Building Rooftop Gardens in NYC

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Summary

New Yorkers do not consume enough fruits and vegetables on a daily basis, whether from lack of stores, time, or money. Thus, we have created a plan for establishing rooftop gardens across the city. This plan will allow New Yorkers in public housing and in food deserts to garden plants on their rooftop with our help and supervision.

This plan will take approximately five years, during which we will first work on the rooftop and backyard to make them suitable for gardening. The cost is expected to reach $26.3 million across all five years, which is well worth the health and social benefits that urban horticulture provides.

Our team consists of four members, every member of our team has a BS in their respective field, Israel and Benny are civil engineers, Michael is an environmental engineer, and Yosef is an agricultural engineer. In the last couple of years, we've collaborated with other major metropolitan cities like Chicago, Seattle, and San Francisco to expand the accessibility of fresh produce through rooftop gardens.

Introduction

In a 2019 report, the New York State Department of Health (DOH) revealed that roughly one-third of adults (31.2%) in New York do not include fruits or vegetables in their daily diet, with some counties having figures as high as 42.4% (New York State Department of Health, 2019). A study by the New York Academy of Medicine found that nearly one in four children and 13% of seniors over 60 years old fell into this category (Libman et al., 2016). Additional research found that only about 10% of New York City residents consume five or more servings of fruits and vegetables per day—the recommended daily amount—and only 50% consume two or more (Li et al., 2016).

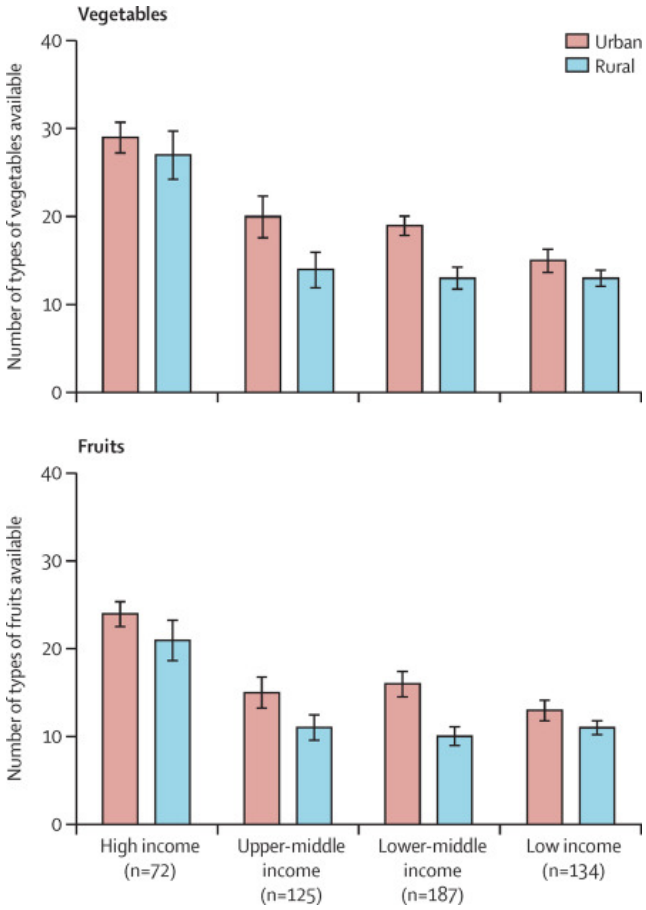

Figure 1. Mean number of types of vegetables and fruits available by socioeconomic class

These residents show a genuine desire for healthier diets but struggle to afford or locate produce that would sustain such a diet. A 2014 study on access to food in the five boroughs found that 1.4 million residents, or one in six, did not have reliable access to nutrition (Libman et al., 2016). A 2010 study by researchers from Columbia University found that low-income neighborhoods, such as Central Harlem, lack supermarkets and grocery stores that provide crucial access to fresh fruit and vegetables (Pereira, 2018). This is backed up by data from a study on the availability and affordability of fruits and vegetables, shown in Figure 1, which found that lower-income communities had fewer options when shopping for produce (Miller et al., 2016).

This document proposes the promotion of urban horticulture in New York City in lower-income communities to ease the burden on residents with limited access to fresh produce. Urban horticulture is the cultivation of specific fruits, vegetables, and other plants that can thrive in an urban environment such as a large city (Khan et al., 2020). The document details a plan to support NYC residents in beginning rooftop gardens by allocating resources for the preparation and construction of such gardens, as well as by providing guidance on how to ensure an urban garden's longevity and success. The document is split up into three sections: the project description, which details the mechanisms by which this plan will be carried out; the budget, which breaks down the costs involved with the implementation of this proposal; and the conclusion, which discusses long-term effects and considerations associated with the proposal.

Figure 2. Rooftop garden on the roof of a high-density residential tower

Project Description

The end goal of the project is to establish rooftop gardens in New York City that will yield fresh, local fruits and vegetables to greatly increase access to nutritional produce that is lacking in many New Yorkers' diets. There are two main steps in achieving this goal: preparing rooftops to support gardens and providing building managers with the resources to establish the gardens. To increase efficiency and flexibility, the plan can be modified during its implementation to address any potential issues.

Compared to purchasing produce from a large grocery store, maintaining a rooftop garden has been shown to support sustainable economic growth in individual neighborhoods and provide accessible food sources for lower-income communities. Researchers from Sultan Qaboos University found that urban horticulture reduces local price volatility and stabilizes food prices, especially after the economic turmoil of the COVID-19 pandemic (Khan et al., 2020).

A major consideration in creating rooftop gardens is whether or not the rooftop has enough structural strength to support the weight of the soil and water necessary to maintain the garden. Therefore, there is a need for prior inspection and approval by the New York City Department of Buildings before gardening can commence. Officials from the department will have to visit each site interested in participating in the program to ensure that there is adequate strength and that the roof is water-tight. Rooftops that are determined to not be within specifications will either be disqualified from the program or must undergo maintenance to prepare them for the gardens.

To carry out the task of supporting residents in establishing and maintaining gardens, our proposal includes a social media initiative campaign to boost awareness about the program. Advertisements will be placed on social media platforms like Facebook, YouTube, and TikTok which generate interest in rooftop gardens. These advertisements will motivate residents to grow fresh fruits and vegetables while also providing them with techniques on how to start gardening. Given sufficient information and resources, NYC residents will be able to grow their fresh vegetables and fruits on their rooftops within approximately ten months. The information, which will also be disseminated through mailed pamphlets, includes instructions on constructing and assembling raised garden beds, tips for cultivating specific crops, and guidance on creating an optimal growing environment.

After the approval of the rooftops structural integrity, building managers will reach out to our team and coordinate the delivery of materials to the location. Materials including pots, raised garden beds, soil, fertilizer, watering cans, and seeds. Building managers will also be responsible for assembly of raised garden beds. This should be fairly easy and require no special technical skills as outlined in the instructions in the pamphlets.

Our proposal tackles the promotion of rooftop gardens in three distinct phases. The first phase tackles New York City Housing Authority (NYCHA) public housing since it is more representative of those without secure access to fresh produce. The second phase will expand the program to privately owned apartment complexes and residences deemed to be in "food desert" zip codes. The third and final phase will then further expand the scope of the program to government offices and public facilities such as schools.

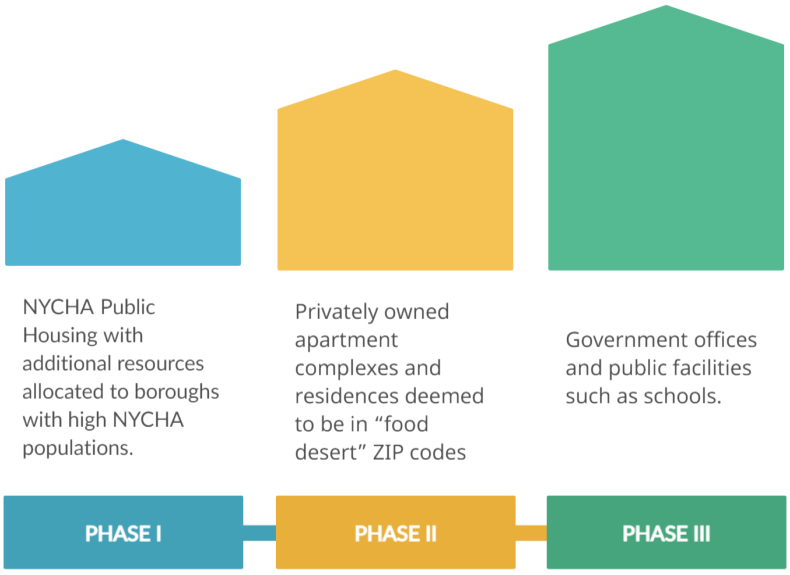

Figure 3. Program roll-out in three phases

Phase I

As mentioned previously, priority is given to NYCHA campuses since they represent residents who are more likely to lack access to fresh produce. The average family income of a NYCHA household is just $24,454, well below the $67,046 city-wide average (New York City Housing Authority, 2022; United States Census Bureau, 2018). Although work will be completed concurrently in all five boroughs, more resources will be allocated to the boroughs with a larger NYCHA population. In order of greatest population to least, boroughs will be prioritized as follows: Brooklyn, Manhattan, Bronx, Queens, and Staten Island (New York City Housing

Authority, 2022). This phase of the plan is expected to take around one year to complete since the city already closely coordinates with NYCHA on public projects.

Phase II

The second phase extends eligibility to private apartment complexes and residents located in “food deserts”, which are defined by the U.S. Department of Agriculture as a tract where a significant portion of the population is “more than one-half mile to a supermarket” (United States Department of Agriculture, 2022). Digital and physical copies of an interest survey will be sent to building managers who are determined to be in a food desert to gauge community interest. The building managers have the option of opting in or out of the program. This phase is expected to take significantly more time than the first since we must coordinate with several private owners without city partnerships. This phase is expected to take around two years to complete, due to the added difficulty of coordinating with private landowners.

Phase III

The third and final phase will include government office buildings and public facilities such as schools. Rooftop gardens established as part of this phase benefit all residents, not just those who require supplemental access to food. Students and city workers are great targets in particular, as gardening can promote education and collaboration among these groups. Participants can learn how to tend to the needs of specific crops while enjoying the benefits of a greener space. This phase is also expected to take around two years to complete, for similar reasons to those of Phase II.

It is important to note that the program is currently designated solely to help low to moderate-income NYC households and those in food desert zip codes with access to fresh

produce. As the proposal currently stands, there are no plans to extend this program to privately owned apartment complexes and houses outside of food desert ZIP codes. Not only would this be costly, but it would be burdensome and take a lot of time and human capital and may end up harming local businesses that offer food to well-serviced areas.

Challenges

Perhaps the biggest challenge we may face when implementing this project is whether New York City residents will be consistent in maintaining the gardens and ensuring that they are not left without gardeners after a period of time. We hope those willing to sign up for the project will be diligent in this task, but we concede that this outcome is not certain. Employing some sort of oversight committee for the gardens could solve this problem, but this would require more money on top of what we expect to be a costly plan.

Budget

Firstly, we must hire experts for the inspection and certification of the rooftops of participating buildings. The average salary for a roofing inspector in New York City is between $25 and $40, but the average amount of $33 will be used for budget calculations (Talent.com, 2023). We must also factor in the cost of construction workers for the fortification of rooftops and balconies to support gardening, and the average hourly rate is $20 (PayScale, Inc., 2022). We will do inspections of all the buildings and constructions of balconies, if necessary, throughout NYC. In this way, the budget for inspection and construction will be estimated at $16,000,000 for five years of projects.

Similarly, we will need money for planting materials on the rooftops of the buildings if we get permission from the residents. In this way, the first thing that we need for rooftop gardening is green layers, the cost for these layers is $10 - $50 per square foot. Next, the other materials for rooftop gardening are less expensive than green layers, but green layers are a crucial part of rooftop gardening. Other materials like plastic bags, bottles, cans, and containers cost $100 to $200, seeds for planting cost almost $500 to $1000, lightweight soils cost $50 to $100. For this planting material distribution materials, if we get help from students as a volunteer then we can save money that we have to spend on workers. But if we cannot get help as volunteers then the average salary for the workers who will distribute materials to all the rooftop gardens in the city will cost $15 per hour. So, the estimated cost for the material for rooftop gardens and the salary of the workers will be around $15 million throughout the city for the six-month project. It is expensive, but the health of the residents is more important.

Furthermore, we must start a campaign on social media to motivate the residents and to provide them with awareness of the benefits of rooftop gardening. The cost for this purpose is estimated that $500,000. Also, we must make and get pamphlets for the guidelines on rooftop gardening for the residents, it will cost almost $500,000. The total estimated cost for this project will go beyond $26.3 million.

Plan	**Employee Pay (Total for five years)**	**Extra Expenses**	**Total Budget**
Inspection/Certification	$16,000,000	$500,000	$16,500,000
Planting Material/Green Layer	$9,000,000	$200,000	$9,200,000
Advertisements and Other Expenses	$500,000	$100,000	$600,000
Total Cost	$25,500,000	$800,000	$26,300,000

Table 1. Summary of expenses

Conclusion

The lack of access to organic, fresh and affordable produce is a serious and overlooked issue in New York. Our solution is simple: establish rooftop gardens on government buildings, with the approval of the NYC Department of Buildings. While we expect this solution to take up to five years to kickstart into full effect and cost $26.3 million. Despite the steep price tag, this project is expected to provide fresh fruits and vegetables to over 1 million residents, which is around one in every eight New York City residents. Improving the health and quality of life for the less fortunate across the city is our aim, and we expect this project to help further this goal. Although we will have to place our faith in New Yorkers to maintain the integrity of these gardens, that is a bet we are more than willing to make. There are many things that define a New Yorker, but one that perhaps comes up the most is hard-working and we know that our fellow New Yorkers will work hard in providing themselves and others fresh and free produce that they are desperately lacking in.

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