



WPI



COPENHAGEN'S CASE FOR URBAN FARMING: A FEASIBILITY STUDY



Gabriela Hoops, Hannah Olshansky, Robert Rosen, & Justin Tavares

WORCESTER POLYTECHNIC INSTITUTE

Copenhagen's Case for Urban Farming: A Feasibility Study

An Interactive Qualifying Project (IQP)
Submitted to the Faculty of:

WORCESTER POLYTECHNIC INSTITUTE

In Partial Fulfillment of the Requirement for the
Degree of Bachelor of Science

Submitted By:

Gabriela Hoops
Hannah Olshansky
Robert Rosen
Justin Tavares

April 30, 2018

Submitted to:

Project Advisors:

Holly Ault
Constance Clark

Project Sponsor:

Claus Knudsen, Center Leader

This paper represents the work of WPI undergraduate students in completion of a Bachelor of Science degree requirement. WPI routinely publishes these reports on their website without edit or peer review.



WPI



Abstract

Copenhagen seeks to be carbon neutral by 2025. Miljøpunkt Amager, a Copenhagen environmental organization, was curious about urban farming's potential to further environmentalism in Amager. Our project examined the environmental, social, political, economic, civic, and public health implications of urban agriculture in order to identify the requirements for the realization of urban farms in the region. We analyzed the costs of an urban farm in order to create economic models of potential farm implementations. Through research and interviews, we were able to assess the potential of urban farming within Amager and provide recommendations to further promote urban agriculture in the community.

Acknowledgements

Our group would like to thank these individuals and organizations for all of the time and effort they have provided us during the completion of our project.

Our sponsor Miljøpunkt Amager:

Claus Knudsen
Hodan Osman
Lisa Arre
Maja Guldager
Lotte Kristensen
Inge Hopps
Monika Most

Thank you so much for welcoming us into your organization and providing so much helpful advice and guidance. We have loved working with you and we cannot thank you enough.

Our WPI advisors and staff that aided us for fourteen weeks:

Seth Tuler
Holly Ault
Constance Clark
Paige Neumann

Our school that gave us the opportunity to work on the project:

Worcester Polytechnic Institute

Executive Summary

Why Investigate Urban Farming?

Global warming is an international crisis. Agriculture accounts for 12% of greenhouse gas (GHG) emissions annually (Linguist et al., 2012). As such, alternate agricultural practices such as urban farming will play a large role in the global pursuit of environmental sustainability. In 2005, the city of Copenhagen adopted the Copenhagen Climate Plan. The plan established the ambitious goal of becoming a carbon neutral municipality by 2025. In order to achieve this goal, Copenhagen must eliminate an estimated 1.2 tons of greenhouse gas emissions annually (Dahal & Niemelä, 2017). One avenue to decrease GHG production is urban farming. Urban farms, agricultural ventures located within metropolitan areas, are currently excluded from the Copenhagen Climate Plan (Greensgrow Farms, 2018; City of Copenhagen Technical and Environmental Administration, 2009). Consequently, their potential for assisting in urban environmentalism is largely untapped.

Our project examined the many economic, social, political and environmental implications of urban agriculture within Amager. Through this examination, we sought to identify strategies for market identification, facility acquisition, crop selection, farm operation, community outreach and the many other tasks necessary for the realization of urban farms. By investigating the various components, we were able to identify the minimum requirements for the creation of urban farms within Amager and provide Miljøpunkt Amager with recommendations to help promote the establishment of urban farming initiatives.

How to Investigate Urban Farming?

In order to complete this comprehensive assessment of urban farming in Amager, we identified five objectives that necessitated investigation:

1. Identifying potential markets and feasible business models to create an economically sustainable urban farm.
2. Assessing the economic viability of urban farming initiatives within Amager.
3. Determining criteria for a feasible urban farm including location, farm operation, crop selection, and labor structure.
4. Analyzing the impact of local regulations on potential urban farming initiatives.
5. Identifying organizations and individuals that would engage with urban farming projects.

In order to satisfy these objectives, we completed an initial literature review to understand all of the components of urban farming projects. We then built upon this research by identifying over one hundred urban farms and examining the information on their websites. This online research provided insight into urban farms on a global scale. Additionally, we investigated the price points of urban farm components within Copenhagen. We also delved into other logistical concerns such as the details of local regulations and local climate as well as potential avenues for funding an urban farm through grant programs.

Onsite in Copenhagen, we conducted interviews with representatives of pre-existing urban farms, restaurant owners, and leaders of social organizations. Additionally, we contacted urban farms globally and conducted email interviews to obtain a more comprehensive perspective on urban farming. Our research allowed us to gain multiple perspectives in order to fully comprehend all aspects of urban farming initiatives.

What Have We Found?

After investigating the many facets of urban farming, we were able to gain insight into the economics, logistics, and social implications of urban farming projects within Amager. Our group analyzed the many revenue streams and costs associated with urban farms. In addition, we examined the logistics of creating an urban farm including the legal process, location identification, physical infrastructure and crop selection. The team also investigated the social component by pinpointing the ways that community members interface with urban farming and by exploring the potential for urban farming to advance social causes within the community.

Economically, we found that **urban farms utilize a combination of revenue streams that include CSAs, farm stands, and restaurants.** Our group noticed this trend when examining the economic strategies of urban farms globally. In these investigations, we also found that **urban farms use organizational profits, private funding, and grants to cover the startup and initial operation costs of urban farms; these costs are primarily dictated by the variable size and infrastructure of the farm.**

Logistically, we examined the issues of regulations, location, infrastructure, and crop selection on urban farms. On the regulatory side, it became evident that **because these initiatives are relatively new within Copenhagen, many regulations are undefined, causing a challenging legal process.** Operations on rooftops also result in specific challenges. **Due to a lack of undeveloped space, rooftops provide the most potential for urban farms within Amager; however, these rooftops must meet extensive specifications.** Rooftop farms in Copenhagen require more than just specified regulations including reinforcements, elevators, and fencing. In addition, **due to climate barriers, urban farms in Amager will likely require greenhouses in addition to traditional outdoor irrigation and growing setups** to grow their produce. Greenhouses are necessary because they extend the growing season and protect delicate crops from the cold climate of Copenhagen. Although some crops are hardy enough to grow outdoors in the Copenhagen weather, these hardy crops are often not the most profitable options. **In the crop selection process, urban farms must take into account climate, resource availability, and yield; however, the most important factor is often market demand.**

Lastly, we found that **urban farms often combine social missions with profitable business models in order to involve the surrounding community.** One frequent opportunity for this community involvement can be found in the farm labor. **Although most urban farms have a small number of permanent employees, the majority of the physical labor is often done by volunteers or participants in social welfare programs.** Volunteer work allows urban farms to

interact with their community and to add value to their enterprise. Not only are they an economically sustainable environmental initiative, but they are able to incorporate social missions as well.

As an extension of our research, we developed case studies that outline the basic logistical and financial considerations involved with starting an urban farming business. In conducting these case studies, we primarily focused on four main variables: revenue streams, subsidized rent, volunteer labor, and greenhouses. In varying revenue streams, we created economic models for a CSA, farmer’s market, and restaurant collaboration, and modeled farms with different combinations of these three revenue streams. Because we observed that many farms negotiated for negligible rent, we also compared farm profitability when paying rent compared to when rent is subsidized. Similarly, we observed the effect of eliminating paid labor in favor of free volunteer labor on farm success. Lastly, we examined farms that increase production via extending the growing season with greenhouses versus farms that lack greenhouses and only have sheds to store tools. By varying these components, we are able to demonstrate a range of economic situations for a 500 square meter rooftop farm in Amager. The four cases we examined can be seen in Table 1.

Table 1: Case Descriptions

	Subsidized Rent	Greenhouse	CSA	Farmer’s Market	Restaurant	Volunteer Labor
<i>Case 1</i>	✓	✓	✓	✓	✓	✓
<i>Case 2</i>				✓		
<i>Case 3</i>			✓			
<i>Case 4</i>			✓			✓

In examining the projections for each of these cases, we observed that Case 1 is successful and breaks even during the fourth year of operation, making 260.000 kr. over five years (Figure 1). We anticipated this result as Case 1 represents the ideal scenario for urban farm creation. In reality, it is unlikely an urban farm will be created in this optimal scenario. Consequently, we created Cases 2, 3, and 4 in order to model a farm that is both economically viable and realistic.

Case 2 loses approximately 2,1 M kr. by year five. Similarly, Case 3 also loses money; however, it reduces the deficit seen in Case 2 by 1,3 M kr. The only difference between these two scenarios is that Case 2 uses a farm stand while Case 3 uses a CSA. This comparison shows that CSA is a more profitable strategy than a farmer’s market. Because both Case 2 and 3 result in a deficit, the farm model requires adjustment in order to become profitable. By assuming all physical labor is performed by volunteers, we obtain Case 4 which demonstrates a successful model. Case 4 breaks even in year five and makes 270.000 kr. over the first five years. Thus, Case 4, a 500 square meter farm with volunteer labor and a CSA, provides an example of an economically and logistically viable urban farming initiative within Amager.

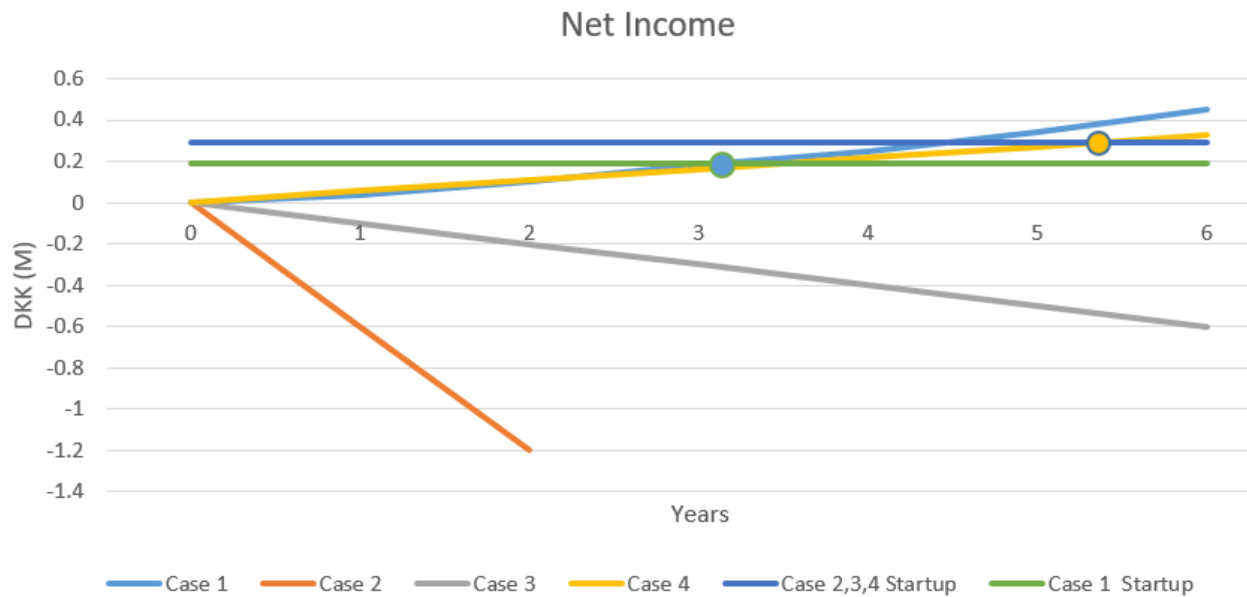


Figure 1: Net Income

What is the Next Step for Urban Farming in Amager?

After examining all of these facets of urban farming initiatives, we identified three overarching recommendations to promote urban farming within the Amager community.

1. **Continue to research the logistics of urban farming.**
2. **Streamline the process of establishing an urban farm by creating municipal support initiatives.**
3. **Network with individuals, businesses, and social organizations within the Amager Community.**

Continue to Research the Logistics of Urban Farming

Over the course of this project, we have conducted extensive research into the components of urban farms; however, there is room for further inquiry. Specifically, **prospective urban farmers should further investigate farm revenue streams, crop selection, and farm infrastructure.** Although we observed different examples of CSA, farm stands, and restaurant collaborations, our research did not extend to analyzing the different methods of executing each of these profit strategies to maximize profits. Consequently, we recommend that organizations looking to promote urban farming, such as Miljøpunkt Amager or prospective urban farmers, conduct further research into the optimal methods of implementing each revenue strategy. This research would identify the most profitable and easiest methods of selling produce using each of these profit models.

In terms of crop selection, identifying the benefits and drawbacks of specific crops proved outside of our scope. Our group believes the next step is conducting market research to single out the crops in high demand in the Copenhagen market. In addition, this research could be

expanded to analyze these crops in terms of yield and market value. This research would allow urban farming projects to identify the most profitable crops in Copenhagen's specific market.

Similarly, we were able to identify the need for greenhouses, but looking at the advantages and disadvantages of specific greenhouse structures was outside of our focus. Identifying the most economical and environmentally friendly greenhouse options would be a productive continuation of this research.

Streamline the Process of Establishing an Urban Farm by Creating Municipal Support Initiatives

The municipality of Amager could help to facilitate urban farming projects within the community. First, the municipality could assist in the identification of potential urban farm locations. The district could conduct a survey of rooftops to identify those already equipped for urban farms. In our research, we were able to identify many of the attributes required of a rooftop in order to make it a viable candidate for an urban farm. The next step is to apply these qualifications to rooftops within Amager in order to identify optimal locations for urban farms. Another strategy that could be used to promote urban farming is providing incentives to building owners that host farms on their roofs. In our research, we found that many rooftop urban farmers negotiate with building owners for extremely low or nonexistent rent payments. The municipality could encourage these agreements by providing tax or utility breaks to building owners that host urban farms. Lastly, in order to simplify legal process involved with establishing a farm, we recommend compiling a document detailing all of the regulations that apply to rooftop urban farming projects. A compiled document would allow for more standardized expectations between regulatory bureaus and the prospective farmers. This list would streamline the legal process associated with creating urban farms.

Establish networks between individuals, businesses, and social organizations within the Amager Community

We recommend that Miljøpunkt Amager pursue community outreach to establish connections with individual citizens, potential economic partners, and social organizations. Our research demonstrated that individual citizens are important contributors to urban farming initiatives. As a result, we recommend reaching out to the local residents in order to gain support for these initiatives, as well as getting individuals involved in the process of establishing and running urban farms. Gaining support could be achieved through public programming, social media outreach, marketing campaigns, or in-person conversations. Networking with companies and organizations also provides potential for economic partnerships. Many companies have programs to promote sustainability and community service. It would be beneficial to Miljøpunkt and similar advocacy organizations to interact with companies and organizations that would be interested in funding or sponsoring new urban farming initiatives. In addition, Miljøpunkt Amager should continue to network with social welfare organizations. Not only does urban farming have the potential to be an environmental boon to the community, but it can also be integrated into social welfare programs. Interfacing with social welfare programs often provides a labor force for the farm while adding value to the community.

In creating these recommendations, we helped Miljøpunkt Amager promote urban farming initiatives in their region. Over the course of this project, we were able to gain comprehensive insight into the impacts and requirements of urban farming. This insight helped us craft our recommendations for furthering urban farming in Amager. In addition, our understanding of urban farming practices allowed us to create economic models of potential implementations for urban farms in this community. The projections of these models clearly show that creating a logistically and economically feasible urban farm in Amager is an achievable goal. Therefore, in this examination of urban farming, we have demonstrated that urban farming is a feasible enterprise in the Amager community.

Authorship

Gabriela Hoops:

Gabriela's main contributions were within research and graphic design. She took the lead on creating the posters and created presentations for the group. Aside from this Gabriela helped researching for the deliverables, conduct interviews, edit the paper, and participate in all general team activities and discussions.

Hannah Olshansky:

Hannah's main contributions were within the writing and editing of the paper. She took the lead on drafting and editing all sections. Outside of writing, Hannah helped to contact urban farms, conduct interviews, present, and participate in all general team activities and discussions.

Robert Rosen:

Robert's main contributions were being the main data researcher for most of the sections of the paper, case studies, and main deliverables. These topics contain but are not limited to crop requirements, farm revenue streams and projections, and contacting our urban farms. Outside of data researching, Robert helped edit the paper, conduct interviews, and participate in all general team activities and discussions.

Justin Tavares:

Justin's main contributions were being the primary writer and editor of the case studies report and conducting research for the paper. In addition, he was the primary author of the social impacts section of the background, organizational engagement sections of the methodology, and the location prerequisites and farm infrastructure sections of the findings chapter. He was also the primary author of most progress reports, contacted restaurants to interview, and participated in all general team activities and discussions.

Table of Contents

Copenhagen’s Case for Urban Farming: A Feasibility Study	i
Acknowledgements.....	ii
Executive Summary.....	iii
Authorship.....	ix
Table of Contents	x
List of Figures	xii
List of Tables	xiii
1 Introduction.....	1
2 Background.....	3
2.1 Copenhagen as a Frontrunner in Urban Environmentalism.....	3
2.2 Impacts of an Urban Farming Project.....	3
2.2.1 Environmental Impacts	5
2.2.2 Economic Impacts.....	5
2.2.3 Social Impacts	6
2.2.4 Civic Impacts	7
2.2.5 Public Health Impacts.....	7
2.3 Best Practices for Design and Operation of Urban Farms.....	8
2.3.1 Farm Infrastructure	8
2.3.2 Business Models for Urban Farming	10
2.4 Summary.....	10
3 Methodology.....	12
3.1.1 Interview Procedure.....	14
3.1.2 Identify Potential Markets and Feasible Business Models to Create an Economically Sustainable Urban Farm.....	14
3.1.3 Assessing the Economic Viability of Urban Farming Initiatives within Amager	14
3.1.4 Determining criteria for a feasible urban farm including location, farm operation, crop selection, and labor structure	15
3.1.5 Analyzing the Impact of Local Regulations on Potential Urban Farming Initiatives..	16
3.1.6 Identify Organizations and Individuals that would Engage with Urban Farming Projects.....	16
3.2 Summary.....	17
4.0 Findings and Analysis.....	18

4.1 Revenue Streams.....	19
4.2 Farm Financials.....	20
4.3 Crop Selection.....	22
4.4 Regulations	23
4.5 Labor Structure	24
4.6 Community Engagement	25
4.7 Farm Location Prerequisites	25
4.8 Farm Infrastructure	30
5.0 Case Studies	32
5.2 Model Development.....	32
5.2.1 Business Models	32
5.2.2 Crop Selection.....	33
5.2.3 Startup Costs	33
5.2.4 Operation Costs.....	34
5.3 Results.....	35
6.0 Conclusions and Recommendations	37
References.....	41
Appendix A: Urban Farm Contact List.....	48
Appendix B: Copenhagen/Denmark Organizations Contact List.....	52
Appendix C: Simon Hansen Interview	53
Appendix D: Emil Stroh Interview	57
Appendix E: Michael/Kristian Skaarup Interview.....	59
Appendix F: Chris Chimenti Interview Transcript.....	62
Appendix G: Joah Pinje Interview Transcript	67
Appendix H: Kenneth Ellegaard Interview Transcript.....	71
Appendix I: Johanna Lundell Interview Summary.....	74
Appendix J: Why Urban Farming Poster.....	75
Appendix K: Urban Farming for Amager Poster.....	76
Appendix L: Revenue Stream and Greenhouse Data Totals	77

List of Figures

Figure 1: Net Income	vi
Figure 2: ØsterGro (ØsterGro, n.d.).....	8
Figure 3: Noma Rooftop Greenhouses	9
Figure 4: Sundholm Urban Gardens	9
Figure 5: Farm Revenue Streams.....	19
Figure 6: Copenhagen Projected Population Growth (Københavns Kommune, 2015).....	26
Figure 7: Focused Urban Development Areas in Copenhagen (Københavns Kommune, 2014) .	27
Figure 8: Government Protected Green Areas in Copenhagen (Københavns Kommune, 2014) .	27
Figure 9: Sunlight Analysis of Amager rooftops (Københavns Kommune, n.d.)	29
Figure 10: Net Income	36

List of Tables

Table 1: Case Descriptions	v
Table 2: Impacts of Urban Farming.....	4
Table 3: Research Methods Breakdown	13
Table 4: Startup Expense Items	21
Table 5: Grants Available in Denmark	22
Table 6: Sample Crop Requirements	23
Table 7: Copenhagen Average Monthly Sunlight (ClimaTemps Online Database, n.d.).....	30
Table 8: Copenhagen Average Monthly Temperature & Rainfall (Climate-Data Database, n.d.)	30
Table 9: Case Descriptions	32
Table 10: Profitable Crops	33
Table 11: Startup Costs.....	34
Table 12: Operational Costs.....	35

1 Introduction

Global warming is an international crisis. In the twentieth century alone, the global annual average temperature rose by 0.74 °C (IPCC, 2008). If left unchecked, greenhouse gas emissions may continue, increasing temperatures by up to 4.0 °C in the next century and precipitating numerous natural disasters such as flooding, droughts, and sea level rise (Saeidi et al., 2011; IPCC, 2008). In order to avoid these disasters, scientists estimate that carbon emissions must be reduced by more than 60% (IPCC, 2008). Agriculture accounts for 12% of greenhouse gas (GHG) emissions annually (Linguist et al., 2012). As such, alternate agricultural practices will play a large role in the global pursuit of environmental sustainability.

Copenhagen has been carbon conscious for more than a decade. In 2009, the city adopted the Copenhagen Climate Plan. The plan established the ambitious goal of becoming a carbon neutral municipality by 2025. In order to achieve this goal, Copenhagen must eliminate an estimated 1.2 tons of greenhouse gas emissions annually (Dahal & Niemelä, 2017). One avenue to decrease GHG production is urban farming. Urban farms, agricultural ventures located within metropolitan areas, are currently excluded from the Copenhagen Climate Plan (Greensgrow Farms, 2018; City of Copenhagen Technical and Environmental Administration, 2009). Consequently, their potential for assisting in urban environmentalism is largely untapped.

Urban farming projects lower carbon emissions by aiding in carbon sequestration, providing an alternative use for organic waste and decreasing the need for freight transportation (Grard et al., 2018; *A Greener Transport System in Denmark*, 2012). A study in Sutton, UK compared 16 fruits and vegetables grown via urban farming and commercial farming methods. On average, the GHG emissions from production and transportation were reduced by 69.4% when the crops were grown using urban farming techniques (Kulak, Graves, & Chatterton, 2013). Urban farming could also help address other environmental issues such as stormwater mitigation and regulation of urban temperatures (Grard et al., 2018). Urban farming also provides economic, social, and health benefits. Economically, urban farming would create jobs, provide training, increase real estate values, and reduce upkeep costs for municipal agencies (Zigas, 2012; Golden, 2013; Voicu & Been, 2008). Socially, urban farming can provide education and engagement opportunities, and stimulate cultural and cross-generational integration (Golden, 2013; USDA, 2017). Furthermore, urban farming can promote improved nutrition by increasing accessibility of local produce.

When considering urban farming as a potential solution to GHG emissions, many factors necessitate investigation. The ideal location, proper farming methods, correct target market, required funding, and workforce all require research. Additionally, we must consider the social, political, economic, and environmental factors that will affect the overall success and longevity of an urban farm. Miljøpunkt Amager, a private environmental advocacy organization concerned with the neighborhoods of Amager Øst and Amager Vest, seeks to “develop Amager into an environmentally sustainable district” (Miljøpunkt-Amager). Miljøpunkt Amager wants to investigate urban farming’s potential to build upon established green initiatives in order to further environmentalism within Amager. Miljøpunkt has begun to create and organize

maintenance of urban gardens; however, they have yet to investigate initiatives based on urban farming (Miljøpunkt-Amager).

This project examined the many economic, social, political and environmental implications of urban agriculture within Amager. Through this examination, we sought to identify strategies for market identification, facility acquisition, crop selection, farm operation, community outreach and the many other tasks necessary for the realization of urban farms. By investigating the various components, we were able to identify the minimum requirements for the creation of urban farms within Amager and provide Miljøpunkt Amager with recommendations to help promote the establishment of urban farming initiatives within their community.

2 Background

In this chapter, we will discuss information relevant to conducting an analysis of the many components of urban farming. First, we introduce Copenhagen's environmental strategy. We then consider how urban farming can be a potential solution for furthering Copenhagen's climate plan. Third, we analyze the environmental benefits of urban farming, as well as potential risks that need to be considered. The economic, social, and health impacts of urban farming are then examined for additional incentives and drawbacks. Finally, we investigate effective farming infrastructures and business models that promote an economically sustainable urban farm. The section highlights the important aspects that contribute to successful urban farms.

2.1 Copenhagen as a Frontrunner in Urban Environmentalism

The City of Copenhagen is a leader in urban environmentalism. In response to the global environmental crisis, the City instituted the Copenhagen Climate Plan in 2009 (City of Copenhagen Technical and Environmental Administration, 2009). This plan seeks to minimize Copenhagen's contribution to global warming and sets a goal of achieving carbon neutrality by 2025 through the execution of over 160 initiatives (Damsø, Kjær, & Christensen, 2017). Many of these 160 projects have been successfully actualized. As a result, Copenhagen leads Europe with the "lowest energy intensity in the European Union." (Damsø et al., 2017) In December of 2017, Copenhagen won its third consecutive C40, an award bestowed annually to five cities globally for the demonstration of climate action leadership, in the category of 'Cities4Energy' (C40 Cities Climate Leadership Group, 2017; W, 2017). Initiatives such as the creation of Pocket Parks throughout the city and the institution of traffic tariffs contributed to Copenhagen's exemplary environmental progress (City of Copenhagen, The Technical and Environmental Administration, 2009). Since 1990 alone, Copenhagen has reduced greenhouse gas emissions by 20% (Halloran & Magid, 2013).

Although Copenhagen is making significant strides, if the municipality is to reach carbon neutrality by 2025, more work needs to be done. The climate plan is structured to address specific areas of interest including greener transport, environmental awareness for individual citizens, environmentally conscious urban development and more (City of Copenhagen, The Technical and Environmental Administration, 2009; Damsø et al., 2017). Thus, the municipality should investigate new opportunities for carbon reduction and environmental sustainability.

2.2 Impacts of an Urban Farming Project

One potential opportunity to further Copenhagen's plan is urban farming. Urban farming is an agricultural enterprise, often with primarily economic motivations, located within a metropolitan area (Bernd Pölling, 2016). Urban farming is also characterized by its ability to supply the surrounding community with fresh food and other products (Mougeot, 2000; Grard et al., 2018). Urban farms often have social or environmental goals as well. But in order to be a viable

urban farm, the enterprise must be an economically sustainable business. Sustainability is important because it makes urban farming a feasible long-term component of urban initiatives. For instance, farms such as Greensgrow in Philadelphia, PA, and Groundwork in Somerville, MA have been operational since 1997 and 2000 respectively (Greensgrow Farms, 2018; Groundwork Somerville). When correctly implemented, urban farms have the ability to support themselves economically, while also reducing GHG emissions, and providing many other social, civic, and health benefits (Mougeot, 2000). A comprehensive breakdown of the advantages and drawbacks discussed in this chapter are listed in Table 2.

Table 2: Impacts of Urban Farming

	Positive	Negative
Environmental	<ul style="list-style-type: none"> ● Reduces freight transportation ● Regulates urban temperature ● Mitigates stormwater runoff 	<ul style="list-style-type: none"> ● Causes potential chemical pollution from inorganic fertilizers ● Needs a large amount of water
Economic	<ul style="list-style-type: none"> ● Raises property values ● Creates competition to lower overall food prices ● Decreases cost and labor-intensive upkeep of vacant lots 	
Social	<ul style="list-style-type: none"> ● Promotes cultural and cross-generational integration ● Increases community engagement ● Aids lower income populations ● Provides health and environmental education opportunities ● Reduces crime and vandalism 	<ul style="list-style-type: none"> ● Creates unpleasant noises and smells
Civic	<ul style="list-style-type: none"> ● Reduces crime and vandalism, decreasing the burden on police and city administration ● Reduces dumping and cost of upkeep on vacant lots, decreasing the burden on the department of public works and waste management agencies 	
Public Health	<ul style="list-style-type: none"> ● Provides healthier food options ● Improves air quality 	<ul style="list-style-type: none"> ● Soil contamination can potentially contaminate produce

2.2.1 Environmental Impacts

Outside of simply lowering CO₂ levels, urban agriculture projects provide many benefits. Urban farming helps to improve air quality, mitigate runoff, and regulate temperature in urban areas (Grard et al., 2018). For example, New York City's Central Park is an average of 5-10 °C cooler than the rest of the city (Heather, 2012). Urban agriculture has been shown to reduce urban temperatures by 0.67° C (Heather, 2012). In Vancouver, BC, green roofs reduce buildings' energy consumption by 9%. Additionally, Urban Farming provides stormwater mitigation through absorption into the agricultural plot itself as well as capture for irrigation. For example, in Philadelphia, it is estimated that a 1,000 square foot rooftop garden will mitigate approximately 22,500 gallons of water per year (Heather, 2012). Consequently, urban farming has the potential to be the next step in creating a green and carbon neutral Copenhagen.

Although urban farming provides many advantages, there are potential adverse environmental effects. First, inorganic fertilizers and other chemicals have the potential to become added pollutants (Meharg, 2016). Second, urban farms may create noise pollution and pervasive unpleasant smells, which are concerns for the surrounding community (Meharg, 2016). Third, urban farms require large amounts of water, which can often be a limited resource (Pfeiffer, Silva, & Colquhoun, 2015). Globally, 1,300 liters of water on average are needed to produce enough food for an individual for a year (Rockström et al., 2009). In the next four to five decades, 36% of people globally will experience water shortages (Rockström et al., 2009). Hence, it is crucial that urban farms are water conscious. If urban farming is to be truly beneficial to the environment, it is important to be aware of the risks so that they can be minimized in practice.

2.2.2 Economic Impacts

Urban agriculture has the potential to engender economic growth within communities. Urban gardens can raise property values within their communities (Voicu & Been, 2008). Increased green space through urban farms and gardens can help mitigate vandalism and crime in urban communities (Voicu & Been, 2008). The green space and beautification which urban farming provides often create more desirable neighborhoods. For example, in New York City "the presence of gardens raised property values as much as 9.4% within five years of establishment" (Voicu & Been, 2008). These neighborhood improvements precipitate a more competitive real estate market in the area.

In addition, by locating food cultivation within urban areas, agricultural businesses are able to provide fresh, healthy foods at comparatively low prices through Farmer's Markets and Community Supported Agriculture (CSA) initiatives (Pfeiffer et al., 2015). These low prices and fairly simple yet profitable models are made possible by the direct connections between producer and consumer (Pölling, 2016). Because urban farms are located within the communities they serve, these businesses are able to connect directly with the end users of their products and eliminate many costs associated with shipping and selling products. The direct connection allows commodities generated by urban agriculture not only to be profitable for the agricultural venture but also to be affordable for the customer (Pfeiffer et al., 2015). Local food production

also serves to create competition with traditional rural farming and drive down overall food prices in the area, creating healthy economic competition (Mougeot, 2000).

2.2.3 Social Impacts

Urban agriculture can foster community engagement across socioeconomic sub-groups. A study from the University of California showed that the presence of green space promotes interpersonal interaction and breaks down barriers between individuals within neighborhoods (Golden, 2013). Urban farming can facilitate community engagement in environmental projects, which increases awareness of green spaces within a city. Green space awareness can create “networked movements increasing activism and engagement of citizens” (Golden, 2013). Therefore, urban agriculture can build interpersonal connections based on shared goals and promote advocacy for the preservation of important urban green spaces.

Sub-groups within a community can benefit from urban farming projects as well. For instance, urban farming can help immigrants connect with the established population and promote cultural and cross-generational integration. Urban farms provide opportunities to share cultural varieties of vegetables and fruits in neighborhood markets. Activities such as growing cultural foods, cheese-making, beekeeping, cooking and preparing food can be introduced in the community through programs such as cooking and growing demonstrations, harvest dinners, or festivals (Lanarc & Golder, 2013). Little Haiti Garden in Miami, for example, enables the area’s Haitian community to use traditional farming techniques in producing often-unavailable crops such as callaloo and calabaza (Mackenzie, 2016). From a demographic study in 2006, 18.6% of residents in Amager Øst and 22.5% in Amager Vest were immigrants or their descendants (Larsen & Møller, Aug 2013). Consequently, urban farms within Amager could have a significant impact on those communities. In addition to immigrants, low-income residents can also benefit from urban farming projects. Urban farms often donate excess produce to homeless shelters and other charitable organizations. For example, the Duncan Street Miracle Garden in Baltimore donates up to half their produce to local soup kitchens (Corrigan, 2011). Thus, urban farming can provide fresh produce that would normally be unavailable to low-income groups.

Urban farming can also serve as a tool for the education of urban youth (USDA, 2017). Urban farming centers can host field trips and after-school visitation programs as well as being school food providers. For example, the USDA Farm to School Network works to change food purchasing and environmental education practices in schools. This organization urges schools to prioritize serving local food in cafeterias and provides educational programs in agriculture, food systems, health, and nutrition. These efforts are often successful as in the United States “63 percent of school districts with farm to school programs completed at least three farm-to-school related activities” (USDA, 2017).

The educational benefits of urban agriculture are not limited to youth. Urban farming can also raise awareness of environmental issues and urban sustainability in the general population. Some urban farms will host programs and events for the general public that incorporate local chefs, foods, and other farming organizations (Lanarc & Golder, 2013).

Although urban agriculture can be a powerful force for social progress, there are concerns associated with urban farms. Smells and noises associated with an urban farm are potential complications for the surrounding community (Meharg, 2016). Although loud farm equipment is rarely needed, as with any industrial endeavor, noise is a concern. If the enterprise is to be located within a residential community, it is essential that the facility is not disruptive. Unpleasant odors can also be a problem. Animal manure and compost, which are often used as fertilizers, can produce potent odors that can be detected by people living in the vicinity (Grard et al., 2018).

2.2.4 Civic Impacts

Municipal agencies, such as law enforcement and waste management, can benefit from urban farming projects as well. Urban farms provide a means of maintaining vacant lots and reducing crime and vandalism, which reduces burdens on police and city administration. When vacant lots are turned into urban farms, the area is transformed into a safe space that increases the community's pride and attachment to the vicinity. Two reports in the *Journal of Environment and Behavior* determined that aggression and violence were "significantly lower" when people lived near a green space (Mackenzie, 2016). Urban agricultural projects generate more neighborhood watches and an overall concern for others in the neighborhood, allowing law enforcement to focus on other areas of a city (Golden, 2013). Urban agriculture groups are frequent advocates for local change (Lanarc & Golder, 2013). They also lower the cost of upkeep for the city's department of public works since the community plays a voluntary role in the project's maintenance. In addition, the reduction of illegal dumping in vacant lots also helps a city's waste management agency through a decrease in cost and labor intensive upkeep. A study by an advocacy group in San Francisco showed that "community management of vacant lots transformed into urban agriculture sites saved the Department of Public Works an estimated \$4,100 a year per site by preventing vandalism, dumping, and labor-intensive upkeep" (Zigas, 2012).

2.2.5 Public Health Impacts

Urban agriculture effects change not only through policy and law, but also through overall health habits. Studies have shown that access to fresh produce within the community increases consumption of more nutritional food (Armstrong, 2000). Mental health can also improve as people often find greenspace beneficial to overall happiness and satisfaction (Armstrong, 2000). Urban farming additionally helps decrease air pollution. For asthma alone, a study of ten European cities revealed that "14% of the cases of incident asthma in children and 15% of all exacerbations of childhood asthma were attributed to exposure to pollutants" (Guarnieri & Balmes, 2014). Urban farming can help mitigate the negative health effects of urban air pollution.

Although urban agriculture could prove invaluable for public health in urban areas, there are certain risks that must be considered. Soil contamination, especially lead contamination, is a major concern when growing on urban land. For instance, examination of soil in Boston revealed that 88% of urban gardens in Boston used lead-contaminated soil (Wortman & Lovell, 2013). Although many fruiting plants do not absorb the lead and become contaminated

themselves, there is still a risk of ingesting lead contamination found on the exterior of the produce. Additionally, farmworkers are at risk as well as they may inhale contaminated dust as they work (Wortman & Lovell, 2013).

2.3 Best Practices for Design and Operation of Urban Farms

In order to provide all of the potential environmental, economic, social, civic, and health benefits, an urban farm needs a feasible infrastructure and a sustainable business model.

2.3.1 Farm Infrastructure

Urban farms come in many different shapes and sizes. There are four main types: rooftop farms, greenhouses, vertical farms, and vacant lot farms. Rooftop farms come in two main varieties, open-air rooftop farms and rooftop greenhouses. Open-air rooftop farms treat the roof of a building like a traditional plot of land. One example of an open-air rooftop farm is ØsterGro in Copenhagen. ØsterGro (Figure 2) is located in the district of Østerbro on the roof of an old car auction house. The agricultural setup uses 600 square meters of rooftop to create an urban farm focused on organic food production (ØsterGro, 2018). Rooftop farms are spatially efficient; however, they can prove challenging because they are exposed to the surrounding atmosphere of the city. Because many urban areas experience significant air pollution, the produce from rooftop farms may be at risk of contamination (Meharg, 2016).



Figure 2: ØsterGro (ØsterGro, n.d.)

Rooftop greenhouses, such as the greenhouses at the world-renowned Michelin star restaurant Noma (Figure 3), are indoor agricultural setups that are often used to create more consistent growing environments (Sanyé-Mengual, Anguelovski, Oliver-Solà, Montero, & Rieradevall, 2015). Since they are indoors, they are able to increase crop yields by avoiding the effects of changes in climate. Greenhouse-based soilless systems have the added benefit of being better at avoiding contamination. Local rooftop greenhouses may soon be responsible for all tomato production for the City of Barcelona (Sanyé-Mengual et al., 2015). These urban greenhouses eliminate 441 grams of CO₂ emissions for every kilogram of tomatoes produced (Sanyé-Mengual, et al., 2015). Rooftop greenhouses also have the potential to be integrated into

buildings in order to utilize residual heat. The use of residual heat alone could eliminate 87 kW/h of heat demand on a typical winter day (Sanyé-Mengual, et al., 2015).



Figure 3: Noma Rooftop Greenhouses

An alternative to rooftop farming is vacant lot farming as seen in Figure 4. This strategy repurposes vacant city lots and converts them to urban farms. These enterprises function in much the same way as rooftop farms, except that they are located in abandoned lots within cities. Urban farming on vacant lots presents several challenges, namely pollution in city water and soil (Meharg, 2016). In cities like Somerville, Massachusetts, these obstacles have been overcome to produce large working urban farms (Hara, Murakami, Tsuchiya, Palijon, & Yokohari, 2013). While they may be difficult to implement, these vacant lot farms can prove beneficial to the community and the municipality as farm labor maintains the lots. In addition, manicured green areas create more community pride, which in turn reduces crime and vandalism and improves neighborhoods (Mackenzie, 2016).



Figure 4: Sundholm Urban Gardens

A similar indoor farming model is that of the vertical farm. Vertical farms differ from greenhouses in that vertical farms grow produce indoors and use artificial light instead of sunlight. Vertical farms pose challenges as they require large quantities of electricity and complex and often expensive infrastructure; however, their yields are often far higher than those of any other urban farming method. For instance, a vertical farm in in Kyoto Japan uses a 2,828 square meter building to grow 7.7 million heads of lettuce annually (Eaves & Eaves, 2018).

2.3.2 Business Models for Urban Farming

Just as there are many options for the physical infrastructure of urban farms, there are many business models as well. Often, urban farms utilize the Community Supported Agriculture (CSA) model in which individuals pay a set fee for a share of the crops produced by the farm. Greensgrow, a longstanding urban farm in Philadelphia, PA has utilized this model successfully for the past ten years (Greensgrow Farms, 2018). The CSA model is popular because it takes advantage of the direct connection between producer and consumer. Because there is no middle-man in the transaction, this method of trade is often more profitable for the producer and consequently more affordable for the consumer (Pfeiffer et al., 2015). ØsterGro also subscribes to the CSA model with approximately 40 members at any given time; however, ØsterGro's primary motivation is social and not economic. Although they are structured as a profit-oriented business, their labor is primarily provided by volunteers, and their fundamental motivation is to promote environmentalism within their community (ØsterGro - danmarks første tagfarm).

Other urban farms have taken the social mission even further by being completely non-profit entities. For instance, the Society of St. Vincent de Paul in Phoenix runs an urban farm with the primary goal of producing food for a soup kitchen. The food produced on this farm is served to thousands of people each day in charity dining rooms and distributed in food boxes to hungry families (St. Vincent de Paul, 2006). Non-profit urban farms often maintain their operations through charitable fundraising and grants. There are many environmental and social grants available to urban farming initiatives. For instance, since an urban farm counts as an environmentally sustainable initiative, a Vancouver urban farm, Sole Food Street Farm, was able to expand into a two-acre farm with financial support from a multitude of donations from companies and corporations as well as grants and city funds (Lanarc & Golder, 2013).

Conversely, some urban farms have no societal mission and are strictly business ventures. For instance, urban farms may exist to supply restaurants. One example of this type of urban farm can be found at Noma in Copenhagen. This world-renowned restaurant sources their produce from an urban farm located on their roof. The urban farm is run by professionals, and the crops are tailored specifically to the menu of the restaurant. There is never a concern about producing crops that consumers will not buy as they are growing specifically what is needed for the restaurant's menu. Having an urban farm on their roof ensures that they always have fresh local produce on hand (Gordinier, 2015).

Other urban farms create profit by providing produce to farmers' markets or running their own farm stands. Plant it Forward, an organization in Houston, Texas helps refugees establish urban farms as a source of income for their families. These urban farms then sell their produce at farmers' markets throughout Houston. In addition, many farms supplement income from farmers' markets by running their own produce stands (Farm stands, 2014).

2.4 Summary

Urban farming has been shown to provide many environmental benefits that aid urban communities in promoting urban environmentalism. In addition, the economic, social, and health

impacts of urban farming are overwhelmingly positive and offer benefits to numerous groups and organizations within the community.

An urban farm needs an efficient infrastructure, a profitable market, an involved community, prudent crop selection, and many other components in order to achieve success. Through this research, we have identified many of the necessary components of an urban farm and examined several of options for implementations. Now we need to consider these models within the context of the Amager community. We will attempt to address the challenges presented by land shortages, pollution, local regulations, and many other considerations in order to provide comprehensive suggestions for the implementation of urban farms within Amager, Copenhagen.

3 Methodology

The goal of our project was to develop a feasibility study for an economically sustainable urban farm within Amager. From our research on the environmental, economic, social, civic, and health impacts of urban farming, we determined the primary project objectives that would cover the topics relevant to our feasibility study. In this chapter, we begin by identifying the kinds of research and analysis methods that we used, followed by a discussion of how those methods were executed. Based on our project objectives, we then identified the information necessary for our deliverable and described the research methods that were used to obtain this information. Finally, we investigated the specifics of these tasks within Amager to provide recommendations that meet the criteria for a successful urban farm within the community. Our project objectives included:

1. Identifying potential markets and feasible business models to create an economically sustainable urban farm.
2. Assessing the economic viability of urban farming initiatives within Amager.
3. Determining criteria for a feasible urban farm including location, farm operation, crop selection, and labor structure.
4. Analyzing the impact of local regulations on potential urban farming initiatives.
5. Identifying organizations and individuals that would engage with urban farming projects.

Through our background research and discussions with our sponsor, Claus Knudsen of Miljøpunkt Amager, we identified the categories of information that were included in our study in order to satisfy all six project objectives. Our report provides information on:

- Potential Markets
- Farm Financials
- Farm Location Prerequisites
- Farm Infrastructure and Equipment
- Farm Labor Structure
- Crop Selection
- Local Laws and Regulations
- Organizational Engagement and Education

To obtain this information, we used two main methods: interviews and online research. These two research methods took several forms and were used in different combinations in order to obtain the desired information for our study (Table 3).

Through our online research we sought to gain insight into urban farms on a global scale. We were able to identify one hundred urban farms and not only contact them, but learn about them through the information on their websites. This provided insight into some of the most common urban farming strategies. Additionally, we used the internet to look into the price points of urban farm components within Copenhagen. We also examined other logistical concerns such as the details of local regulations and local climate. We also researched potential avenues for funding an urban farm through grant programs.

Table 3: Research Methods Breakdown

Objective	Online Research Topics	Interviewees	Information Learned
Identifying Potential Market and Business Models	<ul style="list-style-type: none"> • Established urban farm revenue strategies • Farmer’s Market and Supermarket supply chains • New Nordic Cuisine Restaurants 	<ul style="list-style-type: none"> • Urban Farm Owners • Farmer’s Market Owners • Supermarket Executives • Restaurant Owners • School Board Representatives 	<ul style="list-style-type: none"> • Potential Market • Crop Selection • Farm Infrastructure
Assessing Economic Viability	<ul style="list-style-type: none"> • Equipment cost • Crop sales • Transportation cost • Labor Cost • Farm Material Costs 	<ul style="list-style-type: none"> • Urban Farms Owners • Urban Farm Workers 	<ul style="list-style-type: none"> • Startup Cost • Operation Cost • Payback Period
Determining Criteria: Location, Farming Operations, Labor Structure, and Crop Selection	<ul style="list-style-type: none"> • Weather data • Structural data • Crop emissions, energy, cost profile • Farming processes 	<ul style="list-style-type: none"> • Urban Farm Owners • Urban Farm Managers and Founders • Representatives from Environmental Agencies 	<ul style="list-style-type: none"> • Location Prerequisites • Farm Infrastructure and Farm Equipment • Labor • Crop Selection
Analyzed local regulations	<ul style="list-style-type: none"> • Regulations governing farm operation • Regulations on sale of produce • Zoning Laws 	<ul style="list-style-type: none"> • Local Government Officials • Urban Farm Owners 	<ul style="list-style-type: none"> • Local Laws and Regulations
Identifying Organizational Engagement and Partnership	<ul style="list-style-type: none"> • Local schools • Local social welfare initiatives • Local Green Initiatives 	<ul style="list-style-type: none"> • Superintendents and Principals of schools • Representatives from Environmental Organizations • Urban Farm Owners 	<ul style="list-style-type: none"> • Potential Market • Startup Funding • Labor • Other benefits of partnerships

3.1.1 Interview Procedure

We conducted interviews via phone, email and in person. When conducting interviews, we first identified pertinent parties to interview by speaking with our sponsor and obtaining his recommendations. In addition, we conducted our own internet research to identify local urban farms and new Nordic cuisine restaurants that touted their use of local foods. We contacted those parties via email in an attempt to schedule interviews. In the event that the individual was unavailable or located outside of Copenhagen, we sent interview questions via email. In each interview, the subjects were informed of the purpose of the research and any potential risks involved. For each interview, we tailored our questions to the individual with whom we spoke. This helped us to maximize the pertinent information gained from each interview as each individual has insight on different topics.

3.1.2 Identify Potential Markets and Feasible Business Models to Create an Economically Sustainable Urban Farm

Potential Markets

To identify potential markets, we interviewed ten individuals involved with existing urban farms. When speaking with farm managers and owners, we gained information on how they connect with customers and market their produce. We also spoke with restaurant owners and operators in Amager in order to ascertain their current supply channels and see if an urban farm could fit into their supply chains. Our team researched restaurants within Amager and greater Copenhagen that expressed interest in local produce on their websites and contacted them. Speaking to restaurant representatives provided us with insight into how they obtain their produce so that we were able to analyze where an urban farm fits best within that supply chain. Specifically, we were able to gain insight into the demand for local produce and the types of crops that these establishments would be interesting in buying.

Business Models

Speaking with urban farm operators and founders also helped us to examine urban farming business models in action. These interviews provided information on how different revenue strategies were implemented and the benefits and drawbacks of each method. We were also able to learn about how these models would work within Copenhagen specifically. Beyond the urban farms we were able to visit in person, we examined one hundred urban farms globally. We identified the revenue streams used by these enterprises and compiled these data in order to demonstrate the most common business models.

3.1.3 Assessing the Economic Viability of Urban Farming Initiatives within Amager

Economic viability is of paramount importance when creating an urban farm. The potential to be a self-sustaining enterprise is one of the large draws of these initiatives. In order to understand the economic viability of urban farms, we interviewed representatives of urban farms globally

regarding their startup costs and operation costs. These interviews helped us understand the components that require funding. We then estimated values for these costs by creating case studies of the minimum financial requirements and best case financial requirements for an urban farm. Creating these case studies involved extensive online research. The costs of contractors and farming equipment can be found by looking up vendors and researching pricing. In this way, we obtained data that creates a more accurate picture of the financials of an urban farm specifically within Amager.

3.1.4 Determining criteria for a feasible urban farm including location, farm operation, crop selection, and labor structure

One of the biggest hurdles urban farming has to overcome is land availability. Urban space is limited, land prices are high, and farming activities can sometimes be prohibited. These factors often severely limit potential urban farm locations (Lanarc & Golder, 2013). For this reason, one of the most important decisions an urban farm can make is where to establish their operation. There are several factors to consider such as availability of land, required structural support, and access to sunlight. In order to obtain this information, we conducted research using land-use databases within Copenhagen, as well as past weather data with regards to rainfall, average seasonal temperatures, and hours of sunlight. We also investigated rooftops; however, analyzing each rooftop within Amager and providing the most optimal ones was outside of our scope, and as such, we focused on identifying promising areas and identifying criteria that a potential farm site needs to meet. For instance, we focused on defining the required amounts of sunlight and the structural integrity required to support a rooftop urban farm. By providing criteria within these areas, we can define optimal sites for an urban farm within Amager without identifying specific locations.

Our interviews with founders of urban farms also allowed us to gauge the required farming operations and equipment that go into producing crops. Touring farms gave us a visual representation of a larger urban farming operation within Copenhagen. We were able to observe farming processes and obtain important details regarding farming processes, such as soil preparation, seeding, fertilizing, watering, harvesting and storing produce.

In addition, it was important to understand the environmental impacts of farming processes. We received information on the most environmentally beneficial farming practices by interviewing founders of urban farms and representatives from environmental organizations. Some of the environmental and health issues that we focused on included mitigating harmful soil contamination, preventing inorganic fertilizers and pesticides from entering water supplies, managing limited water supplies, and promoting biodiversity. From this, we were able to make recommendations on how to optimize the farm infrastructure in order for an urban farm to be as environmentally beneficial as possible.

The labor structure of an urban farming enterprise was also important. In addition to interviewing representatives of local urban farms within Denmark, we asked the urban farm employees that we emailed to provide information on the current number of employees and what other forms of labor they have used. An urban farm's labor force can take several alternative forms outside of typically paid labor, such as volunteers from environmental organizations and

paid labor of participants in rehabilitation programs. With this information, we obtained insight into the number of employees and the types of workers that would be needed, as well as how volunteers can play a role in a farming business.

Although our interviews covered issues related to crop selection, we needed to do additional research to address some of the financial and environmental details of crop selection. In addition to the demand for certain crops, we also needed to know which crops would be economically and environmentally viable. We researched the most highly consumed crops within Denmark, and for each potential crop, we estimated the cost of production and transportation versus the estimated profit. This information allowed us to evaluate which crops would be more financially viable. We also spoke to representatives of restaurants who provided insight into the potential for growing specialized crops. Also, we investigated the environmental impact of specific crops such as water consumption. We also considered the growing space and yield associated with each crop. This allowed us to provide a breakdown of which of the selected crops would be the most economically profitable.

3.1.5 Analyzing the Impact of Local Regulations on Potential Urban Farming Initiatives

Local regulations can often influence how urban farms are built as well as the products used and sold. For example, compost is an agricultural staple and many farms choose to produce their own compost on site; however, farms often have to import compost due to regulations that eliminate or reduce their composting abilities (Lanarc & Golder, 2013). Regulations can also limit farming techniques and equipment as well. In many areas, there are regulations on greenhouses because they are often thought to create noise and light pollutants within residential areas (Lanarc & Golder, 2013).

In order to gain an understanding of what regulations will come into play when creating urban farms within Amager, we not only investigated the regulations online but also interviewed representatives of current urban farms who have navigated these regulations. These interviews also allowed us to understand the roadblocks encountered when identifying and obtaining farm locations. Speaking to urban farm owners allowed us to understand the practical effects of any legislation. We addressed these questions to farm owners specifically in Copenhagen because regulations are location dependent and this sample area is the one applicable to our problem.

3.1.6 Identify Organizations and Individuals that would Engage with Urban Farming Projects

Collaboration with green organizations can be a powerful tool in the creation and maintenance of urban farms. As discussed in section 2.2, urban farms contribute more to communities than just food. Consequently, many local governments, foundations, and businesses have the incentive to provide grant funding to support organizations dedicated to sustainable local food production. We conducted internet research to examine the kinds of funding available through these organizations and compiled a list of some potential partner organizations. Additionally, through our interviews with urban farmers in Copenhagen, we were able to observe the kinds of

partnerships incorporated in their farms and learn about the potential for collaboration with companies and green advocacy organizations within the Copenhagen community.

Involvement with local schools would allow students to learn about issues related to urban farming and/or provide a market for the farm's produce. Conducting interviews with representatives from a school gardening initiative helped us to understand the educational potential of urban farming field trips and other outreach programs. This allowed us to assess local school interest in partnering with an urban farm.

In addition, our sponsor connected us with multiple social organizations looking to incorporate urban farming into their social welfare efforts. When interviewing representatives of these organizations, we sought to find out how urban farming could help further these organizations' social missions. We also learned how these organizations would interface with urban farms and investigated the potential of incorporating social welfare components into urban farming initiatives within Amager.

3.2 Summary

Through all of these conversations with individuals in social organizations, restaurants, schools, and established urban farms, we were able to gain a more comprehensive understanding of urban farming in the context of Amager. A large part of this process was comparing the experiences of individuals who have worked with urban farms in the past. These individuals could be farm founders or farm consumers; however, no matter their involvement, they were able to tell us what worked and what did not in their previous experience with urban farming. These insights allowed us to expand our knowledge of urban farming in order to provide useful recommendations for furthering urban farming projects within Amager.

4.0 Findings and Analysis

Our investigation of urban farming yielded two main types of information: numerical data and qualitative descriptions and observations. In this chapter, we summarize both types of information as they relate to the previously identified objectives. By analyzing the information we gained in relation to our project objectives, we obtained the following findings:

- 1. Urban farms utilize a combination of revenue streams including CSAs, farm stands, and restaurants.**
- 2. Urban farms use organizational profits, private funding, and grants to cover their startup and initial operation costs; these costs are primarily dictated by the size and infrastructure of the farm.**
- 3. In the crop selection process, urban farms must take into account climate, resource availability, and yield; however, the most important factor is often market demand.**
- 4. Because urban farms are relatively new within Copenhagen, many regulations are undefined, causing a challenging legal process.**
- 5. Most urban farms have a small number of permanent employees; the majority of the physical labor is often done by volunteers or participants in social welfare programs.**
- 6. Urban farms often combine social missions with profitable business models in order to involve the surrounding community.**
- 7. Due to a lack of undeveloped space, rooftops provide the most potential for urban farms within Amager; however, these rooftops must meet extensive specifications.**
- 8. Due to climate conditions, urban farms in Amager may require greenhouses in addition to traditional outdoor irrigation and growing setups.**

4.1 Revenue Streams

Urban farms utilize a combination of revenue streams including CSAs, farm stands, and restaurants. As seen in Figure 5, out of the one hundred urban farms we examined, over 90% utilized farm stands either individually or at larger farmers' markets; however, this is typically not enough to sustain an urban farm independently. Approximately three quarters of the farms that sell via farm stands also implement an alternate revenue stream. Many urban farms also implement some form of a CSA. About half of the hundred farms sampled used a CSA model. CSA structures follow the general model of having a fixed number of participants paying a standardized fee for a share of the farm's produce. These fees can be paid at different intervals and the prices vary depending upon the farm. Because the concepts of CSAs and farm stands rely on the availability of fresh produce each week, CSAs and farmers' markets cannot run year round in most places.

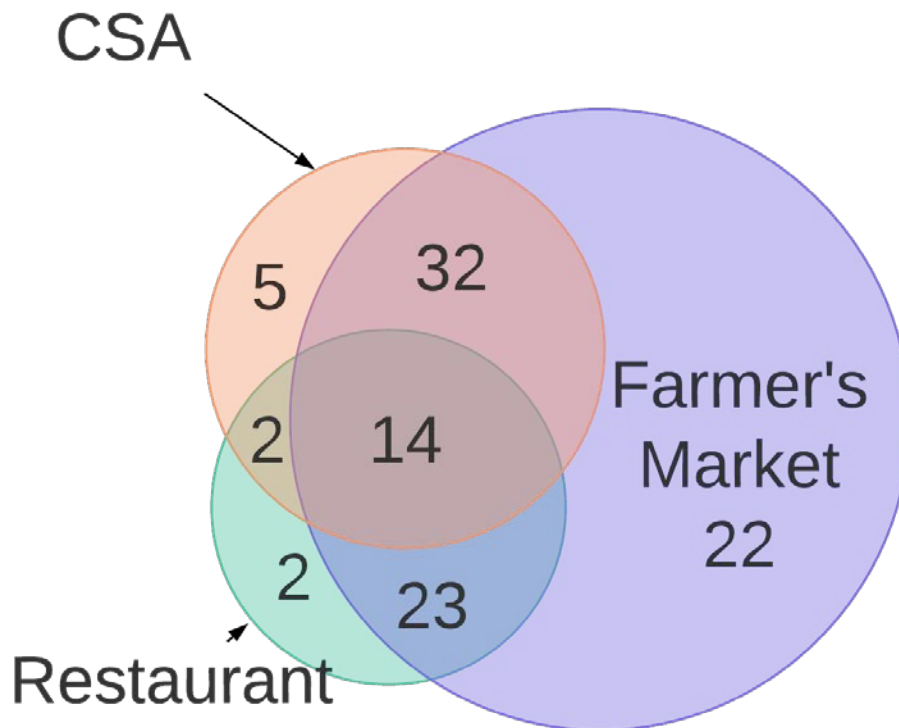


Figure 5: Farm Revenue Streams

Collaboration with restaurants is also a common strategy used by approximately half of the urban farms we examined. Due to the prevalence of the new Nordic cuisine movement in Copenhagen, restaurant collaborations may be a viable path for urban farms in this community. Representatives of urban farms within Copenhagen expressed interest in producing greens and other products for specific restaurants (S Hansen, personal interview, March 22, 2018; K Skaarup, personal interview, April 3, 2018). This model is beneficial because the profit margin is higher for specialized crops used by local high-end restaurants. Specialized crops such as edible flowers and microgreens have to be extremely fresh, which provides a business opportunity for urban farms because of their close proximity to many of Copenhagen's high-end

restaurants. Not only are these potential business partnerships a desirable strategy for urban farms as they are highly lucrative, but local produce is also in high demand from restaurants in Copenhagen. Simply through internet research, we were able to find twenty high-end new Nordic cuisine restaurants that tout their use of local produce in Copenhagen. Some of these restaurants already collaborate with farms outside of the city or even have their own farms. In addition, restaurant collaborations within Copenhagen can go further than simply supplying produce. For instance, ØsterGro has a restaurant located on the premises of the urban farm. Not only does ØsterGro help to supply food for the restaurant, but the farm also receives 6.5% percent of the restaurant's profits as compensation (K Skaarup, personal interview, April 3, 2018). This setup demonstrates the potential for multiple forms of collaboration with local restaurants.

Restaurant 56° is a prime example of restaurant and farm collaboration. In speaking with the head chef and owner, Kenneth Ellegaard, we learned that Restaurant 56° strives to use solely locally sourced organic produce. Currently, the bulk of their produce comes from the planters that they maintain on-site in conjunction with a farm outside of the city run by the restaurant. Although farms in Copenhagen are not currently part of Restaurant 56°'s supply chain, there is potential for restaurants like this one to gain value from urban farms. First, Restaurant 56°'s production is seasonal, and as such, they become reliant on imported produce as well as pickled and preserved products in the winter. Urban farms that utilize greenhouses could be used to continue production during the winter and thus provide fresh local produce when restaurant gardens are out of season. In addition, Kenneth Ellegaard of Restaurant 56° remarked that certain crops must be especially fresh. The proximity of urban farms makes them well suited to providing extremely fresh ingredients to restaurants within the city (K. Ellegaard, personal interview, April 11, 2018).

4.2 Farm Financials

Urban Farms use organizational profits, private funding, and grants to cover their startup and initial operation costs; these costs are primarily dictated by the size and infrastructure of the farm. When examining farm financials, the first category that necessitated analysis was the startup costs for an urban farm. Through our examinations of urban farms both globally and within Copenhagen, we identified a standard set of startup costs applicable to the majority of urban farming endeavors. The exact amounts associated with each item vary depending upon the size of the farm, the location, the crops being grown, and many other factors; however, the items that require funding when starting an urban farm remain consistent. Based on information from the urban farms we examined, we identified a set of costs, shown in Table 4, involved with acquiring the facilities, utilities, and legislative permits needed to create an urban farm.

Table 4: Startup Expense Items

Legislative	Facilities	Utilities
<ul style="list-style-type: none"> ● Building Inspection ● Building Permits ● Insurance ● Environmental Assessment 	<ul style="list-style-type: none"> ● Space ● Greenhouse ● Farming Tools ● Soil ● Fencing 	<ul style="list-style-type: none"> ● Electricity ● Water ● Sewage

A large initial investment is required to cover all of the costs listed in Table 4. Consequently, urban farms often negotiate partnerships or utilize available grants and funding in order to mitigate these costs. For instance, none of the urban farm owners that we interviewed paid for their land. In some instances, such as Alemany farm in California, USA and Urban Agriculture Australia in Canberra, Australia, the land was donated by their respective governments. Alternately, rooftop farms often negotiate with businesses or building owners to use their roofs for minimal rent. As the founders of ØsterGro were searching for the best rooftop to establish themselves, they found the rooftop of an old car auction house. ØsterGro’s founders negotiated with the owner of the auction house and now the farm has use of the property rent-free (K. Shaarup, personal interview, April 3, 2018).

Although rent is a significant expense, many other costs also require funding when starting an urban farm. Monetary donations are a common strategy of fundraising used to establish urban farms. For example, The Green Bronx Machine, a cooking and education program for school children in the Bronx with an indoor urban farm, was able to exceed their fundraising goal of \$33,000 using crowdsourcing on Barnraiser, a website specifically tailored to helping farmers, nonprofits, educators, as well as food startups (Schatz 2016). Similarly, the school gardens at Islands Brygge were completely community funded (J. Lundell, personal interview, April 11, 2018). Grants are often used in conjunction with private funding to pay for start-up costs. For example, Food Field Detroit received a farm service agency loan with a seven year return period (N. Link, email interview, March 19, 2018). The pursuit of grants is a viable strategy in Copenhagen as both ØsterGro and Refarmed (Appendix G) were recipients of governmental grants over 1 million DKK or approximately 160,000 USD. In addition, Refarmed also received 10 million DKK or approximately 1,650,000 USD from Field, a supermarket with which they have partnered to sell produce. For initiatives within Amager, as well as all of Denmark, there are many grants that may be applied as illustrated in Table 5. Though the initial costs can be formidable, these grants illustrate some ways to fund these projects.

Table 5: Grants Available in Denmark

Name of Grant	Description	Funding For	Amount (DKK)
Environmental Technology Development and Demonstration Program (MUDP)	These grants are designed to support development and processes related to environmental technology. The typically has a focus in one of eight areas: Water, climate adjustment, circular economy and the reuse of resources in waste, cleaner air, loess noise, fewer problematic chemicals, industrial environmental efforts, and ecological construction.	Development and demonstration	0.52 – 18.63M
Green Development and Demonstration Programme	These grants are designed to support demonstration and development of networking of business-oriented thinking in the Danish food industry, transitioning towards both economic and environmental sustainability.	Development and demonstration	0.22 – 14.9 M
InnoBooster	These grants are directed towards small to medium companies, startups, or scientists developing environmentally sustainable practices.	Research and development	0.075- 5.22 M

4.3 Crop Selection

In the crop selection process, urban farms must take into account climate, resource availability, and yield; however, the most important factor is often market demand.

Different urban farms grow many different things. From the one hundred urban farms we researched, we observed over one hundred and fifty different crops being grown. This was a result of our strategy to examine urban farms in many different climates and configurations, both of which influence the types of crops being grown. Crop selection is influenced by many factors such as available space, climate, yield, water requirements, and sun requirements. Within Copenhagen, we have found that the growing season generally runs from May through November with variations depending upon the crops being grown and the availability of greenhouses for sprouting. As seen in Table 6, each crop has a very different set of requirements and benefits.

Table 6: Sample Crop Requirements

	Grow Cycle (days)	Space per Plant (m ²)	Temp (C) Frost tolerance	Rainfall cm (Weekly)
Brussels Sprouts	90	0.389	-2.2 ≤ High	3.81
Potatoes	120	0.953	0.0 ≤ None	5.08
Tomatoes	75	0.465	12.8 ≤ T ≤ 32.2 None	2.54
Cucumbers	60	0.372	0.0 ≤ None	2.54
Peppers	100	0.272	12.8 ≤ None	5.08
Cabbage	120	0.067	-2.2 ≤ None	5.08
Broccoli	85	0.466	-3.3 ≤ High	2.54
Carrots	90	0.015	7.0 ≤ T ≤ 30.0 High	2.54
Onions	60	0.046	-2.2 ≤ High	2.54
Lettuce*	60	0.155	-2.2 ≤ T ≤ 0.6 Low	3.81

*Lettuce is the only vegetable that does not require full sunlight

Because there are so many options to consider, urban farms often begin the crop selection process by identifying the market demand and subsequently examining the feasibility of the desired crops. As discussed in section 4.1, a common urban farming strategy is to grow crops to supply directly to restaurants. Due to the preponderance of Michelin star restaurants in the city, there are many opportunities for urban farms in Copenhagen to pursue this avenue. This strategy is rewarding because crops can be sold at a premium as they are specialized and often required to be extremely fresh. For instance, in their newest urban gardening efforts, Simon Hansen, coordinator of the gardens at Urbanplannen, is planning to grow specialized lettuce and other crops to supply to a specific restaurant. Similarly, ØsterGro is looking into the potential for growing microgreens to sell to new Nordic cuisine restaurants in Copenhagen.

4.4 Regulations

Because urban farms are relatively new within Copenhagen, many regulations are undefined, causing a challenging legal process. As with the creation of any business, many legal procedures must be completed in order to establish an urban farm. Urban farms require business licenses and building permits, as well as special licenses to sell the produce they generate. In order to acquire building permits, the farming premises must undergo inspection to

ensure they comply with fire codes and zoning laws. For rooftop farms, engineers must also examine the building to confirm the structural integrity of the roof.

Additionally, in order to sell their produce, urban farms must undergo inspections to ensure their soil and water are suitable for growing and that their produce is not contaminated. In speaking with Simon Hansen, the administrator of Urbanplannen and Kenneth Ellegaard of Restaurant 56°, we learned that due to Amager's history as a center for industrial production, there is a general assumption that soil and water in that area are contaminated (S. Hansen, personal interview, March 22, 2018; K. Ellegaard, personal interview, April 11, 2018). As such, farms within this area need certifications stating that their operations are contamination free. In order to sell produce, urban farms must be inspected and subsequently authorized for production by the Danish Agricultural Agency (DAA). Furthermore, to be certified organic growers, urban farms require additional inspections from the DAA. These inspections ensure that the farm's produce meets Danish standards for organic products (The Danish Agricultural Agency, 2018).

Because these initiatives are relatively new within Copenhagen, farms sometimes encounter unprecedented regulatory issues. For instance, ØsterGro could not acquire building permits due to regulations requiring a certain number of parking spaces allocated for every building in Copenhagen. In the case of ØsterGro, the roof contained some of the required parking spaces. The urban farm eliminated those spaces causing the building to violate zoning specifications (K. Shaarup, personal interview, April 2, 2018). It can be difficult to navigate the regulatory process when creating an urban farm as some policies may change or are not strictly applicable to urban farming projects. The farm administrators that we have spoken to in Copenhagen have navigated the municipal bureaucracy by partnering with other governmental officials within environmental sectors in order to achieve some assistance in navigating the legal process.

4.5 Labor Structure

Most urban farms have a small number of permanent employees; the majority of the physical labor is often done by volunteers or participants in social welfare programs. Through investigation of urban farms globally, approximately 90% of the farms that we examined incorporated volunteers into their labor structure. There were several methods of achieving volunteer involvement. For instance, Alemany farms in San Francisco employs a 'sweat equity' model in which volunteers are rewarded for their work with produce from the farm (C. Chimenti, phone interview, March 26, 2018). Similarly, ØsterGro rewards volunteer laborers with lunch when they spend an afternoon volunteering. In these ways, urban farms are able not only to engage the surrounding community, but also to acquire free labor for their farms.

Based on our interviews and investigation, we have also found that urban farm labor provides an opportunity to incorporate social welfare initiatives into urban farming projects. For instance, at Sundholm Urban Gardens the plots are maintained by participants in Sundholm's rehabilitation programs for homeless individuals struggling with substance abuse or disability. In this way, the urban garden is used to educate these people in practical trade skills and provide flexible work opportunities for people who may not be able to maintain traditional positions. Similarly, gardening can provide work hours to lower-income residents. According to Simon Hansen of

Urbanplanen, individuals who work 225 or more hours per year are able to receive higher governmental subsidies. The urban agricultural projects incorporated into Urbanplanen serve as an opportunity for residents to easily complete these hours (S. Hansen, personal interview, March 22, 2018). Thus, urban farms present opportunities to help communities and individuals by creating flexible jobs.

4.6 Community Engagement

Urban farms often combine social missions with profitable business models in order to involve the surrounding community. The vast majority of urban farms are not strictly economically motivated enterprises. Over ninety percent of the farms we have examined mention social components within their mission statements. As such, interfacing with the surrounding community is often an integral component of these organizations. However, interactions with the surrounding community provide benefits outside of simply promoting a social mission. When we spoke with urban farmers such as those at Alemany farm, they emphasized the importance of community acceptance. In addition, some farms we researched have CSAs with over 120 participants; in order to achieve this kind of participation, the farm must engage the community. This engagement spreads awareness and advertises for their farm as well.

Farms also engage with organizations such as schools and businesses. Many farms hold workshops with a non-profit social mission structure, while others hold workshops as profitable ventures. For instance, many farms strive to advance their social missions through partnering with schools and promoting environmental education in their communities. Some farms also charge a fee to companies for hosting retreats or other events. Additionally, corporate partnerships can take the form of finding corporate benefactors that will pay to have their names associated with local products. These associations with urban farms provide opportunities for companies to engage in charitable activities and bolster positive public images for their organizations (C. Chimenti, phone interview, March 26, 2018).

4.7 Farm Location Prerequisites

Due to a lack of undeveloped space, rooftops provide the most potential for urban farms within Amager; however, these rooftops must meet extensive specifications. As discussed in chapter two, there are three main types of urban farms: vacant lot farms, vertical farms, and rooftop farms. When examining Miljøpunkt Amager's region of interest comprised of Amager Øst and Amager Vest, we found that rooftop farms are the most feasible option due to space limitations. Rapid population growth and substantial development in Copenhagen restrict potential urban farming locations within Amager. As shown in Figure 6, the population is expected to grow by 36% between 2005 and 2027, with an estimated 100,000 new Copenhageners in the next 10 years (Københavns Kommune, 2015). According to Copenhagen's 2015 Municipal Plan, the city needs 45,000 new homes by 2027 to accommodate this substantial population increase (Københavns Kommune, 2015). The municipality's 2014 urban development plan shown in Figure 7 shows the proposed development areas within Amager (Københavns Kommune, 2014). The school gardens at Islands Brygge have encountered this challenge first

hand. The gardens have been forced to relocate twice due to their land being re-allocated for development. In addition, new construction may block sunlight from reaching the garden which is a common challenge growing at ground level within urban areas (Johanna Lundell, personal interview, April 11, 2017). In addition to the municipality's urban development regions, publicly accessible green areas account for much of the remaining undeveloped space within Amager as illustrated in Figure 8. Consequently, available ground space for urban farming is limited.

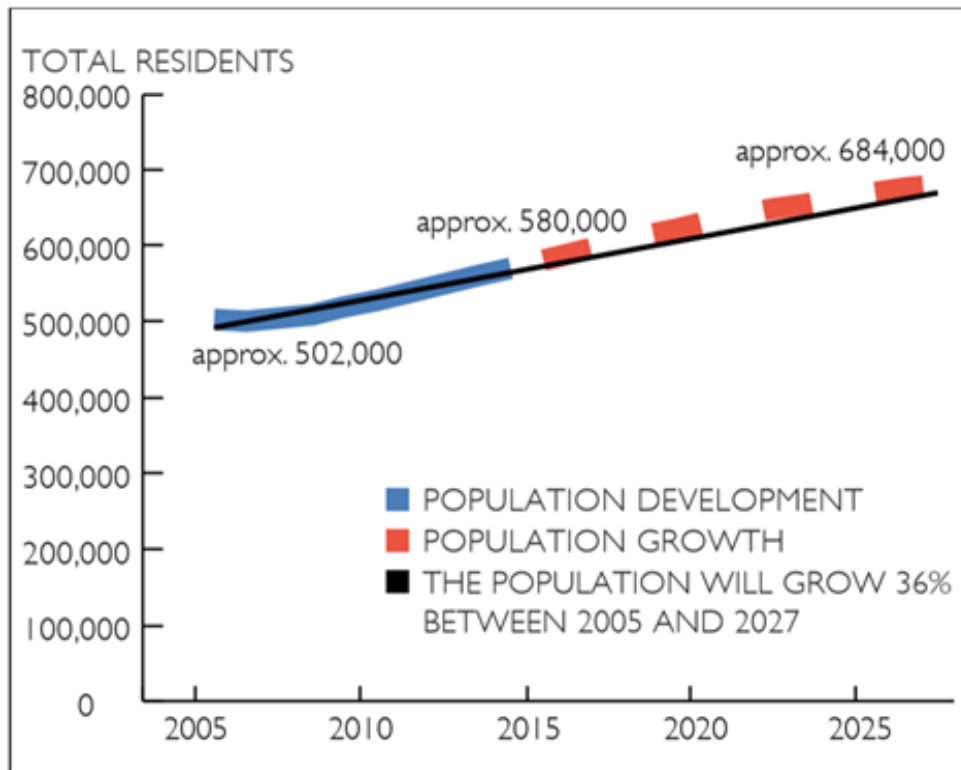


Figure 6: Copenhagen Projected Population Growth 2005-2025 (Københavns Kommune, 2015)

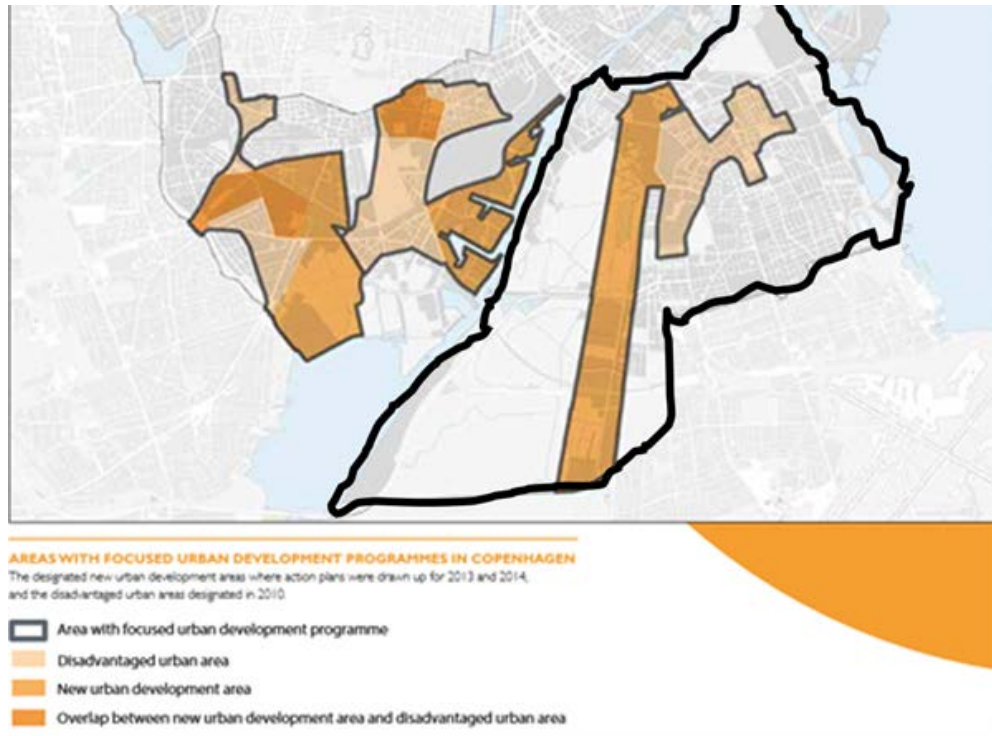


Figure 7: Focused Urban Development Areas in Copenhagen (Københavns Kommune, 2014)

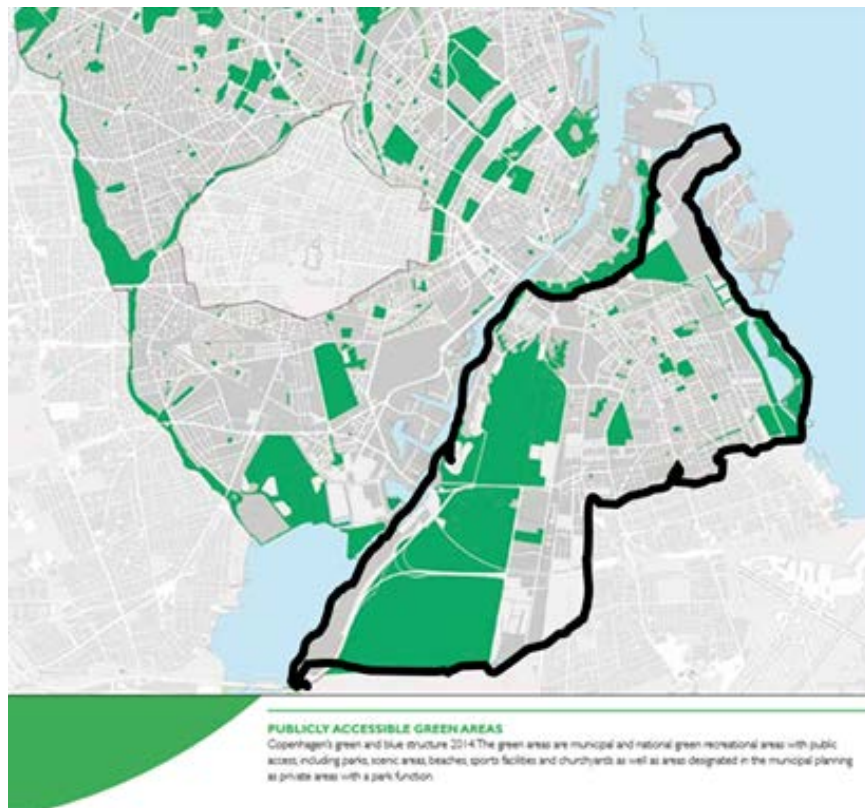


Figure 8: Government Protected Green Areas in Copenhagen (Københavns Kommune, 2014)

Another challenge facing vacant lot farms is soil contamination. In speaking with Kenneth Ellegaard from Restaurant 56 Grader and Simon Hansen from Urbanplanen, we learned that Amager has a history of industrial production and as a result, the area is known for contamination. Although this contamination is unlikely to affect the plants, Amager's reputation for contamination may hinder sales (Kenneth Ellegaard, personal interview, April 11, 2017; Simon Hansen, personal interview, March 22, 2018). Vacant lot farms may also run into security and animal control problems. Simon Hansen said that theft and vandalism were two of the biggest concerns starting the gardens at Urbanplanen (Simon Hansen, personal interview, March 22, 2018).

Although vertical farms do not require undeveloped space, this method of urban farming still presents significant challenges. First, the projected population increase in Copenhagen will likely affect the amount of available space within existing buildings. From the 2015 municipal report, the projected number of new homes needed within Copenhagen assumed that some new residents would move into currently vacant buildings. They estimate that 8,000 to 10,000 new dwellings are expected to be built in the existing city in the form of individual projects, development of empty plots, loft flats, etc., as well as through the conversion of older, outdated office and commercial properties (Københavns Kommune, 2015). Thus, the potential for vertical farming will be hindered by the lack of vacant building space within the next 10 years. In addition, vertical farms must rely solely on artificial lighting since the operation is conducted within buildings with no access to sunlight. Sunlight is far more energy efficient and also more effective for growing than LED light sources. Jenn Frymark, chief greenhouse officer at Gotham Greens, says that "plants thrive in a photo synthetically active radiation range between 400 and 700 nanometers and LEDs only emit light at peak frequencies—480, 560, 700—missing a large part of the spectrum" (Link, 2016). From an environmental perspective, vertical farms do not offer many of the benefits discussed in the background chapter. Because vertical farms operate within buildings, they don't provide some important environmental impacts such as reducing GHG emissions and storm water mitigation.

In contrast, urban farming on rooftops is a promising strategy for the Amager community. Established rooftop farms exist elsewhere in Copenhagen and can provide invaluable information on the logistics involved with creating and running rooftop farms in this community. In addition, flat, empty roof space is readily available within Amager. Figure 9 shows an analysis of rooftops within the Amager sector of Copenhagen. The red rooftops have no inclination, indicating that these rooftops are ideal candidates for rooftop farms. Therefore, rooftop farms have the most potential due to the availability of space and information for these projects.

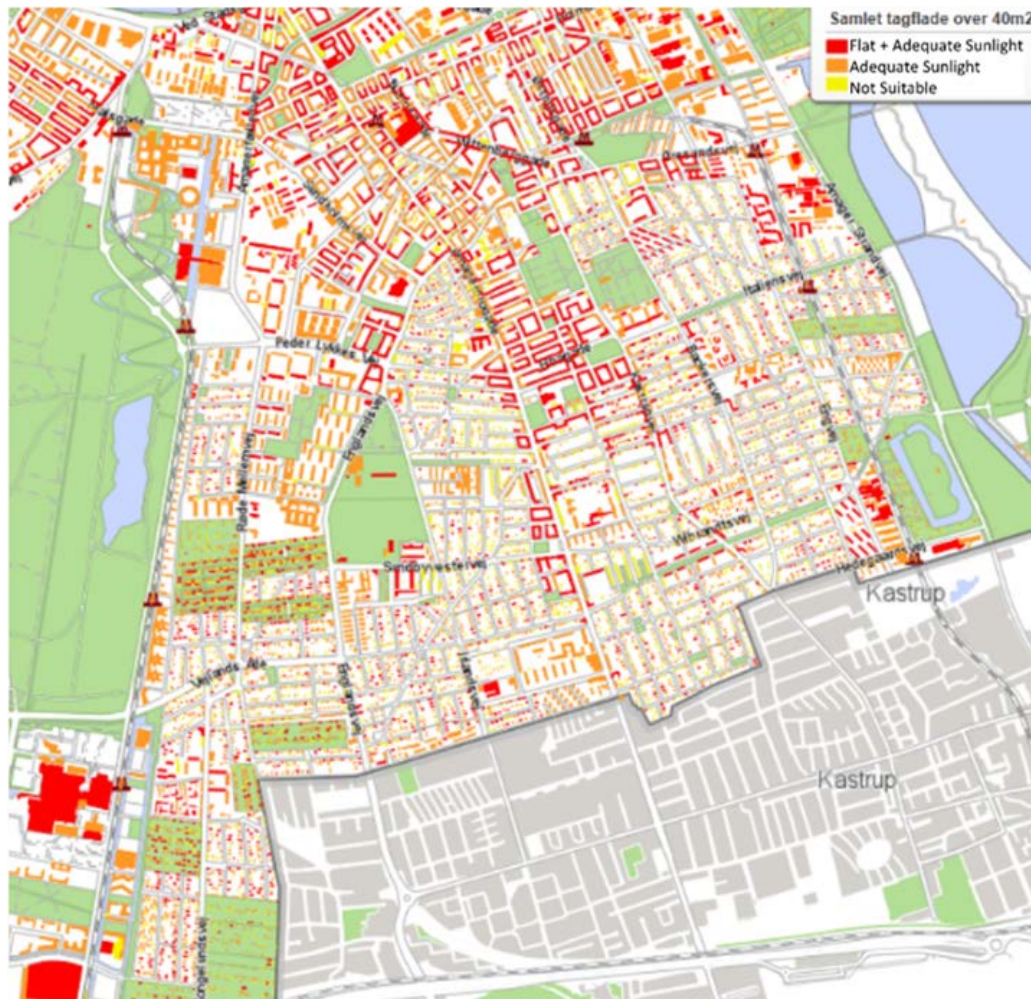


Figure 9: Sunlight Analysis of Amager rooftops (Københavns Kommune, n.d.)

Although there are many flat rooftops within Amager, there are extensive specifications for a rooftop to be suitable for an urban farm. First, a rooftop farm requires unobstructed sunlight. Thus, it is important to examine sun and shade patterns throughout the day. In addition, the rooftop cannot be in close proximity to industrial plants or active chimneys because this increases the risk for chemical contamination. The structural integrity of the rooftop is also a limiting factor. Rooftop farms can easily weigh as much as 500 kg per square meter (Iannotti, 2017). There are also variable factors such as snow and storm water that can further increase the weight of the farm operation. A heavily vegetated green roof with 20-40 centimeters of growing medium can hold between 10-15 centimeters of water, which can generate problematic loads on the roof structure (Iannotti, 2017). Furthermore, there are infrastructure-related regulations in Copenhagen. For example, buildings with three stories or more must be fitted with at least one lift that can serve each floor, including any habitable roof space and basement, but residential houses are often exempt from this provision. Also, if there is an operation taking place on the roof, the entire perimeter must be fenced. There are also fire code regulations. For example, any operation involving people requires an outdoor staircase from the roof.

4.8 Farm Infrastructure

Due to climate barriers, urban farms in Amager will likely require greenhouses in addition to traditional outdoor irrigation and growing setups. The most important climate factors to consider include sun, temperature, rain, wind, and snow. On average, the majority of root and fruiting vegetables require at least six hours of direct sunlight daily (Ecological Garden). Table 7 shows that for over half of the year Copenhagen does not receive the necessary amount of sunlight for these plants to grow. For crops that have a turnover rate of about 30 days, there would only be enough sunlight for a growing season that would produce 4-5 turns per year. Similarly, since Copenhagen has a relatively cold climate, the temperature may pose a problem as well (Table 8). However, there are strategies to increase roof microclimate temperatures. The material of the rooftop can be used to increase the temperature of the roof. Materials like concrete and gravel possess heat storing properties (Green Growing Guide 2014). Additionally, greenhouses regulate temperature and can provide viable growing space when external temperatures are unsuitable.

Table 7: Copenhagen Average Monthly Sunlight (ClimaTemps Online Database, n.d.)





	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
 Average Sunlight Hours/ Day	01:09	01:56	03:48	05:22	07:54	08:10	07:42	06:40	05:14	02:48	01:08	00:36	04:23
 Average Daylight Hours & Minutes/ Day	07:44	09:33	11:47	14:10	16:16	17:26	16:54	15:02	12:43	10:20	08:15	07:08	12:00
 Sunny & (Cloudy) Daylight Hours (%)	16 (84)	21 (79)	33 (67)	39 (61)	49 (51)	48 (52)	46 (54)	45 (55)	42 (58)	28 (72)	14 (86)	9 (91)	37 (63)
 Sun altitude at solar noon on the 21st day (°).	14.5	23.8	34.6	46.2	54.5	57.8	54.7	46.4	35	23.5	14.4	11	34.7

Table 8: Copenhagen Average Monthly Temperature & Rainfall (Climate-Data Database, n.d.)

	January	February	March	April	May	June	July	August	Sep- tember	October	November	December
Avg. Temperature (°C)	-8.8	-7.8	-2.3	5.1	11.7	16.6	19	18.1	13.9	7.9	1.9	-5.4
Min. Temperature (°C)	-14	-13.3	-7.5	-0.4	5.5	10.5	13.1	12.2	8.2	2.5	-2.2	-10
Max. Temperature (°C)	-3.5	-2.2	2.9	10.7	17.9	22.7	25	24	19.6	13.4	6.1	-0.8
Avg. Temperature (°F)	16.2	18.0	27.9	41.2	53.1	61.9	66.2	64.6	57.0	46.2	35.4	22.3
Min. Temperature (°F)	6.8	8.1	18.5	31.3	41.9	50.9	55.6	54.0	46.8	36.5	28.0	14.0
Max. Temperature (°F)	25.7	28.0	37.2	51.3	64.2	72.9	77.0	75.2	67.3	56.1	43.0	30.6
Precipitation / Rainfall (mm)	96	76	80	88	91	92	89	107	112	101	121	111

Irrigation systems ensure that all crops receive an appropriate amount of water consistently through the growing cycle. Many farms, such as the four farms under Gotham Greens, recycle all of their irrigation water for reuse to minimize the use of potable water. (Gotham Greens).

Because Copenhagen receives extensive rainfall for most of the year, as seen in Table 8, precipitation could assist with watering outdoor crops in addition to traditional irrigation systems. Most crops have a water need within $\pm 20\%$ of grasses, so the biggest determining factor is the average temperature. For grasses in temperatures below 25°C , the required water per day is up to 8mm (C. Brouwer, M. Heibloem, 1986). Therefore, even in months with the greatest amount of rainfall (Table 8), irrigation systems are necessary since rainwater alone would not provide enough water to crops. Tanks for collecting rainwater could be used to help provide water to indoor and outdoor irrigation systems as well as long as the roof structure is able to support them. Alternatives to conventional irrigation such as hydroponics and aeroponics would reduce the weight load on the roof as soil would be replaced with lighter growing mediums.

Wind and weather are also important factors to consider. Wind strength increases with height and can have a dehydrating effect on vegetation. Consequently, wind exposure can influence crop selection and irrigation requirements (Green Growing Guide 2014). However, snow and below freezing temperatures are the biggest limitation to the length of the outdoor growing season. Heavy snow can weigh down on crops, significantly reduce temperatures, and block crops from receiving sunlight. Therefore, there needs to be a system for shielding crops from snow.

Due to the climate and weather conditions, growing crops outside year round is not feasible. Indoor facilities such as greenhouses are often used to extend the growing season. Of the farms we examined, over 60% of farms above 40 degrees' north latitude have a greenhouse. Greenhouses allow farms like ØsterGro to extend the production season by cultivating seedlings in their greenhouse while outdoor conditions are unsuitable. This preparation saves time when the growing season begins. Some greenhouses also use more advanced control systems that regulate the CO_2 concentration, humidity, temperature, and amount of light to ensure the optimal growing conditions. Gotham Green's Pullman rooftop farm in Chicago uses an advanced control system that allows 25 crop turns per year for cabbage, compared to three crop turns per year through conventional rural farming (Link, 2016). These controlled greenhouses reduce the duration of the turning period by achieving optimal growing conditions and allow more turns per year by extending the growing season from three to five months to all year.

5.0 Case Studies

From our research on the potential for urban farming within Amager, we developed case studies that outline the basic logistical and financial considerations involved with starting an urban farming business. In conducting these case studies, we primarily focused on four main variables: revenue streams, subsidized rent, volunteer labor, and greenhouses. In varying revenue streams, we created economic models for a CSA, farmer’s market, and restaurant collaboration, and modeled farms with different combinations of these three revenue streams. Because we observed that many farms negotiated for negligible rent, we also compared farm profitability when paying rent compared to when rent is subsidized. Similarly, we observed the effect of eliminating paid labor in favor of free volunteer labor on farm success. Lastly, we examined farms that increase production via extending the growing season with greenhouses versus farms that lack greenhouses and only have sheds to store tools. By varying these components, we are able to demonstrate a range of economic situations for a 500 square meter rooftop farm in Amager. The four cases we examined can be seen in Table 9.

Table 9: Case Descriptions

	Subsidized Rent	Greenhouse	CSA	Farmer’s Market	Restaurant	Volunteer Labor
Case 1	✓	✓	✓	✓	✓	✓
Case 2				✓		
Case 3			✓			
Case 4			✓			✓

5.2 Model Development

We modeled what we have seen to be a typical rooftop urban farm. In these case studies, the simulated farm is located on a 500 square meter rooftop. We chose a 500 square meter farm as we found that to be the average size of flat rooftops within Amager (København Kommune, n.d.).

5.2.1 Business Models

We considered three revenue strategies: CSA, farmer’s market, and restaurant collaboration. In modeling a CSA, we estimated sixty participants based upon the size of the farm, projected crop yields, and the CSA models we have observed in working farms. Due to Copenhagen’s seven month growing season, we projected a twenty-four week CSA which leaves room for growing weeks prior to vegetable production. In our CSA calculations, we attempted to emulate preexisting CSAs we observed with 5 kg weekly shares costing 3,600 kr. annually. This CSA structure allocated approximately half of the produce to the CSA. In modeling farm stands, we predicted profit by assuming the produce is sold at standard Danish market value. For restaurant collaborations, we assume the farm is profit sharing with Michelin star restaurants. From there we found that restaurants typically have 3% profit margins (Statista, 2016). Extrapolating this

three percent from the gross revenue of the restaurant allows us to obtain the restaurants' daily profits. We then allocate six percent of this profit to the farm based on our observations of other farm-restaurant profit share relationships.

5.2.2 Crop Selection

In deciding what to grow on our simulated farms, we selected nine vegetables, seen in Table 10, rated highly for efficiency based on yield per square meter, average selling price, and growing time (National Garden Bureau, 2017). We verified the selling prices of these crops by observing pricing in Danish grocers and cross-referenced our selected crops with the most popular vegetables in Denmark. Growing space is divided equally between these nine crops. For restaurants, we assume the farm would grow microgreens and other specialty crops in a greenhouse solely for the restaurant.

Table 10: Profitable Crops

Crop	Yield/Area (kg/m²)	Grow Cycle (Days):	Selling Price/kg (DKK)
Tomatoes	9.9	75	19 kr.
Lettuce	2.8	60	11 kr.
Turnips	5.4	90	29 kr.
Peppers	8.4	100	32 kr.
Beets	5.9	80	30 kr.
Broccoli	1.9	85	32 kr.
Carrots	30	90	4 kr.
Cucumbers	2.5	60	21 kr.
Onions	9.8	60	9 kr.

5.2.3 Startup Costs

In estimating startup costs for an urban farm, we used a Danish farming vendor to obtain prices for purchases such as wood, dirt, tools, lights, and fencing (XL-Byg, n.d.). We also priced agricultural systems such as irrigation systems and greenhouses through Danish farm suppliers. When not using a greenhouse, we assumed the farm would require a shed. In addition, we accounted for the cost of installation of walkways and composting bins. When estimating the cost of structural inspections and subsequent roof reinforcement, we could not find Denmark specific information. Consequently, we estimated inspection and roof reinforcement costs based

on a case study detailing inspections conducted in the United States (Agdas, D. et al., 2016). All of the startup costs are detailed in Table 11.

Table 11: Startup Costs

	Case 1	Case 2, 3, & 4	Source
Inspections	10.000 kr.	10.000 kr.	(Agdas, D. et al., 2016)
Fence	0 kr.	58.000 kr.	(XL-Byge, n.d.)
Roof Reinforcement	8.000 kr.	8.000 kr.	(Parskiy, N. D. et al, 2017)
Tile/Walkway	15.000 kr.	19.000 kr.	(XL-Byge, n.d.)
Wood	11.000 kr.	13.000 kr.	(XL-Byge, n.d.)
Plywood	40.000 kr.	34.000 kr.	(XL-Byge, n.d.)
Topsoil	25.000 kr.	25.000 kr.	(Boland's, 2018)
Tools	8.000 kr.	8.000 kr.	(XL-Byge, n.d.)
Greenhouse/Shed	41.000 kr.	1.000 kr.	(XL-Byge, n.d.)
Lighting	5.000 kr.	5.000 kr.	(XL-Byge, n.d.)
Irrigation System	2.000 kr.	2.000 kr.	(XL-Byge, n.d.)
Construction of Beds	81.000 kr.	139.000 kr.	Installation cost = material cost
Total	246.000 kr.	322.000 kr.	

5.2.4 Operation Costs

The farm must pay for rent, labor, utilities, and general maintenance. In calculating rent costs, we were unable to identify the cost of roof-space rental in Copenhagen; however, we were able to find the cost of renting roof for solar panels in Germany. Extrapolating rooftop rental costs from there, we estimate rent for a 500 square meter rooftop farm to be 4.000 kr. annually.

Based on the size of our project and our observations of other functional farms, we budgeted for two paid employees. We also account for the cost of hiring unskilled labor when necessary by accounting for an employee being paid Danish minimum wage (Statistics Denmark, 2017). In analyzing utilities, we identified the need for water and electricity. We determined the water needs of the farm based on the water demand of our selected crops and average rainfall from May through November. One cubic meter of water costs 40.29 kr (Danish Ministry of the Environment, n.d.). In addition, we set aside a contingency fund equivalent to ten percent of our operational costs. This fund is meant to account for depreciation on tools and infrastructure and any other unexpected expenses. The full breakdown of operational costs can be found in Table 12.

Table 12: Annual Operational Costs

	Case 1	Case 2,3	Case 4	Source
Rent Yearly	0 kr.	4.000 kr.	4.000 kr.	(Solar Facts and Advice, 2013)
Farm Laborer*	0 kr.	160.000 kr.	0 kr.	(Statistics Denmark, 2017)
Manager	240.000 kr.	240.000 kr.	240.000 kr.	
Water	5.000 kr.	5.000 kr.	5.000 kr.	(Danish Ministry of the Environment, n.d.)
Seedling Starts	400 kr.	400 kr.	400 kr.	(XL-Byge, n.d.)
**Electricity	30.000 kr.	60.000 kr.	60.000 kr.	(Statista, 2016)
Seeds	1.200 kr.	900 kr.	900 kr.	(Aamlid, T. S. et al, 2007)
Compost	3.000 kr.	3.000 kr.	3.000 kr.	(Danish Topic Center, 2016)
***Miscellaneous	30.000 kr.	47.000 kr.	31.000 kr.	
Total	310.000 kr.	520.300 kr.	344.300 kr.	

*In Case 1 and 4, farm laborers are volunteer based including the main farmer

**In Case 1 electricity is partially subsidized as observed in our research

*** We set aside a ten percent contingency fund equivalent to our annual operational cost

5.3 Results

In examining the projections for each of these cases, we observed that Case 1 is successful and breaks even during the fourth year of operation, making 340.000 kr. over five years (Figure 10). We anticipated this result as Case 1 represents the ideal scenario for urban farm creation. In reality, it is unlikely a real world urban farm will be created in this optimal scenario. Consequently, we created Cases 2, 3, and 4 in order to model a farm that is both economically viable and realistic.

Case 2 loses approximately 2,1 M kr. by year five. Similarly, Case 3 also loses money; however, it reduces the deficit seen in Case 2 by 1,5 M kr. The only difference between these two scenarios is that Case 2 uses a farm stand while Case 3 uses a CSA. This comparison shows that CSA is a more profitable strategy than a farmer's market. Because both Case 2 and 3 result in a deficit, the farm model requires adjustment in order to become profitable. By assuming all physical labor is performed by volunteers, we obtain Case 4 which demonstrates a successful model. Case 4 breaks even in year five and makes 290.000 kr. over the first five years. Thus, Case 4, a 500 square meter farm with volunteer labor and a CSA, provides an example of an economically and logistically viable urban farming initiative within Amager.

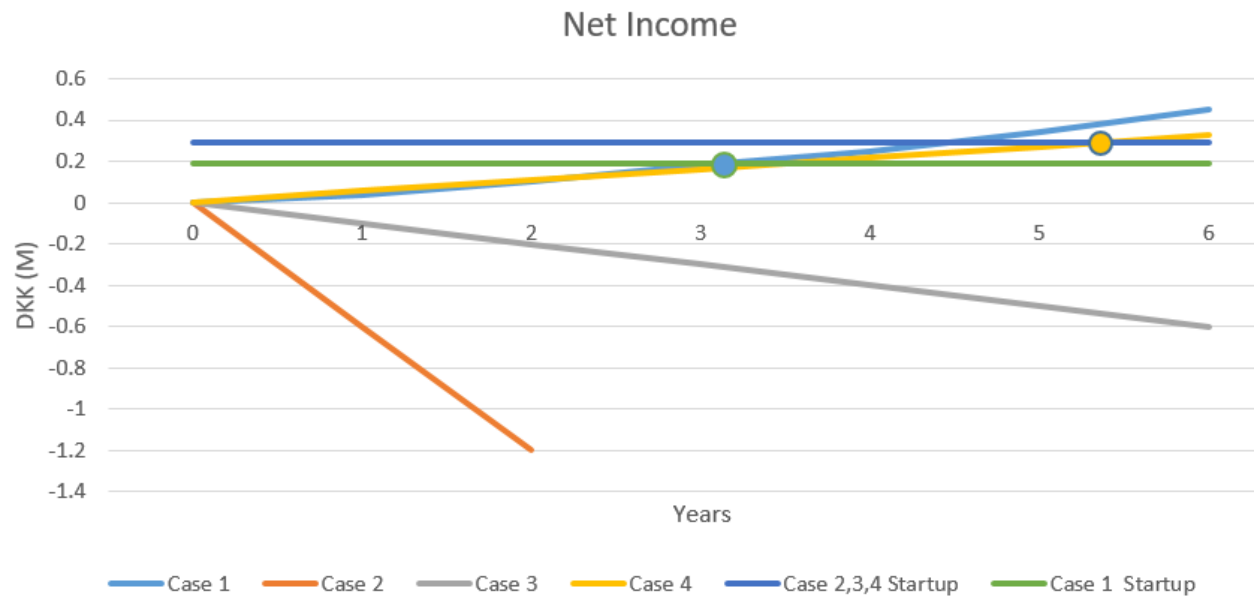


Figure 10: Net Income

6.0 Conclusions and Recommendations

After investigating the many facets of urban farming, we were able to gain insight into the economics, logistics, and social implications of urban farming projects within Amager. Our group analyzed the many revenue streams and costs associated with urban farms. In addition, we examined the logistics of creating an urban farm including the legal process, location identification, physical infrastructure and crop selection. The team also investigated the social component by pinpointing the ways that community members interface with urban farming and by exploring the potential for urban farming to advance social causes within the community.

Economically, we found that **urban farms utilize a combination of revenue streams that include CSAs, farm stands, and restaurants.** Our group noticed this trend when examining the economic strategies of urban farms globally. In these investigations, we also found that **urban farms use organizational profits, private funding, and grants to cover the startup and initial operation costs of urban farms; these costs are primarily dictated by the variable size and infrastructure of the farm.**

Logistically, we examined the issues of regulations, location, infrastructure, and crop selection on urban farms. On the regulatory side, it became evident that **because these initiatives are relatively new within Copenhagen, many regulations are undefined, causing a challenging legal process.** Operations on rooftops also result in specific challenges. **Due to a lack of undeveloped space, rooftops provide the most potential for urban farms within Amager; however, these rooftops must meet extensive specifications.** Rooftop farms in Copenhagen require more than just specified regulations. **Due to climate barriers, urban farms in Amager will likely require greenhouses in addition to traditional outdoor irrigation and growing setups** to grow their produce. Greenhouses are necessary because they extend the growing season and protect delicate crops from the cold climate of Copenhagen. Although some crops are hardy enough to grow outdoors in the Copenhagen weather, these hardy crops are often not the most profitable options. **In the crop selection process, urban farms must take into account climate, resource availability, and yield; however, the most important factor is often market demand.**

Lastly, we found that **urban farms often combine social missions with profitable business models in order to involve the surrounding community.** One frequent opportunity for this community involvement can be found in the farm labor. **Although most urban farms have a small number of permanent employees, the majority of the physical labor is often done by volunteers or participants in social welfare programs.** Volunteer work allows urban farms to interact with their community and to add value to their enterprise. Not only are they an economically sustainable environmental initiative, but they are able to incorporate social missions as well.

Over the course of this project, we were able to gain comprehensive insight into the impacts and requirements of urban farming. This understanding of urban farming practices allowed us to create economic models of potential implementations for urban farms in this community. The projections of these models not only serve to show the comparative profitability of different

urban farming practices, but also clearly demonstrate that creating a logistically and economically practicable urban farm in Amager is an achievable goal. Therefore, in this examination of urban farming, we have demonstrated that urban farming is a feasible enterprise in the Amager community.

6.1 Recommendations

After examining all of these facets of urban farming initiatives, we identified three overarching recommendations to promote urban farming within the Amager community.

- **Continue to research the logistics of urban farming.**
- **Streamline the process of establishing an urban farm by creating municipal support initiatives.**
- **Network with the Amager Community.**

6.1.1 Research

Over the course of this project we have conducted extensive research into the components of urban farms; however, there is room for further inquiry. Specifically, **prospective urban farmers should further investigate farm revenue streams, crop selection, and farm infrastructure.** Through our research, we identified the three most common market strategies implemented by urban farms: CSA, farm stand, and restaurant collaboration. We were able to examine the frequency of these approaches and the varying methods of combining revenue strategies. Although these are the three main methods of selling produce, there is variation within these strategies. For instance, ØsterGro's CSA requires a flat rate payment but does not require any labor. Conversely, farms such as Alemany farms do not require a monetary contribution but instead employ a "sweat equity" system where participants are expected to contribute to the labor on the farm (C. Chimenti, phone interview, March 26, 2018; K Skaarup, personal interview, April 3, 2018). Although we observed different examples of CSA, farm stands, and restaurant collaborations, our research did not extend to analyzing the different methods of executing each of these profit strategies. Consequently, we recommend that organizations looking to promote urban farming, such as Miljøpunkt Amager, conduct further research into the optimal methods of implementing each revenue strategy. This research would identify the most profitable and easiest methods of selling produce using each of these profit models.

When looking into crop selection, we were able to identify the contributing factors and the variety of available crops. However, identifying the benefits and drawbacks of specific crops proved outside of our scope. We learned that the key factor in crop selection is growing the correct crops for the market. Our group believes the next step is conducting market research to single out the crops in high demand in the Copenhagen market. In addition, this research could be expanded to analyze these crops in terms of yield and market value. All of this research

would allow urban farming projects to be able to identify the most profitable crops to grow in Copenhagen's specific market.

Lastly, prospective urban farmers should further examine greenhouse infrastructure. We were able to identify the need for greenhouses, but looking at the advantages and disadvantages of specific greenhouse structures outside of our focus. Identifying the most economical and environmentally friendly greenhouse options would be a productive continuation of this research. Research could include investigations of the advantages and drawbacks of systems such as aquaponics and hydroponics, as well as alternate methods of protecting plants and extending the growing season.

6.1.2 Municipal Support Initiatives

The municipality of Amager could help to facilitate urban farming projects within the community. First, the Technical and Environmental Management division of the municipality could assist in the identification of potential urban farm locations. In previous years, this division has examined rooftops for optimal solar panel locations. Similarly, the municipality could conduct a survey of rooftops to identify those already equipped for urban farms. In our research, we were able to identify many of the attributes required of a rooftop in order to make it a viable candidate for an urban farm. The next step is to apply these qualifications to rooftops within Amager in order to identify optimal locations for urban farms.

Another strategy that could be used to promote urban farming is providing incentives to building owners that host farms on their roofs. In our research, we found that many rooftop urban farmers negotiate with building owners for extremely low or nonexistent rent payments. This agreement would accelerate profitability in the farm's initial stage, which would help the farm become an economically sustainable business faster. On a larger scale, motivating building owners to collaborate with urban farms through tax or utility breaks would help in the development of urban farming projects within Amager.

Finally, one of the largest hurdles facing urban farming projects within Amager is legislation. Because urban farming initiatives are relatively new within Copenhagen, many regulations are undefined, causing a challenging legal process. In order to combat this, we recommend compiling a document detailing all of the regulations that apply to rooftop urban farming projects. A compiled document would allow for more standardized expectations between the municipality and the prospective farmers, streamlining the legal process associated with creating urban farms.

6.1.3 Networking with the Amager Community

One of the most significant findings we gleaned from our research is the value of community outreach. **As a result, we recommend that Miljøpunkt Amager pursue community outreach to establish connections with individual citizens, potential economic partners, and social**

organizations. These connections assist in both establishing the farming enterprise and in furthering the impact of a pre-existing operation.

Individual citizens are important contributors to urban farming initiatives. Our research showed that the majority of urban farm labor comes from community volunteers. We also learned that community acceptance and support is extremely beneficial for urban farming initiatives. We recommend reaching out to the local community members in order to gain support for these initiatives, as well as getting individuals involved in the process of establishing and running urban farms within Amager. Gaining support could be achieved through public programming, social media outreach, marketing campaigns, or in-person conversations.

In addition to networking with individuals, networking with companies and organizations also provides extensive potential. Many companies have programs to promote sustainability and community service. It would be beneficial to Miljøpunkt and similar advocacy organizations to interact with companies and organizations that would be interested in funding or sponsoring new urban farming initiatives. This type of networking is how organizations like ReFarmed obtained much of their funding.

Miljøpunkt Amager should also continue to network with social welfare organizations. Not only does urban farming have the potential to be an environmental boon to the community, but it can also be integrated into social welfare programs in a mutually beneficial relationship. Interfacing with social welfare programs often provides a labor force for the farm while adding value to the community. Integrating a social mission into the urban farm may also help to gain more grants and funding from sectors outside environmental activism.

6.2 Technology and Society

As with the implementation of any new technology, urban farming has a multitude of implications outside of the technical considerations. When examining this problem, our team had to consider the economic, social, political, environmental, and public health impacts of urban farming. The integration of social missions into urban farms exemplified the effectiveness of this interdisciplinary outlook. By looking at urban farming from a social standpoint, one can see its potential as a source of employment for the disadvantaged within a community. Economically, this partnership is beneficial because it provides low-cost labor to the farm. In addition, it establishes an urban farm within the community which furthers environmentalism. Providing this type of employment also has beneficial impacts both politically and on public health. It is important to look at urban farming from a variety of perspectives outside of the technical because it is this type of thinking that promotes new ideas that have an impact outside of simply creating the most efficient technical model. Consequently, urban farming within Amager has the potential to exemplify the benefits of the integration of socially conscious technological progress.

References

- Aamlid, T. S., Havstad, L. T., & Boelt, B. (2007). Seed Production in the Northern Light. *Bioforsk FOKUS*, 2, 0809-8654
- Added Value Farms. (n.d.). Who we are. Retrieved from <http://www.added-value.org/mission/>
- Agdas, D., Rice, J. A., Martinez, J. R., & Lasa, I. R. (2015). Comparison of visual inspection and structural-health monitoring as bridge condition assessment methods. *Journal of Performance of Constructed Facilities*, 30(3), 04015049.
- Agritopia. (n.d.). The farm. Retrieved from <http://thefarmatagritopia.com/the-farm/the-commercial-farm/>
- Armstrong, D. (2000). A survey of community gardens in upstate New York: implications for health promotion and community development. *Health and Place*, 6(4), 319-327. doi:10.1016/S1353-8292(00)00013-7
- Alemany Farms. (n.d.). About us. Retrieved from <http://www.alemanyfarm.org/about-us/>
- Atlantic Beach Urban Farms. (2018). Atlantic Beach Urban Farms. Retrieved from <https://www.atlanticbeachurbanfarms.com/>
- Baltimore Free Farm (2018). About us. Retrieved from <https://www.baltimorefreefarm.org/>
- Boggy Creek Farm. (n.d.). History of the Farm. Retrieved from <https://www.boggycreekfarm.com/history>
- Boland's Excavating and Topsoil. (2018). 2018 Prices. Retrieved from <http://bolandstopsoil.com/prices/>
- Bougnom, B. P., & Piddock, L. J. (2017). Wastewater for urban agriculture: a significant factor in dissemination of antibiotic resistance. *Environmental Science & Technology*, 51(11), 5863.
- Brick Street Farms. (n.d.). Mission Statement. Retrieved from <http://www.brickstreetfarms.com/when-where/#mission-statement>
- Brooklyn Grange. (n.d.). About Brooklyn grange. Retrieved from <https://www.brooklyngrangefarm.com/about-brooklyn-grange-1/>
- Cities Climate Leadership Group. (2017). *C40 Cities Bloomberg Philanthropies Awards*. Retrieved from <http://www.c40.org/awards>
- Caviccio Greenhouses. (2018). The farm - about us. Retrieved from <http://www.cavicchio.com/about-farm/about-us/>
- Cherry Hill Urban Garden. (n.d.). History. Retrieved from <https://cherryhillurbangarden.wordpress.com/about/>
- Chimenti, Chris. (2018, March 26). Phone Interview.
- City of Copenhagen Technical and Environmental Administration. (2009). *Copenhagen climate plan*. City Hall, Copenhagen
- Civic Works. (n.d.). About us. Retrieved from <http://realfoodfarm.civicworks.com/about-us/our-farm/>
- CivicWorks. (2014). Introducing civic works. Retrieved from <https://civicworks.com/about-us/>
- Common Good City Farm. (n.d.). About us. Retrieved from <http://commongoodcityfarm.org/about>
- Commonwealth Urban Farms of OKC. (n.d.). About us. Retrieved from <http://commonwealthurbanfarms.com/about/>
- Cottonwood Urban Farm. (n.d.). Who we are and where we're going. Retrieved from <http://www.cufarm.org/about.html>

- Corrigan, M. P. (2011). Growing what you eat: developing community gardens in Baltimore, Maryland. *Ohio University Applied Geography*, 31(4), 1232-1241.
<https://doi.org/10.1016/j.apgeog.2011.01.017>
- Creme de la Crop. (2015). Farm Store. Retrieved from <https://www.cremedelacrop.com/farmstore>
- Dahal, K., & Niemelä, J. (2017). Cities' greenhouse gas accounting methods: a study of Helsinki, Stockholm, and Copenhagen. *Climate*, 5(2), 31. doi:10.3390/cli5020031
- Damsø, T., Kjær, T., & Christensen, T. B. (2017). Implementation of local climate action plans: Copenhagen – towards a carbon-neutral capital. *Journal of Cleaner Production*, 167, 406-415. doi:10.1016/j.jclepro.2017.08.15
- Danish Ministry of the Environment. (n.d.) Water Supply in Denmark. Retrieved from http://www.geus.dk/program-areas/water/denmark/vandforsyning_artikel.pdf
- The Danish Environmental Agency. (2018). Ministry of Environment and Food of Denmark. Retrieved from <http://eng.lbst.dk/agriculture/>
- Danish Ministry of Transport, Building, and Housing. (2012). A greener transport system in denmark. City Hall, Copenhagen.
- Danmarks Statistik. (2018). Prices and Consumption. Retrieved from <http://statistikbanken.dk/statbank5a/default.asp?w=1745>
- Earthworks Farm Community Garden. (2015). History. Retrieved from <http://earthworksfarmgarden.org/about-us/history/>
- Earthworks Urban Farm. (2018). About us. Retrieved from http://www.cskdetroit.org/earthworks/about_us
- Eat Your City Organics. (n.b.). Our story. <http://www.eattheyard.net/about-us/>
- Eaves, J., & Eaves, S. (2018). Comparing the profitability of a greenhouse to a vertical farm in Quebec. *Canadian Journal of Agricultural Economics/Revue Canadienne D'Agroeconomie*, 66 (1), 43-54. doi:10.1111/cjag.12161
- Ellegaard, Kenneth. (2018, April 11). Personal Interview.
- Expatisan. (2018). Cost of living in Copenhagen, Denmark. Retrieved from <https://www.expatisan.com/cost-of-living/copenhagen>
- Falling Waters Farm. (n.d.). What makes us great. Retrieved from <http://www.fallingwaters.farm/>
- Farm Alliance of Baltimore. (2018). About us. Retrieved from <http://www.farmalliancebaltimore.org/about-us/>
- Food Field Detroit. (n.d.). About us. Retrieved from <http://www.foodfielddetroit.com/about-us/>
- Fort Lauderdale Vegetables. (2018). Our Farms. Retrieved from http://www.fortlauderdalevegetables.com/Our_Farms.html
- Gardeners In Community Development. (2016). Welcome to the community gardens of Dallas. Retrieved from <http://gardendallas.org/>
- Germantown Kitchen Garden. (n.d.). About us. Retrieved from <http://germantownkitchengarden.com/>
- Golden, S. (2013). Urban agriculture impacts: social, health, and economic: a literature review (p. 6-14). UC Sustainable Agriculture Research and Education Program Agricultural Sustainability Institute at UC Davis. Retrieved from <http://asi.ucdavis.edu/programs/sarep/publications/food-and-society/ualitreview-2013.pdf>
- Gordinier, J. (2015, September 14). René Redzepi Plans to Close Noma and Reopen It as an Urban Farm *The New York Times*. Retrieved from <https://www.nytimes.com/2015/09/16/dining/noma-rene-redzepi-urban-farm.html>
- Gotham Greens. (2018). Our farms. Retrieved from <http://gothamgreens.com/our-farms>

- Growing Home. (n.d.). Mission and Vision. Retrieved from <http://growinghomeinc.org/about-us/>
- Grard, B. J., Chenu, C., Manouchehri, N., Houot, S., Frascaria-Lacoste, N., & Aubry, C. (2018). Rooftop farming on urban waste provides many ecosystem services. *Agronomy for Sustainable Development*, 38 (1), 1-12. doi:10.1007/s13593-017-0474-2
- Green Gate Farms. (n.d.). The farm. Retrieved from <https://greengatefarms.net/thefarm/>
- Greencity Market. (2018). About us. Retrieved from <http://www.greencitymarket.org/about/>
- Greensgrow Farms. (n.d.). What is urban farming? Retrieved from <http://www.greengrow.org/urban-farm/what-is-urban-farming/>
- The Grove. (n.d.). The grove. Retrieved from <http://www.thegrovehouston.com/>
- Growing Lots Urban Farm. (2018). About us. Retrieved from <https://www.growinglotsurbanfarm.com/about/>
- Guarnieri, M., & Balmes, J. R. (2014). Outdoor air pollution and asthma. *Lancet (London, England)*, 383(9928), 1581-1592. doi:10.1016/S0140-6736(14)60617-6
- Halloran, A., & Magid, J. (2013). The role of local government in promoting sustainable urban agriculture in Dar es Salaam and Copenhagen. *Geografisk Tidsskrift-Danish Journal of Geography*, 113(2), 121-132. doi:10.1080/00167223.2013.848612
- Hansen, Simon. (2018, March 22). Personal Interview.
- Hara, Y., Murakami, A., Tsuchiya, K., Palijon, A. M., & Yokohari, M. (2013). A quantitative assessment of vegetable farming on vacant lots in an urban fringe area in metro Manila: can it sustain long-term local vegetable demand? *Applied Geography*, 41, 195-206. doi:10.1016/j.apgeog.2013.04.003
- Harpke Family Farm. (n.d.). About us. Retrieved from <http://www.harpkefamilyfarm.com/about-us/>
- Heather, K. L. (2012, Nov. 5). *The environmental benefits of urban agriculture on unused, impermeable and semi-permeable spaces in major cities with a focus on philadelphia, PA* (Master of Environmental Studies Capstone Projects). Retrieved from http://repository.upenn.edu/mes_capstones/46
- Himmelbeet. (2018). Projekte. Retrieved from <https://himmelbeet.de/projekte>
- Iannotti, M. (2017). Rooftop gardening: What to consider before planning a rooftop garden. *The Spruce*, Retrieved from <https://www.thespruce.com/rooftop-gardening-1403340>
- Indianapolis Parks Foundation. (2018). Indy Urban Acres. Retrieved from <https://www.indyparksfoundation.org/indy-urban-acres/>
- JBG Farms. (n.d.). About the farm. Retrieved from <https://jbgorganic.com/thefarm>
- Just Food. (n.d.). About us. Retrieved from <http://www.justfood.org/about-us>
- Keep Growing Detroit. (2018). Cultivating a food sovereign Detroit. Retrieved from <http://detroitagriculture.net/about/>
- Københavns Kommune. (n.d.). Solceller Map. Retrieved from <http://kbhkort.kk.dk>
- Københavns Kommune. (2015). *City of Copenhagen Municipal Plan 2015: The Coherent City*. Retrieved from https://kp15.kk.dk/sites/kp15.kk.dk/files/municipal_plan_2015.pdf
- Københavns Kommune. (2014). *The Coherent City: Municipal Planning Strategy 2014 for the City of Copenhagen*. Retrieved from https://kp15.kk.dk/sites/kp15.kk.dk/files/municipal_plan_2015.pdf
- Kooperative GartenCoop Freiburg. (n.d.). Wissen. Retrieved from <http://www.gartencoop.org/tunsel/wissen>
- Kulak, M., Graves, A., & Chatterton, J. (2013). Reducing greenhouse gas emissions with urban agriculture: a life cycle assessment perspective. *Landscape and Urban Planning*, 111, 68-78. doi:10.1016/j.landurbplan.2012.11.007

- Lanarc, H.B. & Golder. (2013). *The urban farming guidebook: Planning for the Business of Growing Food in BC's Towns & Cities*. Retrieved from <http://api.ning.com/files/wZ6gv5BX9U6oMB6kBykzSeibP5LQz04oUVr5bMqEHd15i-sT9Zj-yJw-0JbjieKfsUzASTx-11BiUOp8S2VHHeQ5MHPAnI6R/UrbanFarmingGuidebook2013.pdf>
- Land's Sake. (n.d.). About us. Retrieved from <https://landssake.org/about-us/>
- Larsen, J. E., Möller, I. H. (2013) The increasing socioeconomic and spatial segregation and polarization of living conditions in the Copenhagen metropolitan area.
- Laughing Frog Farm. (n.d.). Sustainable farm life - permaculture farming, organic principles. Retrieved from <https://thelaughingfrogfarm.com/>
- Linquist, B., Groenigen, K. J., Adviento -Borbe, M. A., Pittel
 agronomic assessment of greenhouse gas emissions from major cereal crops. *Global Change Biology*, 18(1), 194-209. doi:10.1111/j.1365-2486.2011.02502.x
- Lil' Starts Urban Farm & Plant Nursery. (n.d.). Our Farm. Retrieved from <http://lilstarts.com/>
- Link, J. (2016, June 3). Why Chicago is becoming the country's urban farming capital. *Fast Company Newsletter*, Retrieved from <https://www.fastcompany.com/3059721/why-chicago-is-becoming-the-countrys-urban-farming-capital>
- Local Harvest. (2016). Family Farms. Retrieved from <https://www.localharvest.org/organic-farms/>
- Local Roots. (n.d.). Who we are. Retrieved from <https://www.localrootsfarms.com/who-we-are/>
- Local Sprout. (n.d.). Our farm. Retrieved from <http://www.localsprout.com/our-farm/>
- Lundell, Johanna. (2018, April 11). Personal Interview.
- Mackenzie, A. (2016). Beyond food: community gardens as places of connection and empowerment. *Project for Public Spaces*, Retrieved from <https://www.pps.org/article/beyond-food-community-gardens-as-places-of-connection-and-empowerment>
- Mass Audubon. (2018). About mass audubon. Retrieved from <https://www.massaudubon.org/about-us>
- McGrath, M. (NPR Host). (2018, February 16). You Bet Your Garden [Audio podcast]. Retrieved from <https://www.npr.org/podcasts/381443696/you-bet-your-garden>
- Meharg, A. A. (2016). City farming needs monitoring: Pollution poses a significant challenge to food production in urban environments. *Nature*, 531(7594 S1), S60.
- Metro Atlanta Urban Farm. (2016). The farm. <http://themetroatlantaurbanfarm.com/the-farm/>
- The Michigan Urban Farming Initiative. (2013). About MUFI. Retrieved from <http://www.miufi.org/about>
- Mill City Grows. (n.d.). About us. <http://www.millcitygrows.org/about-us/>
- Mill Creek Farm. (n.d.). About us. <https://www.millcreekurbanfarm.org/content/about-us>
- Groundwork Somerville. (n.d.). Mission. Retrieved from <http://www.groundworksomerville.org/about/mission/>
- Moondog Farms. (n.d.). Who we are. Retrieved from <http://moondogfarms.com/whoweare/>
- Mougeot, L. J. A. (2000). *Urban agriculture: Definition, presence, potentials and risks, and policy challenges*. Cities Feeding People Series Report 31. *International Development Research Centre*. Retrieved from <https://idl-bnc-idrc.dspacedirect.org/bitstream/handle/10625/26429/117785.pdf?sequence=12>
- The Natick Community Organic Farm. (n.d.). The Natick Community Organic Farm. Retrieved from <https://www.natickfarm.org/>
- National Garden Bureau. (2017). Which vegetables are most efficient?. Retrieved from <https://ngb.org/>

- North Brooklyn Farms. (n.d.). About north Brooklyn farms. Retrieved from <http://www.northbrooklynfarms.com/general-info/>
- Oakland Avenue Urban Farm. (n.d.). The Oakland avenue urban farm. Retrieved from <http://www.oaklandurbanfarm.org/about.html>
- Ohio City Farm. (2018). About. Retrieved from <https://www.ohiocityfarm.com/about>
- ØsterGRO. (n.d.). Welcome to Denmark's first roof farm. Retrieved from <http://oestergro.dk/>
- Oxen Hill Farm. (n.d.). Who we are. Retrieved from <http://www.oxenhillfarm.com/description>
- Parskiy, N. D., Molodtsov, M. V., & Molodtsova, V. E. (2017). Cost effectiveness of precast reinforced concrete roof slabs. *IOP Conf. Series: Materials Science and Engineering*, 26210.1088/1757-899X/262/1/012036
- Payscale. (2018). Salary data & career research center (Denmark). Retrieved from <https://www.payscale.com/research/DK/Country=Denmark/Salary>
- Pfeiffer, A., Silva, E., & Colquhoun, J. (2015). Innovation in urban agricultural practices: Responding to diverse production environments. *Renewable Agriculture & Food Systems*, 30(1), 79-91. doi:10.1017/S1742170513000537
- Pinje, Joah. (2018, April 9). Personal Interview.
- Plant It Forward Farms. (2018). Our farms. Retrieved from <http://plant-it-forward.org/our-produce/farm-stands/>
- Pölling, B. (2016). Comparison of farm structures, success factors, obstacles, clients' expectations and policy wishes of urban farming's main business models in North Rhine-Westphalia, Germany. *Sustainability*, 8(5), 446. doi:10.3390/su8050446
- Prinzessinnengarten. (2018). Projekthistorie. Retrieved from <http://prinzessinnengarten.net/projekte/projekthistorie/>
- Recovery Park. (2014). About us. Retrieved from <http://www.recoverypark.org/about-us>
- Reservoir Community Farm. (n.d.). Green village initiative's mission. Retrieved from <https://www.gogvi.org/aboutgvi/>
- Revision Urban Farm. (2015). Our story. Retrieved from <https://www.vpi.org/revision/who-we-are/our-story/>
- Ripe City Urban Farm. (2016). About ripe city. Retrieved from <http://ripecity.org/about-us/>
- Rockström, J., Falkenmark, M., Karlberg, L., Hoff, H., Rost, S., & Gerten, D.. (2009). Future water availability for global food production: The potential of green water for increasing resilience to global change. *Water Resources Research*, 45, W00A12. doi:10.1029/2007WR006767
- Rose's Berry Farm. (2017). About us. Retrieved from <https://www.rosesberryfarm.com/>
- Saeidi, D., Mirhosseini, M., Sedaghat, A., & Mostafaeipour, A. (2011). Feasibility study of wind energy potential in two provinces of Iran: North and South Khorasan. *Renewable and Sustainable Energy Reviews*, 15(8), 3558-3569. doi:10.1016/j.rser.2011.05.011
- Sanyé-Mengual, E., Anguelovski, I., Oliver-Solà, J., Montero, J. I., & Rieradevall, J. (2015). Resolving differing stakeholder perceptions of urban rooftop farming in mediterranean cities: Promoting food production as a driver for innovative forms of urban agriculture. *Agriculture and Human Values*, 33(1), 101-120. doi:10.1007/s10460-015-9594-y
- Sanyé-Mengual, E., Oliver-Solà, J., Montero, J. I., & Rieradevall, J. (2015). An environmental and economic life cycle assessment of rooftop greenhouse (RTG) implementation in Barcelona, Spain. Assessing new forms of urban agriculture from the greenhouse structure to the final product level. *The International Journal of Life Cycle Assessment*, 20(3), 350-366. doi:10.1007/s11367-014-0836-9

Sarvodaya Farms. (2015). Our farming practices. Retrieved from <http://sarvodayafarms.com/our-farming-practices/>

Sauvie Island Organics. (2018). History and Mission. Retrieved from <http://www.sauvieislandorganics.com/about-us/history-mission/>

Seattle Parks and Recreation. (2017, November 28). Rainier Beach urban farm and wetlands. Retrieved from <https://www.seattle.gov/parks/about-us/current-projects/rainier-beach-urban-farm-and-wetlands>

Schatz, R. D. (2016, February). Why foodies and farmers are flocking to a crowdfunding site called Barnraiser. *Forbes Online*, Retrieved from <https://www.forbes.com/>

The Side Yard Farm and Kitchen. (n.d.). Local food for the local community. Retrieved from <https://www.thesideyardpdx.com/>

Skarsgard Farms (2018). How we're different. Retrieved from <https://skarsgardfarms.deliverybizpro.com/p-41-about-us.html>

Skaarup, Kristian. (2018, April 3). Personal Interview

Skylare, Elisabet. (2004) The new Nordic food manifesto. Retrieved from <http://www.norden.org/en/theme/ny-nordisk-mad>

Solar Facts and Advice (2013). A primer in solar rooftop leasing. Retrieved from <http://www.solar-facts-and-advice.com/solar-rooftop-leasing.html>

Southside Community Land Trust. (n.d.). About us, Retrieved from <https://www.southsideclt.org/about-us/>

Springdale Farm. (2016). About springdale farm. Retrieved from <http://www.springdalefarmaustin.com/about-springdale-farm/>

Statista. (2018).

Steadfast Farm. (2017). About us. Retrieved from <http://www.steadfast-farm.com/>

Stone's Throw Urban Farm. (n.d.). About. Retrieved from <http://www.stonethrowurbanfarm.com/about>

Stroh, Emil. (2018, March 21). Personal Interview.

Sub-Edge Farm. (n.d.). About. Retrieved from <http://subedgefarm.com/about>

Sunspot Urban Farm. (n.d.). Practicing regenerative farming. Retrieved from <http://sunspoturbanfarm.squarespace.com/the-farm-1/>

Sweetwater Community Farm. (n.d.). The farm. Retrieved from <http://sweetwater-organic.org/the-farm/>

The National Gardening Association. (2018). When to plant vegetables in Copenhagen, Denmark. Retrieved from. <https://garden.org/apps/calendar/?q=Copenhagen>

Three Part Harmony Farm. (2018). The farm. Retrieved from <http://threepartharmonyfarm.org/thefarm/>

Tiger Mountain Foundation. (2018). Learn more about TMF. Retrieved from <http://tigermountainfoundation.org/about>

United Community Centers. (n.d.). Urban farms. Retrieved from <https://ucceny.org/urban-farm/>

Urban Agriculture Australia. (2012). Case studies. Retrieved from <http://www.urbanagriculture.org.au/about/case-studies/>

The Urban Canopy. (2011). Vision. Retrieved from <http://www.theurbancanopy.org/vision/>

The Society of St. Vincent de Paul. (20018). Urban farm. Retrieved from <https://www.stvincentdepaul.net/programs/urban-farm>

Urban Farming Institute of Boston. (n.b.). About us. Retrieved from <https://urbanfarminginstitute.org/about-us>

Urban Farms of Central Ohio. (n.d.). About us. Retrieved from <https://www.urbanfarmsofcentralohio.org/about-us/>

Urban Folk Farm. (n.d.). About. Retrieved from <https://www.urbanfolkfarm.com/about>

The Urban Homestead. (2017). By the numbers. Retrieved from <http://urbanhomestead.org/about/by-the-numbers/>

Urban Life Ministries. (2015). Who we are. Retrieved from <https://www.urbanlifed.org/what-we-do/>

Urban Roots. (n.b.). Our story. Retrieved from <https://www.urbanrootsgr.org/history/>

Urban Roots. (2018). Our history. Retrieved from <http://urbanrootsmn.org/about-us/>

Urban's Farm & Greenhouses. (n.b.). About us. Retrieved from <https://www.urbansfarmandgreenhouses.com/about.html>

Urth Farms. (2017). Our farm. Retrieved from <http://urthfarmsorganic.com/about/>

USDA. (2017, December). *Research shows farm to school works*. Food and Nutrition Service Division. USDA 2015 Farm to School Census. Retrieved from <https://fns-prod.azureedge.net/sites/default/files/f2s/ResearchShows.pdf>

Voicu, I., & Been, V. (2008). The effect of community gardens on neighboring property values. *Real Estate Economics*, 36(2), 241-283. doi:10.1111/j.1540-6229.2008.00213.x

W, C. (2017, Dec 6). Copenhagen wins prestigious c40 climate prize. *Copenhagen Post* Retrieved from <http://cphpost.dk/news/copenhagen-wins-prestigious-c40-climate-prize.html>

Waldingfield Farm. (2018). About the farm. Retrieved from <http://waldingfieldfarm.com/about-the-farm/>

Waltham Fields Community Farm. (2018). About Waltham community farm. Retrieved from <http://communityfarms.org/about/overview>

Whitelock Community Farm. (n.b.). History. Retrieved from <http://whitelockfarm.org/about/>

Wild Carrot Farm. (n.d.). Welcome to our farm. Retrieved from <http://www.wildcarrotfarm.net/>

Woodland Urban Farm. (2018). About our farm. Retrieved from <http://woodlandurbanfarm.com/about-our-farm/>

World Freight Rates. (2013). Freight calculator. Retrieved from <http://worldfreightrates.com/freight>

Wortman, S. E., & Lovell, S. T. (2013). Environmental challenges threatening the growth of urban agriculture in the United States. *Journal of Environmental Quality*, 42(5), 1283. doi:10.2134/jeq2013.01.0031

XL-Byg. (n.d.). Haven. Retrieved from <https://www.xl-byg.dk/produkter/haven/>

Zenger Farm. (2018). About. Retrieved from <https://zengerfarm.org/about-the-farm/>

Zigas, E. (2012). Public harvest: Expanding the use of public land for urban agriculture in san francisco. *SPUR Report*. Retrieved from https://www.spur.org/sites/default/files/publications_pdfs/SPUR_Public_Harvest.pdf

2 Friends Farm. (2018). About us. Retrieved from https://www.2friendsfarm.com/About_2_Friends_Farm

Appendix A: Urban Farm Contact List

Farm	Location	Website
Brooklyn Grange	Brooklyn, NY	https://www.brooklyngrangefarm.com/
Tiger Mountain Foundation	Phoenix, AZ	http://tigermountainfoundation.org/
Real Food Farms	Baltimore, MD	http://realfoodfarm.civicworks.com/
Food Field Detroit	Detroit, MI	http://www.foodfielddetroit.com/
Urban Agriculture Australia	Canberra, Australia	http://www.urbanagriculture.org.au/
Alemany Farms	San Francisco, CA	http://www.alemanyfarm.org/
Metro Atlanta Urban Farm	Atlanta, GA	http://themetroatlantaurbanfarm.com/
Gotham Greens Pullman Rooftop Farm	Chicago, IL	http://gothamgreens.com/our-farms
Ohio City Farm	Cleveland, OH	https://www.ohiocityfarm.com/
Rainier Beach Urban Farm	Seattle, WA	https://www.seattle.gov/parks/about-us/current-projects/rainier-beach-urban-farm-and-wetlands
Springdale Farm	Austin, TX	http://www.springdalefarmaustin.com/
Skarsgard Farms	Albuquerque, NM	https://skarsgardfarms.deliverybizpro.com/summary.php?go=products&cat=326&24
Sunspot Urban Farms	Fort Collins, CO	sunspoturbanfarm.squarespace.com/the-farm-1/
Revision Urban Farm	Boston, MA	https://www.vpi.org/revision/
The Urban Farming Institute of Boston	Boston, MA	https://urbanfarminginstitute.org/
Urban Roots	Grand Rapids, MS	http://www.urbanrootsgr.org/
Baltimore Free Farm	Baltimore, MD	http://www.baltimorefreefarm.org/
Baltimore Civic Works	Baltimore, MD	https://civicworks.com/
Whitelock Farm	Baltimore, MD	http://whitelockfarm.org/
Prinzessinnengarten	Berlin, Germany	http://prinzessinnengarten.net/
Himmelbeet	Berlin, Germany	https://himmelbeet.de/
Urban Canopy	Chicago, IL	http://www.theurbancanopy.org/home
Greencity Market	Chicago, IL	http://www.greencitymarket.org/
Eat the Yard	Dallas, TX	http://www.eattheyard.net/
Gardens in Community Development	Dallas, TX	http://gardendallas.org/
Commonwealth Urban Farm	Oklahoma City, OH	http://commonwealthurbanfarms.com/
Keep Growing Detroit	Detroit, MI	http://detroitagriculture.net/

GartenCoop	Breisgau, Germany	http://www.gartencoop.org/tunsel/
The Grove Rooftop Farm	Houston, TX	http://www.thegrovehouston.com/
Moondog Farms	Santa Fe, TX	http://moondogfarms.com/
Mill Creek Urban Farm	West Philadelphia, PA	https://www.millcreekurbanfarm.org/
Germantown Kitchen Garden	Philadelphia, PA	http://germantownkitchengarden.com/
The Farm at Agritopia	Gilbert, AZ	http://thefarmatagritopia.com/
Local Sprout	San Antonio, TX	http://www.localsprout.com/
Urbanlife Ministries	San Diego, CA	https://www.urbanlifed.org/
Sarvodaya Farms	Pomona Valley, CA	sarvodayafarms.com/
Common Good City Farm	Washington DC	http://commongoodcityfarm.org/
Three Part Harmony Farm	Washington DC	http://threepartharmonyfarm.org/
Steadfast Farm	Queen Creek, AZ	http://www.steadfast-farm.com/
Michigan Urban Farming Initiative	Detroit, MI	http://www.miufi.org/
Earthworks Urban Farm	Detroit, MI	http://www.cskdetroit.org/
Oakland Avenue Urban Farm	Detroit, MI	http://www.oaklandurbanfarm.org/
Recovery Park	Detroit, MI	http://www.recoverypark.org/
United Community Centers	Brooklyn, NY	https://ucceny.org/
Bushwick City Farm	Brooklyn, NY	https://www.ecostationny.org/
Red Hook Community Farm	Brooklyn, NY	http://www.added-value.org/
Just Food	Brooklyn, NY	http://www.justfood.org/
North Brooklyn Farms	Brooklyn, NY	http://www.northbrooklynfarms.com/
Mill City Grows	Lowell, MA	http://www.millcitygrows.org/
2 Friends Farms	Attleboro, MA	https://www.2friendsfarm.com/
Mass Audubon	Lincoln, MA	https://www.massaudubon.org/
Cavicchio Greenhouses	Sudbury, MA	http://www.cavicchio.com/
Waltham Fields Community Farm	Waltham, MA	http://communityfarms.org/
The Natick Community Organic Farm	Natick, MA	https://www.natickfarm.org/
Lands Sake	Weston, MA	https://landssake.org/
Cherry Hill Urban Garden	Baltimore, MD	https://cherryhillurbangarden.wordpress.com/
Strength to Love 2	Baltimore, MD	http://www.farmalliancebaltimore.org/farms/strength-to-love-ii/

Cottonwood Urban Farm	Los Angeles, CA	http://www.cufarm.org/
The Urban Homestead	Los Angeles, CA	http://urbanhomestead.org/
Local Root Farms	Los Angeles, CA	https://www.localrootsfarms.com/
The Growing Experience	Long Beach, CA	https://www.localharvest.org/the-gr
Earth Works Farm Garden	Los Angeles, CA	http://earthworksfarmgarden.org/
Stone's Throw Urban Farm	Minneapolis, MN	http://www.stonethrowurbanfarm.com/
Growing Lots	Minneapolis, MN	https://www.growinglotsurbanfarm.com/
Urban Farms and Greenhouses	Minneapolis, MN	https://www.urbansfarmandgreenhouses.com/
Urban Roots MN	Minneapolis, MN	http://urbanrootsmn.org/
Indianapolis Parks Foundation	Indianapolis, IN	https://www.indyparksfoundation.org/indy-urban-acres/
Creme de la Crop	Valparaiso, IN	https://www.cremedelacrop.com/
Growing Home	Chicago, IL	http://growinghomeinc.org/
Falling Waters Farm	Indianapolis, IN	http://www.fallingwaters.farm/
The Side Yard Farm and Kitchen	Portland, OR	https://www.thesideyardpdx.com/
Zenger Farm	Portland, OR	https://zengerfarm.org/
Rockwood Urban Farm	Portland, OR	https://www.rockwoodurbanfarm.com/
Lil' Starts	Portland, OR	http://lilstarts.com/
Sauvie Island Organics	Portland, OR	http://www.sauvieislandorganics.com/
Plant It Forward Farms	Austin, TX	http://plant-it-forward.org/
Green Gates Farms	Austin, TX	https://greengatefarms.net/
Johnson's Backyard Garden	Austin, TX	https://jbgorganic.com/
Laughing Frog Farm	Hempstead, NY	https://thelaughingfrogfarm.com/
Boggy Creek Farm	Austin, TX	https://www.boggycreekfarm.com/
Atlantic Beach Urban Farms	Atlantic Beach, FL	https://www.atlanticbeachurbanfarms.com/
Ripe City Urban Farm	Tallahassee, FL	http://ripecity.org/
Sweetwater Community Farm	Tampa, FL	http://sweetwater-organic.org/
Mother Earth's Urban Farm	Tampa, FL	https://www.localharvest.org/michelle-doll-mother-earths-urban-farm-M49258
Brickstreet Farms	St. Petersburg, FL	http://www.brickstreetfarms.com/
Urban Folk Farms	Jacksonville, FL	https://www.urbanfolkfarm.com/
Harpke Family Farm	Orlando, FL	http://www.harpkefamilyfarm.com/
Fort Lauderdale Vegetables	Fort Lauderdale, FL	http://www.fortlauderdalevegetables.com/
Urth Farms Organic	New Britain, CT	http://urthfarmsorganic.com/

Sub Edge Farm	Farmington, CT	http://subedgefarm.com/
Reservoir Community Farm	Bridgeport, CT	https://www.gogvi.org/reservoircommunityfarm/
Wild Carrot Farm	Bantam, VT	http://www.wildcarrotfarm.net/
Waldingfield Organic Farm	Washington, CT	http://waldingfieldfarm.com/
Oxen Hill Farm	Suffield, CT	http://www.oxenhillfarm.com/
Rose's Berry Farm	Glastonbury, CT	https://www.rosesberryfarm.com/
Southside Community Land Trust	Providence, RI	https://www.southsidect.org/
Urban Farms of Central Ohio	Cleveland, OH	https://www.urbanfarmsofcentralohio.org/
Woodland Urban Farm	Cleveland, OH	http://woodlandurbanfarm.com/

Appendix B: Copenhagen/Denmark Organizations Contact List

Urban Farm:	Email:
City Garden in Sundholm	acsu@sof.kk.dk, DK56@sof.kk.dk
ØsterGro	skaarup.kristian@gmail.com
ReFarmed	camilla@refarmed.dk
Urbanplanen	simh@3b.dk
Brooklyn Grange	info@brooklyngrangefarm.com
Tiger Mountain Foundation	Contact Form - http://www.tigermountainfoundation.org/contact
Real Food Farms	realfoodfarm@civicworks.com
Food Field Detroit	peckproduce@gmail.com
Urban Agriculture Australia	canberracityfarm@gmail.com
Restaurant:	Email:
Restaurant 56°	info@56graderkbh.dk
Schools:	Email:
Københavns Skolehaver	johanna@skolehavenib.dk

Appendix C: Simon Hansen Interview

We met with Mr. Simon Hansen, company owner of UrbanPlanen. Our sponsor, Claus, gave us the initial contact because Simon is currently working in lower level housing areas to bring urban farming back to the neighborhoods. Simon currently has two urban farms that residents all over the neighborhood can tend to and grow whatever crops they want. Simon believes this green area brings the community together and allows people to learn where their food comes from. The group met with him and asked him a series of questions as shown below. We used a computer to take notes and a phone recorder to record the interview for later transcription.

Ms. Olshansky: What projects are you currently working on related to urban farming?

Mr. Hansen: As of right now, I'm involved with mainly two projects. There are two areas for gardens: one right outside of the office and one next to the housing. In total, we have 19 gardens and we are starting up a new big one in April. My guess is that it is more than 1,000 sq. meters. We teamed up with Miljøpunkt Amager and a local waste sorting organization that allows us to take stuff to use for the garden. We are going to have a greenhouse, an outdoor kitchen, and an oven. Part of the mission of our gardens is the social dimension, but also for the economic part. We plan to talk to some high-end restaurants around Copenhagen and sell some specialized crops for them. I think this will be a good business model. My younger brother is a chef at one of these restaurants and he's talking to some people there. They say it is a good model, and so I'm going to wait until next year to try it. It's a bit technical, but there's a policy if you work 225 hours a year, then you get a certain amount of money from the state. Therefore, we want as many people as possible from our neighborhood to reach that limit because then they will receive more money. Many people who live here are in families that have it hard as it is now, and there are many families with children. We've had gardens down here since 2014, and it has been working. I have tried to have as little participation with the gardens as possible. We give people their own square in the garden, and the vegetables they grow can be taken home to their own kitchen. There are two different models: one is the community one where you have all your vegetables and you share them and another is when you have your own garden. We have the model where you take them home from your own garden. This is good because some of the families are tight with money, so we try and supply this little supplement to their kitchen in terms of groceries. I know other places in Copenhagen have the other model and they are quite happy with it. We are trying to do both because we want to have some community gardens for everybody as well, but it's just harder. We also have 9 beehives at the local schools, and last year we produced 500 kilograms of honey. We allow some people to take honey home for themselves, and the rest we sell to restaurant and label ourselves. You could call it a marketing strategy so people know that UrbanPlanen and all the bad things that are here are not true because we produce some good quality honey. It's not much, but at least it's something.

Ms. Olshansky: So you talk about how a main goal here is for people here to have food for their families. What else do you want the community to get out of it? How do you want it to benefit this community?

Mr. Hansen: We produce vegetables, but for me the production of community is the most important thing. If they are playing football in the fields, it is fine with me to get some community out of that. When you establish the gardens it costs some money, but we get a lot of it for free so it is not that expensive. Here, it's a cheap way of letting people meet each other, and so that's the most important thing for me. Meeting neighbors is a bit of a problem out here because there are 5,500 people living here. They all don't know each other that well so it is a great place to start. Also, today I was knocking on the doors here to tell people about the garden, and they were happy that the field was being turned into something more attractive. If people like to grow whatever they want to grow then that I great. Of course, there are different things that we want to get out of it, but for me it is mainly the meeting between neighbors and to have a place that looks nice. When there's a garden, it is a great place to have a festival or concert because it looks nice.

Ms. Olshansky: **Could you tell us more about what it takes to get something like this started? Is there a way that you decide what you want to grow? Is it up to the residents?**

Mr. Hansen: It is up to the residents. I was talking to the chairman who told me that the board wanted to have something in this area. I proposed some gardens, and we had a big meeting with the residents that were interested. We had around 20 people come, and after the residents were going to decide for themselves how it is going to be. I would do it, but I want them to take action. We had a weekend in April when we met up with the people and built the gardens together. This is nice because then you have all people together making decisions. The decisions aren't that big. For example, "are we going to have a path here?" or "are we going to have gardens here?" I don't care much about those questions. For me, all the decisions are going to be made by the residents. I will deal with the logistics, such as getting the soil, and I have to figure out what they are going to grow in them and how they are going to get water. Adding things such as a greenhouse and a kitchen is just a bonus. I talked to some people, and we have a garden that works with the local kids. We have some of the kids that aren't able to sit still in school work at the garden so that they can have time off of school. They are going to build a kitchen. We find out all of the different players that are going to contribute to the garden. We find some good contacts, such as Miljøpunkt Amager, and they are good with the organizational part and the backbone structure. For me, I'm going to find out all the different partners that want to be a part of this and who find the value of having a garden like Miljøpunkt Amager. Some of the residents aren't good in Danish, so having some common purpose helps a lot to bond with other people in the neighborhood. Some people are really good at gardening while some people are not, so it's good to have a lot of different people with different backgrounds. You can see in the gardens that different things are growing, and they can share things with each other from their cultures.

Ms. Olshansky: **Have you had any problems or challenges running your gardens? Maybe some you didn't anticipate when you started them? Is there anything you are aware of now that didn't come to mind when you started the first one?**

Mr. Hansen: Of course, but the first one wasn't that hard anyway. We had a lot of discussions on if we think people are going to steal vegetables and are going to ruin the garden. We understood the concern, but we are either going to have the gardens or we won't have the gardens so we figured we'd try it out because we are paying for it anyway. And so we built the

gardens, and the biggest problem as I understand is that there are a lot of dogs and they poop in the garden. You just need to build a fence that is around 2 meters high, which is just high enough so that the dog can't get over it. You don't want to have a big fence because people would wonder what goes on behind there, which takes away from the beauty of the farm. I got the permission from the board and that was all I needed, but it was good to get the opinions from the neighbors.

Ms. Olshansky: Even though your gardens are mostly not for profit, do you have to get any permits or other permission in order to grow vegetables or sell honey?

Mr. Hansen: With the honey there are special laws and they are not that restrictive, so it's easy to sell honey nearly all over Denmark. In term of the vegetables, I'm not sure yet but I've talked to a lab that does tests on the soil to test the quality. It's much easier to grow directly in the ground because it is more work to build a bed and put soil in. I'm hired by the company that owns the whole residency, so it makes it easier for me to navigate through the restrictions. Since this is a public park, the Kommune has a special consultant that helped me navigate in that process. I talked to him and he was quite helpful and made it a lot easier. Sometimes if you know who to contact it makes it easier.

Mr. Tavares: Are inspections of soil quality important? Are there any regulations where you have to get soil inspected?

Mr. Hansen: No, but we will if we are going to sell them in the future. There has been a lot of pollution. The production of many things causes a lot of polluting throughout all of Amager. If people find out you're growing in Amager, they are going to ask about the quality of your soil.

Mr. Rosen: Is there anything you plan to grow to sell? What does Amager want? What is profitable?

Mr. Hansen: There is a special kind of cabbage that I heard is very fine and small. The high-end restaurants with Michelin stars will hopefully want to pay a bit more. I can't compete with the local grocery stores. Therefore, we have to grow some special crops like herbs.

Ms. Olshansky: Do you grow organic here?

Mr. Hansen: The people are not allowed to use artificial pesticides, but most likely we are not organic because they buy supplies from different sources. They don't really need to be organic because they grow for themselves, so it doesn't matter to me. Some people don't have a lot of money, so I was told to tell them that they need to buy these certain kinds of seeds that are less pricy than other ones. It's not my place I guess. We still have rules on what can and cannot be used in the garden.

Mr. Tavares: What is the structure of the gardens? Do you only grow directly in the ground?

Mr. Hansen: We just grow directly into the ground. There are some animals. The residents are allowed to take some of the animal waste to use for the soil. We might let the residents use the future greenhouse if they want, but it also depends what kinds of produce the restaurants want at the time. At this time, I'm not sure.

Appendix D: Emil Stroh Interview

The urban farming group met with Mr. Emil Stroh, company owner of Sundholm gardens. Our sponsor, Claus, gave us the initial contact because Mr. Stroh is currently working with recovering drug addicts and mental illness patients who are trying to bring sanity back into their lives through urban farming. Mr. Stroh has one large urban farm at the moment alongside with a greenhouse that the workers get paid to take care of. He believes this gives the recovering people a sense of pride in their work and allows them to learn responsibility, which acts as a form of therapy. The group met with him and asked him a series of questions as shown below. We unfortunately could not record the interview, so after the meeting the group recorded as much information as possible on our computers.

Mr. Rosen: How did you get the funding for your farming business?

Mr. Stroh: We get our funding from the municipality.

Mr. Rosen: What inspired you to create this business model with special needs and disenfranchised people? Is your labor force all homeless people or people in need, or do you have a hired full time staff as well?

Mr. Stroh: We have 25 workers in the summer, and they are all homeless people or people with special conditions (mental problems, ptsd, alcoholic, drug addicts). They get paid 40 kroner an hour and they can work from 8:00-14:00 every day. We try to inspire them instead of telling them what to do. I rather be a coordinator than a dictator. This style gives the people a chance to learn and use the information they already know for the better instead of the worse. This gives trust and allows them to use their education and own ideas to solve problems. There are no therapy services, but they are not allowed to drink or do drugs while they are working which helps them get over some of their problems. The gardening itself is the therapy. Also, coming into work they are not allowed to be too stoned or too drunk.

Mr. Rosen: How would you explain your business model?

Mr. Stroh: We are a non-profit for the most part. Most of our funding is from the government and we are a social branch. We do not sell the produce. We have a community gardening program in which we sell a box plot for 150 kroner for the full year. We have about 60 boxes.

Mr. Rosen: Do you partner with any organizations?

Mr. Stroh: We partner with a compost company and a kindergarten. The kindergarten kids help the people act better and present a better version of themselves. We are trying to incorporate a learning component to show how to compost for the kids.

Mr. Rosen: Were there any problems or barriers when you started?

Mr. Stroh: One issue was that the land where we have the greenhouses had glass all over the ground. It took us a full 2 years to get rid of the glass. The grass was also very polluted, so we could not grow plants in the grass. Instead we used raised beds to grow crops. We grow mostly tomatoes and chili peppers. A chili is a vegetable that really brings people together. To stay seasonal, we sell Christmas trees in the winter.

Mr. Rosen: What other plans do you have for the business?

Mr. Stroh: We also started a carpentry section that is in the very early stages.

Mr. Rosen: Do you have any livestock on the farm?

Mr. Stroh: We have chickens and rabbits. The chickens serve no purpose right now and the rabbits are used as therapy animals.

Appendix E: Michael/Kristian Skaarup Interview

The urban farming group met with Kristian Skaarup, one of the company owners of Østergro. Our sponsor, Claus, gave us the initial contact because they are currently running a very successful urban farm on a rooftop above an old car garage in Copenhagen. He and two other business partners and their huge volunteer group maintain and run a large urban farm. The farm provides fresh vegetables to their CSA program and to a restaurant they have partnered with. The group met with him and asked him a series of questions as shown below. We used a computer to take notes and a phone recorder to record the interview for later transcription.

Ms. Olshansky: How did your farm start? What are your missions?

Mr. Michael: Østergro started back in 2014 by 3 people. We established a CSA because we felt that Copenhagen really needed a new community garden on a larger scale. It was inspired by a New York rooftop farm called Brooklyn Grange where Olivia, one of the founders, used to work. She figured why not do this in Copenhagen? The municipality wanted to start a green neighborhood, and this fitted perfectly with our mission to create a link between the city people and the farmers since people have forgotten how to produce food and were taking it for granted. We wanted to promote knowledge sharing and create more awareness for organic products and the process from the ground to the table. In 2014, we started rooftop farm with a CSA model. There were originally 15 members, and today there are now 40 members. Every week we collect a bag of organic products from the farm and a farm about 30 kilometers away. A team of 100 volunteers every Wednesday prepare the bags, harvests crops, and sows the land, and we reward them by feeding them a lovely lunch after their work by the chef in Østergro. We are planning to start a new CSA model farm in Vesterport for 100-150 members. This is going to be built by 2019 and we will be partnering with a local farmer.

Ms. Olshansky: What is your growing season?

Mr. Michael: The growing season is May to November. The last harvest day is in December. We grow specific crops that inspire people to eat new ways. Our crops are what people ate in the old days such as beets in the winter period. The herbs and eggs are mainly for the restaurant, while the vegetables are mainly for the customers. We think microgreens are the next big thing to sell to Michelin star restaurants. We already started to grow for the new season, but because of the weather, we had to postpone the season a bit. We are developing a model for a big farm outside of Copenhagen and are finding other rooftops that can work as well. By 2019, we should have a new farm called VesterGRO.

Ms. Olshansky: Can you discuss your community/volunteer impact?

Mr. Michael: We started organically and the volunteers created a Facebook group without us even knowing. The local newspapers wrote about them, which projected them for success. We didn't do any other marketing.

Ms. Olshansky: How is the farm funded?

Mr. Michael: Financially, we are supported a lot by the municipality, which gave us 1 million kroner. The farm was founded by a wealthy business man who donated money and the building to us. Although we receive money support, Østergro is a nonprofit organization. We have a CSA model, so the members pay a fee. The restaurant opens every Monday to Thursday with two covers per night, and it is an organic restaurant. Østergro pays no rent (old car house) but pays for utilities. The restaurant pays 6.5% of profit to Østergro. The CSA fees aren't enough to support the business, so the profit share agreement was made to support everything.

Ms. Olshansky: What challenges did you face?

Mr. Skaarup: The most important thing is to create great connections with the municipality and the government. Rooftop farms are a new thing here so there are a lot of regulations. We tried to break down the regulations and come to an agreement, but we have had a lot of problems with legislation. There are parking regulations about a required number of parking spots to every building, and this roof just so happens to have some parking spaces. This building is supposed to have 29 parking spaces and they only have space for 18, and so they need 11 more that are supposed to be on the roof. We've been working on it for 1.5 years. We can't get a building permit until parking spaces problem is solved. Then, the restaurant needs a permit to selling alcohol, but first we need building permit. Because the urban farm idea is very new to the municipality, they do not understand the problems and situation we are in. Rooftops need electricity, water, special fence, and tiles instead of stone. Electricity is cheap but plumbing is not cheap. The fence is also expensive, but this rooftop already had fence installed. The farming project was perfect until the law came into play.

Ms. Olshansky: Can you address any more regulations?

Mr. Skaarup: You need to see if the roof can actually hold the weight of the farm. Luckily, the owners had engineers that already knew how to test and figure it out. In general, you need to have an engineer check it and also have the municipality check if everything is good to go. There are also fire code regulations in which you need two sets of stairs from the rooftop.

Ms. Olshansky: How did you find the space?

Mr. Skaarup: Olivia met up with the municipality and discovered an initiative called the climate neighborhood, where they renew an area every 5 years. The focus in these areas is to make it more livable and nicer to be in. This happened to be one of the areas. They provide 60 million crowns to create a neighborhood plan. In this area, the focus was capturing and recycling rainwater, since the sewer system isn't big enough to handle all the rain. They wanted to slow the water down instead of pumping it into the sewer. Some park could act as a dust pan to hold back the rain so the sewers can process the water. Then they will let the rest of the water go when the sewers have processed most of the water. The problem is that they need to have plants that can withstand the water. That's basically how we found the place and realized it was perfect so we

made a contact with the building owner, who gave them the building and rent for virtually nothing.

Ms. Olshansky: Do you hold other events?

Mr. Michael: Music festival and weddings.

Appendix F: Chris Chimenti Interview

Transcript

The group spoke with Chris Chimenti, owner of an urban farm in California, USA. He currently is a non-profit and donates all of his crops to the local community. Chris believes this will allow people to gain lost knowledge on where your food that you eat actually comes from. We reached out to him to learn about his urban farm and learn some of the specifics an urban farm needs to run successfully. We used a phone recorder to record the interview for later transcription and used a computer to take minutes of the interview as they happened.

Mr. Chimenti: Hello, this is Chris.

Mr. Rosen: Hello Chris. This is Robbie. I contacted you about an interview.

Mr. Chimenti: Hello Robbie. How's it going?

Mr. Rosen: Good. So just so you know, you're on speaker and in the room is two of my group members.

Ms. Hoops: Hi, I'm Gabi

Mr. Chimenti: Hey there.

Ms. Olshansky: Hi, I'm Hannah.

Mr. Chimenti: Ok, great.

Mr. Rosen: We just wanted to discuss some of the questions that we sent you. You said that not all of them pertained to your organization so if you want to start us off and give us a little explanation of what you guys do we'd love to hear it.

Mr. Chimenti: Yes. So I thought a call would be a little bit easier because I think our urban farm is a bit different and doesn't really fall under too many of your questions. So do you want me to just dive through the questions or just kind of explain Almany farm as it stands?

Mr. Rosen: Whatever you feel fits. Option one seems beneficial so you can go with that.

Mr. Chimenti: Ok. So under financials, we have the main startup costs. So Almany farms was started by a group of anarchists, idealists, and environmental activists. We actually squatted on a piece of city land so the startup costs were pretty much zero.

Mr. Rosen: Wow yeah. That's awesome.

Mr. Chimenti: I mean on the whole it was zero. It was definitely people gathering their own funds or getting donations or getting free starts to start planting things to get things going.

Mr. Rosen: Yup.

Mr. Chimenti: So as a whole and as a history, there wasn't really a group sitting down looking at how to start it and determining the startup costs and what would be needed. It was more like let's do this. We were interested in food security in this corner of San and we found this piece land that was not being utilized, and so we grabbed it.

Mr. Chimenti: You know I would say if I were starting a farm from scratch, it's just like any other business or any other farm. There's a standard model. Are you leasing the land or do you have to pay some kind of monthly fee for your land? Are you actually going to pay staff or are you going to have some type of volunteer model? Then of course, you're going to have your tools and your inputs to make things grow, so you need your seeds and your fertilization.

Mr. Rosen: Yeah. That makes sense. Just going down the list of questions, did you encounter any unexpected expenses that were more expensive than you initially thought?

Mr. Chimenti: I think probably the hardest thing in logistics for us was the farm scale going from two 50 ft. beds to 3.5 acres of planted fruit and vegetables. We didn't have a green house in the beginning, so we couldn't do our own starts. That started getting very expensive on a logistical scale, so we used resources from all around the bay area for people who might let us do our starts for free or for trade or barter. So this was a huge expense in the beginning.

Mr. Rosen: Okay. Are you profitable by any chance? Have you broke even?

Mr. Chimenti: Well since we're on city property, we cannot actually sell any of our produce. So everything is actually given away for free.

Mr. Rosen: Okay.

Mr. Chimenti: So we grow 11 tons of fruit and vegetables every year, and it's all given away for free.

Mr. Rosen: Now I'm just jumping around because I'm kind of curious. What types of vegetables do you grow?

Mr. Chimenti: So we have 140 fruit trees. We have everything from apples, stone fruits, avocados, pineapples, guavas, and citrus. So pretty much there's a broad spectrum of fruit trees. And then as far as broad-spectrum crops, you name it. We're in a California climate so we're growing year-round. We grow all your greens, kale, collards, beets, radishes, lettuces, brussels sprouts. We pretty much grow everything that's in your traditional supermarket or farmers' market.

Mr. Rosen: Okay. So that's a good segue into my next question then. You said you give it away, but do you give it away to these supermarkets or give it away to these farmers' markets. Or is it more like a CSA model or do you give it away to people in your area?

Mr. Chimenti: Over the years we've tried a few things. One thing was that starting something like this and wanting to tackle food security, we didn't want to see food go to waste because you can't get it in peoples' hand. Our model right now has been pretty successful. I would say 90% or more now is at full harvest. In San Francisco, there's actually a free farm stand in a neighborhood every Saturday, so I would say about 50% of our harvest goes there. We do a large Friday harvest, and the people that run that farm stand get the food. Then, the primary model for actually growing so much produce and actually keeping the space running is actually sweat equity. So if you come out and volunteer, at the end of the day you take home whatever is harvested. Through that model, we have people coming out on our volunteer days or corporate groups signing up. At the end of the day, it's kind of like a big reward for the work you accomplished and you're taking home organic fruits.

Mr. Rosen: Yea I like that. So all your labor is all volunteers?

Mr. Chimenti: Yup. We're a volunteer co-manager group, and the labor that supports that management group is all walk-in or school groups, corporate groups. However, in the last 9 months we're trying to figure out a more sustainable model. We pushed hard in fundraising rounds, and I think we're going to hire someone for 30 hours a week and actually pay them.

Mr. Rosen: Ok cool. You may or may not answer this either way I understand. With this new approach you said sustainable, so are you now trying to make money here?

Mr. Chimenti: No. It's still not a money proposition. We're a nonprofit by rule of C3. We're just trying to figure out how to keep it running and how to keep the programs we have running. We have summer camps that we run, and we're building a jobs program right now. The only way to really do that from the core management group fluctuating as people come in and out of the group throughout the years. As people come in and out, we obviously all have full time jobs as well. There's always someone in the group who could be there more than a couple times a day, so we could always figure out schedules and keep things running, but you know recently we've kind of hit that road block. The core group is getting older and life is getting more complicated and so that's not possible. The only way we can keep running what we have is to pay someone to be there. But there's really no profit model.

Mr. Rosen: Okay. Jumping around here once again, you were talking about how you connected with the surrounding community. Could you elaborate, like what else do you do other than what you already said?

Mr. Chimenti: This might kind of tie into one of your questions. This will also answer the questions that asked "if you were doing this again would you do it the same way", and I would probably say no. If you're going to start surveying a piece of land in an urban environment, the first thing I would've done now is actually canvas the neighborhood to a degree to see if they actually want this. The corner of the city that we're in is an economically disadvantaged corner

of the city, so there was this broad assumption that trying to bring fresh fruit and job skills into that area would be a benefit and that it would be welcomed, but that hasn't been the case. Canvassing the neighborhood now, you might see that they'd rather have basketball courts and soccer field on that land. You know gardening labor doesn't exactly translate to everyone as something that's fulfilling. Those are very complicated socio-economic things that you need to take into account and make sure that the community you're going into really wants something like this. Over the decade or so, we've definitely made connections with the community and with the community leaders, but it's been main struggling point really connecting with the right people.

Mr. Rosen: Okay. I understand where you're coming from. So, you mentioned you picked a location. What made you go with that location? I know you said you squatted a lower funded area, but is there a specific reason why you picked it?

Mr. Chimenti: I would say so. The site has an urban farm history. It was an urban farm education center before we showed up there, and it had a profit model but actually went out of business. So, we choose it because it already had that significance in the neighborhood so it was easy to take it over again. But if you can imagine it being empty for over two years, no one would've ever known that anything had ever happened in that space. We choose it because there was some infrastructure in place that had essentially been abandoned, so there was an opportunity to more easily regenerate that abandoned property. Some of the founding folks definitely thought of that corner of the city and how the folks living there had disadvantages and how this would be an opportunity for them. Building jobs programs and bringing healthier food into the area for free was some of the initial drivers.

Mr. Rosen: I like that. There was already some infrastructure there that had some meaning to it, so why not try to grow on it? I think this is our last question unless you had anything else to add. We were curious what was the goal for creating the urban farm?

Mr. Chimenti: It's actually in our mission statement. We want to promote education for ecological horticulture and how we can make it a more sustainable growing system. We want to grow green job skills since, at least in the state of California, agriculture is a multi-billion-dollar business, and there is an opportunity for people to learn skills and trades in that area. And so, we want to teach and get city dwellers interested in farming as well. We're going into an epidemic with aging farmers and their children not taking over their land, so we are trying to connect the city and the farm. We want to promote food security and learning how to grow your own food, since we can't always dependent on these systems that are in place. Also, if you're economically disadvantaged, growing your own food is a great way to get healthy fruits and vegetables into your own diet. So those are some of the core things.

Mr. Rosen: Cool. I like that. We appreciate your time. Do you have anything to add? Any last remarks or anything?

Mr. Chimenti: Yup. So, is this just a broad program where you are putting together a paper, or is there actually a site or someone who you are trying to help set up an urban farm?

Ms. Olshansky: Yeah. So, what we are doing is we're working with an environmental organization in Copenhagen called Miljøpunkt Amager. They're interested in potentially starting urban farms in their community, which is in the neighborhood of Amager, and they want to know what's the best way to do that and if this would be a feasible thing to do here. So, we're looking at urban farms all over the world and within Copenhagen to try and see all of the elements that go into an urban farm so that we can make recommendations for them as to what might work within this specific community. We're also writing a paper and doing all of that, but our main goal is to help this particular environmental organization.

Mr. Chimenti: Okay. Great. For Copenhagen, your startup costs is going to be green houses. With your growing seasons there, you're going to need a greenhouse.

Ms. Olshansky: Yeah. So, we're looking at that so we're probably thinking like rooftops and rooftops greenhouses are most likely going to be the way to go in this particular area. But, going off of that, is it okay if we use this interview transcript of it within our interview and within our research?

Mr. Chimenti: Oh sure! Yeah, as I've said, the urban farm community is just that, so any way we can help to develop more. You know one thing that we're seeing more as with our space as we migrate back more to an urban environment is we're becoming more and more a refuge for our overworked office workers. We've seen a huge uptick in corporate visits to our site, which is really also helping in funding our programs. Most times when a corporate business visits, they'll donate \$1000 or something like that. And we run pretty much everything off of donations. There are people that are looking for these green spaces that are actually missing out on the opportunity to get their hands dirty and feel muscles that they already do not utilize, and so there's a lot of other benefits to an urban farm outside of the food storing as one.

Mr. Rosen: Thank you so much for talking to us. This was really helpful

Mr. Chimenti: Yup, nice and easy. If you need anything, please just reach directly out to me and I can answer any questions.

Mr. Rosen: Of course! We appreciate it! Thank you, and have a good one.

Mr. Chimenti: Thanks, you too. Bye.

Appendix G: Joah Pinje Interview

Transcript

The group spoke with Joah Pinje, one of the executives of ReFarmed, an urban farming startup organization. He is currently in the process of actualizing his first urban farming project, a 500 sq meter rooftop farm above Bilka, a hypermarket, in Ørestaden. We reached out and met with him to learn from his unique perspective starting an urban farming business in Copenhagen. We used a phone recorder to record the interview for later transcription and used a computer to take minutes of the interview as they happened.

Ms. Hoops: We were hoping you could explain your mission for us, and then you could just tell us how you started and where you got your ideas from?

Ms. Olshansky: Because we know you started at or with Miljøpunkt Amager, so could you tell us a little more about what you do and more than what we can figure out through google translate via your website?

Mr. Pinje: Sure. So, it actually started with Camilla. She worked there at Miljøpunkt Amager about two and a half years ago with Claus. We talked to Claus about where we could put an urban farming project that we are currently planning. He had some different contacts, and we also got in contact with Fields, the shopping center. And since then the concept has developed from being a more idealistic and more nonprofit project into being a commercial project. So, we have different commercial partners, and we have developed this concept of integrating horticulture greenhouses into a commercial supermarket building. We have found sort of these resources that can go into production, such as residual heat, surplus water, bio waste. On top of that, we're going to put sun cells on the roofs, so we're going to make an off-grid production. So, this project with fields is going to be a prototype. We are prototyping this farm that is going to be a 500 sq. meter greenhouse. We will be growing herbs, vegetables, and fish that will be sold in the supermarket two levels below and to hotels and restaurants in the area. We're going to shorten down the distribution and food miles.

Ms. Hoops: If you don't mind me asking, you said fish and you're doing a rooftop farm. How are you going to incorporate fish into your farm?

Mr. Pinje: So, we just came from a meeting with an architectural company and engineering company, and they have been researching the building aesthetics. They found that the building can hold all of the fish tanks and the greenhouse in specific areas on the rooftop.

Ms. Hoops: Did you guys pick this building because of the infrastructure?

Mr. Pinje: Well by chance. Also, this shopping center Fields was actually looking for a project on this rooftop that they hadn't been using well since the building was built. But it turns out every project had got stuck in the operation part, and they couldn't find anyone to actually operate the project. And the project turned out to be too small scale, so when we approached

them they found that the project was interesting for them. And since then we've kind of developed the project and the concept with them, and the whole scenario is now taking off. This fall we are going to actually start producing crops. We are building this spring and summer, grow produce in the fall, and sell in early 2018.

Ms. Olshansky: What are you guys planning on growing in addition to fish and herbs. What process did you go through to decide?

Mr. Pinje: So, we have a partner who is an expert in aquaponics, and she is producing fish and herbs in a symbiosis. And those two things are going to be produced in addition to what the supermarket wants. We're seeing how much of each product they're selling, and then we're currently in the planning phase of choosing what kinds produce to grow and how much is going to be produced. It seems like, based on the economy and the budget, it is sustainable so far.

Ms. Hoops: So, you've kind of touched upon the budget a little bit, and if you don't mind me asking where are you getting your funding coming from? Are getting it from grants, outside investors, or is it your own money that you're fronting?

Mr. Pinje: Of course, we've been fundraising quite a bit since we've started, and so far, the biggest grant that we've gotten was funded by *Aldania*, which is the second biggest fund in Denmark. And the Kommune granted us 3.5 million Danish kroner. So right now, we are negotiating with Fields, a big French company that has 180 centers around Europe. They have committed themselves to the project, and they are putting in around 10 million Danish kroner into the project. On top of that, we are going to find an investor or bank to finance the rest of the project.

Ms. Olshansky: So, I know you mentioned that not only are you collaborating with the supermarket, but you're also hoping to sell to restaurants and hotels in the area. How did those connections come about? Are there restaurants that reached out to you? How are you planning on producing specific crops for specific places?

Mr. Pinje: We're not hoping. We're actually going to produce to restaurants and hotels. So, we're going to land this agreement with the hotel. We got in contact with them through networking. We were recommended to the group, and of course, there has been a lot of talk and it's not a secret that this project is happening. Eventually, we came into contact with them, and the CEO of this agricultural group was introduced to the project. Then, he contacted us and the group that is now meeting with us. The first meeting is still on going and I am excited to have this agreement.

Ms. Olshansky: So, there's a lot of infrastructure that goes into this project whether it's the greenhouses or aquaponics. To get all of this finalized and constructed, did you have to go through any municipal regulations? What was that process like? Are there regulations in place to govern these kinds of things?

Mr. Pinje: Two and a half years ago, we made this feasibility study sponsored by the Danish Business Authority. An engineering company that was also involved in this feasibility study

looking over land. They had actually worked on part of the Fields building, so they know the building and all of the drawings. To pitch it to Fields and Nehaus, we had this whole feasibility study drawn up with this whole scenario. We had to find out if this building and roof could actually hold all of these fish tanks and a greenhouse. Also, we had to see if we could find the resources to heat up the greenhouse year-round. So, we drew up this whole scenario. And then we had to make this reports to the business authority, and since then we've kind of developed the project.

Ms. Olshansky: You're really close to being up and running, but who will be running the daily farm operations? Are you going to have hired workers, are there trained urban farm workers in Copenhagen? How will that work?

Mr. Pinje: I've told you about our partner who is a aquaponic expert. He's going to need a part time assistant working with the herbs especially, and then we will also need logistical staff who are going to pack and deliver, but also be part of the experience. We're going to create this viewing line which they're going to be responsible for which is kind of wholistic design that gives the customer a wholistic experience from the greenhouse and fish and we're going to give customer an insight into how we are producing, how we are delivering, and how we can create a sustainable business but also an environmentally sustainable as well in part with a circular economy and zero-waste approach.

Ms. Hoops: You have touched upon wanting it to be a wholistic experience. Are you going to be running programs? Such as trying to bring in the outside community so that even if they're not necessarily customers, they can at least understand where their food comes from.

Mr. Pinje: Yes, this has also been part of our journey because we started out trying to reach every kind of part of the project, both social sustainability and environmental sustainability and economy and so on. But we found out that in order to succeed with this then we had to narrow it down, find out what is our core. In order to be a success, we had to make this business case, for our business partners and for our investors and customers. We had to focus on the production and the experience part of it and not leaving out, but continue pushing forward with the social implication part of it. Which is also interesting for a shopping center especially because the faculties draw families to the center, to bring in more customers, which is interesting for them. So we're not focusing on that right now, and it's going to be a later addition.

Ms. Olshansky: So this is a really involved process and there's a ton of things that have gone into it, and I'm sure not everything's gone right, and things have gone awesome. But if you were to do this again are there any big problems that you faced, any problems that you didn't anticipate, maybe some things that you would have done differently?

Mr. Pinje: Yes, we would have chosen another partner or a different supermarket. Because this collaboration with the supermarket hasn't been perfect. This is also why we've been working on this project two and a half years now, it could have launched a year and a half ago. If we had a better cooperation with the shopping center. So picking the right partners is probably one of the important things, and making clear expectations of responsibilities and so on. It's so hard when

you're working with the wholistic and circular mindset you are working across the existing organizational unit or what you call it. And companies are not accustomed to thinking that way. So ultimately in the future that's going to be one of the biggest challenges, there's no way around it. That's our mission to implement these kind of wholistic concepts and productions and in order to make an impact we think we have picked supermarkets and kind of the big players. Where customers are not used to think in terms of sustainability and to approach them and make them more aware of different ways of producing and yea. Change their mind set and make them more aware of the need to change the way we yes, make it into trenches. We kind of want to approach those people who don't necessarily agree with us. Then we are selling in different things, in fresh crops and new experiences. That's our way to make an impact.

Ms. Olshansky: I really want to see all of this happen. Thank you so much this is so interesting and helpful.

Ms. Hoops: I really appreciate you taking the time to step away from that and speak with us.

Mr. Pinje: One thing I didn't touch upon is that while this is our prototype as I told you, so we're going to scale up and we are already talking this, with the aim of actually scaling up this concept and we have this ten year plan and by 2020 we expect to establish 1 farm a year. And we will be focusing on establishing in other countries as well. So that's interesting for us, but also our investor, which is E-on, and our energy partner solar-ray, who is also partnering with our company. This first project is crucial for us to succeed, in order to grow and invest heavily.

Ms. Olshansky: Thank you so much this was very interesting.

Appendix H: Kenneth Ellegaard Interview Transcript

The group spoke with Kenneth Ellegaard, owner and head chef of Restaurant 56° in Christianshavn. One of his missions with the restaurant is to promote the use of locally grown organic produce, and so most ingredients are grown from their garden in the back of the restaurant or from a partnered farm just outside Copenhagen. We reached out and met with him to learn about crop selection unique to a restaurant and the logistics of running their own garden. We used a phone recorder to record the interview for later transcription and used a computer to take minutes of the interview as they happened.

Ms. Olshansky: What is your mission other than just selling food?

Mr. Ellegaard: We have been here for ten years and we have a little farm down in Lolland one hour from here where we grow our own vegetables. Then, we have the garden out here (outside restaurant) where we are trying to have more vegetables. We cannot have it in the ground. We need to have it in boxes because the ground is not too good here in this area. Every year we need to make new soil so we take leftovers from the kitchen and put them in boxes out here so we have soil for the next year. All the herbs are here and small kale but all of the big vegetables like carrots and potatoes are at the farm. We have to have more than what we can grow ourselves so we don't have to worry about anything. It is difficult to have biodynamic and all that if you don't know the people who are growing them. The idea we are thinking is if you know the people that are growing the things then you know more about it and we have a history down there at the other farm. When we in the 90s the people that signed were making it biodelotic to spray roundup. You know the man who grows the vegetables and we can go down there and get ideas for new dishes and see different vegetables that we have not tried before. We are trying new things every year, growing new herbs and trying it in dishes. After vegetables are grown we take the seeds and pickle them so we have many things for the winter because it's difficult to grow things the whole year. We also can save and ferment vegetables, pickled vegetables, dry them so we have them. We have been here 10 years where we have hosted many weddings and have bells the restaurant here and we try to hold it in the old mind or still don't do too many things because there is a law. We try every day to make new things and two new dishes every week so menu is changing every week and with the weather. We have some new neighbors Noma so that's fun to talk to them also they also have two big greenhouses.

Ms. Olshansky: Have you been doing the gardening since you started 10 years ago. How did you get into that? Did you know you would do that when you started?

Mr. Ellegaard: When we started we had 10 major plots down here and then a greenhouse looking like this exactly when we started then we ended with both. Then we just put everything here. We started the other farm slowly. My mom came with small herbs from the garden. Here we have the space for it down there at the other farm, originally there was not as much space. Slowly we have been growing more and more things and starting up this farm down at lolland 7 years ago. But it's also difficult but it was a good start.

Ms. Olshansky: How do you choose what you are growing in seasons?

Mr. Ellegaard: Always what is in season, and also traditional things strawberries, potatoes, all these traditional things in season and also we like to trying new crops. We buy the seeds from the biodynamic community where they have all the special seeds (nursery). Many of them are more family grown and it's a good place to buy them because there are no chemicals and all that and that what we want to grow in ground.

Ms. Hoops: Have you encountered any problems? Is it difficult changing menu so often?

Mr. Ellegaard: Rotating the menu is not a problem. But you need to think all the time about a new dish because when you change the first one you must be prepared with the next idea as well, so that you can test it throughout the week leading. It also helps us to be competitive, because you need to try to think the dishes all of the time and you have this drive also for the chefs it's good to have rotation instead of just making the same menu every day the whole year. It can also be difficult to come up with seasonal dishes, as the seasons are different every year. This year normally we have asparagus but now there is nothing so it is difficult to say in April we have always this but it changes every year. The winters have not been as cold recently and so we can have more vegetables the whole year. This year it was very cold so it's difficult. It's the nature that is shaping the menu.

Ms. Olshansky: When are you generally able to start growing. When does your season start?

Mr. Ellegaard: Tomorrow we are starting out in the garden to put seeds in so the season starts here. Also need to start a month before anything starts to grow. Also we are going to start putting things in the ground at the other farm. We try to grow until hopefully December. I think october is the best month and the best time is not in the summer because it's not too hot and is perfect for the vegetables.

Ms. Olshansky: Did you have to get any kind of approvals or was there any kind of process to get approved?

Mr. Ellegaard: No, we got permission to grow immediately. It's also a little bit strange. In Denmark we have all the regulations but it depends where and who you are.

Ms. Olshansky: How did you go about figuring out how to grow in boxes?

Mr. Ellegaard: I had a student here whose father was a farmer who's living at the farm down in Lolland. He's helping me find new seeds to put it in the ground and help us decide what to try this year. The man is a good man to have because I don't have the time to be down there and do all the things. But when we put the seeds in the ground, they can grow themselves. Of course you need to harvest all the produce and then eventually put more seeds in the ground.

Ms. Hoops: Has he used any techniques other than raised plots to have more effective crops and higher yield?

Mr. Ellegaard: We have tried making stuff out of the dead vegetables. We have tried many strange things to make a solution that you can spray on the vegetables so that animals don't try to come and eat them. We put flour on the kale so that small worms don't eat it. We don't have so many big animals here but we have many small animals. We don't want them to eat all of the vegetables. At noma they are trying to make many things to spray that are organic so that they can grow more. They are growing vegetables inside fish and some other cool things to see.

Ms. Olshansky: Is all of the gardens here and the farm run by the staff of the restaurant?

Mr. Ellegaard: Part of the restaurant. We want to have the whole area with hay so we can grow in that but it's difficult. There is whole space still to grow things. We just need the time.

Ms. Olshansky: If you were to go this whole process again, is there anything you would do anything differently?

Mr. Ellegaard: We needed to have more space in the boxes and have more boxes. At the start, we had very small boxes and it is difficult every year to change the soil because you need money and things for it. We should have started the old soil and all of that from the start. We have a lot of it now so that's one thing. But the farming was good. Up here we have the restaurant so you need to focus on the restaurant. This is more fun to just have it because you could just buy all the things but it's good to have the history that you could go out there and take the herbs for the menu. Many of the herbs and flowers are better out there than if you buy them. They would be greasy and not so good so it's good.

Ms. Hoops: How do you sustain yourselves through the winter? Do you only pickle?

Mr. Ellegaard: We also buy Danish vegetables and we save onions, potatoes, and carrots in the soil as much as we can. But of course, if we have 200 people for wedding we can not as many vegetables ready so we still buy things from other people in the winter. But of course, we save as many things as we can and pickle and have things in the ground. It's difficult to save for many people. If you have a wedding, you have to have something.

Appendix I: Johanna Lundell Interview Summary

Can you tell us about your mission?

Ms. Lundell: Children cannot sit in classes in school all day. We have to go outside. The school needs more outside space since they are continuing to build small buildings. This farm is my own idea. I've been fighting with the Kommune for years. It's very difficult to have a great initiative and whole local community supporting me and then still have so many problems getting this actualized. Even if it's perfectly framed in the environmental movement and it is so good for kids to get outside. The school children all have their own plots to grow produce outside and all participants are volunteers. We use horse manure in the soil for nutrients. Then we talk about what we harvest. We have fireplaces where we make food together as community. In spring, we prepare the soil together. End of autumn we put horse manure on it so things grow so it's not bare soil that is losing nutrients.

Ms. Olshansky: What do you decide what to grow?


Ms. Lundell: Onions, carrots, potatoes and flowers if they like just very basic things. We aren't selling them so we grow stuff to cook with. They are also allowed to take the produce home and take ownership of it. The season is also very distinct so you follow the season.

Ms. Olshansky: What challenges have you faced?

Ms. Lundell: Yes so I went to the Kommune with this idea and was in the process of getting it started. But then the Kommune realized there was this open space here and decided to make plans to build here. They are building a nursing home. This three story building is going to create shade on most of the garden so it is unfortunate that we have to move. We have had problems with this area because of nearby traffic. We have had problem with soil compaction from trucks and the soil becomes bad and doesn't provide nutrients. This compaction also doesn't allow water to be absorbed so water just sits there and eventually floods the area.


Appendix J: Why Urban Farming Poster

This poster is intended for use at the Green Your City conference in September of 2018. This poster will stimulate conversation regarding the impacts of urban farming and the reasons to investigate urban farming initiatives.



MILJØPUNKT
AMAGER


Why Urban Farming?



WPI

Environmental

Central Park, NY, USA




On average, Central Park is 5-10 °C cooler than the rest of the city

Advantages: Improves air quality, absorbs rain water runoff, and regulates temperature

Urban farming will help Copenhagen achieve its Climate Plan goals

Østergro, Copenhagen, DK




Østergro is a 600m² urban farm on the roof of an old car auction house. Østergro uses both a CSA and restaurant as revenue streams. They engage with the community by hosting events such as festivals, weddings, and tours of the farm.

Poster made for Miljøpunkt Amager by WPI students: Gabriela Hoops, Hannah O'Leary, Robert Rosen, & Justin Tavares

Social

Little Haiti Community Garden, Florida, USA




Little Haiti hosts culture sharing events

Advantages: Fosters cultural integration and community engagement, aids lower income populations, provides health and environmental education

Economic

Sundholm Garden, Copenhagen, DK




Sundholm, creates jobs for participants in rehabilitation programs

Advantages: Creates jobs, fosters competition, raises property values, lowers food prices

Civic

Baltimore Community Garden, Maryland, USA




Baltimore's community garden reduces crime in the community

Advantages: Reduces crime and vandalism, reduces upkeep costs of vacant lots

Public Health

The Green Bronx Machine, New York, USA




GBM offers healthy lunches to school children


Advantages: Provides healthy food options and increases understanding of food production

Appendix K: Urban Farming for Amager Poster


This poster is intended for use at the Green Your City conference in September of 2018. This poster will stimulate conversation regarding the implementations of urban farming and the methods of turning into an economically sustainable business.



Urban Farming for Amager

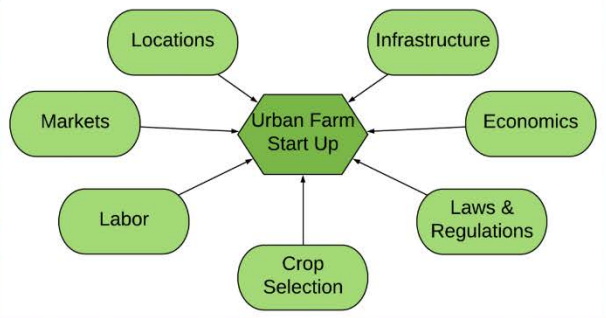


Locations




Rooftops
Vacant Lots
Vertical Farms

What Goes Into an Urban Farm




Infrastructure



Greenhouse
Garden Beds/Plots
Utilities

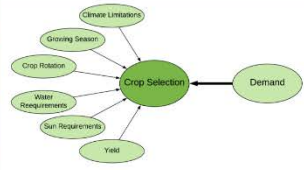
Markets




CSAs
Farmers' Markets
Restaurants

Crop Selection


Factors to Consider



Profitable crops to grow




Economics




Start Up Costs
Operational Costs
Payback Period

Labor



Volunteers
Social Welfare Participants
Paid Laborers

Laws & Regulations



Structural Analysis
Building Codevcs
Fire Codes
Business License

Poster made for Miljøpunkt Amager by WPI students: Gabriela Hoopes, Hannah Olanowuski, Robert Posen, & Justin Tavares

Appendix L: Revenue Stream and Greenhouse Data Totals

Farm Name	Farm #	CS A	Farmers Market	Restaurant	Greenhouse
Brooklyn Grange	1	1	1	1	1
TigerMountain Foundation	2	1	1	1	
Real Food Farms	3	1	1	1	
Food Field Detroit	4	1	1	1	1
Aleman Farms	5	1	1		
Metro Atlanta Urban Farm	6		1		1
Gotham Greens Pullman Rooftop Farm	7		1	1	1
Ohio City Farm	8	1	1	1	
Rainier Beach Urban Farm	9		1		1
Springdale Farm	10		1	1	
Skarsgard Farms	11	1			
Sunspot Urban Farms	12	1			
Revision Urban Farm	13	1	1		1
The Urban Farming Institute of Boston	14		1	1	
Urban Roots	15		1		
Baltimore Free Farm	16	1	1		1
Baltimore Civic Works	17	1	1		
Whitelock Farm	18	1	1		1
Prinzessinnengarten	19		1	1	
Himmelbeet	20		1	1	
Urban Canopy	21	1	1		
Greencity Market	22		1	1	
Eat the Yard	23		1	1	
Gardens in Community Development	24		1		

Commonwealth Urban Farm	25	1	1	1	1
Keep Growing Detroit	26		1	1	1
GartenCoop	27	1			
The Grove Rooftop Farm	28			1	
Moondog Farms	29		1	1	
Mill Creek Urban Farm	30		1	1	
Germantown Kitchen Garden	31		1	1	1
Gotham Greens Greenpoint Rooftop Farm	32		1		1
Gotham Greens Gowanus	34		1		1
Gotham Greens Hollis	35		1		1
The Farm at Agritopia	36	1	1	1	
Local Sprout	37		1	1	
Urbanlife Ministries	38	1		1	
Sarvodaya Farms	39	1			
Common Good City Farm	40	1	1		
Three Part Harmony Farm	41	1			1
Steadfast Farm	42	1	1	1	
Michigan Urban Farming Initiative	43		1	1	1
Earthworks Urban Farm	44		1		
Oakland Avenue Urban Farm	45		1		
Recovery Park	46			1	1
United Community Centers	47		1		
Bushwick City Farm	48		1		1
Red Hook Community Farm	49	1	1		
Just Food	50	1	1		
North Brooklyn Farms	51		1		1

Mill City Grows	52		1		1
2 Friends Farms	53		1	1	1
Mass Audubon	54	1	1		1
Cavicchio Greenhouses	55		1	1	1
Waltham Fields Community Farm	56	1	1		1
The Natick Community Organic Farm	57	1	1	1	1
Lands Sake	58	1	1		
Cherry Hill Urban Garden	59		1		
Strength to Love 2	60		1	1	1
Cottonwood Urban Farm	61	1	1	1	1
The Urban Homestead	62		1		
Local Root Farms	63		1	1	
The Growing Experience	64	1	1		
Earth Works Farm Garden	65	1	1		
Stone's Throw Urban Farm	66	1	1	1	
Growing Lots	67	1	1		
Urban Farms and Greenhouses	68		1	1	1
Urban Roots MN	69		1	1	1
Indianapolis Parks Foundation	70		1		1
Creme de la Crop	71		1		1
Growing Home	72	1	1	1	1
Falling Waters Farm	73		1	1	
The Side Yard Farm and Kitchen	74		1	1	1
Zenger Farm	75	1	1		1
Rockwood Urban Farm	76	1	1		1
Lil' Starts	78	1	1		1

Sauvie Island Organics	79	1	1		1
Plant It Forward Farms	80		1	1	
Green Gates Farms	81	1	1		1
Johnson's Backyard Garden	82	1	1		1
Laughing Frog Farm	83	1	1		1
Boggy Creek Farm	84		1	1	1
Atlantic Beach Urban Farms	85		1		1
Ripe City Urban Farm	86	1	1	1	
Sweetwater Community Farm	87	1	1		1
Mother Earth's Urban Farm	88	1	1		1
Brickstreet Farms	89	1	1		1
Urban Folk Farms	90	1	1		
Harpke Family Farm	91	1		1	
Fort Lauderdale Vegetables	92	1	1		
Urth Farms Organic	93	1	1		1
Sub Edge Farm	94	1	1		
Reservoir Community Farm	95	1	1		1
Wild Carrot Farm	96	1	1		1
Waldingfield Organic Farm	97	1	1	1	1
Oxen Hill Farm	98	1	1	1	1
Rose's Berry Farm	99		1		1
Southside Community Land Trust	100		1		1
Urban Farms of Central Ohio	101		1		1
Woodland Urban Farm	102		1		1
Totals	102	53	91	42	54

