this case refers to resources such as the various universities in the city, and also the Civic Garden Center, that are constantly producing bodies of knowledge and skills that can both directly and indirectly benefit the project.
Zone 0
Indoor Kitchen/Dining
Food Storage
Greenhouse

Zone 1
Kitchen Garden
Outdoor Kitchen/
Dining
Chicken Coop

Zone 2
Sloped Growing Area
Rain Garden
Apiary
Tool Storage

Zone 3
Vacant Lots
Kroger
MUCCE
City Roots
Venice on Vine

Zone 4
Freestore Foodbank
Farm @ Elm & Liberty
Eco Youth Garden
Findlay Market

Zone 5
Civic Garden Center
University of Cincinnati
Cincinnati Zoo

High Frequency of Use
Requires Most Attention

Low Frequency of Use
Requires Least Attention
fig. 30: Approximately 100,000 gallons per inch of rain can be captured from the existing buildings.

left, and above:

fig. 31: All of the shadows that fall on the site between 9am and 3pm in December, June, and March/September.
Sectors

Sectors are external forces that act on the site. As can be seen in the diagram on page 45, the sectors taken into consideration were the summer and winter sun, summer and winter winds, and views. The other primary sector is rainfall. Cincinnati receives steady rainfall throughout the year and the two existing buildings on the site offer up to 100,000 gallons of water collection. There is more than enough water for irrigation as long as it is captured and stored adequately. Due to its urban nature, the site is less affected by wind than other more open areas. Additionally, the existing buildings block the cold winter wind, which is the biggest concern.

The most important sector acting on the site is the sun. This site was chosen in great part for its large exposure to the sun, as well as the various microclimates created due to the shadows and thermal mass caused by the two abandoned buildings. These conditions were strongly considered when designing the project to take advantage of or even enhance certain sectors in order to attain a diverse set out of outcomes.
The program for the design project is based around the food cycle, as is demonstrated by the organizing scheme for this document. By providing a place for all of the activities related to food growing and consumption, local residents can mutually have access to a bigger and better kitchen and food storage space than what they individually have in their urban apartments, as well as a venue to share food with friends and neighbors. Additionally, they can learn from each other and from the integrated farm about the journey of food from seed to supper and back again.

When initially exploring the project, the primary spaces thought to accomplish that mission were a kitchen and dining space, a greenhouse, and a food storage pantry. This alone was too vague, and yet also limited in yielding any type of meaningful design results so the focus went to the users of this facility and their needs, yields and behaviors.

Although the proposed project would be open to the public, it would ideally be set up similar to a Community Supported Agriculture (CSA) program, where members share in the rewards and losses that a farm incurs. However, instead of paying a fee like in most CSAs, members in this case earn their share by volunteering, and extra funds are secured by public support and private donations until the project is able to financially support itself. The main users are 1-2 full-time staff members, part-time volunteers/members, specialized guest volunteers, and random passersby.

A full-time paid staff member takes care of daily administrative responsibilities including regular maintenance, education and outreach. She is the record keeper and follows all of the activity that occurs at the site. She knows all of the volunteers and is active within the community attempting to strengthen the local food network by contacting local restaurants, gardens, and groceries. She greets guests and is in charge of opening and closing the center. Her office doubles as a lab where research is done during spare time to analyze the effectiveness of current methods of operation and discovering new means growing food and integrating systems.

The next most frequent user is a member volunteer who can participate in whichever part of the food cycle they feel most qualified for. This person might be a boy who stops in after school to help weed the garden, or a grandmother who would prefer to prepare dinner. All types of people are encouraged as volunteers to take advantage of a diverse range of knowledge, energy, and time schedule. These volunteer...
members would commit to a certain number of hours of service at specified times to ensure that all responsibilities are being accounted for.

Another type of volunteer would be a specialized guest that would be invited to share his specific knowledge. He might be a chef at a local restaurant or an expert gardener/farmer who can pass on skills and information that the members were previously lacking. This type of volunteer would be encouraged to stress the use of local materials and ingredients – particularly those already available on site – to reduce input costs and energy. In return he receives fresh produce and potential employers for his own business.

The last user type is someone who uses the site less directly. She lives across the street and has pleasant views of the site, smells the blossoms and aromas coming from kitchen, and has slightly improved climatic conditions due to the summer shade offered by the vegetation from the site and a reduced heat island effect. A random passerby has a similar experience, however, he might actually walk onto the site, or into the building out of curiosity to interact with the volunteers and the landscape. These types of users benefit from the project just by proximity, and might eventually become members to further enhance that return.

Identifying the users helped to determine the specific activities and functions that need to be designed for. The administrative activities necessitate an office that the full-time staff members can use that is somewhat cordoned off from the more community-oriented area. All of the planting, maintenance, and processing activities involve a lot of tools, equipment and supplies that require storage, in addition to the space already allotted for food storage. There also needs to be an area that accommodates personal needs and items. At this point, the summary of space types includes the following: a kitchen, a dining area, a greenhouse, an office, a storage area, and a bathroom/locker room for personal use. As the greenhouse extends the growing space indoors, the programmed space also flows outward, resulting in spaces for outdoor cooking and eating. The integration and overlap of these spaces is crucial to their success and is discussed further in the design summary.

The outdoor growing space is the largest programmed area and it consists of various types of growing conditions. These are defined by their microclimates – wet or dry, sunny or shaded, warm or cold, etc. – and also by slope, soil depth, and frequency of use. Space for helpful small animals such as chickens, fish, and bees also needs to be accounted for. The relative location of these spaces to each other, as well as to indoor spaces was key to the design of the site.

\fig{33}{Random assembly of program elements.}
The form and size of the program spaces, both indoor and outdoor, were determined from the inside out, and from the outside in. Because the center is meant to feel intimate and welcoming, the size of spaces like the kitchen and dining area were determined using typical residential size requirements, and then modified to accommodate more people both eating and cooking in the space at once. The limiting factors were the exterior design of the site – a new topography – and proportion. The size of the greenhouse was modeled after small-scale production greenhouses, which are around 1000 sq ft. Because the project is meant as a community space to learn more about the whole food cycle and to gain access to fresh healthy food, the amount of food produced was not seen as a limiting factor in sizing either the greenhouse or the exterior growing area, particularly since all surfaces were seen as having food growing potential. The diversity of plants that could be grown was prioritized over the amount.

In order to determine space adjacencies and organization, it was important to recognize how the different program elements related to each other. By discovering what different spaces needed in addition to what they could offer, rooms could be formed and connected based on mutual relationships. Figure 34 shows how interconnected all of the program elements are in addition to how resources can be produced within the system of the site/building that are needed by other parts of the site/building. Recognizing the existence of mutually beneficial relationships, even on the most basic level as seen in the diagram, proves that a lot can be accomplished with much fewer external resources than is normally assumed to be necessary. The connections between the different site forces and program elements in the diagram could also be tightened if they were arranged three-dimensionally, which was a primary consideration in the final design.

\textit{fig. 34: Interdependence of selected site forces and program elements.}
Supper is the reward for a long day’s work. It is the result of all the phases of the food cycle wrapped up in a well-presented delicious meal to be shared with others. It necessitates the act of consumption – the taking in of food by all the senses. It is a collection of comestibles that evokes an awareness of the many factors – human and otherwise – without which it could not exist.

Described below is the culmination of the project, delivered in a digestible manner with the intention of clarifying the product of the various processes that went into making it.
SUMMARY OF DESIGN

CONCEPT

One of the main problems identified with urban agriculture in this thesis was the limited view of what qualified as growing space. Some small-scale forms of urban agriculture, including window boxes, and climbing plants grown on trellises, most of the larger scale applications revert back to a rural model that is vast and flat. Considering the space limitations of cities, even those experiencing abandonment, it seems as though the most logical direction to move would be up. However, unlike some of the recently proposed vertical farms, this project focuses on creating a site that is accessible at the human scale, and only occupying the void that resulted from the demolished buildings. Other problems included a lack of permanence and relation to the street.

The solution to these issues was essentially to create a south-facing hill that was formed by a building devoted to the rest of the food cycle. On this particular site, the south end has fewer buildings, allowing a lot of sun to reach the site. On the north end, Fourteenth Street experiences more activity and has a denser stock of buildings, creating an opportunity for the new building to interact with the life on the street. Plopping a hill in the middle of a city block might seem counterintuitive, but a hill actually provides many more growing conditions than a flat surface. First, a hill has more surface area than its flat footprint, which allows for more growing space. Second, water can be fed to the whole site via gravity and strategically placed swales. Third, the new solar aspect reduces the shading from other nearby plants and buildings. Fourth, different microclimates are formed between the top and bottom of the hill.

As was discussed earlier in the document, integrating a building into the hill would improve the functions of both by creating a thermal mass for the growing surface, and an insulated interior for the building. Also, tucking the building under the growing surface actually increases its surface area rather than compromising it, which is normally the threat of adding buildings to farms or gardens. Programmatically, locating all parts of the food cycle on one site is also advantageous, and the addition of a permanent structure practically eliminates the risk of losing the farm to future development.

TOPOGRAPHY

Creating a uniformly sloped hill would only be slightly better than the horizontal planes which are currently the norm. Therefore, a varied topography with different slopes, solar aspects, and soil depths...
was devised in order to create the most diverse set of growing opportunities as well as to allow the building more flexibility and access to natural light. As can be seen in Figure 40, limiting factors were used to determine a new topography for the site where the building would be located. These factors included keeping the height below the existing buildings on site, allowing the winter sun to reach buildings across the street, and preserving the access of the sun to the NE corner of the site. From there the rest of the topography was formed in accordance with needs of the proposed building including access to the growing area, solar orientation, and areas of water catchment.

**Stacking and Edge**

In order to optimize the relationships between the different program elements, the different spaces are organized such that they have vertical and horizontal access to each other. There are six occupiable levels and yet the highest point on site is less than 25 feet above ground level. The floors are stacked radially around a core spiral staircase to make more efficient use of space and resources. This mirrors the 7-Layer beneficial guild of a forest garden in permaculture that consists of the root layer, the ground cover layer, the herbaceous layer, the shrub layer, the low-tree layer, the high-tree layer, and the climbing layer which spans them all vertically. In the proposed building (see Figure 45), the floors are stratified into approximately four foot increments. The food storage level is 8 ft below ground to take advantage of the naturally cool earth. The office is sunk a few feet below ground level and is located more towards the interior of the site, giving it some privacy. The greenhouse is on the ground level and is the first area one encounters when entering the building. This floor, which also contains a wash room, serves the practical function of acting as a mudroom to leave dirty things before accessing other parts of the building, and the educational function of being a constant reminder where food comes from. The greenhouse’s southern exposure also offers views out onto the rest of the site, reinforcing that second function. The next floor up is the kitchen and dining area just a few feet above ground level. This floor is the heart of the community space and has views to the street, the greenhouse, and the outdoor kitchen. The kitchen and dining space are open to each other in order to foster more interaction and to make the diners both more aware and appreciative of the meals that they are served. This floor is directly above the food storage space. Approximately 8 feet above ground level is the outdoor kitchen and dining area, which looks out over the whole site, has direct access to the kitchen garden — the ground rises to meet this patio area — and extends the cooking and
dining experience from inside to outside. This area is located directly above the office space. The highest level is situated between 10-15 ft higher than this space, as it is both the roof over the rest of the building, and the raised growing space. Because of the substantial depth of the soil this level is lifted well above the other floors. Like the climbing/vine layer of the 7-layer guild, a core spiral staircase connects all of these floors including the roof growing area while acting as a central light shaft.

In addition to these spaces, a pond is located in front of the greenhouse to act as thermal mass, water storage, and a reflective surface to direct winter light up to the kitchen. Also, the abandoned buildings on site are slightly altered in order to house less demanding programmatic needs, such as garden tool storage, workshop space, a chicken coop, and an area to grow mushrooms (see Collage #2 in Figure 46).

Although some of the floors have visual access to each other, they all overlap slightly in order to improve their edge condition. These areas of overlap create vertical circulation opportunities that allow the transfer of objects such as food, compost, and trash between floors. This is also how water, smoke, heat, and even light in some cases move from floor to floor, which allows resources to be used several times in their path from source to sink.

The final design provides a warm and welcoming experience for its users to gather, learn, and celebrate with each other while making the whole food cycle as visible and accessible as possible. The building and the site are fully integrated to make the most of existing resources in order to keep input costs, maintenance, and any negative environmental impacts to a minimum.
fig. 36: Schematic evolution of the site and building from construction to a fully grown site.

fig. 37: Explorations in plaster of how building could be cast to include structure and perforations.

fig. 38: Developing “the hill.”
left, CW from top:

fig. 39: Study model demonstrating 3-D winter shadows.

fig. 40: Study model using limiting factors to determine new topography.

fig. 41: New site topography based on various conditions and design choices.

right:

fig. 42: Detail of topo model showing NE corner entrance to site.

left, left to right:

fig. 39: Study model demonstrating 3-D winter shadows.

fig. 40: Study model using limiting factors to determine new topography.

fig. 41: New site topography based on various conditions and design choices.

right:

fig. 42: Detail of topo model showing NE corner entrance to site.

pages 60-61, from left to right:

fig. 43: Sketch of overlapping condition of floors used for vertical circulation.

fig. 44: Building plan on site, and extruded.

fig. 45: Stratification of program with all levels stacked in line.

pages 62-63, from left to right:

fig. 46: Collages in progress for final presentation depicting overall site strategy, treatment of existing buildings, horizontal and vertical edge conditions, and the prevalence of water on site.
growth medium
outdoor kitchen/dining
indoor kitchen/dining
greenhouse
office
storage
vertical circulation
The process of composting drives the concept of renewal. Composting is both the beginning and end of the food cycle. It collects food in its various stages – as the unused parts of annual plants, the inedible parts of the plants that were harvested, and the leftovers that went uneaten of those plants. This means that none of the food or plants go to waste, but instead are decomposed back into organic matter. The resulting substance is a critical component of healthy soil needed to grow new plants, starting the food cycle all over again.

This project is merely setting the stage for what is to come. All of the work that concludes at this point lays the foundation for the implementation of the proposed project, or one similar to it. Additionally, it contributes to the discussion on how cities will feed themselves in a post-oil future.
CONCLUSION

The world is in a state of disarray. The economy is floundering, natural resources are consumed at unsustainable rates, weather patterns are all amiss, and millions of people suffer from inadequate nutrition both domestically and worldwide. It is difficult to argue at this juncture in time that business can go on as usual without serious repercussions. This should be cause for alarm, but not for panic. The human race has an incredible amount of embodied knowledge as well as learning potential. The Earth produces an extraordinary amount of resources for our use, and could produce even more if we were to manage them properly. The key is to link these resources together such that a healthier ecosystem results in a healthier and happier people.

At the heart of all of this is food and our relationship to it. The more we detach ourselves from the very thing that sustains us, the more damage we do to our bodies, society, and the planet. Food production and consumption cannot be done in isolation. Unfortunately, the status quo for agricultural practices has become so accepted, or at least willfully ignored, that we have forgotten that the process of growing food should not be a battle with the land, nor should its consumption be a battle with our bodies – or pocketbooks.

Small changes on a large scale can start to influence the way people view food, and the biggest obstacles to this are currently access and education. The project resulting from this thesis brings together all of the aspects of the food cycle, both to give urban residents the opportunity to have the food they desire, and also to inform people how many different things are impacted by the way they eat.

Permaculture as a design methodology lays out all of the fundamentals that are necessary to reinstate the harmony and balance between humans and their natural surroundings. But without the creative integration of architecture, it will remain limited to rural areas. As the world’s population continues to increase and gravitate towards cities, the urban realm is rife with opportunity to redesign the way food is produced and distributed. An architecture based on permaculture improves growing conditions and an individuals relationship with food, environment, and community. Thoughtful design has the power to positively influence many aspects of society, and the specific combination of architecture and permaculture can accelerate the realization of desirable long-term goals. This thesis hopes to fuel that process.
Resources are the inputs needed to make any system function properly. They consist of a stock of assets that can be drawn upon for future use. Some are renewable, others are not. Some are natural, others are manufactured. Some improve with use, while others degrade. Whatever their variety, resources are necessary for any person, organization, or system to sustain itself.

Many types of resources were drawn upon to make this thesis possible. A hefty supply of food, water, funds, and other amenities sustained me personally throughout the project, while the thesis itself depended on the contribution of certain people, literature, and precedent work. The following section makes those specific resources known.
Like every permacultural project, nothing comes about in isolation. This thesis was built upon the work of many others before me, and was inspired, supported and honed by several indispensable parties. In addition to the many books and projects consulted, the following people/organizations greatly helped this thesis come to fruition:

**Vincent Sansalone**, my studio professor and first thesis chair.

**Tom Bible**, my professor and second thesis chair.

**Turner Farm**, which offered me the firsthand experience of organic farming with animals and provided me with a steady supply of fresh eggs and vegetables.

**The Planning and Construction Departments at Arcosanti**, who included me in the design and construction of the Greenhouse/Energy Apron project.

**The Cincinnati Permaculture Guild**, who trained me in permaculture and provided me with a support network throughout this thesis.

Additionally, I would like to thank my family, friends, professors and classmates for standing by me throughout these four years of architectural education. I couldn’t have done it alone.


Witchel, Alex. “‘The Minister of Food: Can the British superchef Jamie Oliver remake America’s diet in one of the country’s unhealthiest towns?’” *The New York Times Magazine*, October 11, 2009.

1. Observe and Interact

2. Catch and Store Energy

3. Obtain a Yield

4. Apply Self-Regulation and Accept Feedback

5. Use and Value Renewable Resources and Services

6. Produce No Waste
The following precedents were chosen for their demonstration of a particular permaculture principle. Although most of these projects – ranging from architecture and urban design to agriculture and landscape design – employ many of the permaculture principles, each precedent is associated with one of five highlighted principles to analyze its expression of that given condition. The extent to which permaculture was explicitly used as a design influence, if at all, is unknown, but the visibility of the principles in all of these projects shows that there is an existing correlation between architecture and permaculture design.

**Arcosanti Greenhouse/Energy Apron**

The Greenhouse/Energy Apron project at Arcosanti in Mayer, AZ was conceived of nearly 30 years ago, but is currently under way. The initial design by Italian architect Paolo Soleri has since been altered to encourage the start of construction, in order to make it more manageable for the many amateur volunteers that provide the labor. The concept, however, remains the same, and aligns with the principle to “catch and store energy.” The greenhouse is situated on a hill at the bottom of a mesa. Energy from the sun is captured and stored in the plants that grow within the greenhouse and water is collected at the bottom of the sloped roof. Additionally, the apse effect is used in conjunction with thermal mass to offer an additional energy store for the plants. The heat collected within the greenhouse is then channelled up to the primary dwelling areas to warm spaces in the winter, or to ventilate spaces in the summer when combined with the chimney effect.

**Sidwell Friends School Wetland**

The Sidwell Friends Middle School in Washington, DC is a progressive Quaker school that chose to include a sustainable landscape as a learning laboratory as part of its new construction in 2007. The primary example of this is the water management system designed by Andropogon Associates, which is a notable implementation of the principle to “use an value renewable resources and services.” The new wetland treats water from the kitchen and bathrooms which is then pumped to toilets and cooling towers. Any excess water that is not absorbed by the green roofs ends up in the pond and rain garden. Swales help to channel the wastewater and rainwater to be used for irrigation.
7. **Design from Patterns to Details**

8. **Integrate Rather Than Segregate**

9. **Use Small and Slow Solutions**

10. **Use and Value Diversity**

11. **Use Edges and Value the Marginal**

12. **Creatively Use and Respond to Change**
Growing Power Aquaponics System

Growing Power is an urban farm and education center in Milwaukee, Wisconsin. The project was initially started by Will Allen as a profit venture for his own use that evolved into a community asset. In addition to growing plenty of food and teaching people the value of healthy eating, Allen has created innovative ways to combine functions that provide more output for less input. In this particular case, he used the principle of “integration” to create an Aquaponics system – a combination of aquaculture and hydroponics – where the outputs of each part of the system become the necessary inputs for the other part, reducing work load and use of resources.

Public Farm 1

Public Farm 1 was a temporary installation in the summer of 2008 in the courtyard of P.S. 1 – a satellite of the MoMA – in Queens, New York as part of their annual Young Architects competition. Although the annual project is normally beach themed, the winners of the competition, WORKac, opted for a design that addressed a more pressing issue – that of urban food production. Constructed out of many large cardboard tubes, the farm took on a double-sloped formation and held a wide variety of plants. The project employed the principle of “diversity” in many ways. First, there was a great diversity of plants that had varying exposure to the sun and proximity to water. Second, by raising the planting area the farm was able to stack different uses, allowing for growing above, and activity below. This created the opportunity for different types of activities that relate to the height or function of the growing space above.

The High Line

The High Line is an elevated urban park opened in June 2009 in the lower west side of Manhattan that was a collaborative design between James Corner Field Operations and Diller, Scofidio, and Renfro. Located on an obsolete freight train line, the park was devised as a way to pay tribute to the district’s industrial past by converting approximately a mile and a half of neglected land to another green space within the city that has views of the river, the skyline, and the streets below. The designers were inspired by the wild plants that had taken over the railway and incorporated stretches of native species into the design of the new hardscape. The “edge” principle of permaculture is demonstrated by the manner in which they did this, by increasing the surface area where they connect. This avoids the harsh edge condition where softscapes are abruptly cut off to meet a street or sidewalk that is seen in many urban settings.