Urban Farming

2019

LMNts
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Contents

Introduction

There is nothing novel about the idea of urban farming. Arguably, urban farming has been around since people stopped hunting and gathering. As technology has advanced and our cities have grown larger, food has been able to be produced further and further away. Out of sight and mind.

If you were born after the 1960s and lived your whole life in a city then the idea of urban farming might seem new because you might not know any other food source than a grocery store or a restaurant.

This report recalls the rich history of urban farming and explores its future.

How Can Urban Farming Be Permanently Integrated In The Urban Landscape?

Background & Context

Origins of Urban Farming

The origins of several modern urban farming techniques can be traced back to medieval Paris. These techniques reached their peak importance during the second half of the 19th century when the population of Paris doubled from one million to two million. At the time 8,500 farmers worked 3,500 acres of land equating a sixth of the city's land area, in the Le Marais district (Cockrall-King, 2012, p.83).

Gardens were enclosed by stone walls that shielded plants from the weather and created small microclimates. The walls absorbed heat throughout the day and released it back into the garden at night increasing garden temperatures by 18°F or more (De Decker, n.d.). Soil was constantly amended with horse manure which was an abundant waste product of the transportation system. These two techniques were crucial to extending the growing season, early harvests, and near year-round cultivation of the most finicky crops. Glass topped frames or cloches were also commonly placed over highly profitable crops to coerce early ripening.

Farmers maximized their gardening resources with dense plantings to reduce water needs and intercropping to enhance growth and yield. Inter-cropping is a technique where multiple plants with symbiotic relationships are planted together. Corn, beans, and squash is a common example, known as the "three sisters." The tall corn stocks provide a structure for the beans to climb, the beans fix nitrogen into the soil, and the large squash leaves shade out weeds (Cockrall-King, 2012, p.82).

The techniques previously described allowed farmers to supply the city with 100,000 tons of fresh produce annually with a surplus exported to England. Despite the high efficiency and significant yields of this system, it is important to note that these farmers were not interested in the highest yielding or most calorie dense crops. Their goal was not to feed the city. Their goal was to produce highly profitable crops outside of their regular growing season.

Figure 1. Garden walls in Paris.

Figure 2. Cold frames.

Figure 3. Glass cloches.

At the end of the 19th century horses had ultimately been replaced by the automobile. The once vibrant farming system was no longer viable without its main input. Additionally, competition for land pushed farming outside the city and the automobile made the change in location a non-issue because farmers were still able to bring their products to market (Cockrall-King, 2012, p.84).

Urban Farming In the United States

1890 - 1910: Age of Immigration

Figure 4. Ellis Island 1907.

Unemployed laborers were encouraged to cultivate vacant lots by social reformers.

School gardens were promoted as an interactive teaching tool. In addition, to aligning with school subjects they taught civics and good work habits.

The civic beautification movement supported vacant lot gardens, children's gardens, window-box gardens, and garden contests. (Lawson, 2005, p.1-2)

1917 - 1919: WWI

Figure 5. WWI Propaganda encouraging women to join the land army.

Propaganda promoted the planting of war gardens by millions of Americans. Produce from these gardens supplemented the domestic food supply. This allowed resources for industrial agriculture to be sent overseas for the war effort.

Emphasized as a patriotic duty, 'The hoe is ranked almost with the gun and the fertilizer bag with the high explosive shell.' (Lawson, 2005, p.119) Gardens were tended to everywhere by everyone.

1930 - 1939: Great Depression

Figure 6. An apple vendor during the Great Depression.

Gardening programs reappeared as a means to: constructively occupy the unemployed, increase access to healthy food, and preserve personal dignity.

Work-relief gardens offered employment for people to garden collectively. Produce from these gardens belonged to an overseeing agency and was usually distributed to the needy or to institutions.

Subsistence gardens provided families with plots, seeds, and technical assistance so households could grow a personal food source. (Lawson, 2005, p.148)

1940 - 1949: WWII

Figure 7. “Grow Your Own.” Propaganda poster by Grover Strong.

Initially the federal government did not include urban gardening in their strategy plan. Experts pushed for improved industrial agriculture instead. Stating, small scale gardens were inefficient and worried inexperienced gardeners would waste seed and fertilizer.

Public desire to contribute to the war effort prevailed and victory gardens proliferated This time the focus shifted from patriotic duty to health, recreation, and morale (Lawson, 2005, p.170).

At their peak, 20 million home scale gardens met 40% of the domestic vegetable supply (Cockrall-King, 2012, p.36).

1970: Civil Rights & Turmoil

Figure 8. 1970 Woodsy Owl head shot.

Gardens reappeared in neighborhoods as representations of resilience in the face of urban decay, resources to combat inflation, an expression of a new environmental ethic, and a place where neighbors could reconnect (Lawson, 2005, p.206).

The community garden movement of the 70s and 80s revealed a shift toward more user involvement in planning and development.

Although gardens were initially established following a top down policy they later became more self sufficient. Operating on local management and responding to the community (Lawson, 2012, p.207).

1990s - 2019: New Food Movement

Figure 9. “Break New Ground.” Victory Garden of Tomorrow poster by Joe Wirtheim.

Gardens today take various forms: job training and entrepreneurial programs, sources of community food security, school gardens, and most commonly neighborhood gardens (Lawson, 2012, p.264).

Neighborhood gardens provide residents with a place where they can practice gardening, which can be recreational and restorative.

More importantly, these gardens serve as a place of encounter where community can be built.

The Industrial Food System

A Population Crisis & A Nitrogen Shortage

At the onset of the 20th century it was believed that the world had reached its carry capacity of 1.6 billion people. A question that weighed heavily on people's mind was: where will the food come from to support the predicted global growth of 9 million people annually? It was known that nitrogen was a limiting factor. Nitrogen substantially improves plant vigor, growth rate, and crop yield. However, available nitrogen fixing methods were slow and required time. Saltpeter, which is a naturally occurring source of rich nitrogen, was limited and most of the deposits were monopolized by Chile. More importantly, fertilizer was not the only use for nitrogen. Nitrogen was also needed to make bombs, putting agriculture in direct competition with warfare.

Manufactured Nitrogen

Scientific innovation by Fritz Haber in 1908 solved the nitrogen scarcity when he discovered how to transform atmospheric nitrogen into ammonia. Later, Carl Bosch built upon Haber's work and formulated the Haber-Bosch process to make ammonia production faster and cheaper. The combination of the Haber-Bosch process and the industrialization push of World War II made it an extremely profitable business (Cockrall-King, 2012, p.39).

Ammunition to Food Production

It was prime time for industrialized food production at the end of World War II. With hunger and food insecurity often at the root of war President Franklin D. Roosevelt was determined to find a way to feed all of the world's people. Industrial agriculture became an important United States postwar policy. Infrastructure created for warfare pivoted to food production, paving the way for industrial agriculture. Factories started producing chemical fertilizers instead of ammunition. Science behind nerve gas was aimed at insects rather than humans, resulting in pesticides. Here marks the tipping point. The use of chemical fertilizers, pesticides and herbicides became standard practice in commercial agriculture; forever changing how we produce food (Cockrall-King, 2012, p.40).

Industrial Agriculture Goes Global

Industrial agriculture expanded to the global stage during the Green Revolution of the 1950s-1960s. Threated by the expansion of communism, the United Stated donated billions of dollars in food aid and exported the industrial agriculture system to third world countries (Cockrall-King, 2012, p.41). Despite the advances of industrial agriculture resources are still taken from the soil faster than they can be replenished. As a solution the fertilizer and pesticide companies presented genetically modified organisms (GMOs) in 1996. In a mere 22 years it is estimated that over 70% of processed foods on supermarket shelves today contain genetically modified ingredients (Cockrall-King, 2012, p.43).

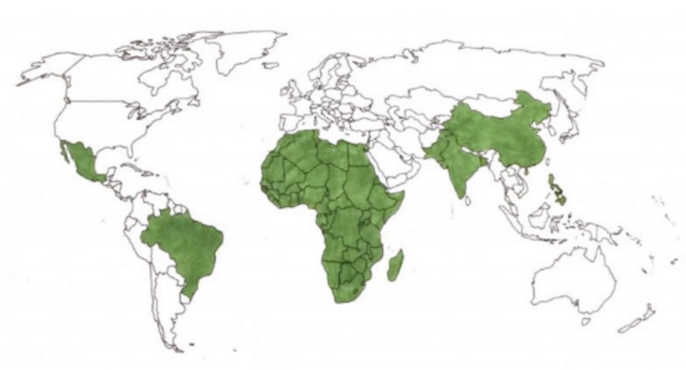


Figure 10. Places where the Green Revolution had an impact (Mexico, India, China, Brazil, Philippines, Bangladesh, Pakistan, and Africa).

Modern Industrial Agriculture

Industrial agriculture has allowed food to be produced in much larger quantities than ever before. It's dedicated to efficiency making food faster, bigger, and cheaper. However, these benefits come with steep social, health and environmental costs.

Large commodity crops such as corn and soybeans are heavily subsidized by the government, allowing them to be sold at prices below the cost of production. These subsidies enable processed foods and fast food to become more economically viable options compared to fresh fruits and vegetables.

Consequently, there is a direct link between income and chronic health conditions like type 2 diabetes and obesity. It is predicted that a third of Americans born after 2000 will contract early onset diabetes; the chance increases to half for minorities (Kenner et al., 2009). In 2016 the Center for Disease Control reported that 93.3 million American adults and 13.7 million children were affected by obesity (Center for Disease Control, 2018).

Another serious health concern related to industrial agriculture is Escherichia coli O157:H7 (E. coli); which can be a fatal. E. coli is commonly found in the stool of livestock animals, such as cattle. Usually people become infected with E. coli after consuming contaminated foods. Industrial agriculture slaughters cattle at a rate of 400 an hour, making it impossible to ensure all carcasses are free of manure before processing. E. coli is not limited to meat, outbreaks have been traced back to leafy greens and even apple juice caused by run off. Industrial agriculture has exacerbated E. coli outbreaks, resulting in recalls on millions of pounds of food (Kenner et al., 2009). The CDC estimates that E. coli O157:H7 sends 3,600 people to the hospital and takes the lives of 30 people each year in the United States (Center for Disease Control, 2016).

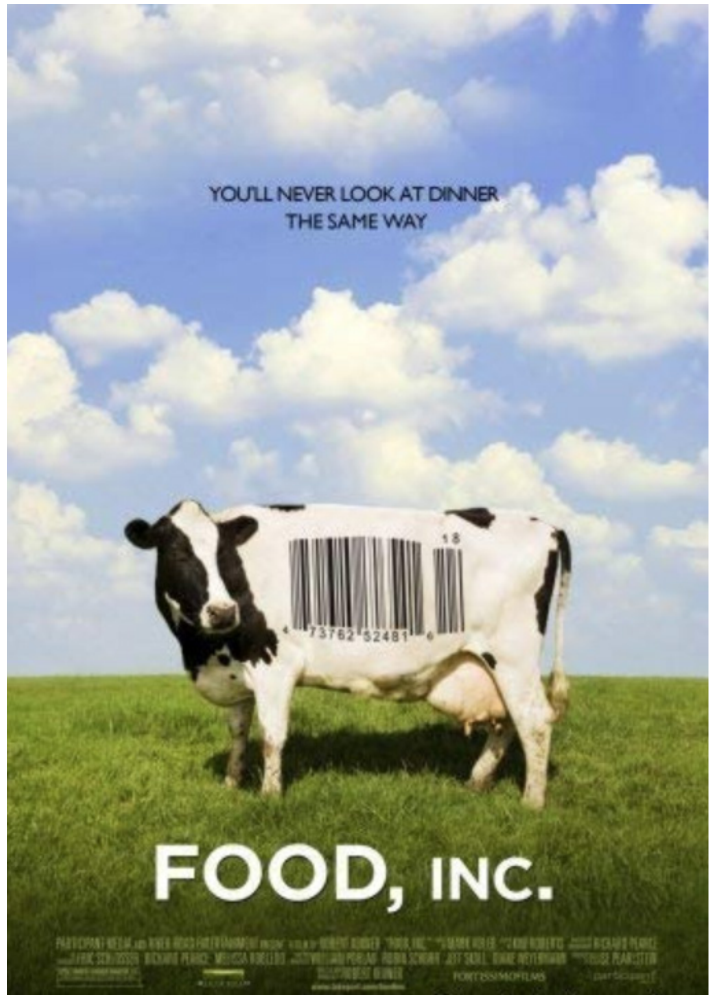


Figure 11. Food Inc. movie poster. A documentary that discusses the industrial food system.

Globalization of our food system began in the 1990s. As a result, grocery store items travel over 1,500 miles on average from where they are grown to where they are sold on grocery store shelves (Crockrall-King, 2012, p.51). In the United States the food system including production, processing, and transportation accounts for 16-17% of our national energy consumption. Transportation alone accounts for 11% of the energy consumed within the food system (Cockrall-King, 2012, p,52). This dependence on fossil fuel has created an unsustainable imbalance in our food system. The current model requires 10 calories of input for every single calorie of food produced (Crockrall-King, 2012, p.51).

A New Food Movement

A new food movement began to take form once some light was shed upon the global industrialized food system. In 1992 Tim Lang, a professor of food policy appeared on the BBC and shocked consumers when he revealed that food traveled across countries and continents before reaching their tables (Cockrall-King, 2012, p.74). The distance food had travelled coined as food miles entered mainstream media in 1994 and became the subject of reports. “The Food Miles Report” in 1993 by the Sustainable Agriculture, Food, and Environment Alliance and “Eating Oil” by the Sustain Alliance in 2001 spurred consumer concern for the environmental impacts of the food system (Cockrall-King, 2012, p.75).

Another food uproar ignited in Rome when McDonalds opened a location close to the Spanish Steps in 1986. Locals were outraged and felt that their food culture was being attacked. Carlo Petrini, a food journalist rallied fast food opposers from 15 countries and established the slow food movement in 1989. By 2000 consumers demanded that grocery stores source their foods closer to home. Slow food philosophies took hold around the globe, and eating locally became a global movement (Cockrall-King, 2012, p.76).

<u>The Omnivore’s Dilemma</u> by Michael Pollan exposed the culture behind the industrial food system and its effects on our bodies, families, and societies. After its release in 2006 people started to seek out food sources beyond the grocery store in farmers markets and community supported agriculture (CSA) programs. Farmer’s markets were nowhere to be found from 1970 to 1990 in the United States. They began to reappear with 2,756 in 1998 and soared to 5,274 by 2009. In under a decade, CSA programs increased from 400 to over 1,400 in 2010 according to the USDA (Cockrall-King, 2012, p.78). Food miles, the slow food movement, and the truth behind industrial agriculture served as the trail blazers for what is urban farming today.

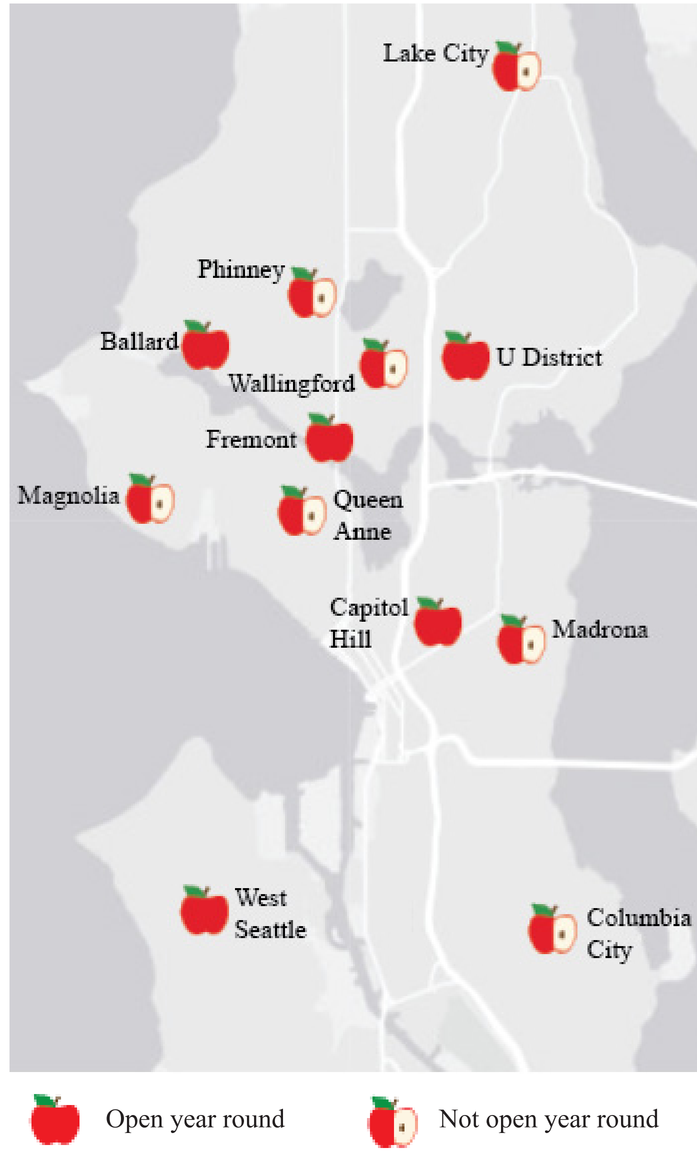
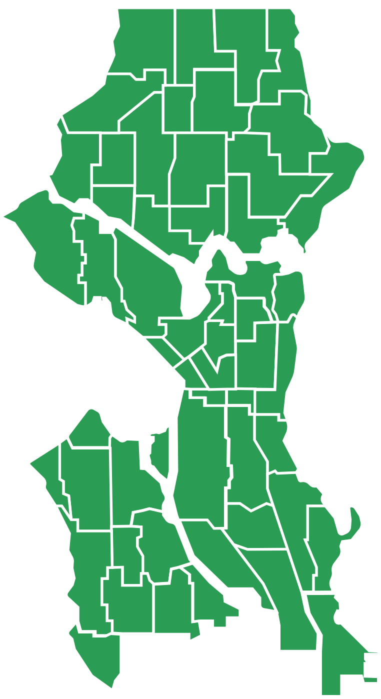


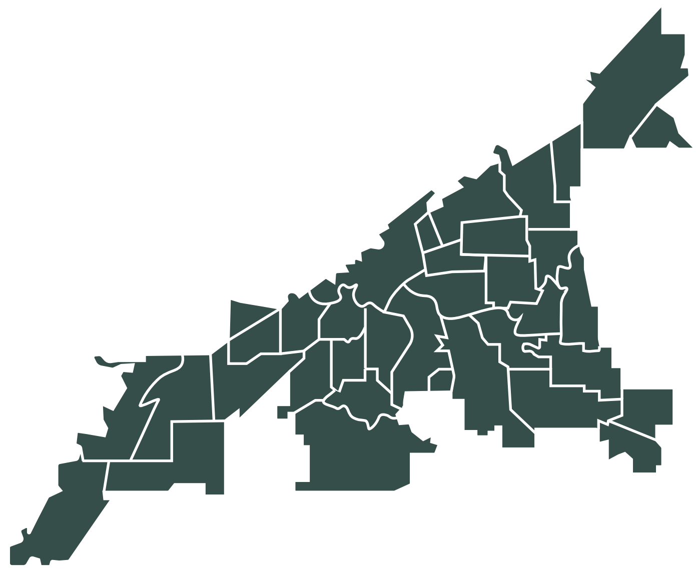
Figure 12. Map of Farmer’s Markets in Seattle. This map excluded Pike Place Market and Pike Place satellite markets.

Can Cities Be Food Self Sustaining?

Can cities be food self sustaining? In other words, can the food required to feed the population of a city be grown within the city's limits. This is an initial question people new to urban farming might have. To answer this question two studies are referenced and analyzed.



Seattle



Cleveland

The first published in 2015, was conducted by Jeffery Richardson and L. Monika Moskal at the University of Washington in the School of Environmental and Forest Sciences. Their study focused on the capacity of urban food crop production and competition with the urban forest in Seattle, Washington.

The Second study published in 2011, was conduced by Sharanbir and Parwinder Grewal at Ohio State University in the Center for Urban Environment and Economic Development. Their study investigated the possible levels of food self reliance for the city of Cleveland, Ohio, considering policy and bylaws regarding urban agriculture.

Urban Food Crop Production Capacity and Competition with the Urban Forest

Jeffrey Richardson & L. Monika Moskal

Background & Context

Seattle has a land area of 83.9mi^2 and a population of 608,660 in 2010. Assuming ideal growing conditions and everyone adopted a vegetarian diet of nine items; researchers were able to determine how much of Seattle's population could be fed annually from produce grown within city limits.

Figure 13. The nine food items (carrots, squash, potatoes, kale, barley, beets, hazelnuts, beans, and apples) comprising the vegetarian diet. Selected for their ability to grow in Seattle's climate and meet daily nutritional requirements.

Findings

Based on the selected diet roughly 13.59 people could be fed annually on 2.5 acres of land. Table 1 shows how much of Seattle's population could be supported given different scenarios.

Percentage of Seattle's Food Needs Met Given Different Scenarios			
Trees		No Trees	
All land in *SFR	5.1	*SFR zones	+35
All land in City	21.3	Non *SFR zones	+19
Grass cover in *SFR	<1	All land in City	29%
Grass cover in City	4%`		

Table 1. Percentage of Seattle's food needs met given different scenarios if land in full sun were converted to intensive farming.

*Single Family Residential Zones

If all land uses (building, tree, and impervious) were converted to intensive farming in single family residential zones (SFR) then 5.1% of Seattle's food needs would be met. If all land uses in the city were converted then 21.3% of food needs would be met. Removing the urban forest would increase Seattle's ability to meet its food needs by 19% - 35%. Conversion of impervious surfaces and building rooftops to intensive farming and removal of the urban forest is extremely unlikely. Most realistically, Seattle would be able to meet 1-4% (6,000 - 24,000 people) of its food needs if existing grass covered areas were converted to intensive farming.

In order to meet 100% of Seattle's food needs pasture/hay and crop land extending a 36 mile radius from Seattle's city limits would need to be converted to intensive agriculture. This area contains an additional 3,729,473 acres and 2.9 million people.

Figure 14. The additional land area required to feed all of Seattle.

Can Cities Become Self-reliant in Food?

Sharanbir Grewal & Parwinder Grewal

Background & Context

Cleveland has a land area of 77mi² and a population of 392,723 people in 2011. This study examined Cleveland's food demands based on weight and expenditures of consumer purchases. Annually, residents of Cleveland spend $89 million on fresh produce and $1.5 billion on all foods and beverages.

Findings

This study determined the potential percentages of food self reliance considering three different growing methods and scenarios. The growing methods investigated include conventional gardening (C), intensive agriculture (I), and hydroponics (H). Potential percentages of food self reliance is shown in the following tables.

Percentage (%) of Food Self Reliance: Scenario 1			
Growing method	C	I	H
Fresh vegetables	22	41	48
Fresh fruit	22	41	48
Shell egg	25	25	25
Poultry	25	25	25
Honey	100	100	100
Total food & beverage	4.2a	6.5	7.4
	1.8b	2.7	3.0

Table 2. Scenario 1: farming on 80% of vacant lots. Including: 80'x80' fruit & vegetable garden, 11'x11' chicken coop & run, and beehives on 15%.

Total food & beverage calculated based on total weight (a) and total expenditure (b).

Percentage (%) of Food Self Reliance: Scenario 2			
Growing method	C	I	H
Fresh vegetables	31	58	68
Fresh fruit	31	58	68
Shell egg	94	94	94
Poultry	94	94	94
Honey	100	100	100
Total food & beverage	9.3a	12.6	13.8
	4.3b	5.5	5.9

Table 3. Scenario 2: Place a 20'x20' vegetable garden on every occupied residential lot; in addition to, farming on 80% of vacant lots. Including: 80'x80' fruit & vegetable garden, 11'x11' chicken coop & run, and beehives on 15%.

Total food & beverage calculated based on total weight (a) and total expenditure (b).

Percentage (%) of Food Self Reliance: Scenario 3			
Growing method	C	I	H
Fresh vegetables	46	85	100
Fresh fruit	46	85	100
Shell egg	94	94	94
Poultry	94	94	94
Honey	100	100	100
Total food & beverage	11.1[a]	15.9	17.7
	4.9b	6.6	7.3

Table 4. Scenario 3: farming on 62% of every industrial and commercial rooftop in addition to scenarios 1 and 2.

Total food & beverage calculated based on total weight (a) and total expenditure (b).

Drawing From Both Studies

In 2017, Seattle had a population of 724,745 people. Using the finding that 2.5 acres of land meets the annual food requirements for 13.59 people from the first study and the scenarios proposed in the second study, the potential for food self reliance for the city of Seattle is described in Figure 16.

Assuming

- A vegetarian diet of recommended portions of the nine food items identified in the first study
- Ideal farming conditions for intensive urban agriculture
- Median age and hight of men and women
- An active lifestyle

If we were to turn to indoor vertical farming under the same circumstances and assumptions it would require 3,732Columbia Centers. The Columbia Center is the tallest building in Seattle at 76 stories with an area of 1,538,000ft^2 or 35.3 acres. If the Columbia Center were converted to a soil based urban farming operation it would be able to support about 192 people annually.

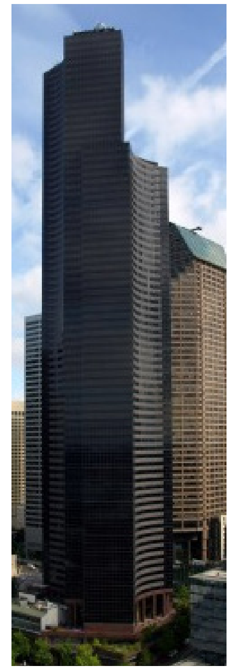


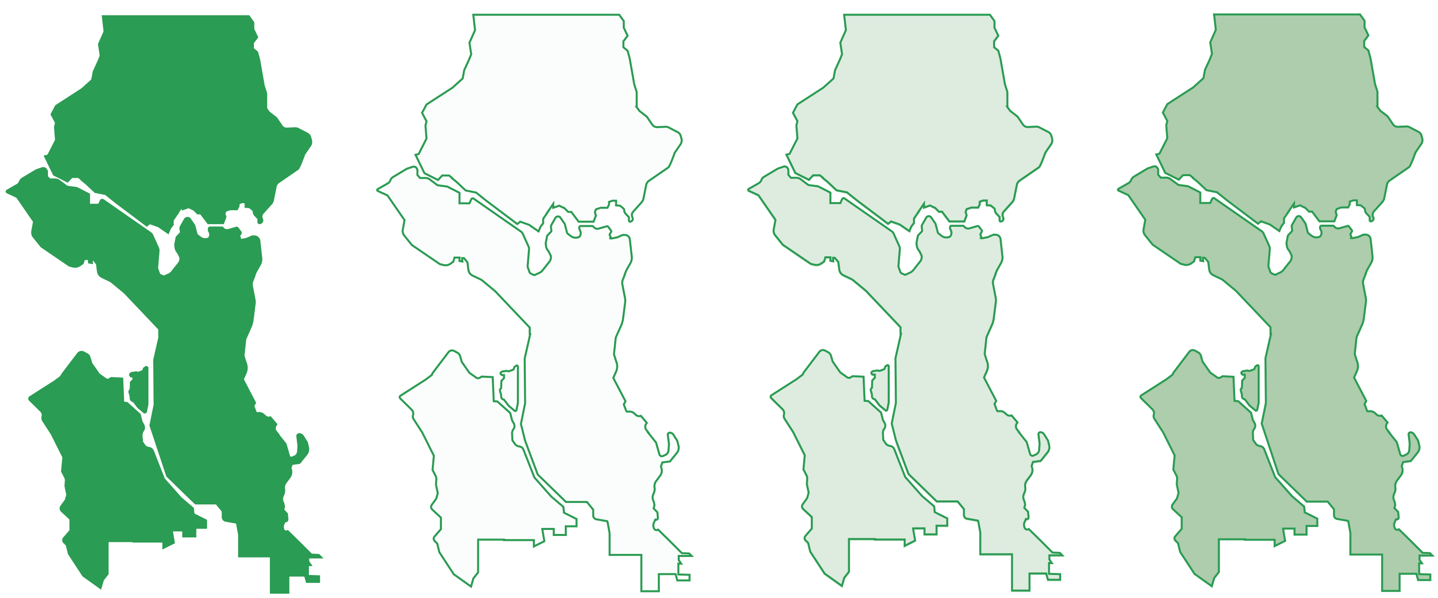
Figure 15. Columbia Center

The Goal: 100%

Dedicating 500 SF to Farming on all single family residential lots

Dedicating 500 SFR Lots
80% of Vacant Lots
100% of Industrial Rooftops

If the equivalent surface area (92.7mi^2) of Seattle were dedicated to farming



100% = 724,745 people
2017 population

1.5% = 10,871 people
97.1% of Seattle's homeless population

14.6% = 105,809 people

40.7% = 294,971 people

Figure 16. Seattle's potential for food self reliance based on various scenarios represented by opacity.

The Purpose of Urban Farming

Clearly, the purpose of urban farming is not to feed urban populations within their city limits. However, the question of how we will feed our cities will become ever more pressing as populations continue to urbanize and the fossil fuel supply declines. An invisible but critical milestone was passed in 2008 when the United Nations (UN) announced that for the first time most of the global population resided in cities. In industrialized nations such as the United States and the United Kingdom 80% of their national populations already live in urban settings. (Cockrall-King, 2012). The UN predicts that 68% of the global population will live in an urban environment by 2050 (United Nations, 2018).

There are various urban farming projects and operations around the world. Each one utilizing assorted growing methods and fulfilling different purposes. There are some large operations that can grow significant amounts of produce and sell it commercially. Some examples include Lufa Farms based in Montreal and Gotham Greens in Brooklyn. Both examples utilize hydroponic growing methods in rooftop greenhouses. Although urban farming will not make cities food self-sustaining it does address the important issue of food security.

Food Security

Food security is defined as, "access to a sufficient supply of nutritious and safe food" (USDA, n.d.). At the highest level, cities have roughly a three-day supply of food at any given moment. Grocery stores keep carefully calculated supply lines because storing massive inventories of perishable items is costly (Cockrall- King, 2012, p.29-30). At a more local level there are people who you might never guess are experiencing food insecurity, like college students.

Last year the University of Washington faculty administered an online survey concerning food insecurity to undergraduate and graduate students across all three campuses. Over a third of respondents reported that they 'sometimes' or 'often' could not afford balanced meals. Another 20% sometimes or often run out of food and do not have the resources to attain more. In each month approximately 9,400 to 10,500 students are forced to skimp on meals to accommodate high costs of tuition and living (Eckart, 2019). Other populations facing food insecurity are those experiencing low income and houselessness. Urban farming projects address food insecurity by donating thousands of pounds of fresh produce to local food banks and shelters annually. Most urban farming projects are much smaller scale and practice organic soil based growing methods.

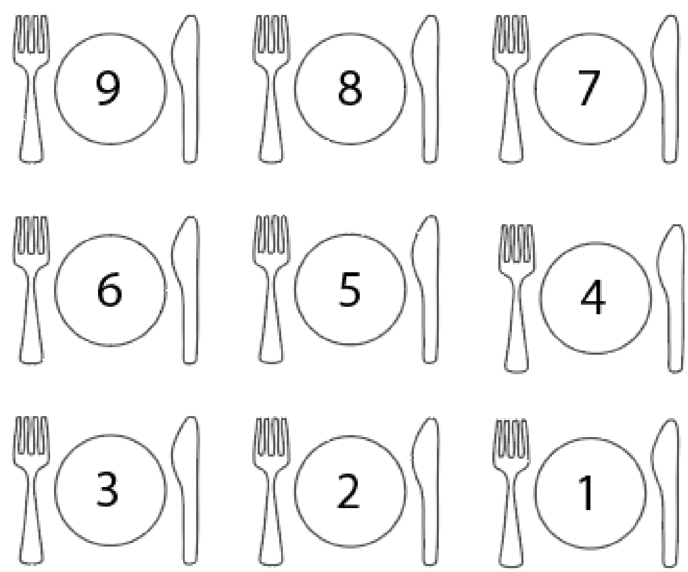


Figure 17. Usually there are about nine meals per person in a city at any given time.

Community Gardens

The ultimate goal of urban farming projects is to build community and provide learning opportunities. Community gardens welcome people from all walks of life and provide them with a sense of belonging. Plants are unique in the sense that they do not discriminate. Plants are indifferent to all of the socially constructed divisions of humankind. If plants are provided with the most basic needs like water, sun, nutrients, and the occasional pollinator they will deliver bountiful harvests. Community gardens act as a place of encounter where people might not meet otherwise. Gardens facilitate opportunities where people can learn from each other and together. Gardening teaches us how to innovate, lead healthy lifestyles, and care for the environment responsibly. Often, community extends beyond the garden to the local community by engaging non gardeners in social, educational and outreach activities. Sometimes community is extended far beyond the local level.

After the September 11 terrorist attacks on the World Trade Center in New York City, the Seattle Center's International Fountain became the civic center for mourning where flowers and thoughts were placed. Volunteers from the Interbay P-Patch separated 80 cubic yards of flowers from the non-comp ostable materials, mixed it with donated brown organic matter, and made compost in their garden facilities. A year later, 1,000 pounds of the "million-flower compost" was delivered by representatives from the Interbay P-Patch as a symbol of healing to the Liberty Community Garden in Manhattan, during its rededication ceremony. In the wake of tragedy, gardens can provide people with a sense of hope (Hou et al., 2009, p.29) (Liberty Community Gardens, n.d.).

Figure 20. Gardeners, friends, and neighbors gather in the Picardo P-Patch to share a potluck meal.

Figure 18 (left). Volunteers gather and separate flowers placed at the International Fountain in the Seattle Center. Figure 19 (above). Mason Shigenaka recites poems from his Seattle classmates to Mike McCormack of Liberty Community Garden during the rededication ceremony.

Growing Systems

Modern urban farming utilizes several different kinds of growing systems. Some are soil based in the ground or in constructed containers and others use soil-less hydroponic methods.

Soil Based

In Ground

- Permaculture
- Biointensive Farming

Constructed Grounds

- Container Gardens
- Productive Green Roofs
- Vertical Growing Structures

Hydroponics

Aggregate Cultures

- Flood & Drain System
- Drip System

Water Cultures

- Raft
- Nutrient Film Technique
- Aquaponics
- Aeroponics

Soil Based Growing Systems

Soil based systems rely on soil to provide plants with the nutrients they need to flourish. To maintain nutrient levels the constant application of compost and organic materials is essential. Generally, soil-based systems are more intuitive, less expensive, and less technologically involved.

Hydroponic Growing Systems

Hydroponic systems eliminate the role of soil by delivering nutrients to plant roots directly via a nutrient rich solution. Some hydroponic systems include an aggregate or growing medium. These mediums are provided as an anchor for plants with more complex root systems. Other hydroponic systems solely use nutrient solutions to cultivate plants. Hydroponic systems are more efficient and produce higher yields than soil-based systems; however, they are more technologically advanced and require more upfront capital and general maintenance. Although hydroponic systems can operate outdoors they are usually run in indoor controlled environments like a greenhouse.

Permaculture

Permaculture is a design system that was introduced by David Holmgren in the 1970s. Originally, this way of design thinking was inspired by a forest ecosystem as a model for sustainable agriculture. Permaculture is grounded in 12 principles; emphasizing mutualistic and symbiotic relationships over competition and predation (Holmgren, 2004).

1.Observe & Interact
Careful observation and thoughtful interactions can liberate us from our dependency on nonrenewable energy and advanced technology when we maximize our human capabilities effectively.

2.Catch & Store Energy
Create closed systems by learning how to capture and reinvest resources.

3.Obtain a Yield
Design a system that supports self-reliance at all phases of the process.

4.Apply Self-regulation & Accept Feedback
Reduce the need for perpetual corrective management by harnessing the relationships between positive and negative feedbacks to create a system that can self-regulate.

5.Use & Value Renewable Resources & Services
Manage and maintain yields by making the best use of natural renewable resources.

6.Produce No Waste
Design a circular system where the outputs from one aspect become the inputs of another.

7.Design from Patterns to Details
Observe other systems and look for patterns. Integrate those patterns into the details of your system.

8.Integrate Rather than Segregate
Understand the roles of each aspect individually and how they benefit each other and the system as a whole. Recognize that each aspect fulfills many purposes and each important function is supported by many elements.

9.Use Small Slow Solutions
Systems should be designed to allow operations to function at the smallest practical scale and at an energy efficient level.

10.Use & Value Diversity
Create a diverse system of biotic and abiotic factors including but not limited to plants, animals, people, and structures as an insurance policy against the uncertainties of nature and everyday life.

11.Use Edges & Value the Marginal
Recognize and conserve contributions from aspects in the periphery. Expansion of peripheral aspects can boost the productivity and stability of the system.

12.Creatively Use & Respond to Change
Leave room for flexibility in your design. Intentionally and cooperatively respond to large scale change beyond your control or influence.

Although not urban, Polyface Farms run by Joel Salatin in Virginia is an admirable example of permaculture. One part of his system involves grass, steer, and chickens. Joel practices intensive rotational grazing. Grasses maintain an important root-shoot ratio, meaning the roots below the soil need to be in balance with the leaf mass above ground. Steer eat down the grass in one paddock and then are moved to another. When the grasses suddenly lose significant amounts of leaf mass, roots are shed that get broken down by decomposing organisms in the soil. Three days later, chickens are brought into the paddock previously occupied by the steer. The chickens scratch at the cow patties spreading manure as they hunt for encased fly larvae. The three-day delay maximizes the food supply for the chickens by allowing the larvae to grow. The paddock has now been heavily fertilized by shed roots and manure from the steer and chickens. The grass goes into a frenzy of growth and four or five weeks later it can be grazed again or cut and stored for winter. On 100 acres, this system yields 40,000 pounds of beef, 25,000 dozen eggs, and 20,000 broiler chickens (TED, 2004). An urban example of permaculture is the Beacon Hill Food Forest in Seattle, Washington. In addition to landscape design, the principles of permaculture can also be applied in the building design process.

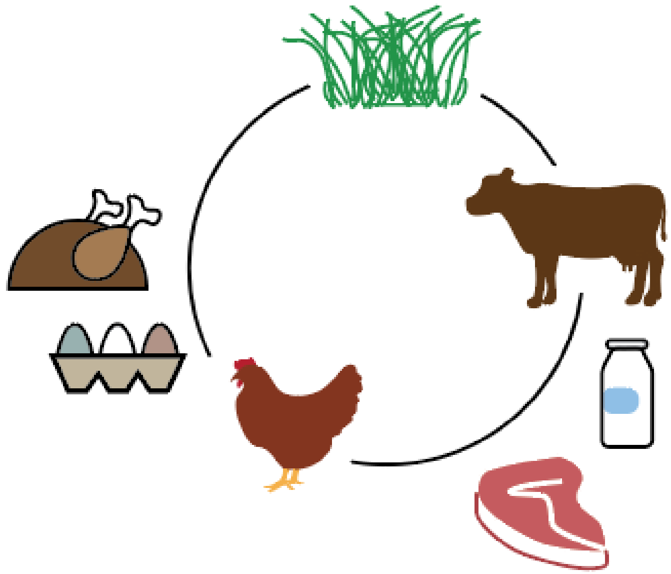


Figure 21. An illustration of permaculture as demonstrated by Joel Salatin. He is able to produce milk, beef, eggs, and chicken with grass being the main input.

Biointensive Farming

Biointensive farming relies on soil health and emphasizes a closed nutrient cycle by composting. Crops are grown in raised beds with a soil depth up to 24 inches. Historic French gardening techniques such as dense plantings and intercropping is also practiced to produce maximum yields on minimal plots of land. Biointensive farming is more water efficient than industrial agriculture as a benefit of increased water retention from constant applications of organic matter. Additionally, these techniques can build up soil heath sixty times faster than nature making it possible for yields to be two to six times greater compared to industrial agriculture (Proksch, 2017, p.27).

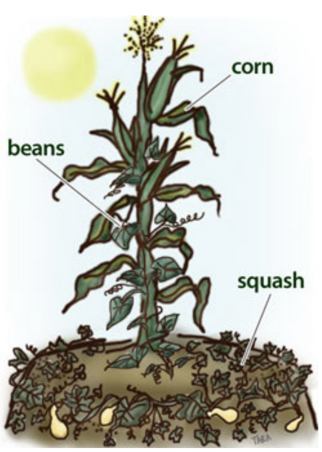


Figure 22. The 3 sisters: corn, squash, and beans. A classic example of intercropping.

Container Gardens

Container gardens are commonly found in the urban landscape because they address the problems of hardscaped surfaces, contaminated soil, and infeasible remediation. They also allow for flexibility and mobility. A wide range of containers can be used for gardening, ranging from recycled crates to custom designed planters. Increased vulnerability to temperature changes, soil loss, and soil drying are challenges for crops cultivated in containers. (Porksch, 2017, p.28). The impact of these challenges decrease as the container volume increases (Porksch, 2017, p.28).

Productive Green Roofs

The transformation of an underutilized rooftop into an edible landscape make productive green roofs a favorable option for the urban environment. Green roofs also offer environmental benefits including, a strategy for storm water management, improvements in urban microclimates, and enhance building performance. Green roofs consist of a series of layers. A substrate layer covers the roof continuously where vegetation grows. Excess water is expelled or stored in a drainage layer. Finally, an additional membrane separates the upper layers from the actual roof of the building (Porksch, 2017, p.30).

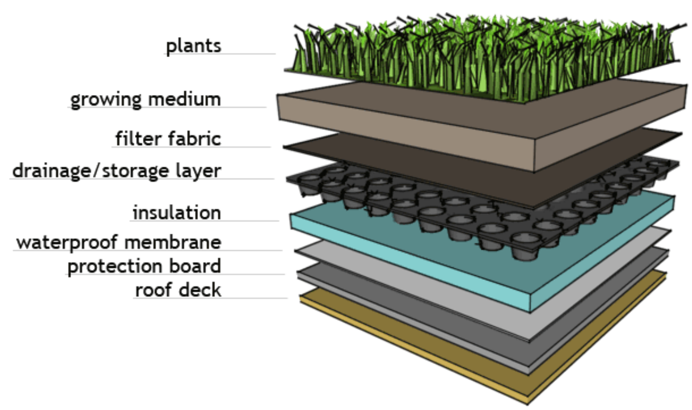


Figure 23. Productive green roof.

Vertical Growing Systems

Two soil based vertical growing systems have been widely adopted in urban environments which are green facades and green walls. Green facades are created by vining, climbing, or trained fruit trees grown on a trellis that is either free standing or anchored to a wall. Green walls are constructed by a collection of pre-vegetated panels, vertical modules, or planted blankets. In addition to structural support, green walls also integrate a watering and fertilization system. This model has not been extensively tested with edible plants because it is usually implemented on a small scale to improve open spaces. The main challenge posed by green walls is an equal distribution of water and nutrients (Porksch, 2017, p.30).

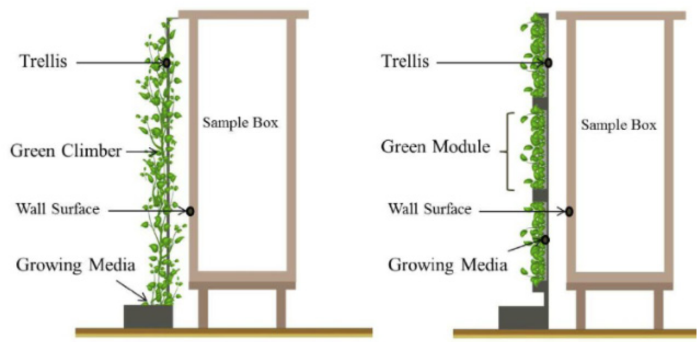


Figure 24. Green facade (Left) and living wall (Right).

Flood & Drain System

The flood and drain system is usually used to grow deep rooting plants. Housed in a waterproof container, plants anchor their roots in an aggregate like coconut husks, clay pebbles, or perlite. Nutrients are delivered to the roots periodically when a water solution is pumped into the containers. Gravity later drains the excess solution into a reservoir to be replenished and give the roots a chance to absorb oxygen (Porksch, 2017, p.32). The weight of the watering containers and risk of leaks present a challenge for building and rooftop integration (Porksch, 2017, p.31).

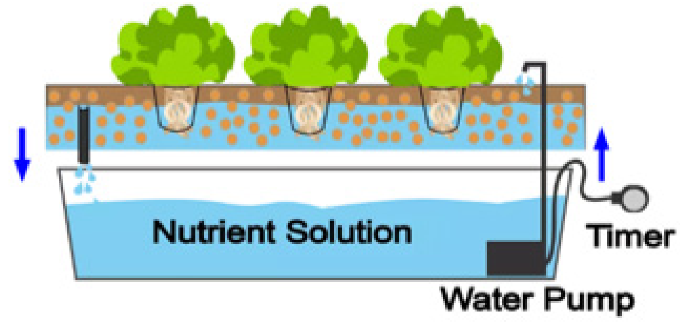


Figure 25. Flood and drain system.

Drip System

This is another hydroponic aggregate system ideal for vining plants like tomatoes, cucumbers, and peppers. Nutrient solution is delivered directly to the root ball of each plant via an individual emitter. High wires are often used to train plants to grow vertically. This system is highly efficient because plants absorb all the solution and evaporation can be prevented with proper measures in place. Rooftops are a suitable location for this method due to its light weight, flexibility, and low infrastructure requirements. Close management is required of this system because it is completely dependent on a pump. If the pump fails due to mineral clogs in the water line then the plants will die quickly (Porksch, 2017, p.33).

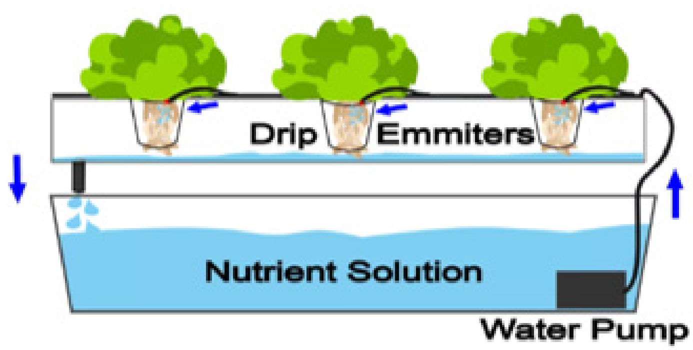


Figure 26. Drip system.

Raft System

The raft system is completely water based. Plant roots are suspended in a nutrient water bath up to eight inches deep. The nutrient solution circulates between the plants and a separate tank where it is sterilized, aerated, and replenished.

Considerable horizontal space is needed for this system and the weight of the water pools makes it best for ground level operations (Porksch, 2017, p.34).

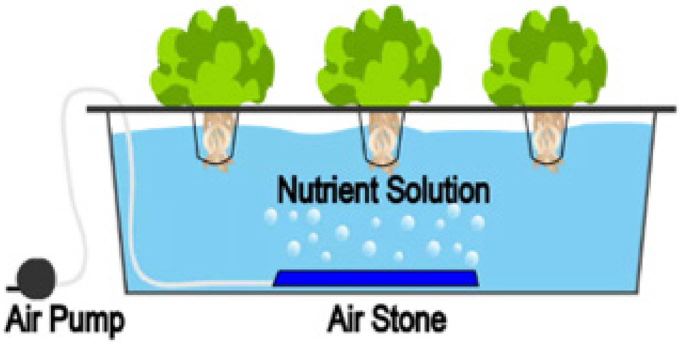


Figure 27. Raft system.

Nutrient Film Technique

Of the hydroponic systems, this is the highest-yielding method. The nutrient film technique suspends plant roots in a narrow trough which the nutrient solution flows through. This system is the most popular hydroponic option for leafy greens. Solution is continually pumped from the bottom of the system where it is sterilized, aerated, and replenished to the top of the troughs. Flexibility of this system is afforded by its light weight and inexpensive infrastructure; making it optimal for building and rooftop integration (Porksch, 2017, p.34).

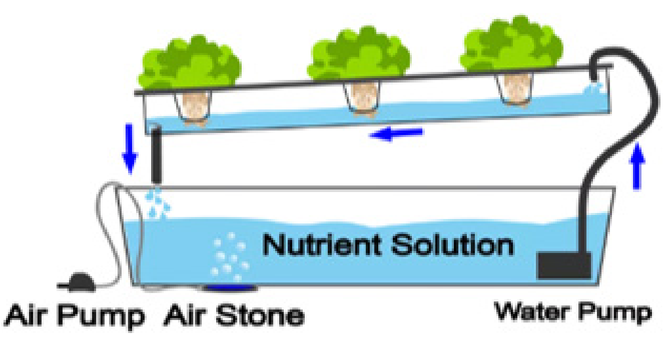


Figure 28. Nutrient film technique.

Aeroponics

In aeroponic systems, plant roots get misted with a nutrient solution in an enclosed chamber. This technique works best for leafy greens, herbs, and medicinal roots. For this system to be successful it requires high pressure pumps and an advanced filtration system (Porksch, 2017, p.34). Aeroponics is a relatively new growing method and is rarely used at the commercial level. However, aeroponics presents several opportunities for building integration.

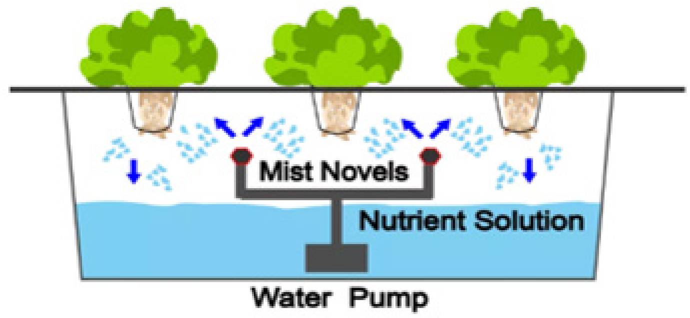


Figure 29. Aeroponic system.

Aquaponics

Aquaponics is a self-fertilizing ecosystem, consisting of a symbiotic relationship between fish, plants, and microbial communities. In a balanced system, the only input is fish food. Microbes in the water create a nutrient solution when they transform the fish excrement into plant fertilizer. This water is then pumped to the plants where they extract the nutrients and filter the water to sustain the fish population. Fish used for aquaponic systems can be edible or ornamental. To ensure the health of the fish and plants water temperature, oxygen, and nutrient levels should be monitored (Porksch, 2017, p.36).

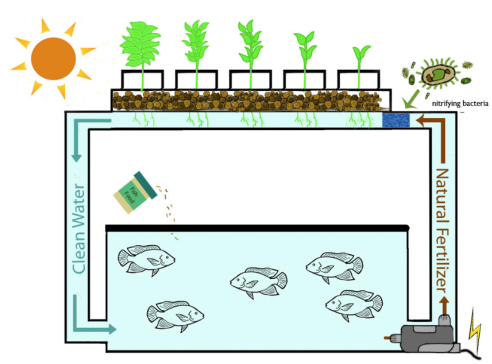


Figure 30. Aquaponic system.

Urban Farming: Reimagined

Opportunities For Urban Farming

Places where farming could be integrated within the urban landscape were explored and are laid out below. Rooftops are also an excellent opportunity for urban farming since every building has a roof.

With the various opportunities and growing systems in mind, a collection of design ideas and concepts were developed.

* Dead space include area underneath structures like

Public: Open to All

Civic

Hospitals
Plazas
Space that cannot be developed
Airports
- terminals
- scrub vegetation

Convention Centers
- lobby
- dinning areas
- terrace

Parks
Prisons
Government buildings

Right of Way

Medians
Boulevards
Roundabouts
* Dead space
Separate bike lanes
Sidewalks
- planting strips
- bus shelters

Neighborhoods

Community gardens
Community centers
Police/fire departments
Libraries

Educational

Pre-schools/ cooperatives
Elementary schools
Middle schools
Highschools
Technical schools
Colleges
Universities

Private: Controlled Access

Apartments & Condos

Lobby
Terrace
Courtyard
Patio/deck
Balcony

Housing Developments

Retirement Homes

Offices

Lobby
Cubicles
Windows
Meeting rooms

New Construction

Commercial: Profit Driven

Shopping Centers

Parking areas
Plazas

Hotels

Lobby
Ballrooms
Conference Rooms
Courtyards
Balconies
Spa
Parking areas

Restaurants

Sites

Museums
Zoos
Aquariums
Amusement parks

Sports Stadiums

Daycare Centers

Industrial: Large Scale Production

Factories

Warehouses

Brown fields

Vacant lots

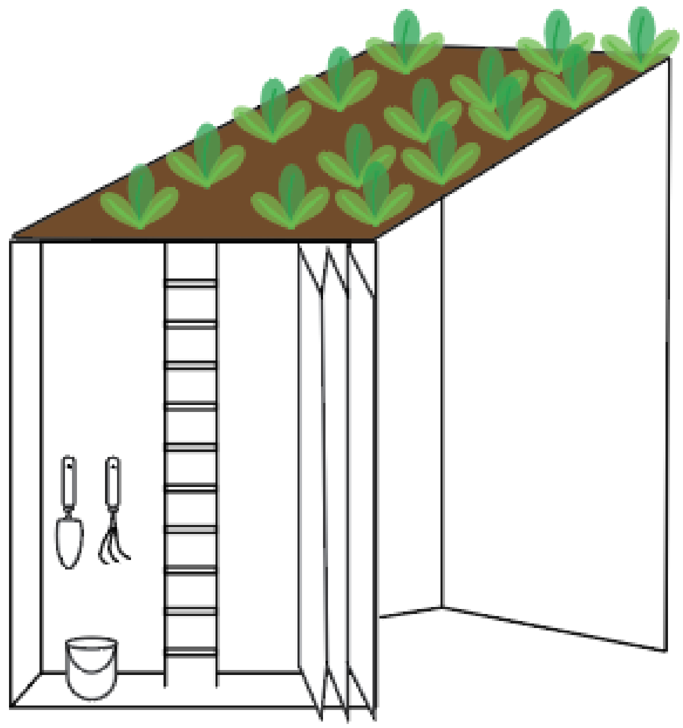
Transit Garden

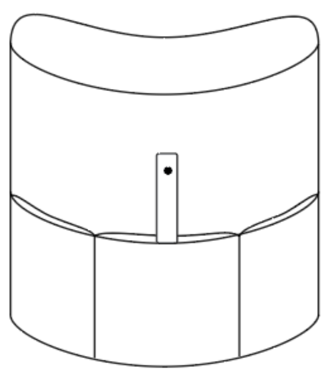
Opportunity: Public
Right of Way
Sidewalks
Bus Shelters

Growing System: Soil Based
Constructed Grounds
Productive Green Roof

The transit garden converts the rooftops of bus shelters into gardening spaces. An access ladder and a storage closet are included in the side of this design. Access is secured by a locking accordion style door.

A garden pack was also designed as part of this concept to help gardeners transport supplies, equipment, and their harvests. The main compartment is equipped to carry soil or water and the pockets on the front provide storage for other gardening necessities.





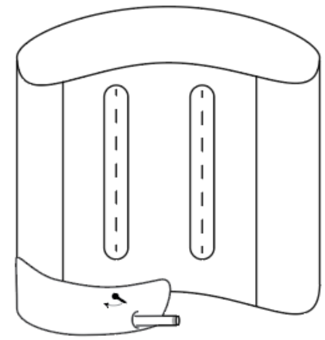


Figure 31 (top). Transit garden. Figure 32 (left) Front view of garden pack. Figure 33 (right). Back view of a garden pack.

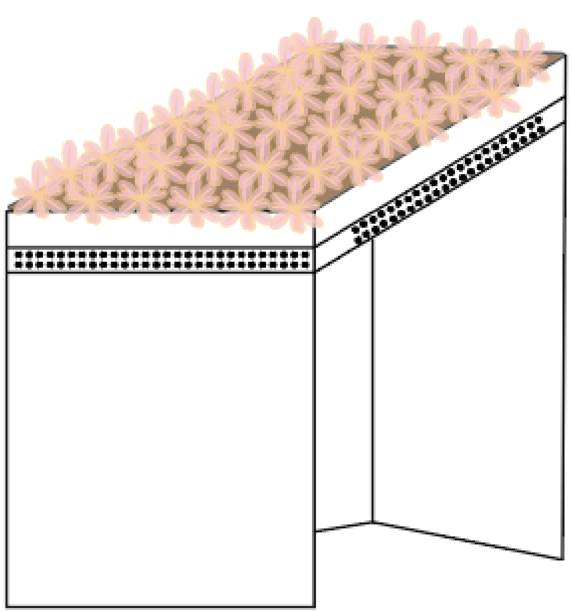


Figure 34. Bus shelter for bees.

Bus Shelters for Bees

If people decide that gardening on top of bus shelters is too ambitious, then perhaps bees may be a better fit. Bus shelters could be designed with bees and people in mind. Bus shelters could offer a place for bees to forage if their roofs were planted with bee friendly vegetation. Shelter could also be provided for solitary bees if small holes were drilled in the shelter.

People's apprehension about being in close quarters with bees is understandable. However, it is less common for pollinator bees to sting as it is fatal to them.

Garden Bicycle

Opportunity: Public

Growing System: Soil Based
Constructed Grounds
Container Garden

John Deere is joining the bike sharing economy. The gardening experience is shared in addition to the bike. A feature for the container gardens will be integrated into the bike sharing app.

The container garden will be equipped with sensors to monitor moisture levels, light exposure, and plant growth. Riders will be provided with incentives to care for the container gardens. Discounts could be offered for watering and parking the bikes in the sun. Riders who frequently tend to the container gardens could be shown where bikes are with containers ready for harvest as another incentive.

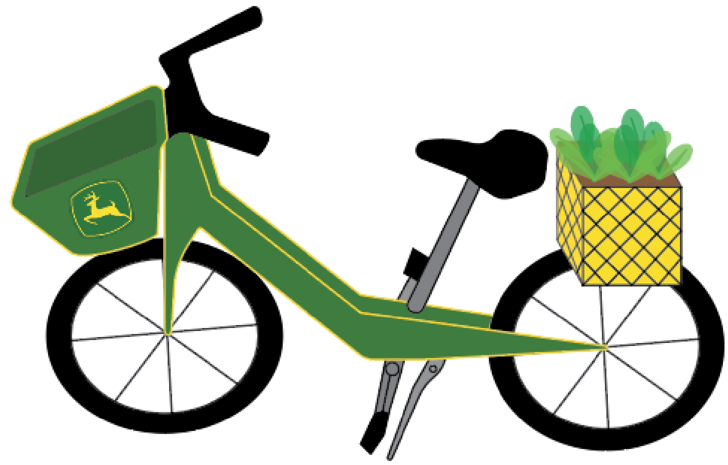


Figure 35. Garden bicycle.

Garden Playground

Opportunity: Public
Educational
Preschools
Elementary Schools

Commercial
Daycare Centers

Growing System: Soil Based & Hydroponic

Integrating gardening into playground toys would be a fun and engaging way to introduce gardening to kids. A hydroponic tunnel slide, a merry go round, and a teeter totter are included in this design concept.

The frame of a swing set could also provide a structure for climbing plants like beans, peas, or grapes. Other plants like squash could be integrated into a frame above monkey bars and provide a shade canopy. Garden playgrounds would be most successful in places where kids are around regularly, like elementary schools or daycare centers.

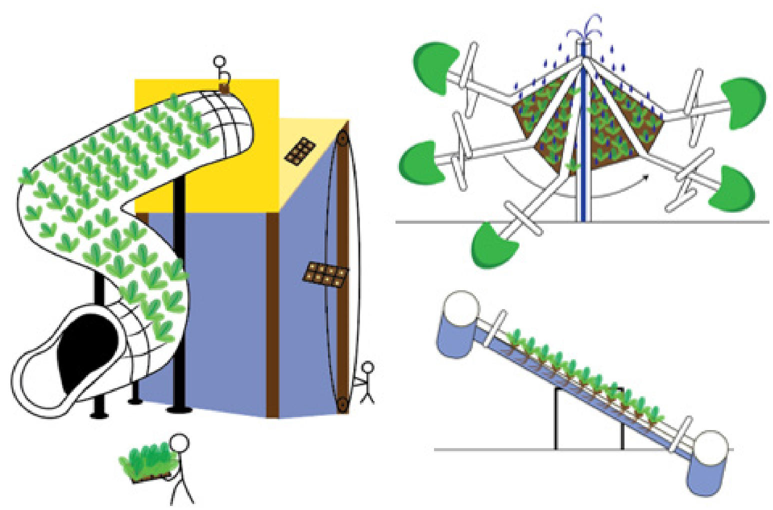
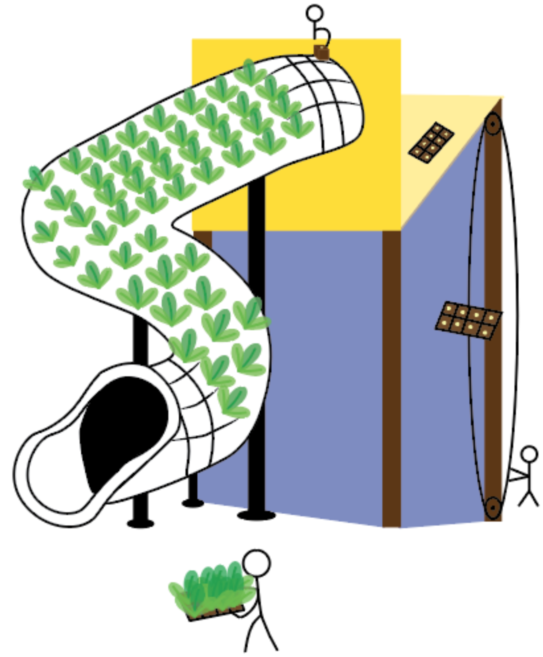


Figure 36. Garden playground.

Hydroponic Tunnel Slide



Opportunity: Public
Educational
Preschools
Elementary Schools

Commercial
Daycare Centers

Growing System: Aggregate Culture
Flood & Drain

The tunnel slide utilizes an aggregate hydroponic growing system. Plants are grown in small containers and placed on tracks on top of the tunnel with water running through them. When the plants are ready for harvest the ones at the bottom of the slide will be removed and the rest will slide down. A pulley system will help transport seedlings from the base of the slide to the top where replanting occurs. Water is stored in the base of slide and a pump circulates it through the system.

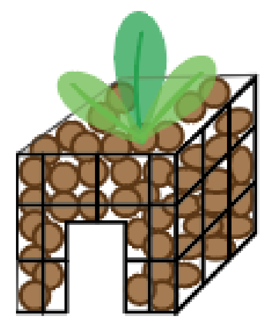
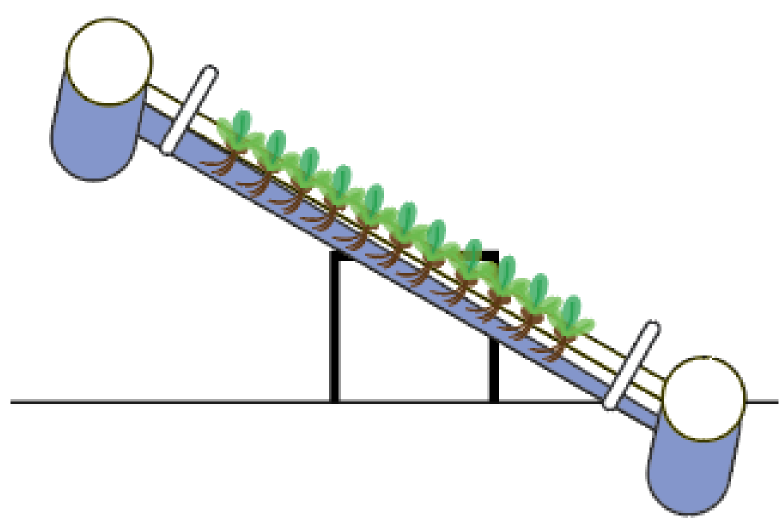


Figure 37 (top). Garden slide. Figure 38 (left) Water system of the garden slide. Figure 39 (right). Growing container for the garden slide.

Hydroponic Teeter Totter



Growing System: Water Culture
Nutrient Film Technique

The teeter totter is another hydroponic system with water basins at each end. Plants are planted in the center of the platform and get watered as the kids play.

Figure 40. Hydroponic teeter totter.

Garden Merry Go Round

Growing System: Soil Based
Constructed Grounds
Container Garden

In this soil-based system, the merry go round acts as a water pump. As the kids go around water gets pumped up to water the plants. The water pressure and range of dispersal increases proportionally with the speed of rotation.

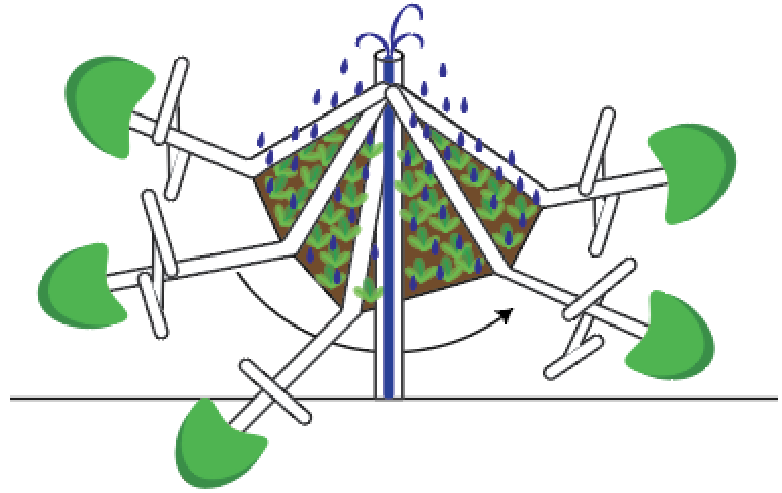


Figure 41. Garden Merry Go Round.

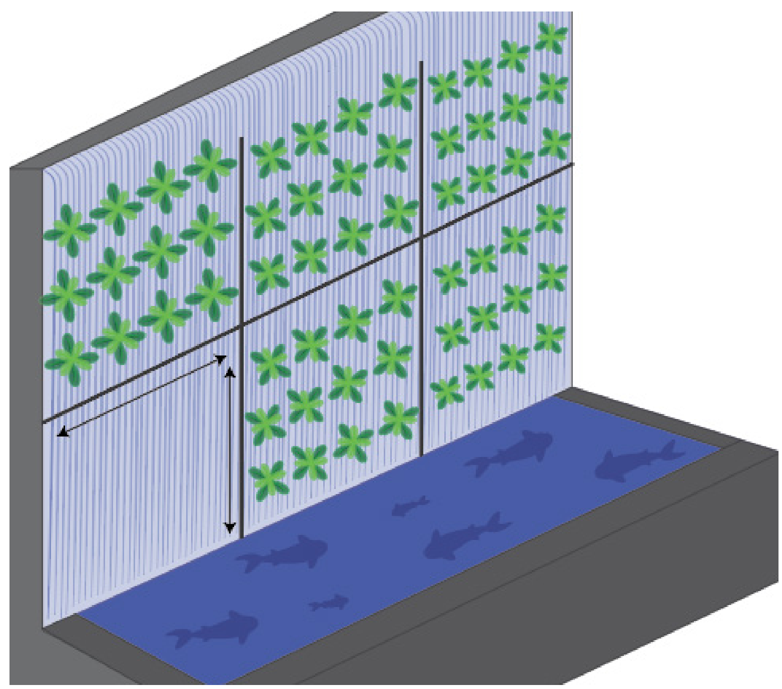
Aquaponic Wall

Opportunity: Public
Convention Centers

Commercial
Shopping Centers
Hotels
Sports Stadiums

Growing System: Hydroponic
Water Culture
Aquaponic

This is an aquaponic system that could be installed in hotels, shopping centers, convention centers, residential buildings, etc. Plants are held in compartments on transparent panels. These panels are on tracks and can be moved horizontally and vertically. The plants are watered by a circulating waterfall behind the panels.



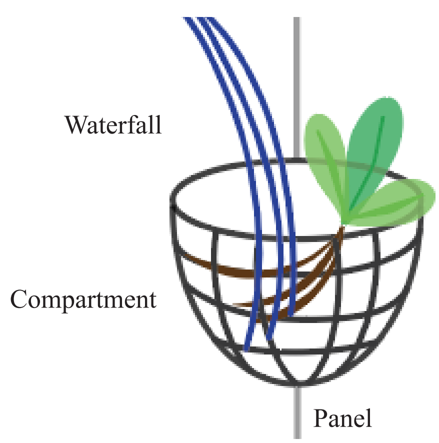


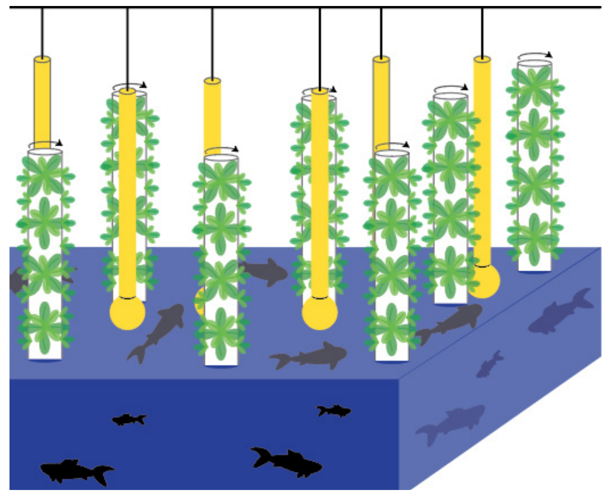
Figure 42 (above). Aquaponic wall. Figure 43 (left). Profile of the growing compartment and panel.

Aquaponic Pool

Opportunity: Public
Convention Centers

Commercial
Shopping Centers
Hotels
Aquariums

Growing System: Hydroponic
Water Culture
Aquaponic/ Aeroponic



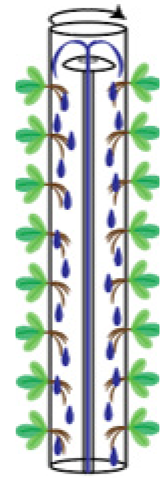


Figure 44 (left). Aquaponic pool. Figure 45 (right). Internal view of the growing towers.

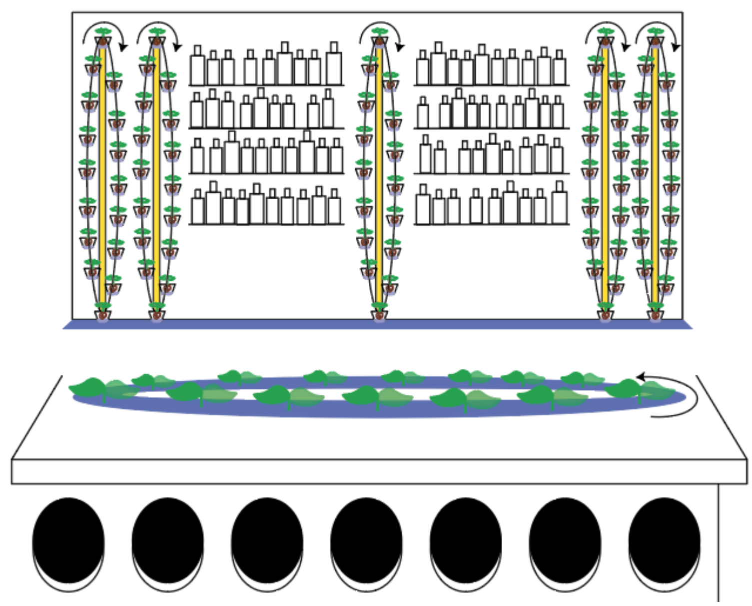
The aquaponic pool can be installed in similar settings as the aquaponic wall. The pool consists of aeroponic growing towers that rotate around lights hanging from the ceiling. Water is pumped up the middle of the growing towers and gets dispersed to the plant roots on its way down.

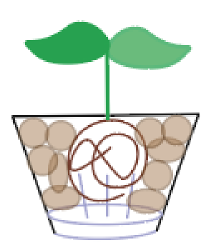
Herb Garden

Opportunity: Commercial
Restaurants
Bars

Growing System: Hydroponic
Aggregate & Culture
Wick & Raft System

This herb garden is installed in a bar and uses a wick system. The containers alternate being dipped in a pool of nutrient solution where an absorbent material delivers water to the plant roots. Plants on the bar counter float on small rafts with their roots suspended in the pool. In addition to providing an aromatic atmosphere, these herbs can be muddled into drinks and used as garnishes.





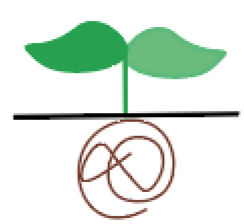
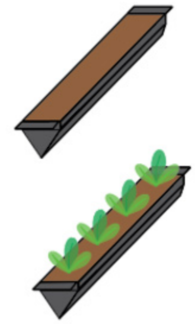


Figure 46 (top). Herb garden integrated in a bar. Figure 47(left). Growing container using a wick system. Figure 48 (right). Raft system on the bar counter.

Garden Cube



Opportunity: Private
Offices

Growing System: Hydroponic
Aggregate Culture

The garden cube is designed to liven up the partitions of office cubicles. Things can still be hung inside the cubicle due to the magnetic properties of the planters. The garden cube offers flexibility because planters simply slip into place and can easily be removed. Additionally, the garden cube is collapsible and mobile making storage a breeze.

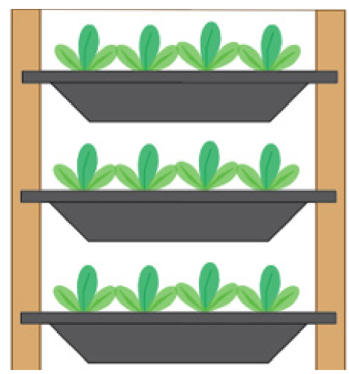


Figure 49 (top left). Garden cube. Figure 50 (top right). Growing containers. Figure 51 (bottom left). Close up of garden cube partition. Figure 52 (bottom right). Plant-less garden cube ready to be collapsed.

Mobile Raised Garden Bed

Opportunity: All

Growing System: Soil Based
Constructed Grounds
Container Garden

This design can be placed anywhere. It would do especially well in hardscaped public open spaces. The pull out or fold down seating and mobility allows the space to remain flexible. It is raised to be accessible for gardeners who use a wheelchair or have a bad back. Opportunity for interactivity is also provided by the chalk board base of the garden bed. A storage cupboard and a removable collapsible polytunnel tent is also featured.

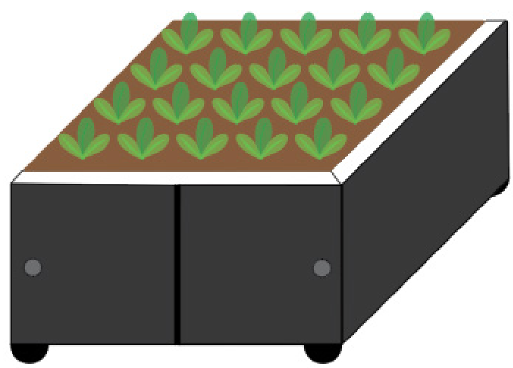
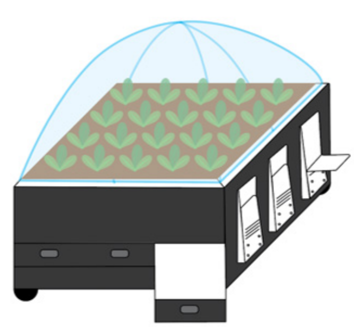
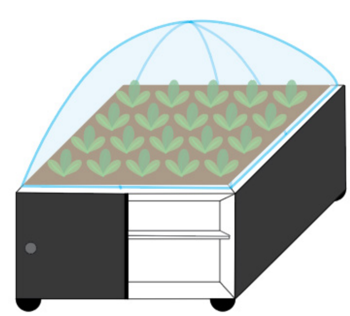
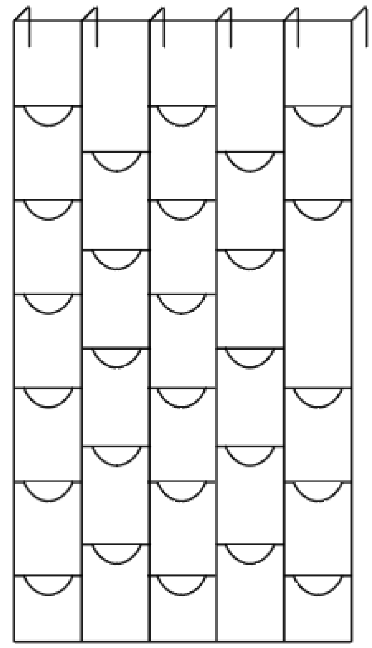


Figure 53 (top). Mobile raised garden bed. Figure 54 (left). Flexible seating. Figure 55 (right). Storage.





Garden Door Frame



Opportunity: All

Growing System: Hydroponic
Aggregate Culture
Vertical Growing Structure

Any door can be transformed into a garden with this design. It consists of a frame hung on a door and planters that can be inserted into it. The frame can act as a trellis for climbing plants like beans or peas or containers can be placed in various arrangements for other plants.

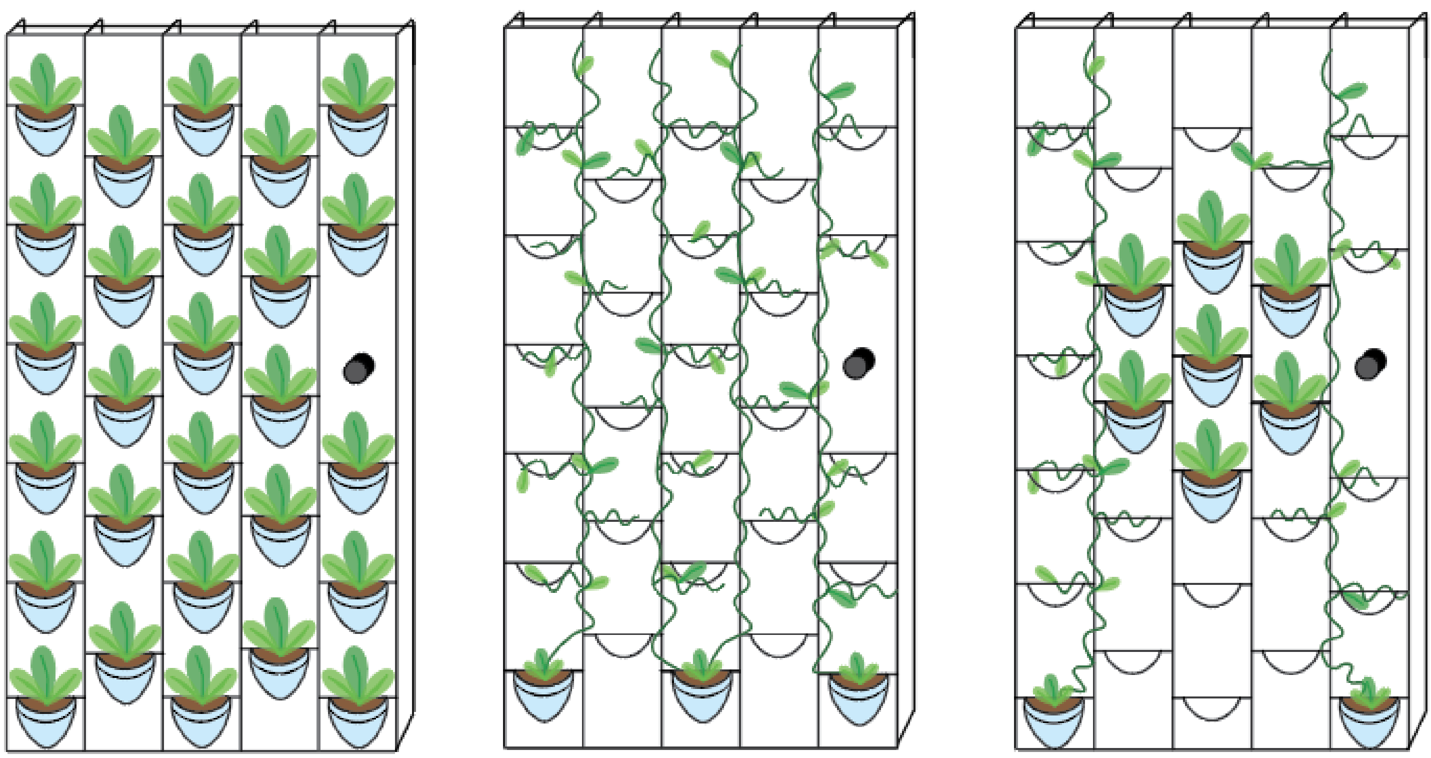


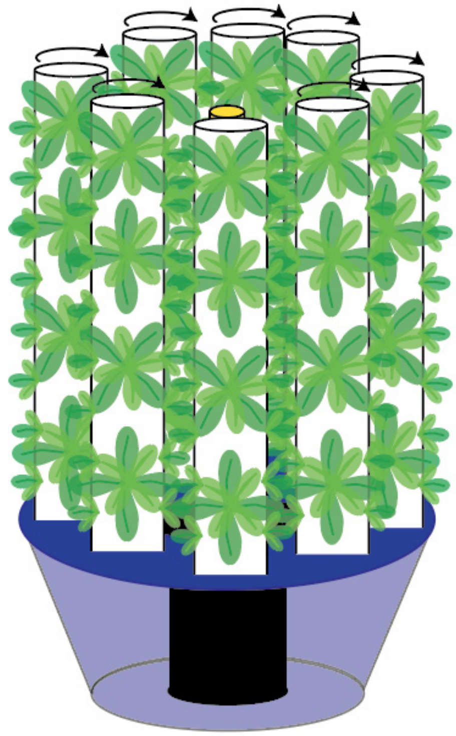
Figure 56 (top). Empty garden door frame. Figure 57 (left). Garden door frame with planters hanging on a door. Figure 58 (middle). Garden door frame with vining plants hanging on a door. Figure 59 (right). Garden door frame with planters and vining plants hanging on a door frame.

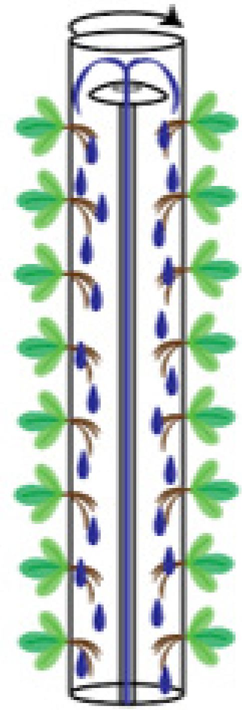
Aeroponic Garden Tower

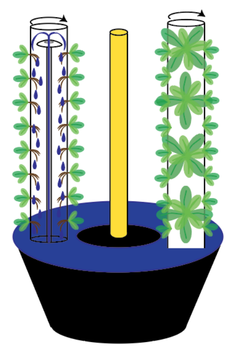
Opportunity: All

Growing System: Water Culture
Nutrient Film Technique

This system can be installed anywhere with a power source. Aeroponic growing towers rotate around a single light source for maximum growing capacity. Nutrient solution is pumped up from the base through the center of the towers and dispersed to plant roots.







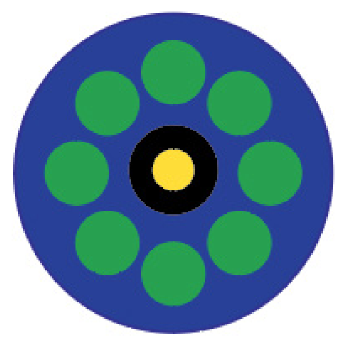


Figure 60 (top left). Aquaponic garden tower. Figure 61 (top right). Internal view of growing towers. Figure 62 (bottom left). Internal view of the aeroponic garden tower system. Figure 63(bottom right). Bird's eye view of the system.

Urban Farming in Seattle

Seattle's P-Patch Program

Seattle established its urban farming roots in 1973 when the city purchased the last three acres of the Picardo farmland. The Picardo brothers, Ernesto, Orazio, and Sabino immigrated from Italy in the 1890s. After a stint in Boston the brothers were initially drawn out west by the promise of the Yukon Gold Rush. After reports of its harsh conditions, the brothers might have reconsidered the gold rush and turned to the gardening and produce industry instead.

The Picardos were "truck farmers." They practiced intensive farming, planting rotating market crops on small plots of land. During the growing season they harvested every day and sent the produce to be sold in various produce stands that were owned or leased by the family. For several years they farmed along the Duwamish waterway until changes to the waterway made the land unfit for farming in 1920 ("The Picardo Farm in Wedgwood", n.d.). They moved their farm to 30 acres in what is Wedgewood today (Cipalla, 2018). In 1922, Ernesto bought the farmland where he gardened until his death in 1961.

At Ernesto's passing all of the Picardo descendants had pursued other occupations except his son, Rainie who still worked the farm. By 1970 only a few acres of the original farmland were left. Pieces of the farm had been sold for post war housing and a city owned playfield. Rainie protected the last 3 acres from development because he did not want the fertile land to go to waste.

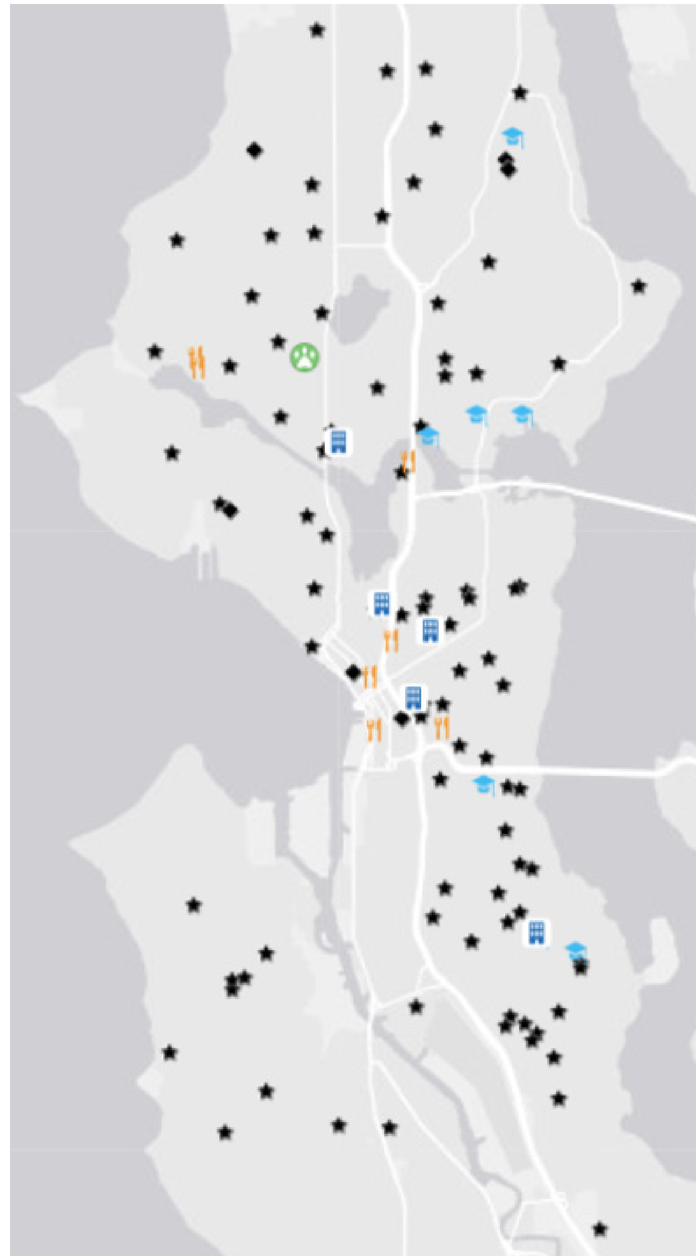
Rainie retired from farming in 1971 (Lawson, 2005, p. 246). At the same time a "back to basics" movement encouraged people to grow their own food as numerous people were left unemployed after Boeing's significant layoffs ("The Picardo Farm in Wedgwood", n.d.). Rainie allowed local residents and students to garden on his land at no cost until annual property taxes of $688 made it an arrangement he could no longer support. He began the process to sell the land in 1973.

Figure 64. (Above) Ernesto Picado with market garden workers c.1923. Figure 65. (Below) City Council Member John Miller planting squash at Picardo in 1974.

An alternative solution arose due to popular interest in continuing the garden. Instead of selling, the city would lease the land as a 10-month experiment in community gardening. City council approved the lease on April 16, 1973 and 210 plots up to 400ft2 were developed. By May 20, 1973 all of the plots had been rented and gardeners paid a $10 fee for water. The end of the first season was celebrated with a harvest luncheon attended by the Mayor, City Council, and at least 60 gardeners. Only 10 gardeners had quit. The city deemed the experiment a success and appointed a task force of citizens and city agency representatives to organize the P-Patch Program (Lawson, 2005, p. 246).

Urban Farming Today

Urban farming in Seattle is alive and well. The P-Patch Program has expanded to include: 89 community gardens, totaling 3,630 plots, and covers 33.7 acres throughout the city. The interest list has over 2,000 people waiting anywhere from three months to four years for a gardening plot. In 2018, P-Patch gardeners donated over 34,000 pounds of fresh produce to food banks and hot meal programs (Seattle Department of Neighborhoods, 2018). The P-Patch Program has been recognized nationally and internationally as an example of community building, gardens growing much more than just fruits and vegetables. In addition to the P-Patch Program there are various other urban farming projects throughout the city integrated at the zoo, schools, restaurants, and residential buildings.



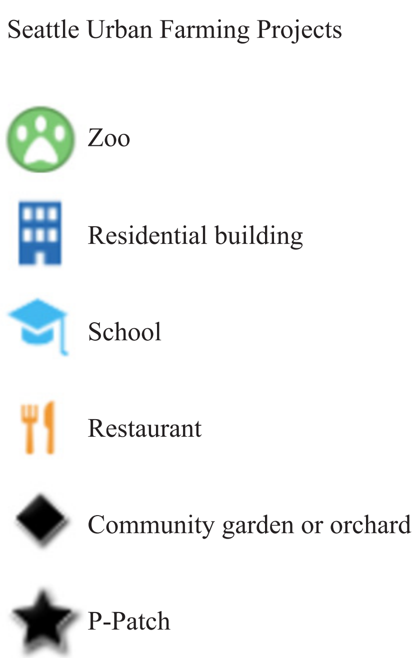


Figure 66. Map of urban farming projects in Seattle.

City Support

Since 1973, the City of Seattle has supported the P-Patch Program with enthusiasm. By 1975, the city had developed 10 more community gardens and purchased the original site on the Picardo farmland. The city declared general support for community gardening in 1992 when resolution 28610 was passed. This resolution called for general maintenance and expansion of the program on surplus city owned land. As part of the city's comprehensive plan the following goal was set in 1994: A P-Patch for every 2,500 households (Hou et al., 2009, p.57). Seattle's Department of Parks and Recreation adopted policy in 2000 that permitted P-Patch gardens in city parks (Hou et al., 2009, p.59).

In response the program's growing wait list of 800 people, a five year strategic plan for expanding the P-Patch Program was put forward by Friends of the P-Patch and the P-Patch Program. The plan called for: four new P-Patches a year, city identification of land owned by the city suitable for gardening, recommendations developed by the Budget Office for capital to acquire leased sites, support staff personnel to oversee 10-12 P-Patches, partnerships between the Department of Neighborhoods and groups working on food security issues, and an annual status report provided by the Department of Neighborhoods to the city council. This plan was adopted by the city council in 2000 and put into motion between 2001 – 2005.

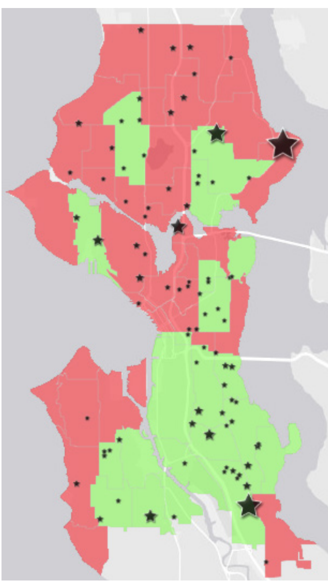


Figure 67. A P-Patch for every 2,500 households (HH) according to 2017 reporting areas.

Size of P-Patch (ft²)

- > 174,240
- 130,000
- 90,000
- 40,000
- < 0

P-Patch per 2,500HH

Less than a P-Patch per 2,500HH

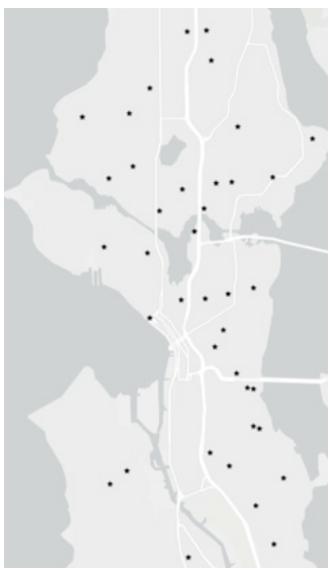


Figure 68. Map of P-Patches established by 2000.

P-Patch est. before 2000

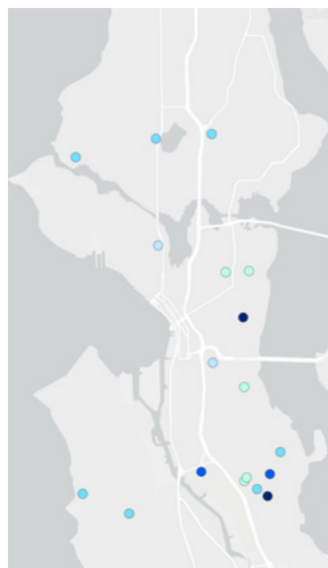


Figure 69. Map of P-Patches established between 2001-2005.

- P-Patch est. 2001 (5)
- P-Patch est. 2002 (2)
- P-Patch est. 2003 (7)
- P-Patch est. 2004 (2)
- P-Patch est. 2005 (2)

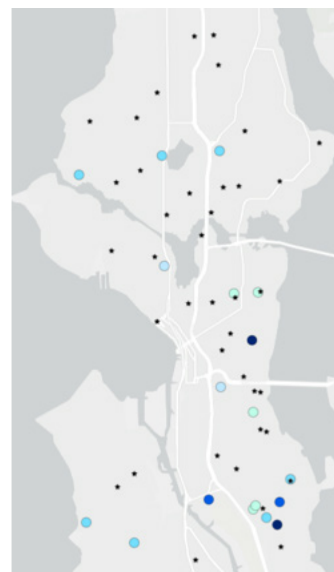


Figure 70. Map of P-Patches established by then of 2005.

- P-Patch est. before 2000
- P-Patch est. 2001 (5)
- P-Patch est. 2002 (2)
- P-Patch est. 2003 (7)
- P-Patch est. 2004 (2)
- P-Patch est. 2005 (2)

There are 314,825 households in the city of Seattle as of 2017. One hundred and twenty six P-Patches are required to meet the one P-Patch for every 2,500 household policy. With 89 P-Patches, the city is 37 P-Patches short. From 2001-2005 the city set a goal of establishing 20 new P-Patches and was able to establish 18 new P-Patches. Currently, there are six P-Patch support staff working in the Department of Neighborhoods. One to three more support staff are needed to meet the goal of a staff member for 10-12 P-Patches. If there were a P-Patch for ever 2,500 households, four or six more staff members are needed.

City support for urban farming projects continues as policy is considered and included in Seattle's 2035 Comprehensive Plan. Community gardens make the agenda in several areas including access to open space, access to food and shelter, and neighborhood plans. Future policy for community gardening in Seattle is included below as described in Seattle's 2035 Comprehensive Plan.

"*Access to Open Space*

Goal: Provide a variety of outdoor and indoor spaces throughout the city for all people to play, learn, contemplate, and build community.

Policy: Create innovative opportunities to use existing public land, especially in the right of way, for open space and recreation, including street plazas, pavement to parks, parklets, lidding of reservoirs and highways, and community gardens (City of Seattle, 2018, p. 141).

Access to Food & Shelter

Goal: Reduce poverty and its effects, which make people, especially children and elderly adults, vulnerable.

Policy: Encourage local food production, processing, and distribution through the support of home and community gardens, farmers' markets, community kitchens, and other collaborative initiatives to provide healthy foods and promote food security (City of Seattle, 2018, p. 155).

Broadview/ Bitter Lake/ Haller Lake Neighborhood Plan

Goal: Stores, restaurant, and schools that provide healthy food choices.
An abundant local food economy that draws from urban agriculture activity in the neighborhood as well as regional food sources.

Policy: Expand access to locally grown food, by attracting farmers' markets and a wider range of grocery stores.

Create opportunities for the community to learn how to establish and maintain urban agriculture practices in the neighborhood through projects such as P-Patches and community gardens, as well as on private property (City of Seattle, 2018, p. 221).

Crown Hill/ Ballard Neighborhood Plan

Goal: A neighborhood with open space, parks, and recreation sites, connected by a network of "green links," that offer a full range of active and passive recreational opportunities to area residents and visitors, throughout Crown Hill/Ballard.

Policy: Create opportunities for people to experience the natural environment through the preservation of publicly owned forested areas, encouraging community gardening (P-Patches), and tree planting on private property and in the public right-of-way, and creating access to views and waterways (City of Seattle, 2018, p. 245).

Pike & Pine Neighborhood plan

Goal: Seek to enhance available open space and seek additional opportunities for pocket parks, community garden, children's play spaces, and other recreational activities.

Policy: Seek to enhance available open space and seek additional opportunities for pocket parks, community garden, children's play spaces, and other recreational activities (City of Seattle, 2018, p. 365).

Denny Triangle

Goal: Strive to accomplish goals for open space as defined for urban center villages

Policy: One dedicated community garden for each 2,500 households in the village, with at least one dedicated garden site (City of Seattle, 2018, p. 289)."

The P-Patch Program is also included in the Seattle Department of Parks & Recreation 2017-2023 Plan. In this six-year time frame the Parks Department has selected 10 P-Patches to rejuvenate. They intend to improve accessibility, update failing infrastructure, maximize the value of upgrades, and improve safety. P-Patches selected for rejuvenation include Estelle Street, New Holly Power Garden, Angel Morgan, Thistle, Squire Park, Hawkins, Thomas Street, Jackson Park, Ravenna, and Evanston (Seattle Department of Parks & Recreation, 2017, p. 87).

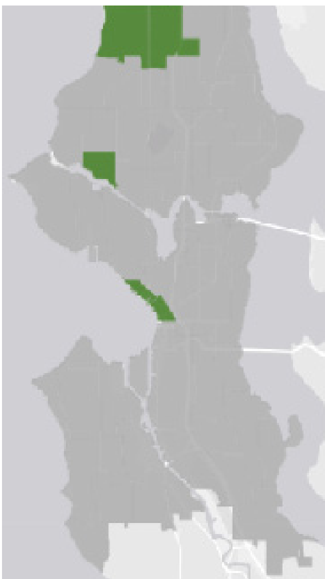


Figure 71. Neighborhood areas including urban farming policy in Seattle's 2035 Comprehensive Plan.

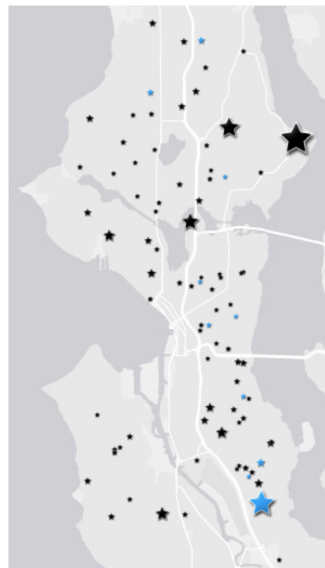


Figure 72. P-Patches selected for rejuvenation in the Parks 2017-2023 Plan.

Supporting Organizations

GROW is a volunteer run non-profit organization. GROW advocates for community gardening projects, helps connect gardeners with the knowledge and resources they need, provides liability insurance for Seattle P-Patches and other community gardening projects, and serves as a fiscal sponsor for community gardens (GROW, n.d.).

Figure 73. GROW's logo.

Tilth Alliance is a non-profit organization that aims to build a food system that is ecologically sound, economically viable, and socially equitable. They work towards this goal by teaching classes surrounding soil management, gardening practices, and cooking and nutrition. In addition, Tilth connects farmers to the support and resources they need and connect consumers with local food products (Tilth Alliance, n.d.).

Figure 74. Tilth Alliance's logo.

Lettuce Link is a program administered through Solid Ground, a non-profit organization fighting poverty. Lettuce Link is a resource for urban farmers providing seeds and education. The program also collects donations grown in community gardens and delivers them to local food banks (Hou et al., 2009, p.56).

Figure 75. Lettuce Link's logo.

The Common Acre reclaims public space and reconnects people with nature and each other by leveraging cultural expression, education, and food. They work with public agencies to gain access to public land and revive it with urban farms, native plants, and pollinator habitat (The Common Acre, n.d.).

Figure 76. Common Acre's logo.

City Fruit is a non-profit organization that maximizes the potential of the urban orchard. City Fruit promotes urban fruit trees by assisting tree owners grow, harvest, preserve, and share fruit. Other key focuses at City Fruit include education, stewardship, food policy, and sustainability (City Fruit, n.d.).

Figure 77. City Fruit's logo.

Roots of All Roads is a mobile farm stand serving south Seattle. They provide access to fresh, affordable, and locally grown produce in areas that do not have existing farmers markets or are experiencing other barriers to fresh foods (Roots of All Roads, n.d.).

Figure 78. Roots of all Road's logo.

Seattle is fortunate to have such an expansive support network for urban farming from it's citizens, city officials, and non-profit organizations. Clearly there is desire to expand urban farming in Seattle. The following section explores a few opportunities where urban farming could be expanded; including, land parcels & snippets, K-12 education, and open space.

Looking Ahead

Land Parcels & Snippets

The City of Seattle has a collection of land snippets and parcels identified in 2017 that cannot be developed due to their small size, odd shape, or location. These sites were evaluated for their potential to become P-Patches based on their location and a set of attributes pinpointed by a strategic framework for developing new P-Patches released by Seattle's Department of Neighborhoods in 2015. Generally, 200ft² is needed per 100ft² plot when accounting for pathways. Ideally, potential P-Patch sites will be able to accommodate 20 plots to adequately function and fully reap the benefits of a community garden. However, in high density areas 10 plots is sufficient. Attributes are divided into two categories, highest priorities receiving 2 points and higher priorities receiving 1 point.

Areas are under served by the P-Patch Program if the nearest P-Patches from the potential site are more than a mile away, have a wait list exceeding 0-6 months, or if the neighborhood population density is greater than Seattle's average of 16 people per acre. Low income is defined as 80% of the city's median household income. In 2017, Seattle's median household income was $83,338. Qualifying low-income as an annual household income of $66,670 or less. If the site is in a neighborhood where the median household income is below $66,670, the median age is over 65, or if more than 50% of the population in non-white then the area consists of under served populations.

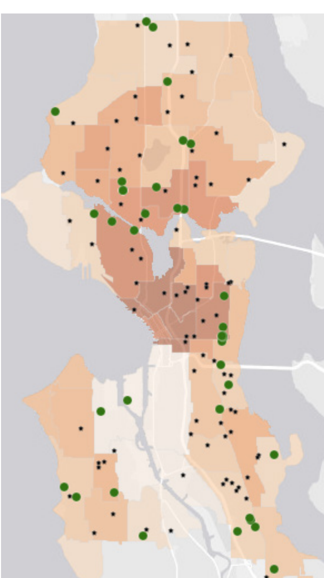


Figure 79. Locations of land parcels and snippets.

Highest Priorities (2pts)

- Area is under served by the P-Patch program based on population density and/or P-Patch wait lists.
- Area is within a neighborhood specifically mentioned in the Parks Levy (Queen Anne, Ballard, West Seattle, and Rainier Valley).
- Area has relatively high percentages of under served populations including low-income, seniors, immigrants, and refugees.
- Site can accommodate 20 or more plots of 100ft².

High Priorities (1pt)

- Area is within designated urban villages according to Seattle's Comprehensive Plan.
- Area aligns with the focus to revitalize Southeast Seattle and South Park.
- Sites can accommodate 10 or more plots of 100ft.² (Seattle Department of Neighborhoods, 2015)

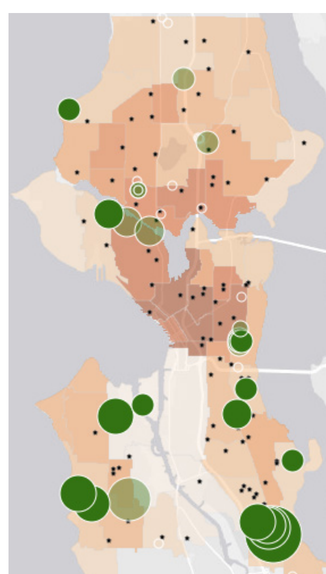


Figure 80. Potential for conversion of land parcels and snippets into P-Patches.

Education

One of the most influential places where urban farming needs to be integrated is in the K-12 education system. It is especially important now that the majority of the world's population lives in cities. In 2017, farmers made up 2.2% of the working population in the United States at an average age of 57 (United States Department of Agriculture, 2017). These people will not be able to farm forever and we need people ready to replace them. Standardizing farming education in K-12 will help students see farming as a realistic career path for themselves, regardless of where they grow up geographically. Gardens are dynamic teaching tools. In addition to farming knowledge, they can complement countless other school subjects and provide a place where social and emotional skills can be practiced.

Currently, gardening education reaches 7,410 students in pre-K-12 schools in Seattle. This education can be farm based or be included in the cafeteria and various classroom types. Some classroom examples include garden, kitchen, and academic (The Edible Schoolyard Project, n.d.). In the 2018-2019 academic year, 52,976 students were enrolled in Seattle Public Schools (Seattle Public Schools, n.d). By standardizing gardens as a teaching tool every student would have access to the many learning opportunities a garden has to offer. More importantly, these young learners become the next shapers of society. Urban farming's place in the built environment could thrive more so than ever before alongside the next generation equipped with an urban farming cognizance

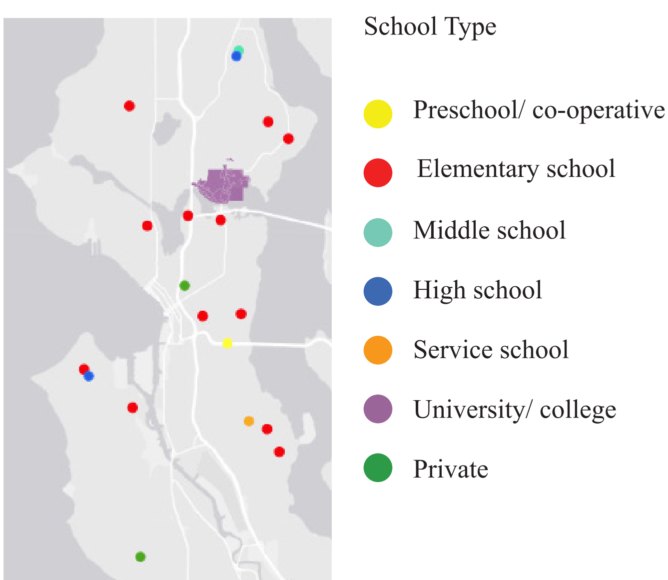


Figure 80. Seattle schools with garden programs.

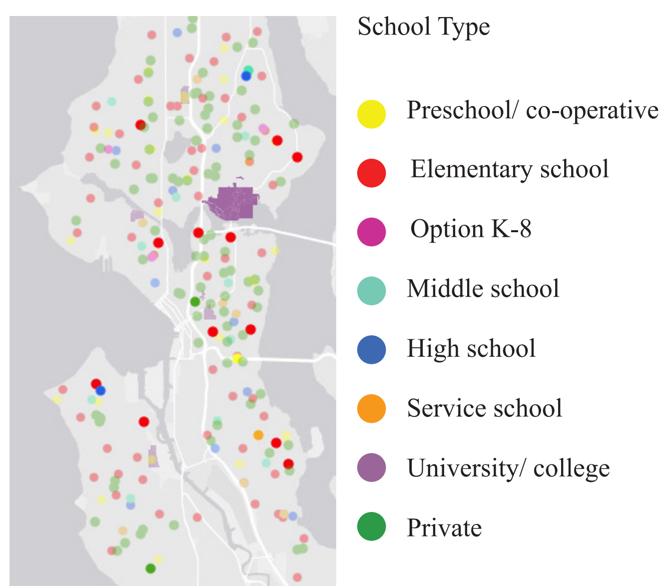


Figure 81. All Seattle schools.

Open Space, Parks, & Parking

Recreational activities are an essential part of general well being. Often times in cities recreational opportunities take the form of parks and open space. The City of Seattle recognizes gardening as a recreational activity among its many other purposes and has allowed the integration of community gardens in city parks. However, there are some distinct differences in the ways people use parks and gardens.

A study on the different uses of parks and gardens by different user groups was conducted in Sacramento, California in the 1980s. Researchers from the University of California Davis studied a community garden and a city park on adjacent city blocks. They found that the garden was a much more active space. People were constantly planting, watering, weeding, harvesting, and socializing. The park was used more as a passive space where people would sit, walk, and read. Another interesting finding was that gardens provided people with access to recreational space they would not have otherwise. One of the reasons people did not use the park being studied was because they used different parks. However, gardeners preferred the garden to the park because the garden provided recreational activities that the park did not. The gardeners were not park users and would not become park users if the garden was unavailable; therefore, they would not have suitable access to green space (Francis, 1987).

In 2016, the Seattle Department of Parks and Recreation administered a survey about park usage. Two of the main things it inquired about was the perception of safety and maintenance of city parks. Overall respondents gave parks a safety rating of 2.6/ B - on a four point scale and a rating of 2.8/ B for maintenance and cleanliness. Integrating community gardens in parks reduces maintenance pressures on park staff allowing them to focus their efforts away from landscape. Garden integration can also increase the perception of safety in parks because the gardeners add eyes to the park that would not be there otherwise (Hou, J., & Grohmann, D., 2018). Interestingly enough, only one of the specific parks called out for safety or maintenance concerns included a P-Patch. With Seattle's vast network of city parks there is plenty opportunity for increased garden integration.

Figure 83. Seattle parks called out by survey respondents for safety and maintenance concerns.

Parking lots are another space where urban farming could expand; especially in high density areas. They are underutilized spaces that are rarely used at their maximum capacity. Belltown is the most densely populated reporting area in Seattle, with a density of 58 people per acre. Green space is scarce, meanwhile parking is abundant. There are 71 parking lots in an area of 326 acres.

Figure 84. Seattle parks and population density with an emphasis on parking lots in Belltown.

Potential Policy Changes

Include urban faming to zoning and land use codes

Land tenure is one of the main challenges for community gardens and urban farming projects. Despite municipal support, urban farming projects are at risk and do not have a permanent place in Seattle's urban landscape.

Allow P-Patches to run their own farm stands

Due to their uncertain future and temporary perception it is difficult for P-Patches to obtain funding. There is some controversy surrounding P-Patches claiming public land for private use. However, putting all of the proceeds from the farm stands back into the P-Patches could be a work around.

Require so much edible green space in all new construction

New construction is going up constantly. We should be proactive and include urban farming in the initial design process, rather than being reactive when crisis strikes.

Secure sites for P-Patch relocation before P-Patches of X many years can be disrupted by development

P-Patches of 30 years old or more for example should be granted some kind of protections. Usually people can retire after 30 years of hard work and be financially secure. A similar model should be established for gardens that have given back to their communities year after year.

Integrate the principles of permaculture and agroforestry into the expansion of the urban forest.

Maintaining and expanding Seattle's urban forest is an important municipal agenda. Integrating food production into the urban forest would add the many benefits and services it provides.

Allow P-Patches to have permanent structures and host a tiny house in a P-Patch

Some P-Patches are not permitted to build permanent structures as part of their land use agreement. Tiny houses range from 100ft^2-400ft^2. P-Patches could further their mission of building community by hosting someone experiencing houselessness. The tiny house tenant could serve as an on site plot monitor. Relieving some of pressure on support staff from the Department of Neighborhoods and water plots when gardeners are gone.

Food For Thought

How can these ideas of urban farming be integrated in our projects?

What will it take for food security to be considered with just as much urgency as housing or transportation in urban planning and development?

How can we shift the perception of access to open green space from a luxury item to a basic human right?

When will the economic, social, and health (physical & mental) benefits of urban farming be fully recognized?

What does a livable city look like?

What kind of quality of life should be expected for all urbanites?

How can we share the importance of urban farming with others?

How can we advocate for policy changes?

How will you be an alley of urban farming?

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16	Seattle's potential for food self reliance based on various scenarios represented by opacity.	Neff, A. (2019).	11
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