

Sustainable Systems
Assignment #3

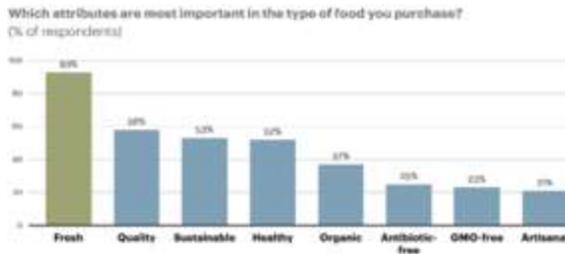
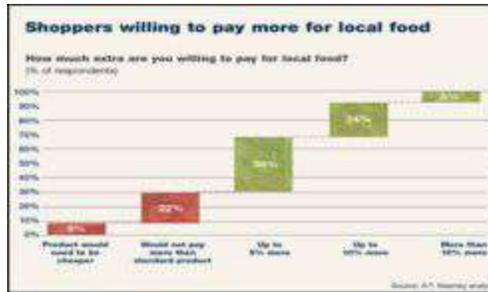
Regional Products and Systems

Urban Farmers: Hydroponics Vertical Farming

| Pros | CONS |
|---|--|
| <ul style="list-style-type: none"> ■ not subject to growing seasons ■ hydroponic farms is double the produce yield of soil-based farms because the growth cycle is constantly restarting ■ | <ul style="list-style-type: none"> ■ Algae Growth ■ Hydroponic System Leaks ■ Clogs ■ Prices |

- Family Business

- Oak City Hydroponics, LLC's Vision is to enhance communities by providing healthy and secure vegetables and fruits year-round.
- Oak City Hydroponics, LLC (OCH) is a locally grown indoor farming community providing a sustainable solution to the growing problem of food security and health. Eating plenty of healthy vegetables and fruits is critical to a healthy and productive life. Food security in modern history has peaked. Billions of pounds of pesticides, herbicides, fertilizers, oil fracking waste, coal ash and other pollutants are poisoning our land, water and air. Transparency in the food industry is broken. OCH's Process Is Transparent; You See the Produce Growing
- FRESHNESS - Consumers want Freshness.
- 93% of consumers say freshness is the most important attribute of vegetables and fruits. 68% of consumers believe local produce is fresher. The consumer says without freshness there is no quality. OCH's freshness is the best possible, picked and delivered within 24 hours.
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- GROWN LOCALLY - In the past decade, "grown locally" has given the traditional grocery stores a new double-digit growth segment.
- Among credence features, "local" is always ranked higher than "organic", even with no clear definitions or regulating body in place to monitor claims about "local". This result suggests that the attribute "local" might be interpreted by consumers as an implicit guarantee or direct assurance which they view as better than a 3rd party certification. For now, a personal assurance from the producers of fruit and vegetables appears to enhance the consumers trust in this type of food (Midmore et al. 2005; Rodriguez-Ibeas 2007; Thilmany et al. 2006) more than a certification.
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- The USDA, which oversees the foods labeled as "Certified Organic", [states quite clearly on its website](#) about its role in organic certification, that "Our regulations do not address food safety or nutrition." Apparently, while most consumers have not seen this statement by the USDA, intuitively they are more comfortable interacting with the producer than trusting a government certification.
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- Therefore, improving the contact between the producer/seller and the consumer, for example, through marketing foods at the farm gate, at direct markets or specialty stores where consumers and producers may interact (Midmore et al. 2005; Thilmany et al. 2006) could be an effective strategy for small firms. This strategy has been demonstrated by the increase in Community Supported Agriculture, (CSAs) in North Carolina. There are now 82 listed Subscription based CSAs in North Carolina. CSAs biggest disadvantage is they are seasonal.



- *Reduces Cost, Saves Time, Reduces Effort, Avoids Hassles* – Cost is a key factor for the purchase of any product. Today time is money. The company can give Walmart Prices with Whole Food Quality because
- distribution cost is reduced, and farm equipment is used for multiple crops in a year. Delivery saves times which is money and eliminates the cost of fuel for the customer. Our subscription model offers price guarantee for up to five years.
- Urban Gardening
 - <https://www.maximumyield.com/definition/2182/urban-agriculture>
- Vertical Farming
 - <https://www.maximumyield.com/definition/2191/vertical-farm>
 -
- Source: <https://www.maximumyield.com/hydroponics-pros-and-cons-of-hydroponic-gardening/2/3049>
 -
- Source: <http://www.jasons-indoor-guide-to-organic-and-hydroponic-gardening.com/hydroponic-system.html>
 - Issues with hydroponics
 - Algae Growth
 - Hydroponic System Leaks
 - Clogs
 - Prices
- Source: <http://www.simplyhydro.com/whatis.htm>
- Manhattan Hydroponic Classes
 - Source: <https://farm.one/class/>
 - Price: \$130.00
 - Duration: 3 Hours (approx.)
 - Location: Manhattan, New York
 - Get hands-on experience from seed to harvest in three hours under the guidance of Farm.One's expert Farm Manager. Students of all experience levels and all

backgrounds are welcome. Classes are limited to 6 students, enabling plenty of one-on-one instruction.

- Teaches:
 - The Principles of Hydroponics
 - Hydroponic Systems
 - Climate & Nutrients for your Crops
 - Growing & Managing from Seed to Harvest
 - Avoiding Pests without Pesticides
 - Pruning & Harvesting for Best Yield

The Farm. One farm in Tribeca (one of two Farm. One farms) is the largest vertical farm in Manhattan, growing hundreds of rare herbs, edible flowers and microgreens for the best chefs in New York. There is no other hydroponic learning space like this.

- - <https://www.ice.edu/newyork/explore-ice/hydroponic-garden>
 - The Hydroponic Garden
 - Inside ICE's new York campus, a fully functional hydroponic herb and produce garden is growing – offering our students a forward-looking, "plant-based" educational experience.
- - <http://www.thegreenboxhydro.com/index.html>
 - *As the only hydroponic and urban gardening supply store in the heart of New York City carrying leading brands, The Green Box aims to always offer customers valuable consultation, a welcoming atmosphere, and competitive price points. Involvement in the local hydroponic and rooftop growing movements will allow The Green Box to enhance community education on the benefits of home growing.*

This project continues our exploration of the relationship between products and byproducts and the interconnectedness of products and systems. We will study sustainability through the design and prototyping of products, services or systems that have social and environmental value beyond profit (monetary value).

Problem: Food Deserts the United States

Research-based solutions

- The Economic
 - Who is benefiting from the production?

■ **Food Safety**

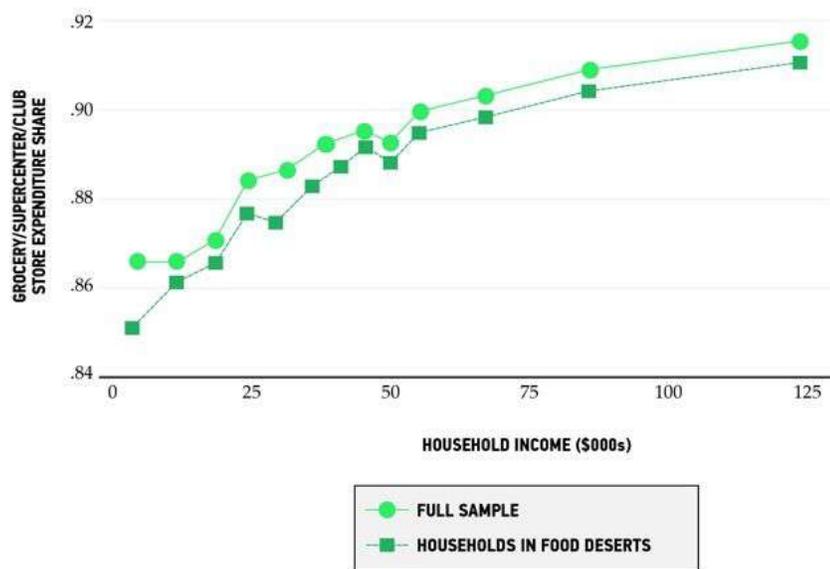
- 48 million US citizens get sick from food contaminated with microorganism each year.
 - looks at four major pathogens that the IFSAC
- the Food and Drug Administration, the Centers for Disease Control and Prevention, and the Department of Agriculture) considered "high priority": E. Coli 0157, Salmonella, Campylobacter, and Listeria. E. Coli, 36 percent from vegetable row crops; Salmonella, 38% vegetables and fruits; Listeria, 50 percent from fruit mostly cantaloupe. There are 31 pathogens that regularly contaminate food in the US.
- *In 2017, there were 131 recalls published by the USDA, representing 20,880,574 pounds of food. This means that every 3 days, the USDA does a recall. Every week almost a million Americans are sickened. The World Health Organization states that each year as many as 600 million, or almost 1 in 10 people in the world, fall ill after consuming contaminated food. Of these, 420 000 people die, including 125 000 children under the age of 5 years.*
- *The onset time of symptoms after digesting contaminated vegetables and fruits is usually not a few hours but 8 or more hours and generally takes days for the symptoms to manifest. Some food poisoning may cause permanent damage or even death many days or years later. In 2016, an outbreak of Hepatitis A occurred at Tropical Smoothies Cafes. It was later discovered that foreign fruits caused the problem. Later some contracted Hepatitis A. Hepatitis A is a contagious liver disease that results from exposure to the Hepatitis A virus, including from food. It can range from a mild illness lasting a few weeks to a serious illness lasting several months. Illness generally occurs within 15 to 50 days of exposure and includes fatigue, abdominal pain, jaundice, abnormal liver tests. Hepatitis A infection can progress to liver failure.*
- **Food Deserts** in the united states
 - <http://www.foodispower.org/food-deserts/>
 - food deserts can be described as geographic areas where residents' access to affordable, healthy food options (especially fresh fruits and vegetables) is restricted or nonexistent due to the absence of grocery stores within convenient travelling distance. For instance, according to a report prepared for Congress by the Economic Research Service of the US Department of Agriculture, about 2.3 million people (or 2.2 percent of all US households) live more than one mile away from a supermarket and do not own a car

- **New York City** – An estimated 750,000 New York City residents live in food deserts, while about three million people live in places where stores that sell fresh produce are few or far away. [28] Supermarkets throughout New York City have closed down in recent years due to increasing rents and shrinking profit margins, but the disappearance of urban grocery stores has had the most serious impact on low-income communities, especially those that are predominantly African-American¹ To fill this void, the city started its Green Carts program, which has been bringing affordable fresh fruits and vegetables to underserved areas while providing jobs for vendors since 2008. Hundreds of Green Carts are already on the streets in food deserts, and that number is rapidly increasing as prospective vendors obtain training, licenses and permits from the city. [30]
- <https://citylimits.org/2018/05/21/new-york-city-s-biggest-food-swamps/>
 - The term “food swamps” was just introduced a few years ago. Food swamps typically exist in food deserts, which are neighborhoods with limited access to grocery stores and healthy food options. Previously, scientists presumed food deserts were linked to severe health risks, like obesity. But it turned out the existence of food swamps more accurately predicts obesity rates than the existence of food deserts can, according to a study published in December by the *International Journal of Environmental Research and Public Health*.
 - *Thirty-one percent of residents are obese, according to the NYC Health Department, compared to the city’s overall rate of 24 percent. Meanwhile, East New York also has the highest diabetes rate in New York City at 18 percent*
 - *“It became a breeding ground for these fast-food chains,” said Council Member Rafael L. Espinal of District 37, which includes East New York, where he grew up. “They know that it’s very*

likely that they have a higher clientele in those areas.”

- It finds that more than half (55 percent) of all ZIP codes with a median income below \$25,000 fit the definition of food deserts—that’s more than double the share of food-desert ZIP codes across the country as a whole (24 percent)
- <https://www.citylab.com/equity/2018/01/its-not-the-food-deserts-its-the-inequality/550793/>

Figure 8: Supermarket Expenditure Shares by Household Income



- <https://journals.cdrs.columbia.edu/wp-content/uploads/sites/25/2016/10/120-237-1-PB.pdf>
 -
 -
- <https://newsone.com/1540235/americas-worst-9-urban-food-deserts/>
- New York
 - The United Food and Commercial Workers Union claim only 550 full service remain in the city. A 2008 study conducted by the New York Department of City Planning estimates that as many as **three million New Yorkers live in communities without enough access supermarkets.** “Many people in

low-income neighborhoods are spending their food budget at discount stores or pharmacies where there is no fresh produce," Amanda Burden, the city's planning director told the New York Times. Experts list neighborhoods in the Harlem, the South Bronx and Brooklyn as some of the city's various food deserts. In the impoverished Hunts Point section of the Bronx, home of the Northeast's largest fresh food wholesale markets, the irony is that the neighborhood surrounding it boasts not one supermarket. Experts such as Susanne Freidberg an associate professor of geography at Dartmouth University claim small profits margins, space constraints, landlords' preferences for tenants that don't attract vermin, a perceived lack of demand and rising rents keep companies from full-service supermarkets in these areas



<http://americannutritionassociation.org/newsletter/usda-defines-food-deserts>

- Is it feasible to produce?
- Does the cost of making allow a continued model of production and profit?

- Does the cost of purchasing enable consumers to sustain their wellbeing?
- Are the raw materials used to create the product renewable?
- Is it economically viable to replenish the materials that were used to produce the product?
- The Social
 - Does the product benefit our society?
 - What are the social implications of its production?
 - How does it improve the community of consumers or users?
 - Does the product foster a healthy work culture, one where the makers have autonomy, emotional, psychological, and physical wellbeing?
 - The Environmental
 - What is the environmental impact of material choices from extraction to discontinued use
 - What effect do production methods have on the environment?
 - What impact does distribution have on the environment?

As we develop our designs, consideration will be given to alternative systems of production and organization that are regenerative and based on interdependencies, and equity.

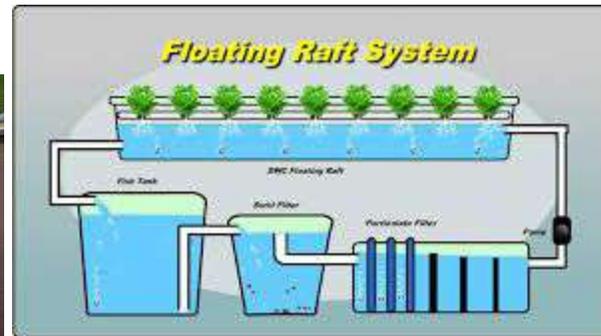
- - The goal is to design products or systems that are ethically produced and have value to the local communities. Part of the design process includes making production methods and resources
 - Transparent along every step of the product's life-cycle.
- Development of the product
 - research and development
 - <https://www.youtube.com/watch?v=Bwfz1PIvGeU>
 - <https://www.diynetwork.com/how-to/outdoors/gardening/how-to-assemble-a-homemade-hydroponic-system>
 - <https://www.smartcitiesdive.com/ex/sustainablecitiescollective/10-high-school-hydroponics-and-aquaponics-programs-bring-sustainable-ag-classroom/1063296/>
 - 1. **Bedford Stuyvesant New Beginnings Charter School, Brooklyn, New York**
 - At the **Bedford Stuyvesant New Beginnings Charter School** in Brooklyn, New York, the school using its Urban Farm for service-learning. Through hydroponics, students grow produce year-round, which helps feed people at the school as well

as community members. Produce grown includes tomatoes, herbs, peppers and greens. Each month, the farm hosts a market days event to recognize the school's rich cultural diversity, as well as to promote health and nutrition. The Urban Farm has partnerships with New York Sun Works, City Hydroponics and Teens for Food Justice.

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- **Cincinnati Hills Christian Academy, Cincinnati, Ohio**
- The aquaponics program at Cincinnati Hills Christian Academy in Cincinnati, Ohio unofficially started in 2011, when students in a science class put a 65-gallon aquarium to use, along with empty soda bottles and shale media. Begun as part of the agriculture and food systems curriculum, the original system has been a prolific producer of food, including hot and bell peppers, lemon balm, greens, basil and kale. Subsequent systems have been constructed, using a variety of fish (perch, catfish and bluegill). Aquaponics is introduced in freshman biology and sophomore chemistry.
- **schools develop areas for students to participate in urban agriculture**
 - o user studies
 - o Packaging
 - o sales / business strategy
 - o marketing and advertising

- o design of instructions or educational information



- o
 - supporting graphics or components
 - a series of maquettes
 - professional prototypes

Presentation/powerpoint skript

Introduction to Hydroponics

By Definition urban agriculture is farming or gardening that occurs within an urban setting. Due to its environmental and spacious limitation urban farming is typically more decorative and creative the regular agriculture.

Fruit trees or vines can be trained to grow vertically. Which lead to vertical farming. A vertical farm grows plants and produce in a vertical orientation, maximizing the use of the location's square footage. Usually it produces cabbage, lettuce and leafy greens.

Hydroponic farming is the growing of crops on a mass scale using a hydroponic system. Plants grown hydroponically are of exceedingly high quality, occupy less space, and consume fewer resources than traditional growing methods. Additionally, hydroponic growing methods, in combination with vertical gardening, have aided in expanding the possibilities of urban gardening and indoor gardening.

1. Cuts down on transportation costs
2. **20 times less water** than soil based gardening.
3. **20% less space** for growing
4. No Pesticides
5. Less Labor
6. Crops **grow faster** in hydroponic culture than in a soil based growing medium.

Identifying The Problem