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Greenroof Growers NYC

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Abstract

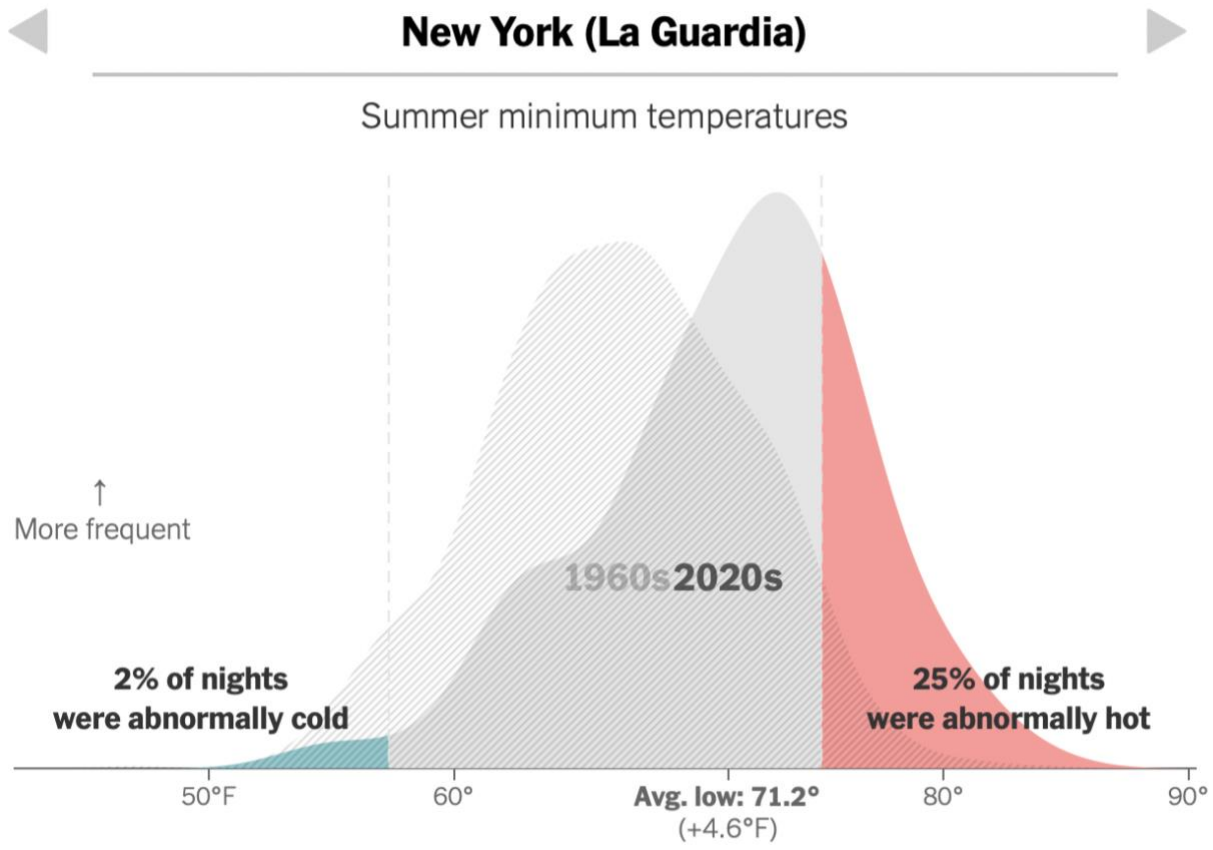
New York City is getting way too hot in the summers, and I blame the lack of greenery. There additionally is also a not enough ways to get local fresh greens, mostly because it seems that there is no space to grow plants. These problems can help be solved by my team and I, by putting to reuse a lot of the not used rooftops across New York City. A lot of these rooftops aren't in use, and I would like to rebuild them into gardens that not only look pretty but can also prove useful when trying to source fresh produce to places that need it.

Introduction

Currently the world is facing a massive crisis, climate change, and we aren't doing enough to stop it. A large area of each of our lives that greatly effects climate change is what we eat. Unfortunately, it's very difficult to eat smart in New York City, there is a huge lack of locally sourced products, and this isn't surprising, where can people grow enough produce to then be able to sell it? The answer to that is rooftops, we just haven't been able to make rooftops a worthwhile venture.

Temperatures in cities are getting hotter. This is occurring all around the United States, In New York specifically in 2021 25% of nights were abnormally hot, while in 1960 about 5% of nights were abnormally hot [1]. As seen in figure 1 average temperatures in New York City are progressively getting higher. This is growing to be a large problem especially because New York City is on the coast. Higher temperatures will cause an uncountable number of problems. Some of these problems include more radical weather changes and an increase chance of heat waves, droughts, flooding, and hurricanes. Hurricanes are an especially large concern in New York City

because of its positioning so close to the ocean. The last hurricane we dealt with, hurricane Sandy, dealt $70 billion dollars in damages [2]. To pay for the damages, they must be taken right out of the taxpayers' pockets. This might mean that to be able to continue to cover costs from hurricanes the state or city government could raise taxes [3]. An additional problem that arises because of higher average temperatures is an increase in air conditioner units. This means higher electricity costs.



[1]

So how would implementing more rooftop gardens throughout New York City help minimize these problems? First green roofs will reduce air pollution and greenhouse gas emissions by reducing air conditioning usage and they can remove pollutants through dry deposition [4]. Second green roofs reduce energy use by reducing heat through the process of

evapotranspiration [4]. Thirdly green roofs can provide multitude of stormwater managements. “Green roofs can reduce and slow stormwater runoff in the urban environment, and also filter pollutants from rainfall. Green roofs can retain nearly all storm-related precipitation during the summer months, with lower retention during the winter months (< 20%). [4]” Lastly green roofs provide an overall improvement of quality of life. These rooftops can provide aesthetically pleasing places for people to enjoy and produce vegetables and fruit which tastes good and provide a healthy alternative to fast food and similar foods.

Table 1. Number of Green Rooftops Throughout New York City

Borough	Number of Green Rooftops in Borough
Brooklyn	134
Bronx	81
Manhattan	464
Queens	49
Staten Island	4

[5]

Table 1 showcases the number of green rooftops across New York City. In total there are 732 green rooftops across all of New York Cities boroughs. Unfortunately, though this only represents about 60 acres of the total 40,000 acres of available space on rooftops in New York City [6]. There is plenty of opportunities for my company to provide services to set up these green rooftops.

Plan of Work

Our plan to increase the number of green roofs across New York City has 4 main steps:

1. Government cooperation and funding
2. Innovation and design of green roofs and surveying
3. Implementation of green roofs through a trial period
4. Wide scale implementation of green roofs.

Task 1. Government cooperation and funding

To start the process of designing an easy wide scale way of creating these green rooftops there is a significant amount of funds needed. To do this most efficiently and easily government funding would be thought to be the quickest and in the long term most effective way. The plan to make these green rooftops is through government help. Climate change and the problems that we hope to help solve through innovation of green rooftops are widescale problems and affect the government directly. It will be hard to convince singular landlords to let us convert their rooftops and make them pay for it. Instead, we could work with the government to create incentives to make these rooftops. This will increase the drive to make these rooftops as owners of houses will see immediate rewards. This would be similar to the way solar panels are treated, those who have them on the tops of their roofs could receive tax write offs or a check every month in the mail.

Task 2. Innovation and design of green roofs and surveying

The next step is to create a way of how to build these green roofs fast, reliable, and cheaply. Additionally, we need to survey some buildings in New York to see how we should

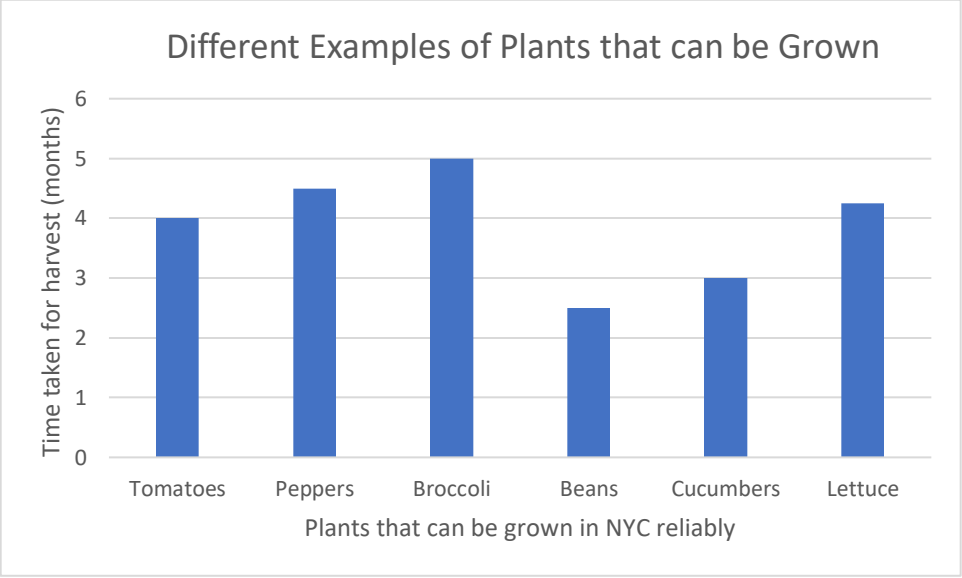
model the green roofs. We also must find where putting green roofs would result in the most efficient output of produce, and where they would help the most. Where there is most promise in New York City in terms of efficient produce output we would begin the trail period with those rooftops.

Task 3. Implementation of green roofs through trial period

Once we can locate where the best places to put these green roofs, we will start to build them in a few different areas. We will continue to monitor them closely, measure different things in the areas where they are being built. We would measure average temperature, CO2 levels, water runoff etc. We must monitor for a while though as the return rate and growth of plants is quite low. As seen in table 2 it shows some plants that produce vegetables or fruits and how long they will take to produce food.

Graph 1. Different Examples of Plants that can

be grown in NYC and how long they will take to be grown



[7]

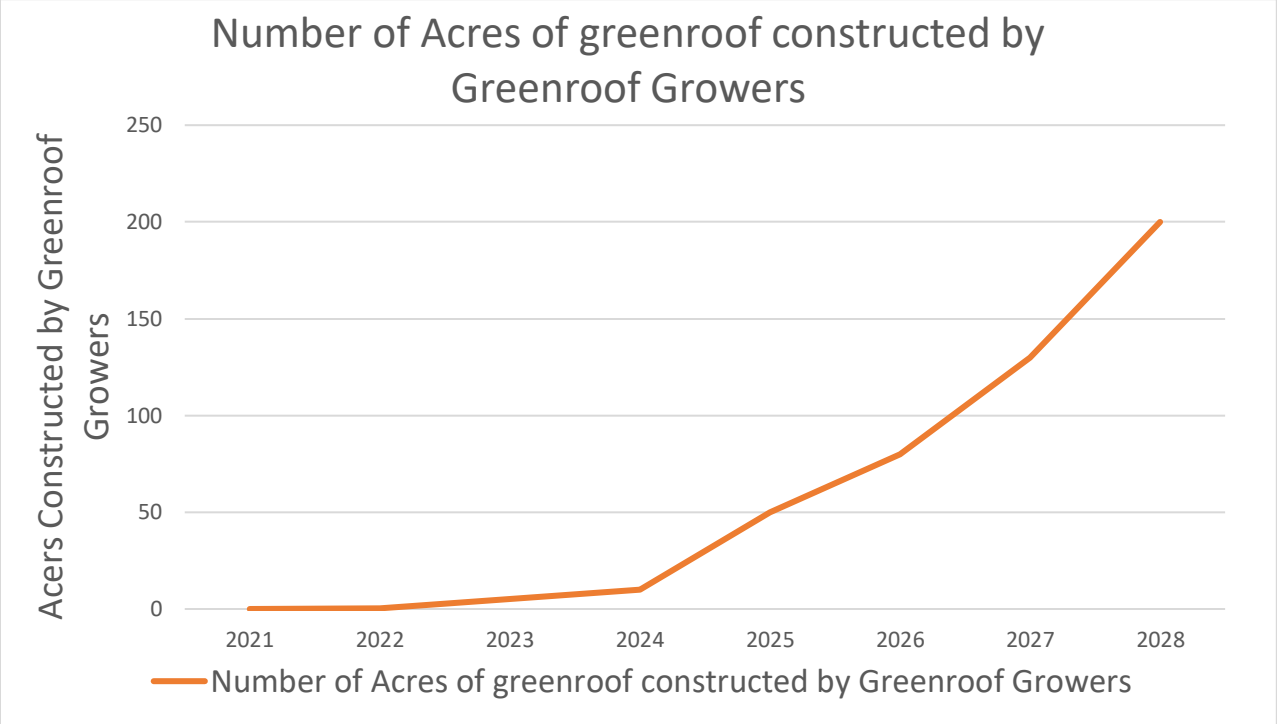
Task 4. Wide scale implementation

This is when we can finally hire a lot of people to start building these green roofs all around New York City.

Timeline

This project will not be a short one. Each step could even take years. The hope is that the first step will take about 6 months and then we can start work on designing green rooftops by my next year and then have multiple prototypes ready by 2022. Then we will go through the trial periods throughout 2022 and then can start widescale production by 2023 or 2024. By no means will this be a short battle but a long and difficult one scattered with legalities and trying to find money.

Graph 2. Projected number of acres of green roofs constructed by The Greenroof Growers



As shown in the line graph in Graph 2 we plan on slowly increasing the acreage of greenhouses throughout New York City over the three years and then picking up production once we have more data on how well the initial green roofs perform. From 2021 to 2024 this includes the initial setup, testing and data collection of the first green roofs. Although through these years we will be building and growing green roofs, we will not focus on creating a significant number of them. Instead producing only a few over the first few years will yield us a couple of acres of land that has been built surrounding rooftop gardens. Following the initial experimental phase, if it goes successfully there will be a dramatic increase in acre size and number of green rooftops. This is the time where there will be the greatest amount of installation as the building owners who would like to have green roofs will commission us to build them as soon as we can but then we will have a hard time finding more places to build green roofs. Hopefully then there will be positive effects of the green roofs and those who had already had the green roofs implemented will serve as an advertisement to show others that green roofs work and are more than just pretty things to look at.

Budget

Ultimately the Budget fully depends on what the government will allow so this step is still largely unknown. A large, very nice, green rooftop can cost up to 200 dollars per cubic foot. The goal of this company is not only to build green roofs for those who want them in New York City but additionally to make them cheaper through computers, hardware, and overall mass production. Those who have a green rooftop in New York City already have them, so its our responsibility to make it easier for more people to have them installed and cost is a massive part of that.

Additionally, maintenance takes a step into the financial talk of the project as well as there is a maintenance cost that come with running or maintaining plants and an area monthly. This companies plan is to make that maintenance specifically every month as cheap as can be, and maybe even some could come out with a profit every month. To do this, we can use machines to do simple functions like regulate soil pH and humidity. These factors must be maintained under certain boundaries, these boundaries are specific to each plant, and are difficult to maintain without professionals. A system that can control these variables can be costly but are being manufactured currently, for example a company by the name of Nuravine which has been made to create these systems.

Table 2. Nuravine products cost and estimated area coverage

Size of Green Rooftop (ft^2)	Nuravine Product	Price ($)
100	Basic	2,149
200	Advanced	3,499
300	Pro	4399
400	Elite	5299
300	CCH2O	3499
300	Hydra Unlimited	3499
300	IdroLab	3499
300	Batch Doser	3499

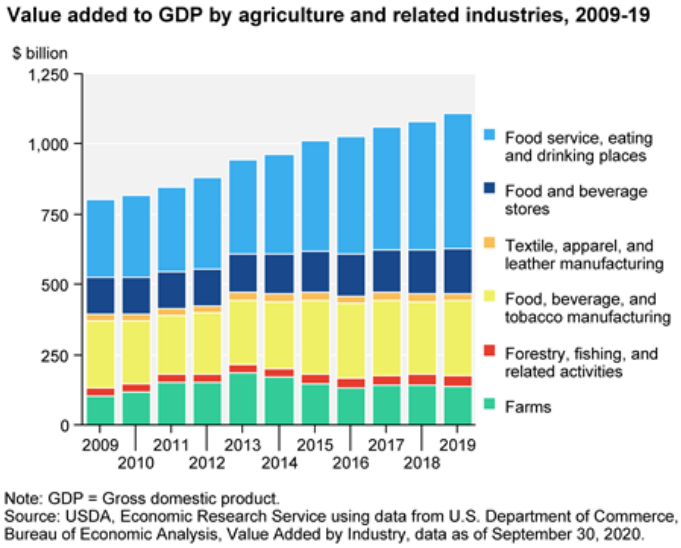
[8]

As seen in Table 2 there is a company producing ways of maintaining fruit or vegetable producing plants in a way that doesn't involve hiring a gardener. These products are similar as to what our team is working as now but our team amplifies the size that these systems can cover. Our team can produce a similar system as the Nuravine team but at about the same price. Being able to make these systems smaller and on a larger scale will allow us to put them on rooftops. Specifically, these computers will be running green rooftops whose owners would like to grow

produce, instead of having a leisurely spot for people. For those types of green rooftops, a gardener is very likely to be required as commonly there is very little extra room for big boxes of electrical equipment that won't impair people view of the gardens. There would also need to be a gardener for those types of green roofs anyways to trim plants, cut grass and to pick any weeds that may be present in the garden.

As seen in Graph 2 there is plenty of money going into the governments hand from food production. I think that this is valuable because it allows us to wedge out some of that money that they are making. Additionally, there is a massive climate change fund, and the hope is that we would be able to dig into that fund a bit so that we can receive funding.

Graph 2. Value added to GDP by agriculture and related industries



Note: GDP = Gross domestic product.
Source: USDA, Economic Research Service using data from U.S. Department of Commerce, Bureau of Economic Analysis, Value Added by Industry, data as of September 30, 2020.

[9]

Qualification

In am a well-equipped team leader with a heavy background in mechanical engineering and computer systems. This should prove useful when making the actual rooftop gardens. We would like to integrate some sort of automation to the process so a well understanding of

software and AI is required. To continue we must hire people from all types of backgrounds. Those in the agriculture industry and in the law industry. A big part of this is trying to get funding from the government so having a strong legal team could prove very useful. Additionally on board is the company Nuravine, who will help us manufacture large scale plant growing systems that are adaptable for outside widescale production of produce. The CEO and main engineers graduated from The City College of New York; thus, they are more than qualified to work on a project such as this.

- Christian
- Graduated from CCNY with Major in Mech Engineering and Minor in Mathematics

- John
- Graduated from John Jay with degree in law

- Bob
- Graduated from Carnegie Mellon with degree in CS

- Steven
- Graduated from Villanova with a degree in CS

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