HOW TO GET SCHOOL CHILDREN ACCESS TO URBAN FARMING BY ACTIVATING VACANT LAND AND ROOFTOPS

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Overall Assessment
Overview

The thesis topic is how to get school children access to urban farming by activating vacant land and rooftops.

Phase one focuses on research about the rooftop urban farming systems in New York. As a high density and high land value city, New York is one of the cities with the largest number of rooftop farms in the United States. People use urban rooftop farms as a medium to improve community engagement and improve environmental issues. For phase one, this thesis researched the operation and conditions of existing rooftop farms, and evaluated the advantages and disadvantages of them to figure out the problems they are facing. In addition, phase one discusses what kind of programs could be used to connect people.

Phase two is aiming to combine different urban farming typologies together and explore how to use urban farming to serve children’s education. The specific idea in phase two is how to use urban farming as a method to create outdoor learning classrooms for children and community members. It also expands on ideas about combining different kinds of urban farming, and developing urban farming with the next generation of children.

Phase three is aiming to place four urban farming typologies according to local conditions at the thesis site, and making urban farming accessible to school children. This phase investigates how to create the specific urban farming system for this site. In addition, phase three is concerned with expanding the existing urban farming design strategies and systems, and introducing new strategies and systems.

Site

The Site Location is Williamsburg. Williamsburg is a neighborhood in Brooklyn, New York. The outdoor open space per person in Williamsburg is 26 square feet, which is the lowest open space per person among other neighborhoods in Brooklyn (which average 64 square feet), recommended open space per person (109 square feet), and citywide average open space per person (158 square feet). There are 26 public and private schools in Williamsburg. 68% of school children have access to parks and open space within a 5-minute walking distance from their schools, but most of the vacant open spaces do not create activities for school students. In order to encourage school students to learn and play from outside space, in this proposal, all the vacant land and all the elevated buildings are changed into productive urban farms.
Phase 1
New York Rooftop Urban Farm Analysis
Abstract

In this phase, the main question is: how can urban rooftop farms be used as a medium to improve community engagement and decrease UHI (Urban Heat Island)? After several rooftop farms and relevant papers were researched in New York City, the main findings concern advantages and disadvantages of existing rooftop farms. The methods used to carry out this phase's investigation are searching a primary dataset, using preliminary GIS analysis, making infographic drawings, and setting a criteria to define successful urban farm rooftops.

Introduction

For phase one, this thesis researched the operation and conditions of existing rooftop farms, and evaluated the advantages and disadvantages of them to figure out the problems they are facing. In addition, this thesis investigates the rooftop urban farming systems in New York City, and how to use programs to connect people.

Methods

1. Searching a specific dataset for urban agriculture and urban rooftop farms in New York City; GIS, academic paper, etc.
2. Using preliminary GIS analysis to the investigate the Urban Heat Island issue in New York City
3. Making infographic drawings to visualize data
4. Setting the criteria to define successful urban farm rooftops
Phase 1 Using urban rooftop farms as a medium to improve community engagement and decrease UHI

The map shows relatively cool areas as dark purple and relatively hot areas as white. The hottest temperatures occur where there are more impervious surfaces and less vegetation.

Existing Rooftop Gardens in NYC

- Eli Zabar’s Rooftop MN
- Intervale Rooftop Garden
- Brooklyn Grange - Long Island City, QN
- Eagle Street Rooftop Farm - Greenpoint, BK
- Gotham Greens, Greenpoints, BK
- Brooklyn Grange - BK
- Hell’s Kitchen Farm Project - MN

Defining urban farms’ sizes

- **Small**: Whether planting a few roof-deck tomato plants or starting a community garden atop an apartment building, rooftop gardeners can’t resist getting their hands dirty. These small-scale growers cultivate vegetables, herbs, flowers and sometimes even fruit to enjoy for themselves and share with others.
- **Medium**: Entrepreneurs, restaurateurs and urban farmers are also drawn to the commercial scale of rooftop farming. Whether growing food in soil or hydroponically, rooftop farmers must consider labor, marketing and distribution strategies in order to ensure the economic stability of their skyline farms and share with others.
- **Large**: The rooftop agriculture industry at large demands attention from city planners, policy makers, architects, landscape architects and academics who are interested in how rooftop agriculture can “feed the masses.”

Temperature Comparisons of Roof Colors and Air Temperature

The chart shows how much cooler green roofs are compared to black and white roofs.

**Fig.2**

**Fig.3**

**Fig.4**

**Fig.5**

**Fig.6**
Phase 1 The Infographic of The Existing Rooftop Farms and Proposed Rooftop Farms

### Existing Rooftop Farms

1. Brooklyn Grange - Long Island City, QN
2. Brooklyn Grange - BK
3. Gotham Greens, Greenpoints, BK
4. Eagle Street Rooftop Farm - Greenpoint, BK
5. Intervalle Rooftop Garden Farm - BX
6. Hell’s Kitchen Farm Project - MN
7. Eli Zabar’s Rooftop - MN

### Vegetable Production

- **Brooklyn Grange - Long Island City, QN**
- **Brooklyn Grange - BK**
- **Gotham Greens, Greenpoints, BK**
- **Eagle Street Rooftop Farm - Greenpoint, BK**
- **Intervalle Rooftop Garden Farm - BX**
- **Hell’s Kitchen Farm Project - MN**
- **Eli Zabar’s Rooftop - MN**

### Considerations for rooftop farming locations:

1. Area of the roof
2. Construction year (prior to 1968)
3. Use and zoning designation
4. Education Programs
5. Light condition
6. Wind speed
7. Community atmosphere

### Scale Type

<table>
<thead>
<tr>
<th>Scale Type</th>
<th>Large</th>
<th>Medium</th>
<th>Small</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetable Production</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Animal feeding</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Educational programs</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Service for restaurants / food markets</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Working with Artists</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Job training/creation</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Farmers market</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Beekeeping</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Planting trees</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Composting</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Seeding saving</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Land Remediation</td>
<td>●</td>
<td>●</td>
<td>●</td>
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<tr>
<td>Transplanting</td>
<td>●</td>
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</tr>
<tr>
<td>Landscaping</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

### Proposed Rooftop Farms

- Brooklyn Grange - Long Island City, QN
- Brooklyn Grange - BK
- Gotham Greens, Greenpoints, BK
- Eagle Street Rooftop Farm - Greenpoint, BK
- Intervalle Rooftop Garden Farm - BX
- Hell’s Kitchen Farm Project - MN
- Eli Zabar’s Rooftop - MN

- **Growing Vegetables/Fruits/Herbs**
- **Volunteer programs**
- **Raising Chickens**
- **Beekeeping**
- **Animal feeding**
- **Educational programs**
- **Service for restaurants / food markets**
- **Working with Artists**
- **Job training/creation**
- **Farmers market**
- **Beekeeping**
- **Planting trees**
- **Composting**
- **Seeding saving**
- **Land Remediation**
- **Transplanting**
- **Landscaping**
- **Volunteer programs**
- **Raising Chickens**
Phase 1 Site Analysis

Location:

Brooklyn: 10559-8001
Lot on 8000
Building on 8001
Year built: 1965

Demographics By Zip Code:

Total population: 85,176
Female population: 42,981 (50.5%)
Male population: 42,195 (49.5%)

Race:

White: 71,903 (84.9%)
Hispanic: 2,771 (3.3%)
Asian: 3,191 (3.8%)
Black: 5,143 (6.1%)

Average number of people per household: 2.49

Age Distribution:

<table>
<thead>
<tr>
<th>Age Group</th>
<th>0-14</th>
<th>15-24</th>
<th>25-34</th>
<th>35-44</th>
<th>45-54</th>
<th>55-64</th>
<th>65+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>1254</td>
<td>1326</td>
<td>1398</td>
<td>1438</td>
<td>1178</td>
<td>972</td>
<td>348</td>
</tr>
</tbody>
</table>

Schools
Restaurants
Churches
Bus Stations/Subway
Libraries
Lofts
Art Studios
Main Streets
Findings + Conclusions

During phase one, the social properties and community connection were the two main factors of consideration. The phase one research, experimentation, and testing confirmed that rooftop urban farms deserve wide implementation development, because urban agriculture can improve community engagement and decrease Urban Heat Island.

Design is a tool that can resolve problems and satisfy people’s needs. For phase two, local urban farmers were interviewed to understand their perspectives. Information was gathered on how the existing farms bring people together and create a community atmosphere through the physical spaces. This led to a deeper understanding of what works and what doesn’t work in existing rooftop farms. Secondly, this thesis drew conclusions from case studies, discussed the characteristics of each sample, and synthesized the results of the case studies. Thirdly, rooftop urban farms can be used as an urban agriculture system, and define the system. Finally, rooftop urban farming systems can work with other topics, for example, food deserts, education programs, and so on.

Assessment

All the methods were used in phase one helped learn more and dig deeply into the thesis topic; however, in order to have a clear answer to the thesis question, which is how rooftop urban farming systems can be used to improve people’s connection to one another, it is necessary to have more face-to-face talks with local farmers.

For the next phase, some urban farmers in New York will be interviewed. Secondly, a specific site will be used to think about what kind of programs can be used and how the programs can improve community engagement. Thirdly, the thesis will investigate the relationship between productive programs and natural forces, for example, wind, water storm, sun, and so on.
Phase 2
Using Urban Farming as A Method to Create Outside Learning Classrooms for Children and Community
Abstract
This thesis question is about using urban farming as a method to create outdoor learning classrooms for children and community. The new knowledge it will bring to the landscape field is about combining different kinds of urban farming, and developing urban farming zones with the new generation in society.

The methods which are brought into this Phase are making GIS site analysis, setting the criteria to locate four urban farming zonings and creating the scenario to develop urban farming programs.

Introduction
The thesis site is located in Williamsburg, Brooklyn. The neighborhood has a population of 32,926. There are 26 private and public schools in Williamsburg, 67.8% of students receive the free lunch; in order to have the free lunch, the children’s family income must be under $15,171. 4.9% of students in Williamsburg receive reduced lunch, which means their family annual income is below $21,590. 68% of school children have access to parks and open space within a 5 minute walking distance, and the number of children per acre is low.

So phase two is aiming to locate the ideal open spaces for urban farming in Williamsburg as a method to create outdoor learning classrooms for children and the community.

Methods
1. Using preliminary GIS analysis to investigate the influence of open space on children’s physical activities and the obesity rate in Williamsburg.
2. In order to locate the potential areas that can be the urban farms, the land use data was extracted from Greenpoint-Williamsburg Rezoning EIS CHAPTER 2: LAND USE, ZONING, & PUBLIC POLICY
3. Creating the scenario to develop urban farming programs: combine different urban farming strategies and bring different land-uses into the same space.
"Wealthier families have access to things poor families do not" said Skinner – everything from soccer camp to safe neighborhood playgrounds.

Lack of open space in high density areas contributes to obesity, shorter life spans, and behavior issues in children.

68% of school children have access to parks and open space within a 5-minute walking distance.

In Williamsburg, 61.2% of student enrolled in a K-12 Public school identify as Hispanic/Latino, which is:
- Higher percentage than average for New York City students (40.5%)
- Higher percentage than average for Brooklyn students (28.1%)
- Higher percentage than average for New York students (25.3%)

72.7% of K-12 public school students in Willamburg participate in the national School Lunch Program (NSLP)
- To qualify for free lunch, children's family income must be under $15,171 in 2015 (below 130% of the poverty line) 67.8% of students in Williamsburg receive reduced lunch.
- To qualify for reduced lunch, children's family income must be below $21,590 annual income in 2015 (185% of the poverty line) 4.9% of students in Williamsburg receive reduced lunch.

The NLSP participation rate here is:
- Roughly average for New York City
- Roughly average for Brooklyn (72.3%)
- Higher than the average for New York

Logo of Hispanic/Latino Population:
- In Williamsburg, 61.2% of student enrolled in a K-12 Public school identify as Hispanic/Latino, which is:
- Higher percentage than average for New York City students (40.5%)
- Higher percentage than average for Brooklyn students (28.1%)
- Higher percentage than average for New York students (25.3%)
### Phase 2 Open Space and Childhood Obesity Rate

#### Open Space Per Person in NYC

<table>
<thead>
<tr>
<th>City</th>
<th>Recommended</th>
<th>Brooklyn</th>
<th>Greenpoint</th>
<th>Williamsburg</th>
</tr>
</thead>
<tbody>
<tr>
<td>26sf</td>
<td>64sf</td>
<td>109sf</td>
<td>158sf</td>
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</tbody>
</table>

#### Childhood Obesity Rate

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>2 to 4-year-old WIC participants</td>
<td>14.3%</td>
<td>14.5%</td>
<td>13.1%</td>
</tr>
<tr>
<td>10 to 17-year-old</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rank among states (2014)</td>
<td>26 sf</td>
<td>25 sf</td>
<td>20 sf</td>
</tr>
<tr>
<td>Rank among states (2011)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rank among states (2015)</td>
<td></td>
<td></td>
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</tbody>
</table>

#### Historical Rates

<table>
<thead>
<tr>
<th></th>
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<td>Rank among states (2014)</td>
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<td>Rank among states (2011)</td>
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<td>15%</td>
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<td>15%</td>
<td>15%</td>
</tr>
<tr>
<td>Rank among states (2015)</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
</tr>
</tbody>
</table>

### Phase 2 Williamsburg Land Use

- Residential
- Business Improvement Districts
- Commercial Corridors
- Industrial Area

Scale: 1'' = 1000'
Propose Zoning Plan

Propose Urban Farming Typologies

CSO is one of the largest sources of ongoing pollution to Newtown Creek.

Ribbed Mussel Population

Renewable Energy with Urban Farming

Wildlife Learning Group

Waterfront Activities

Under the Bridge Urban Farming

1. Wildlife Learning Group
2. Waterfront Activities
3. Under the Bridge Urban Farming

Scale: 1''=1000'
For phase two, the research confirmed that the lack of open spaces is harmful to children, and some open spaces have potential to be used for urban farming in Williamsburg. Nowadays, the urban farming programs are very separate from children’s education. The goal is to connect the different urban farming programs with children’s education.

The logic of the thesis should be improved. Healthy eating habits, exercise, and learning are the three main outcomes. Every step for the thesis, the topic and designs are related to these three points. Also, some suggestions from Peter are very useful. In order to deepen the project, he suggested the thesis re-consider or further develop these zones based on other observations. For example, some specific characteristics of rooftops can make them appropriate for certain kinds of farming and growing based on their dimensions and proximity to the ground. In addition, different illustrations of the site will improve the understanding of the site.

The goal of phase two’s goal is different from phase one. For phase one, the goal was designing a rooftop urban farm. But for phase two, the thesis is aiming to combine different kinds of urban farming and to explore how to use urban farming to serve children’s education. A mix of representations will help people gain a better understanding of the site; for example, GIS and satellite photos. It is necessary to develop more specific guidelines and criteria for the next phase and find the ideal way to present the diagrams to show my idea clearly.
Phase 3

How To Get School Children Access To Urban Farming By Activating Vacant Land And Rooftops
Abstract
Phase three is aiming to imagine the four urban farming typologies: Land Urban Farm, Rooftop Urban Farm, Community Garden, and streetscape urban farm at the thesis site. In addition, it will connect urban farming systems with other systems, for example, the solar system and the water system of the site. The main question is how to create an innovative urban farming system at the site and not just follow the existing urban farming system. The main finding is the existing urban farming systems are very similar, and most of them are based on the productive theme. The methods that are brought into this phase include: Visualize the existing data, Mapping, and Section cutting drawings.

Introduction
For phase three, the thesis is aiming to deepen phase two’s general site analysis and improve the four urban typologies’ strategies, and start to design the programs which can connect education and urban farming in the Williamsburg.

Methods
1. Searching specific datasets including the land use, school location, and traffic and infrastructure, local student family income, and output to the site analysis diagrams
2. Locating all the potential urban farming sites in Williamsburg area based on the site analysis
3. Making perspective drawings to visualize programs
4. Using two cross sections to show the connection between urban farming and other systems and to explore the relationship between urban farming and education.
Phase 3 Site Analysis

New York

Williamsburg

Land Use

- Residential
- Business Improvement Districts
- Industrial Area
- Commercial Corridors

Scale: 1''=1000'
Traffic and Infrastructure

- East River
- Brooklyn Queens Expy
- Brooklyn Bridge
- N

Schools and Green Space

- 68% of school children have access to parks and open space within a 5 minute walking distance

- Subway Stations
- Highway
- Williamsburg Bridge
- Blue Map

- Children Access Within 1/4 Miles
- Children Do Not Have Access Within 1/4 Mile
- Public Access to Parks and Open Space
Potential Urban Farms in Williamsburg

New York Population Density
(People per Square Mile)

- High: 11,600 - 58,000
- Very High: 2,702
- High: 2,008
- Low: 1,286
- Very Low: 0

New York Population Density (Persons Per Square Mile)

- Highest Density: 11,600 - 58,000
- Highest: 2,702
- High: 2,008
- Low: 1,286
- Very Low: 0

Existing Park

- Density: 2,008 persons per square mile
- High Density: Very High
- Low Density: Very Low

Existing Park

- Density: 2,008 persons per square mile
- High Density: Very High
- Low Density: Very Low

Restaurant

- Store
- Art Studio
- School
- Resident

Land Farm (Public)

- Grades 6-8: 304 Students
- Grades Pk-5: 619 Students

East River

- Water Flow
- Sun Angle
- Height of buildings

URBAN FARM TYPOLOGY

- Rooftop Urban Farm
- Community Garden
- Streetscape Urban Farm
- Land Farm

Scale: 1" = 1000'
The main conclusion drawn from phase three shows a beginning for integrated urban farming design, which means the four typologies of urban farming, the urban farming system and the other existing systems in Williamsburg are all integrated. The research, experimentation and testing confirmed the necessity of the integration, and these system designs are the first necessary step. The existing urban farming system still needs to be improved and needs to act according to circumstances. Phase three fixed some problems from phase two, for example, how different illustrations of the site can improve the understanding of the site.

The next step involves a real urban farmer. For phase one and phase two, the design strategies and conclusions are based on the research paper, open data from city government and local urban farmers’ interviews. However, data and information are not true knowledge; knowledge should be gained via real experience.

**Findings + Conclusions**

The research and testing methods in phase three helped to answer part of the thesis question. The thesis research and testing lasted for almost one year. It is easy to put the existing urban farming system to use at the thesis site, but for a thesis design, there should be some more innovation. Creating a new urban farming system is hard but necessary, and it is the main goal for the next phase. The hardest part of this thesis is how to be a creative thesis designer and think out of the box.

**Assessment**
Overall Assessment
Final Conclusions

For phase one, the social properties and community connection were the two main factors of consideration. The phase one research, experimentation and testing confirmed that rooftop urban farms deserve wide implementation development, because urban agriculture can improve community engagement and decrease Urban Heat Island. Design is a tool that can resolve problems and satisfy peoples’ needs. The thesis learned how the existing farms bring people together and create a community atmosphere through physical spaces. This led to a deeper understanding of what works and what doesn’t work in existing rooftop farms. Secondly, this thesis drew conclusions from case studies, discussed the characteristics of each sample, and synthesized the results of the case studies. Thirdly, the research determined that rooftop urban farms can be used as an urban agriculture system, and we defined that system.

During phase two, the research confirmed that the lack of open spaces is harmful to children, and some open spaces have potential to be used for urban farming. Nowadays, urban farming programs are very separate from children’s education. The goal is to connect the different urban farming programs with children’s education. After the review of phase two, it was determined that the logic of the thesis needed to be improved. Healthy eating habits, exercise, and learning are the three main goals. Every step of the thesis, the topic and designs are related to these three points. Also, some suggestions from Peter were also very useful. In order to deepen the project, he suggested the thesis re-consider or further develop these zones based on his observations. For example, some specific characteristics of rooftops can lead them to be advantageous for certain kinds of farming and growing based on their dimensions and proximity to the ground. In addition, different visualizations of the site will improve the understanding of the site.

Phase three is a beginning for the integrated urban farming design, which means it integrates the four typologies of urban farming, and integrates the urban farming system with other existing systems in Williamsburg. The research, experimentation and testing confirmed the necessity of the integration. This is the necessary first step of the new system designs. The existing urban farming system still needs to be improved and needs to act according to circumstances. Phase three fixed some problems from phase two, for example, how different visualizations of the site can improve the understanding of the site. The next step involves a real urban farmer. For phase one and two, the design strategies and conclusions are based on the research paper, open data from city government and local urban farmers’ interviews. However, data and information are not true knowledge; knowledge should be gained via real experience.

Final Assessment

All the methods used in phase one helped me learn more and dig deeply into the thesis topic. However, in order to have a clear answer to the thesis question, which is: “how can rooftop urban farming systems be used to improve people’s connection with one another?”, it is necessary to have more face-to-face talks with local farmers. Some urban farmers in New York are willing to be interviewed, and a specific site will be used to think about what kind of programs can be used and how the programs can improve community engagement. In addition, the thesis will investigate the relationship between the productive programs and natural forces; for example, wind, water, storms, sun, and so on.

Phase two’s goal is different from phase one. For phase one, the goal is designing a rooftop urban farm. But for phase two, the thesis is aiming to combine different kinds of urban farming with different kinds of urban farming typologies, and explore how to use urban farming to serve children’s education. A mix of representations is used to understand the site better; for example, GIS and satellite photos. It is necessary to develop more specific guidelines and criteria for the next phase and find the ideal way to present the diagrams to show my idea clearly.

The research and testing methods in phase three helped to answer part of the thesis question. The thesis research and testing lasted almost one year. It would have been easier to apply the existing urban farming system to the thesis site, but a thesis design requires more innovation. Creating a new urban farming system is hard but necessary, and it is the main goal for the next phase. The hardest part of this thesis is how to be a creative thesis designer and think out of the box.
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4. Fig. 4

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