



# New Haven Farms: Pathways to Growth

William Abi Abdallah, Tania Abraham, Zachary Bogoshian, Calin Brammer,  
Krista Eichenbaum, MaryBeth Farrell, Jingtian Guo, Shari Lynn Lifson, Steven Murphey,  
Ian Pinnington, Michael Ring, Andrew Roe, Lisa Thalheimer, Keith Wong  
Faculty Advisor: Thomas Abdallah

December 2015

Columbia University

M.S. in Sustainability  
Management: Capstone

# 1 CONTENTS

---

2	Acronyms.....	2
3	Executive Summary.....	3
4	Background.....	4
4.1	Urban Agriculture .....	4
4.2	The City of New Haven .....	4
4.3	New Haven Farms (NHF) .....	6
5	Project Objective and Methodology .....	7
5.1	Project Objective .....	7
5.2	Project Methodology .....	8
6	Pathways to Growth.....	9
6.1	Food Production .....	9
6.1.1	Qualitative Descriptions.....	10
6.1.2	Quantitative Assessment.....	20
6.1.3	Optimization Model .....	22
6.2	Education.....	25
6.2.1	Number of People Served .....	25
6.2.2	Education per Person .....	28
6.3	Finance and Organizational Systems .....	30
6.3.1	Financial Sustainability.....	30
6.3.2	Workforce: Staffing and Formal Procedures .....	35
6.3.3	Operational Metrics .....	37
7	Conclusion .....	39
8	Appendices .....	40
8.1.1	Appendix 1: Comparable Organizations.....	40
8.1.2	Appendix 2: Optimization Model Data Sources .....	43
8.1.3	Appendix 3: Education Facility Partnership Opportunities .....	45
8.1.4	Appendix 4: Grant, Donation, and Sponsorship Opportunities .....	49

## 2 ACRONYMS

---

AADE	American Association of Diabetes Educators
ADA	American Diabetes Association
BMI	Body Mass Index
CDE	Certified Diabetes Educator
CSA	Community Supported Agriculture
DIY	Do-It-Yourself
DSMTs	Diabetes Self-Management Training Programs
FBWP	Farm-Based Wellness Program
FMPP	Farmers' Market Promotion Program
HDL	High-Density Lipoprotein
LFPP	Local Food Promotion Program
NFT	Nutrient Film Technique
NHF	New Haven Farms
NPI	National Provider Identification
SNAP	Supplemental Nutrition Assistance Program

### 3 EXECUTIVE SUMMARY

---

In low-income neighborhoods in New Haven, Connecticut, limited access to healthy food is correlated with high rates of metabolic diseases, including diabetes. Founded in 2012, New Haven Farms (NHF) is a non-profit urban farm aiming to address this poverty-health challenge through its Farm-Based Wellness Program (FBWP). The FBWP is offered to low-income patients with high metabolic disease risk factors. The program involves weekly nutrition, cooking, and farming seminars. Patients also receive fresh fruits and vegetables at no cost and are given opportunities to engage in physical activity on the farming sites, increasing the health benefits of the program. Providing the foundation for a long-term strategic plan, this report outlines how NHF can maximize its positive health impact across three focus areas:

1. **Food production:** Increasing food production will enable NHF to serve more FBWP clients and can be achieved in two ways: developing new farmland or increasing yields on existing farmland. Due to cost and access constraints, opportunities to develop new farmland are not discussed in detail. In collaboration with Blue Planet Consulting, four interventions to increase yields were identified: outdoor vertical hydroponics, a high tunnel, indoor vertical microgreens, and a hydroponic greenhouse. Under a \$60,000 capital investment scenario, an Excel-based model indicates that, by adopting the optimal combination of these interventions, NHF can more than double annual food production to 26,000 lbs, increase average yields from .43 lbs/sq ft/yr to .98 lbs/sq ft/yr, and decrease average production costs from \$5.16/lbs to \$4.72/lbs.
2. **Education:** The educational aspects of the FBWP are the nutrition, cooking, and farming seminars offered during the weekly sessions. NHF can maximize its positive health impact via education in two ways: increasing the number of people served and improving the quality of education per person. Opportunities to increase the number of people served include collaborating with Common Ground High School to expand NHF's youth client base and securing a large indoor education facility from Yale University to accommodate future FBWP growth. To increase the quality of education provided, NHF can align its nutrition education with diabetes self-management training programs (DSMTs) and distribute informational education materials, such as cookbooks.
3. **Finance and organizational systems:** As NHF seeks to maximize its health impact through food production and education, it will need to identify recurring income sources to fund growth, formalize its workforce procedures, and continue to develop and track operational metrics. Four potential income sources were identified: grants and donations, corporate sponsorships, revenue from product sales, and health insurance. Implementing a robust workforce model will require two actions: adopting an organizational structure that aligns with best practices and formalizing staffing procedures, which includes documenting responsibilities and implementing a staff scheduling system. Lastly, developing a system to track operational metrics across health and wellness, farming, and education will allow NHF to set organizational goals and measure progress with respect to those goals.

This report is not intended to be prescriptive. Rather, it gives NHF the flexibility to determine its strategic goals and provides the resources needed to achieve those goals. Ultimately, regardless of the direction that NHF decides to pursue, this report outlines practical pathways through which the organization can achieve its mission of promoting healthy living and community development via urban agriculture, today and for years to come.

## 4 BACKGROUND

---

Background research was conducted on urban agriculture, the City of New Haven, and New Haven Farms (NHF). This research helped the team outline the issues and opportunities that NHF is facing and define the scope of the analysis. The research is summarized below.

### 4.1 URBAN AGRICULTURE

Urban farming is the practice of cultivating, processing, and distributing food in or around a village, town, or city.<sup>1</sup> During World War I and World War II, victory gardens were instrumental in providing vegetables and fruits during a time of restricted food supply. During the Great Depression, such gardens gave people jobs, access to food, and hope that things would improve. Today, urban farming encompasses a broad spectrum of models, including small community gardens on vacant lots, larger plots on former industrial sites, and rooftop gardens.

Urban agriculture can benefit local communities in a variety of ways. Where urban farms are developed, fresh vegetables are made available to local residents who might otherwise not have access. In addition, residents have the opportunity to engage in physical activity in gardens, learn new skills, and make a positive impact in their communities. Urban farming is associated with several environmental benefits. Because urban farms are located near the end customer, greenhouse gas (GHG) emissions associated with long-distance food transportation are reduced.<sup>2</sup> Additionally, according to the Environmental Protection Agency (EPA), urban farming can “protect soil fertility and stability, prevent excessive runoff, provide habitats for a widened diversity of flora and fauna, increase carbon sequestration, and reduce the incidence and severity of natural disasters such as floods and landslides.”<sup>3</sup> The presence of urban gardens can also generate mental health benefits, including stress reduction and improved mood.<sup>4</sup>

### 4.2 THE CITY OF NEW HAVEN

New Haven was officially incorporated as a city in 1784, and experienced a boom in the late 18<sup>th</sup> century, when it transformed into a manufacturing hub. After World War II, similar to many U.S. cities, middle class workers in New Haven began moving to the suburbs and the manufacturing industry, especially in the North East, declined. Between the 1960s and 1990s, the central part of the city experienced an economic downturn. This led to the abandonment of many manufacturing buildings and, ultimately, urban decay. The city also experienced a high rate of poverty and associated medical risks during this time. The neighborhood of Fair Haven – the location of NHF – is indicative of New Haven’s hard times: this centrally located neighborhood was once a booming industrial area, but is now littered with abandoned lots.

---

<sup>1</sup> Centers for Disease Control & Prevention. (June 3, 2010). Land Use Planning & Urban/Peri-Urban Agriculture. Retrieved from <http://www.cdc.gov/healthyplaces/healthtopics/healthyfood/landuse.htm>

<sup>2</sup> B. Howard. (2015). Urban Farming Is Growing a Green Future. Retrieved from [http://environment.nationalgeographic.com/environment/photos/urban-farming/#/earth-day-urban-farming-new-york-rooftop\\_51631\\_600x450.jpg](http://environment.nationalgeographic.com/environment/photos/urban-farming/#/earth-day-urban-farming-new-york-rooftop_51631_600x450.jpg)

<sup>3</sup> United States Environmental Protection Agency. (October 19, 2015). What is Urban Agriculture? Retrieved from <http://www3.epa.gov/region1/eco/uep/urbanagriculture.html>

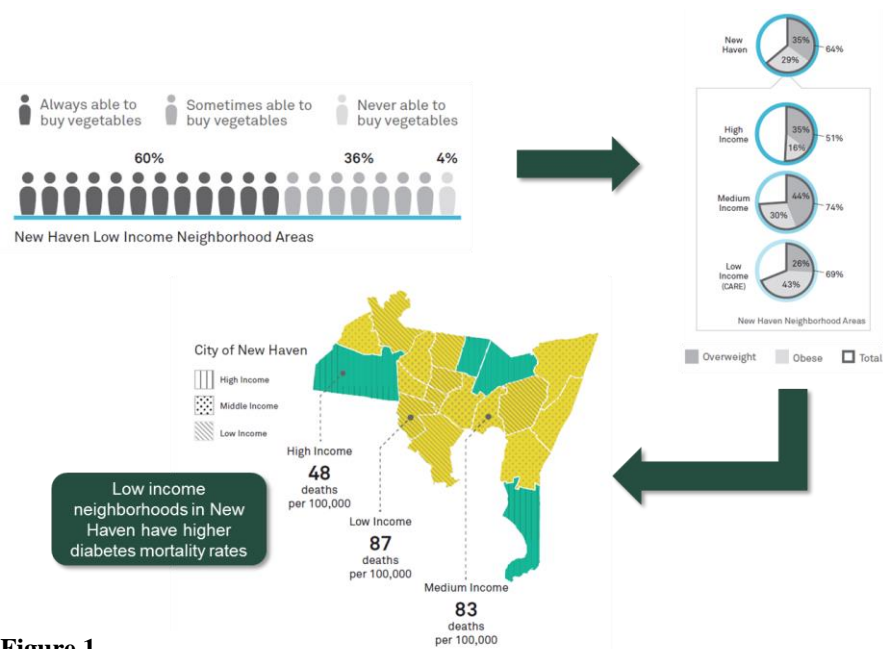
<sup>4</sup> Gardening Matters. (2012). Multiple Benefits of Community Gardening. Retrieved from [http://www.gardeningmatters.org/sites/default/files/Multiple%20Benefits\\_2012.pdf](http://www.gardeningmatters.org/sites/default/files/Multiple%20Benefits_2012.pdf)



As of 2013, the population of New Haven was 130,600. The median household income in the city in 2013 was \$36,000, compared to \$67,000 for the state of Connecticut. The population breakdown by race is as follows: 32% white, 33% black, and 27% Hispanic.<sup>5</sup>

NHF is located in the neighborhood of Fair Haven, which sits along the Quinnipiac and Mill rivers. Almost half of the neighborhood's residents are Hispanic. Within Fair Haven, 29% of the population lives below the poverty level, compared to 23.5% across the city. At 18 to 30 crimes per 1,000 residents per year, crime rates in Fair Haven are higher than the statewide average.<sup>6</sup> Additionally, 14% of Fair Haven residents do not have access to health insurance.<sup>7</sup>

In New Haven, low-income neighborhoods, like Fair Haven, demonstrate higher rates of chronic metabolic diseases, including obesity, diabetes, and heart disease, in comparison to high-income neighborhoods. The 2013 Greater New Haven Community Index Report states that one of the reasons for this disparity is the lack of access to nutritious food in the poorer areas of New Haven – 40% of low-income residents have limited access to vegetables, and in low-income neighborhoods, diabetes mortality rates are two times higher than in high-income neighborhoods (see Figure 1).<sup>8</sup> Lack of exercise and consumption of sugary drinks, such as soda, are also contributing factors. As noted, crime in these neighborhoods is a chronic problem and may discourage residents from walking for exercise.



**Figure 1**

<sup>5</sup> City-Data.com. (2015). New Haven, Connecticut. Retrieved from <http://www.city-data.com/city/New-Haven-Connecticut.html>

<sup>6</sup> City-Data.com. (2015). Fair Haven Neighborhood in New Haven, Connecticut (CT), 06513, 06511 Detailed Profile. Retrieved from <http://www.city-data.com/neighborhood/Fair-Haven-New-Haven-CT.html>

<sup>7</sup> Data Haven & Siena College Research Institute. (August 8, 2015). Data Haven Community Wellbeing Survey. Retrieved from <http://ctdatahaven.org/reports/communityindex2013.pdf>

<sup>8</sup> M. Abraham. (October 10, 2013). Greater New Haven Community Index. Retrieved from <http://www.ctdatahaven.org/reports/greater-new-haven-community-index>

### 4.3 NEW HAVEN FARMS (NHF)

Founded in 2012, NHF is a non-profit organization aiming to promote healthy living and community development via urban agriculture. Working at the intersection of health, poverty, education, and safety, NHF aims to achieve this mission by turning vacant lots in New Haven's poorest regions into urban farms.<sup>9</sup> James Jenkins is the Executive Director of NHF, and as the Farm Manager, Jacqueline Maisonpierre manages the farm sites.<sup>10</sup> These are NHF's only full-time employees. However, the organization also relies on volunteers to help cultivate its 1.5 acres of farmland, which is distributed across nine sites.<sup>11</sup> NHF grows over 30 different crops, including spinach, tomatoes, peppers, eggplant, and strawberries.<sup>12</sup>

In partnership with Fair Haven Community Health Center and Cornell Scott – Hill Health Center, NHF offers the Farm-Based Wellness Program (FBWP). Medical professionals from these institutions refer to the FBWP patients who meet the following criteria: the patient demonstrates at least two diet-related chronic disease risk factors and the patient lives within 200% of the federal poverty level. These doctor-referred patients attend two hour weekly sessions (with their families) during the 16-20 week summer growing season. In line with NHF's mission, the FBWP sessions involve nutrition, cooking, and farming seminars, and each week, participants receive fresh fruits and vegetables at no cost. In addition to learning about healthy living, the participants are given opportunities to work on the farms – this physical activity contributes to the health benefits of the program. Nearly 200 people have completed the FBWP. In 2015, there were 55 FBWP clients, and there was a significant waitlist.

In addition to the FBWP, NHF operates several other programs, including a Community Supported Agriculture (CSA) program, through which residents can pay for weekly produce shares, and Peels and Wheels, which is a compost collection program.

---

<sup>9</sup> New Haven Farms. About Us. Retrieved from <http://www.newhavenfarms.org/about-new-haven-farms>

<sup>10</sup> New Haven Farms. Leadership. Retrieved from <http://www.newhavenfarms.org/about-new-haven-farms/leadership>

<sup>11</sup> New Haven Farms. Why CSA? Retrieved from <http://www.newhavenfarms.org/community-supported-agriculture-program/why-csa>

<sup>12</sup> New Haven Farms – 2015 Crop Plan

## 5 PROJECT OBJECTIVE AND METHODOLOGY

### 5.1 PROJECT OBJECTIVE

The project objective was determined through discussions with NHF. NHF expressed a desire for a three-year strategic plan outlining recommendations for how the organization can: increase food production, improve the quality of the FBWP, increase the number of community members that it serves, and achieve financial sustainability. These requests were synthesized into one overarching objective: how can NHF can maximize its positive health impact? This objective was then broken down into three focus areas (see Figure 2):

- **Food production:** In 2015, NHF produced approximately 15,000 lbs of produce. While this yield exceeded expectations, it was not sufficient to meet the demands of the FBWP and the CSA program. Increasing food production will enable NHF to serve more FBWP clients, and presents an opportunity to increase revenue from food sales. Food production can be increased in two ways: developing new farmland or increasing yields on existing farmland.
- **Education:** NHF can maximize its positive health impact via education in two ways: increasing the number of people that receive nutrition, cooking, and farming education through the FBWP and improving the quality of education per person.
- **Finance and organizational systems:** Currently, 90% of NHF's annual income comes from donations and grants. Securing funding from these intermittent sources requires significant effort, and is not guaranteed. Recurring revenue streams would alleviate these issues. NHF is reliant on two dedicated employees who work tirelessly to help the organization achieve its mission. To ensure long-term success, NHF must formalize organizational roles and effectively staff its operations. Lastly, as NHF grows, it must institutionalize a system to track operational metrics. This will allow NHF to measure its progress with respect to its goals.

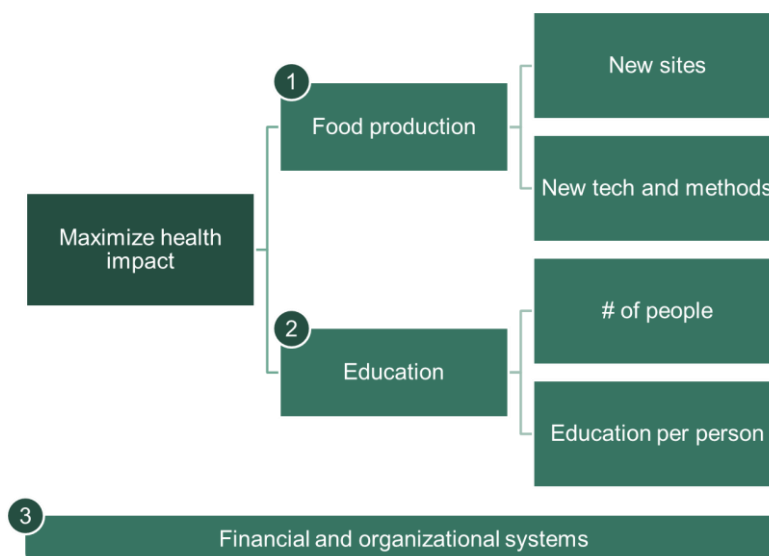


Figure 2



## 5.2 PROJECT METHODOLOGY

To develop practical recommendations for how NHF can maximize its positive health impact, several types of analysis were used. These analysis methods are outlined below, and each has informed the three focus areas outlined above: food production, education, and finance and organizational systems.

- **Analysis of NHF's operations:** Through a site visit and employee interviews, the team gathered operational data from NHF related to food production, education, staffing, and financials. This data informed the analysis outlined in the following sections, and was used as a comparative baseline for the recommendations.
- **Best practice research:** The team reviewed academic literature, industry reports, websites, and comparable organizations to determine best practices across urban farming techniques, farming and nutrition education, financing, staffing, and metrics development. In addition, Blue Planet Consulting<sup>13</sup> was engaged to determine practical opportunities for NHF to increase food production through yield improvements. See **Appendix 1** for an overview of the comparable organizations that were reviewed.
- **Optimization modeling:** Optimization models help decision makers determine the best way to allocate scarce resources to achieve an objective, subject to a set of constraints.<sup>14</sup> Using Excel, an optimization model was created to help NHF determine how much land to allocate to alternative farming methods and what crops to grow under these methods.

Together, this analysis underpins the recommendations in the following section: Pathways to Growth.

---

<sup>13</sup> Blue Planet Consulting. Our Mission: Cities that Grow Food. Retrieved from <http://www.blueplanet.consulting/>

<sup>14</sup> Frontline Solvers. Retrieved from <http://www.solver.com/>

## 6 PATHWAYS TO GROWTH

This section outlines opportunities for NHF to maximize its positive health impact, and is organized according to the focus areas outlined above: food production, education, and finance and organizational systems.

### 6.1 FOOD PRODUCTION

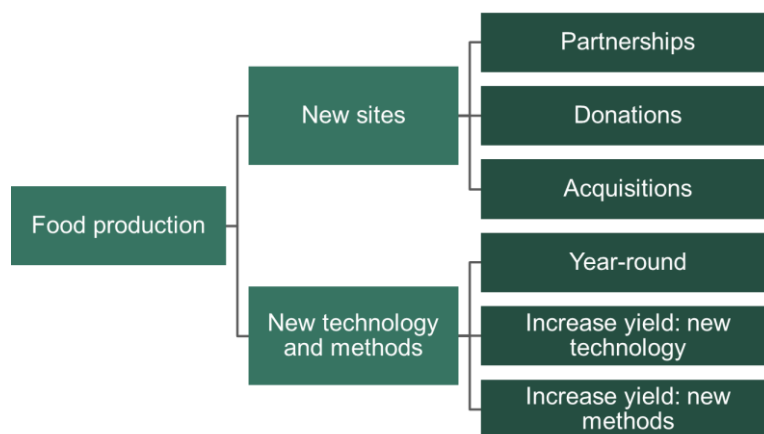


Figure 3

Increasing food production will enable NHF to serve more FBWP clients, and presents an opportunity to increase revenue from food sales. NHF can increase food production by acquiring and developing new farmland or increasing yields (i.e., producing more food across its current farmland).

Research was conducted to determine near-term opportunities for NHF to acquire new farmland. However, due to the cost of land in New Haven and NHF's financial position, it was determined that new farmland could only reasonably be acquired through partnerships with public or private organizations (through which NHF is provided land at little or no cost). Moving forward with one of these partnerships would require action by NHF. As such, this analysis was not developed further, and the remainder of this section focuses on increasing yields on existing land.

Increasing yields requires changing farming methods or adopting new technologies. In collaboration with Blue Planet Consulting<sup>15</sup> – a New York City-based firm that advises public and private institutions on the design, implementation, and operation of urban agriculture projects – four interventions to increase yields were identified. These interventions represent best practices in alternative urban farming techniques and are considered to be practical options for NHF to increase yields.

<sup>15</sup> Blue Planet Consulting. Our Mission: Cities that Grow Food. Retrieved from <http://www.blueplanet.consulting/>

For each intervention, a qualitative description, including implementation options, is presented, as well as a quantitative assessment of costs and benefits. In this section, each intervention is analyzed independently and the scale of each intervention (in sq. ft.) is based on Blue Planet Consulting's recommendation. However, in the following section, an optimal combination of interventions is discussed based on the results of a modelling process.

### 6.1.1 Qualitative Descriptions

The four interventions recommended by Blue Planet Consulting, and the benefits of each, are outlined in Figure 4. Detailed descriptions and implementation options are provided below.

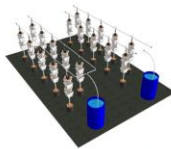



	 Outdoor vertical hydroponic	 High tunnel	 Indoor vertical microgreens	 Hydroponic greenhouse
Resources	✓			✓
Space	✓		✓	
Time		✓	✓	✓

Figure 4

#### 6.1.1.1 Intervention 1: Outdoor vertical farm with a drip hydroponic system (4,000 sq. ft.)

According to the Association for Vertical Farming, a vertical farm is broadly defined as a stacked growing system.<sup>16</sup> Stacking enables farmers to grow more crops per square foot, resulting in higher yields than traditional farming methods. Most vertical farms employ hydroponics. In place of soil, hydroponics uses mineral nutrient solutions to grow crops. Drip irrigation is one form of hydroponics, and refers to a system through which nutrient solutions are delivered directly to plant roots.<sup>17</sup> The learning requirements, benefits, and challenges associated with this option are outlined below:

<sup>16</sup> Association for Vertical Farming. (2015). Glossary for Vertical Farming and Urban Agriculture. Retrieved from <https://vertical-farming.net/vertical-farming/glossary-for-vertical-farming/>

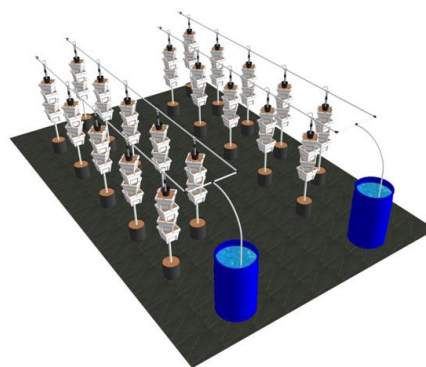
<sup>17</sup> Legislative Council of the Honk Kong Special Administrative Region of the People's Republic of China. (2015). Hydroponic Farming. Retrieved from <http://www.legco.gov.hk/research-publications/english/essentials-1516ise02-hydroponic-farming.htm>

<b>Learning requirements</b>	<ul style="list-style-type: none"> <li>• Equipment installation, growing technique, and pump operation</li> </ul>
<b>Benefits</b>	<ul style="list-style-type: none"> <li>• Increased yields per square foot due to stacking and hydroponic techniques</li> <li>• Drip irrigation hydroponics reduces: water use, fertilizer use, and labor requirements (when automation is used). Additionally, because soil is not used, hydroponics prevents pests and diseases.</li> <li>• Stacking allows for stand-up harvesting</li> </ul>
<b>Challenges</b>	<ul style="list-style-type: none"> <li>• Upfront investment, increased energy consumption, restrictions on crops that can be grown, requires learning new techniques</li> </ul>

Two vendor-based implementation options are described below:

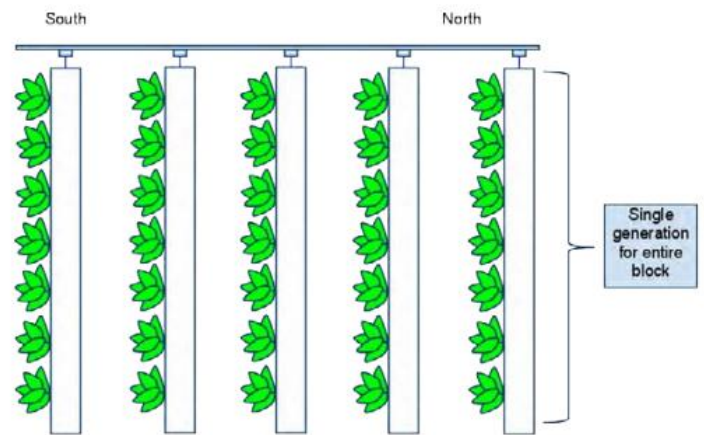
**Option 1: Verti-Gro (<http://www.vertigro.com/>)**

<b>Vegetables that can be grown</b>	<ul style="list-style-type: none"> <li>• Leaves, fruits, flowers, seeds</li> </ul>
<b>Operating characteristics</b>	<ul style="list-style-type: none"> <li>• “The Verti-Gro system features a 5-quart high density EPS (Expanded Polystyrene) pot that rotates and lightweight stacks for maximum production in a limited space. Importantly, these containers insulate the roots, which no other hydroponic system does and they can be used in stacks of 3-10 pots high for commercial hydroponics or by the hobbyist. They can be used outdoors or indoors as well as in greenhouses.”</li> <li>• “Verti-Gro uses both hydro-organic and hydroponic methods of gardening in vertical stacking growing containers”</li> <li>• “The vertical plant stacking system is easily installed in a short time, with little or no experience. The unique add-on capabilities of the Verti-Gro stacking system makes it easy to expand.”</li> </ul>
<b>Site requirements</b>	<ul style="list-style-type: none"> <li>• Full system includes plumbing, pump, and timer. Therefore, water and electricity sources are required.</li> <li>• Water tank can be used, but is not included</li> </ul>



## Option 2: Bright Agrotech, ZipGrow Towers (<https://www.brightagrotech.com/>)

Vegetables that can be grown	<ul style="list-style-type: none"> <li>Leaves, fruits</li> </ul>
Operating characteristics	<ul style="list-style-type: none"> <li>“The ZipGrow tower is composed of a food safe plastic housing with Matrix Media inside that replaces the need for soil. The tower can be hung, strapped, or set onto any surface. At only eight pounds each, the towers are easy to move and handle.”</li> <li>“ZipGrow towers are designed for high density production in both hydroponic and aquaponic applications and will work very well in both.”</li> <li>“We recommend planting your ZipGrow tower with seedlings, also called plugs.”</li> <li>Uses drip irrigation, similar to Verti-Gro</li> <li>“ZipGrow Towers require 60% (or more) less labor than other hydroponic or aquaponic methods”</li> <li>Simple, long-lasting equipment (tower)</li> <li>Modular: can take towers off frame to pick, inspect, or re-arrange</li> </ul>
Site requirements	<ul style="list-style-type: none"> <li>Full system includes plumbing, pump, and timer. Therefore, water and electricity sources are required.</li> <li>2.25 to 2.5 square feet needed per tower</li> </ul>



### 6.1.1.2 Intervention 2: High tunnel (4,000 sq. ft.)

High tunnels, or hoophouses, are unheated greenhouses that can help farmers extend their growing season by providing protection from the elements.<sup>18</sup> High tunnels are unheated, plastic-covered structures that provide an intermediate level of environmental protection and control. High tunnels are passively vented, and can be built as permanent or temporary structures.<sup>19</sup> The learning requirements, benefits, and challenges associated with this option are outlined below:

<b>Learning requirements</b>	<ul style="list-style-type: none"> <li>• Construction</li> <li>• Ventilation and temperature management</li> </ul>
<b>Benefits</b>	<ul style="list-style-type: none"> <li>• Extends the length of the growing season</li> <li>• Premium prices for off-season or early produce</li> <li>• Can improve crop protection and ensure better quality while improving yield</li> </ul>
<b>Challenges</b>	<ul style="list-style-type: none"> <li>• Labor for construction</li> <li>• Site selection</li> <li>• Temperature management</li> <li>• Risk of weather-related damage</li> </ul>

Two vendor-based implementation options are described below:

#### Option 1: FarmTrek – ClearSpan Round Cold Frames

([http://www.farmtek.com/farm/supplies/cat1a%3Bft\\_high\\_tunnels\\_cold\\_frames.html](http://www.farmtek.com/farm/supplies/cat1a%3Bft_high_tunnels_cold_frames.html))

<b>Vegetables that can be grown</b>	<ul style="list-style-type: none"> <li>• No limitations</li> </ul>
<b>Operating characteristics</b>	<ul style="list-style-type: none"> <li>• Structural considerations:             <ul style="list-style-type: none"> <li>○ Easy to assemble; no drilling or welding. 4' rafter spacing. Heavy gauge U.S.-made, triple-galvanized structural steel tubing. Ground posts and purlins on all models. Round style hoop building frame. Baseboards are recommended.</li> <li>○ NHF would have to procure and construct the other elements, which would include a roll-form end frame and side rails, full-length manual roll-up sidewall vents, poly fastening system, single layer clear poly roof and ends, and an end door</li> </ul> </li> <li>• Ventilation:             <ul style="list-style-type: none"> <li>○ Most high tunnels are passively ventilated via roll-up sidewalls and end walls that can be opened or removed.</li> </ul> </li> <li>• Temperature:             <ul style="list-style-type: none"> <li>○ Before planting in a high tunnel, soil temperatures should be a minimum of 10°C (50°F). Raised beds and plastic mulches can be used in the high tunnel to reach minimum soil temperatures early in the year.</li> </ul> </li> </ul>

<sup>18</sup> L.W. Jett. (2014). High Tunnel Crop Production Tips. Retrieved from <http://sustainable-farming.rutgers.edu/wp-content/uploads/2014/09/High-Tunnel-Crop-Production-Tips-by-Lewis-Jett-WVU.pdf>

<sup>19</sup> PennState Extension. (2015). Extending the Garden Season with High Tunnels. Retrieved from <http://extension.psu.edu/plants/gardening/fact-sheets/general-gardening/high-tunnels>



### Site requirements

- Light, wind, and orientation: Choose a site that receives full sun and is free from shadows for the entire length of your projected growing season.
- External connections: The only external connection is the irrigation supply line. There is no permanent heating system and no electrical connections.
- Zoning: Although building permits are not required, growers may have to obtain a zoning permit depending on location.



### Option 2: Poly-Tex (<http://www.poly-tex.com/>)

Vegetables that can be grown	<ul style="list-style-type: none"> <li>• No limitations</li> </ul>
Operating characteristics	<ul style="list-style-type: none"> <li>• Structural considerations: <ul style="list-style-type: none"> <li>○ Everything in the frame only price as well as upper and baseboard lumber U-clamps, end-wall lumber mount fittings and hardware, poly fastening system, single-layer clear poly roof and ends, (2) full-length manual roll-up sidewall vents. Lumber is not included.</li> </ul> </li> <li>• Ventilation: <ul style="list-style-type: none"> <li>○ Most high tunnels are passively ventilated via roll-up sidewalls and end walls that can be opened or removed.</li> </ul> </li> <li>• Temperature: <ul style="list-style-type: none"> <li>○ Before planting in a high tunnel, soil temperatures should be a minimum of 10°C (50°F). Raised beds and plastic mulches can be used in the high tunnel to reach minimum soil temperatures early in the year.</li> </ul> </li> </ul>
Site requirements	<ul style="list-style-type: none"> <li>• Light, wind, and orientation: Choose a site that receives full sun and is free from shadows for the entire length of your projected growing season.</li> <li>• External connections: The only external connection is the irrigation supply line. There is no permanent heating system and no electrical connections.</li> <li>• Zoning: Although building permits are not required, growers may have to obtain a zoning permit depending on location.</li> </ul>



### 6.1.1.3 Intervention 3: Indoor vertical microgreens farm (500 sq. ft., soil-based)

This growing method employs vertical and indoor techniques to yield highly-nutritious leafy green vegetables, called microgreens, in very short growth periods while maximizing grow area square footage.<sup>20</sup> Techniques remain consistent across plant types, offering product mix flexibility, minimal inputs, and year-round production. Microgreens can be sold to restaurants at high margins.<sup>21</sup> The learning requirements, benefits, and challenges associated with this option are outlined below:

<b>Learning requirements</b>	<ul style="list-style-type: none"> <li>• Light: distance, schedules</li> <li>• Water: amount, schedules</li> <li>• Construction: skeleton rack system supporting 4-6 rows of trays</li> </ul>
<b>Benefits</b>	<ul style="list-style-type: none"> <li>• Year-round production</li> <li>• Increased nutrient content</li> <li>• Product mix flexibility</li> <li>• Shorter time to harvest (~7-14 days)</li> <li>• Simple inputs: seed, water, medium, light</li> <li>• High commercial sale price</li> </ul>
<b>Challenges</b>	<ul style="list-style-type: none"> <li>• Labor requirements</li> <li>• Requires learning new techniques</li> <li>• Short product shelf life (~5-7 days)</li> <li>• Capital investment in rack system, trays, and lighting</li> </ul>

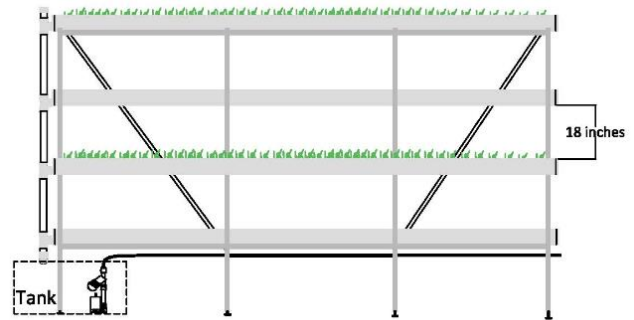
Two implementation options are described below, one vendor-based and one do-it-yourself (DIY):

<sup>20</sup> National Public Radio. (October 15, 2012). Introducing Microgreens: Younger, And Maybe More Nutritious, Vegetables. Retrieved from <http://www.npr.org/sections/thesalt/2012/08/29/160274163/introducing-microgreens-younger-and-maybe-more-nutritious-vegetables>

<sup>21</sup> LocalBusinessPlans.com. (2015). Earn \$1,000/Week Growing and Selling Microgreens. Retrieved from <http://localbusinessplans.com/microgreens/>

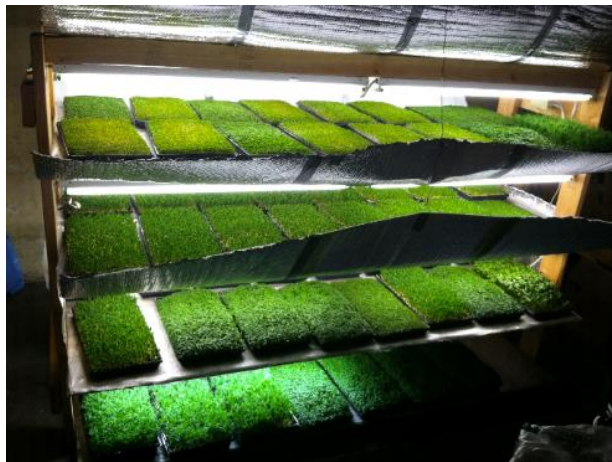
### Option 1: CropKing ([www.cropking.com](http://www.cropking.com))

Vegetables that can be grown	<ul style="list-style-type: none"> <li>Leaves (baby/microgreens, fully mature)</li> </ul>
Operating characteristics	<ul style="list-style-type: none"> <li>Racking structure has 4 levels, each with 4, 10" x 12' growing channels. Artificially lit (fluorescent or LED), indoor, vertical structure, grown in soil, peat moss, or paper towels.</li> </ul>
Site requirements	<ul style="list-style-type: none"> <li>Full system includes vertical stacking structure, pump, plumbing, electricity (for light and water pump), water, ground space (footprint)</li> </ul>



### Option 2: DIY

Vegetables that can be grown	<ul style="list-style-type: none"> <li>Leaves (baby/microgreens, fully mature)</li> </ul>
Operating characteristics	<ul style="list-style-type: none"> <li>Racking structure has 4 levels, each with 16 trays on a 4' x 8' footprint. Artificially lit (fluorescent or LED), indoor, vertical structure, grown in soil. Manually watered and harvested.</li> </ul>
Site requirements	<ul style="list-style-type: none"> <li>Vertical stacking structure, electricity (for light), water, ground space (footprint)</li> </ul>



#### 6.1.1.4 Intervention 4: Hydroponic greenhouse (3,000 sq. ft.)

Hydroponic farming is a soilless alternative to traditional farming, usually conducted in a controlled indoor environment.<sup>22</sup> Hydroponic methods are flexible to deploy, and are often found in vertical farming applications. Use of hydroponic methods allows for maximum control over the amount of nutrients, water, and lighting for crops, allowing the farmer to maximize output and minimize growing time. Within this method, various techniques can be used depending on the plants grown, site constraints, and farmer preferences. This method can be implemented through the purchase of a turnkey system (most capital intensive) or can be assembled in a DIY fashion. The learning requirements, benefits, and challenges associated with this option are outlined below:

<b>Learning requirements</b>	<ul style="list-style-type: none"> <li>• Equipment installation, growing techniques</li> </ul>
<b>Benefits</b>	<ul style="list-style-type: none"> <li>• Increased yields per square foot due to shorter growing times and control over growing conditions</li> <li>• Soilless nature allows for farming in nearly any location, regardless of soil quality</li> <li>• Customizable configurations and methods allow for farming in variety of situations</li> <li>• Controlled methods minimize resource use (water, fertilizer, etc.) as plants receive exactly what they need without any resources wasted from spillover</li> <li>• When automation is deployed, labor needs can be limited</li> <li>• Controlled indoor growing conditions typically protect from pests and disease</li> </ul>
<b>Challenges</b>	<ul style="list-style-type: none"> <li>• Upfront investment</li> <li>• Requires water hookup and electricity for operation</li> <li>• Not all crops can be grown hydroponically</li> <li>• Requires learning new growing techniques and skills (e.g., pump operation)</li> <li>• Close plant proximity can cause diseases to spread quickly</li> </ul>

Three implementation options are presented below, two are vendor-based and one is DIY. Each implementation option uses a different hydroponic growing technique.

#### Option 1: CropKing ([www.cropking.com](http://www.cropking.com)), Technique: Nutrient Film System

<b>Vegetables that can be grown</b>	<ul style="list-style-type: none"> <li>• Leaves, seeds, stalks</li> </ul>
<b>Operating characteristics</b>	<ul style="list-style-type: none"> <li>• “The Nutrient Film Technique (NFT) is a growing system that constantly recirculates a stream of nutrient rich water through food grade (polyvinyl chloride) PVC for growing leaf crops such as lettuces and smaller herbs.”</li> <li>• “A continuous stream of water flows through the food grade PVC channels and returns to tank that is usually underground, often under the growing beds in the greenhouse.”</li> </ul>

<sup>22</sup> C. D’Anna. (2015). Hydroponic Gardens: The Lettuce Raft Method. Retrieved from <http://hydroponics.about.com/od/hydrosystems/a/Hydroponic-Gardens-The-Lettuce-Raft-Method.htm>



	<ul style="list-style-type: none"> <li>• “The CropKing NFT growing system includes a Fertroller continually samples and tests the nutrient solution from the underground tank to monitor the pH and EC (level of fertilizer) so that it can continually adjust both the level of fertilizer and the pH to match the requirements of the plant.”</li> </ul>
Site requirements	<ul style="list-style-type: none"> <li>• System includes pumps, electrical panel, PVC growing channels, nutrient circulation system with Fertroller auto-control, nutrient tanks, seedling system, fertilizer</li> <li>• Water hookup, electric power for circulation system</li> </ul>



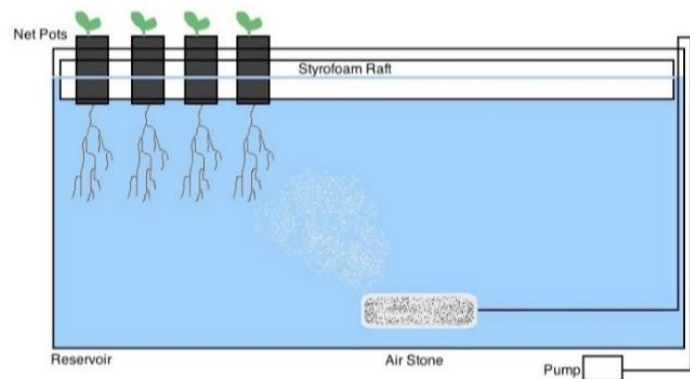
**Option 2: FarmTrek ([www.farmtek.com](http://www.farmtek.com)) and CropKing ([www.cropking.com](http://www.cropking.com)), Technique: Dutch/Bato Bucket System**

Vegetables that can be grown	<ul style="list-style-type: none"> <li>• Fruits, seeds</li> </ul>
Operating characteristics	<ul style="list-style-type: none"> <li>• “The Buckets hold the media in which the plants grow and they can be positioned to provide the plant spacing required for the crop being grown. The system uses perlite filled buckets. Each bucket has a bottom reservoir providing nutrients to the plants between feedings.”</li> <li>• “Excess nutrient solution is conducted away from the plants via the drain line that all the buckets sit on. Fertilizer solution is delivered to the buckets through the injection system, a feed line, emitters, emitter lines and stabilizer stakes. A small microprocessor is used to activate the delivery system on a desired schedule.”</li> </ul>
Site requirements	<ul style="list-style-type: none"> <li>• System includes pumps, electrical panel, buckets, plant supports, auto-scheduler, nutrient circulation system, nutrient tanks, and fertilizer</li> <li>• Water hookup, electric power for circulation system</li> </ul>



### Option 3: DIY, Technique: Raft System

<b>Vegetables that can be grown</b>	<ul style="list-style-type: none"> <li>Leaves, seeds, stalks</li> </ul>
<b>Operating characteristics</b>	<ul style="list-style-type: none"> <li>A raft system is a variation on the NFT system described under Option 1. Rather than relying on a steady stream of pumped nutrient solution, the plants float on top of a nutrient solution reservoir.</li> <li>Requires each plant to be housed in its own chamber, a growing support system that can float over the solution pond, and an aerator to ensure nutrients do not become stagnant and add oxygen</li> <li>Raft must be populated with seedlings in order for established roots to reach the solution</li> </ul>
<b>Site requirements</b>	<ul style="list-style-type: none"> <li>System requires pumps to fill chamber, growing raft, nutrient, nutrient tanks, fertilizer, seedling system</li> <li>Water hookup, electric power for pumps</li> </ul>

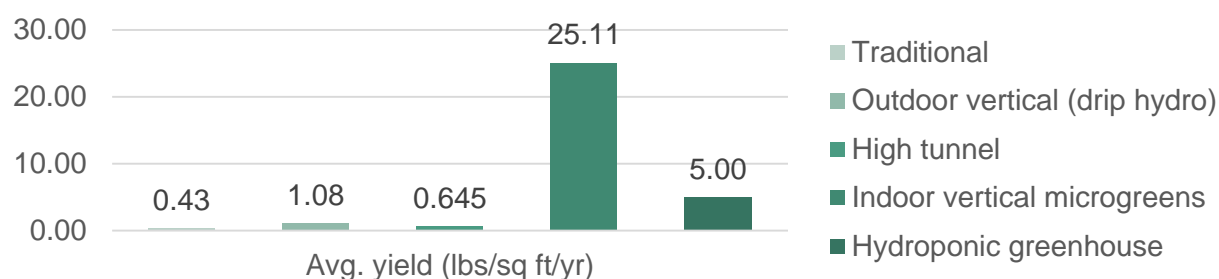




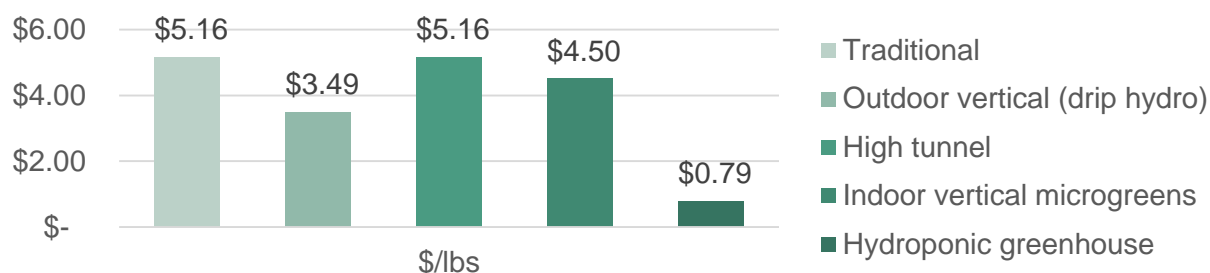
### 6.1.2 Quantitative Assessment

Each of the four interventions have different yield benefits for different crop categories (lbs/sq. ft./yr), result in different production costs (\$/lbs), have different capital requirements (\$/sq. ft.), and are a different size (sq. ft.). As such, the total increase in production and total capital investment is different for each intervention. The average yield, production cost, total production, total investment, and labor requirements for each intervention (and NHF's traditional farming method) are outlined below. See **Appendix 2** for a description of data sources. In this section, it is assumed that only one intervention could be implemented at a time, and therefore each is evaluated independently. It is also assumed that the land area required for each intervention replaces existing farmland (i.e., no new land is used).<sup>23</sup>

#### Average yield (lbs/sq. ft./yr):

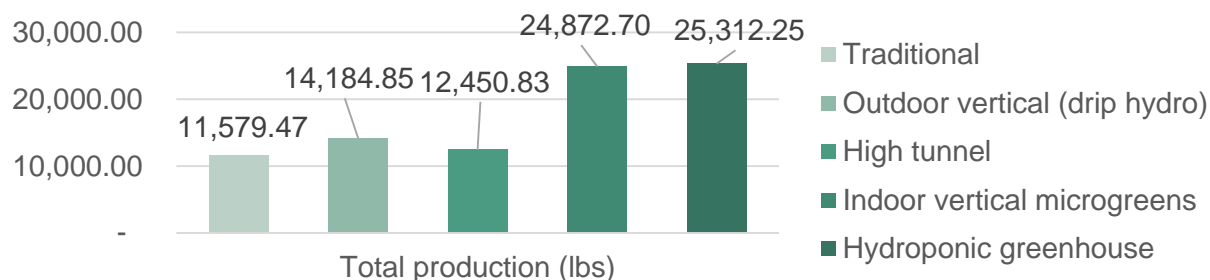


#### Production cost (\$/lbs):



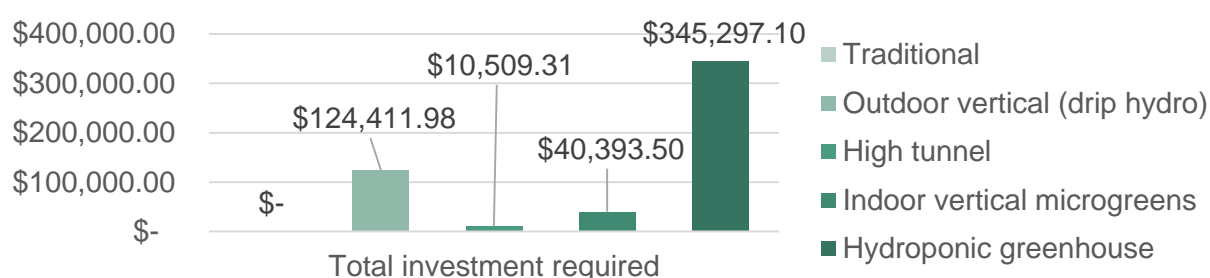
<sup>23</sup> Note: under each intervention, the allocation of land to different crop categories was prorated based on each crop categories' share of total farmland in 2014.

### Total production (lbs):

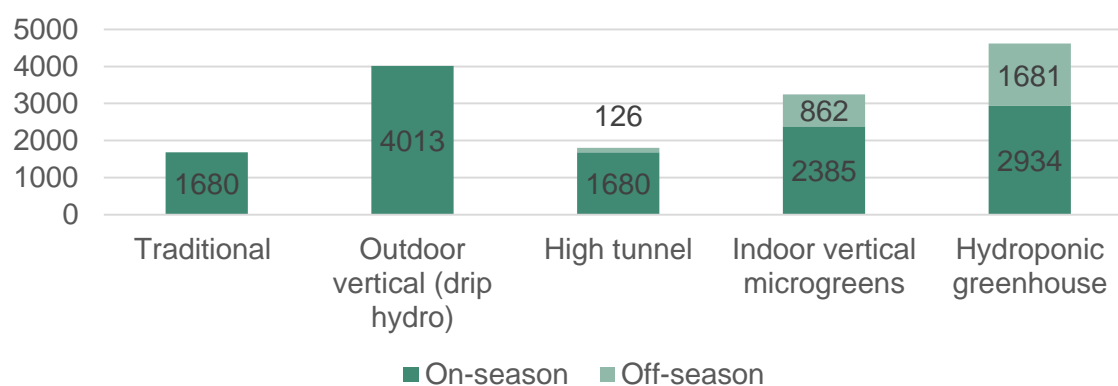


**Note:** total production under each intervention includes both production under the alternative farming technique and production from land that is still farmed under traditional methods. For example, under the outdoor vertical farm (drip hydro) option, 85% of total land is still farmed under traditional methods, and production from this land is accounted for in the total above.

### Total investment required (\$):



### Labor hours required (hrs):



**Note:** similar to total production, total labor hours required under each intervention includes both labor under the alternative farming technique and labor for land that is still farmed under traditional methods. For example, under the outdoor vertical farm (drip hydro) option, 85% of total land is still farmed under traditional methods, and the labor requirements for this land are accounted for in the total above.

### 6.1.3 Optimization Model

In the previous section, each intervention was analyzed independently and the size of each intervention was determined by Blue Planet Consulting. However, because each of the interventions have different capital and production costs and generate different yield benefits across different crops, NHF can maximize production by investing in the optimal combination and size of interventions and producing the optimal combination of crops under each of these interventions.

Optimization models help decision makers determine the best way to allocate scarce resources to achieve an objective, subject to a set of constraints.<sup>24</sup> Using Excel, an optimization model was created to help NHF determine how much land to allocate to each intervention and what crops to grow under those interventions (the model is included as a supplement to this report). Given the range of possible combinations, calculating the optimal solution manually was not feasible. Optimization models have three components:<sup>25</sup>

1. **Objective function:** this is the variable that the decision maker wishes to optimize. For NHF, the objective function is to maximize total annual food production.
2. **Decision variables:** the combination of decision variables that maximize the objective function represent the solution to an optimization model. For NHF, the decision variables are how much farmland to allocate to each intervention and how much of each type of crop to grow under each intervention.
3. **Constraints:** limitations on the inputs or outputs of the model. Constraints restrict the decision variables. For NHF, the constraints are: available capital, the types of crops that can be grown under each intervention, minimum and maximum production requirements for each crop category, and the maximum size of each intervention.

The optimal solution, as determined by the model, is described below for a \$60,000 capital investment scenario. However, NHF can use this model to determine the optimal interventions under any capital investment scenario. Additionally, the model allows NHF to adjust all input variables and constraints. The model also enables NHF to optimize for different objectives, such as minimizing production costs.

---

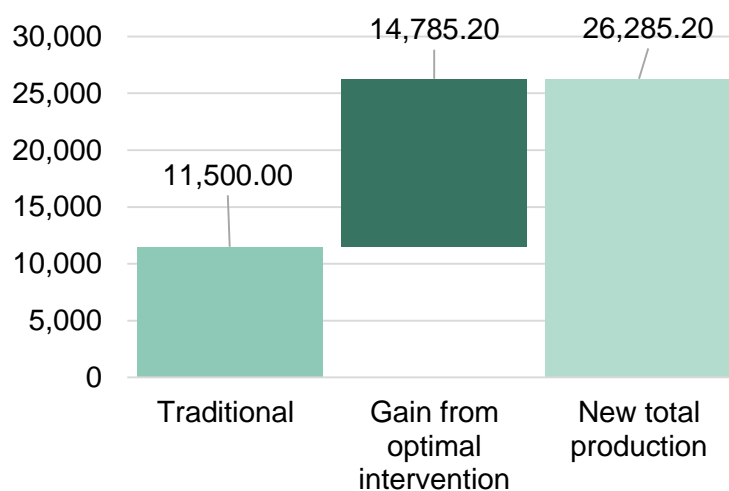
<sup>24</sup> Frontline Solvers. Retrieved from <http://www.solver.com/>

<sup>25</sup> Extreme Optimization. (2015). Optimization Model Basics. Retrieved from [http://www.extremeoptimization.com/Documentation/Mathematics/Optimization/Optimization\\_Model\\_Basics.aspx](http://www.extremeoptimization.com/Documentation/Mathematics/Optimization/Optimization_Model_Basics.aspx)

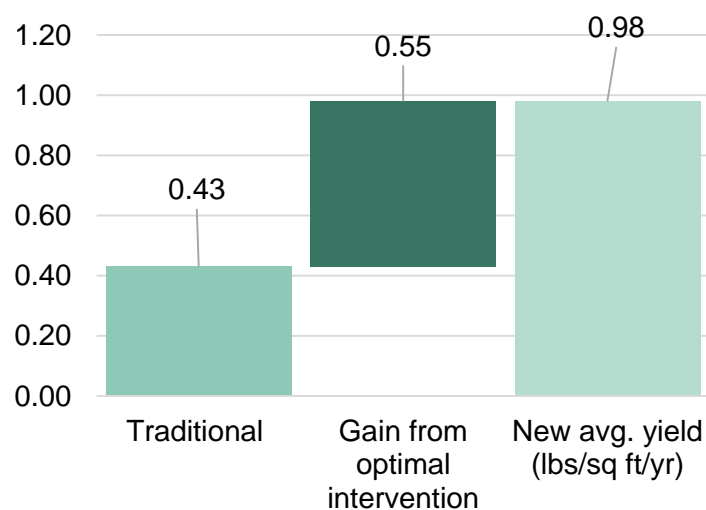
### Optimal allocation of farmland across interventions and crop categories:

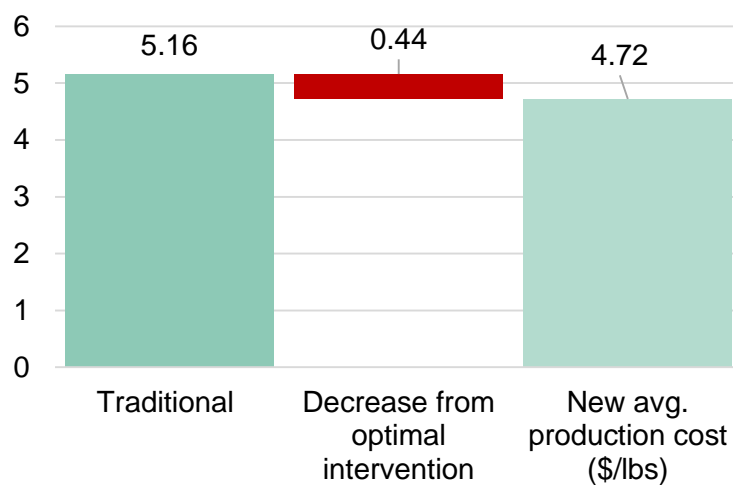
Crop	Traditional	Outdoor vertical (drip hydro)	High tunnel	Indoor vertical microgreens	Hydroponic greenhouse	Total
Bulbs	0.00%	0.00%	5.93%	0%	0.00%	6%
Flowers	0.00%	0.00%	0.86%	0%	0.00%	1%
Fruits	64.79%	0.00%	0.00%	0%	0.29%	65%
Leaves	0.00%	0.00%	0.00%	2%	0.00%	2%
Roots	13.58%	0.00%	8.22%	0%	0.00%	22%
Seeds	4.32%	0.00%	0.00%	0%	0.00%	4%
<b>Total</b>	82.70%	0%	15.01%	2%	0%	100.0%

### Incremental annual production (lbs):



### Incremental avg. yield (lbs/sq ft/yr):



**Reduction in avg. production cost (\$/lbs):****Labor requirements:**

- Total labor on-season (hrs): 2418
- Total labor off-season (hrs): 1032

## 6.2 EDUCATION

The educational aspects of the FBWP are the nutrition, cooking, and farming seminars offered during the weekly sessions. NHF can maximize its positive health impact via education in two ways: increasing the number of people served and improving the quality of education per person (see Figure 5).

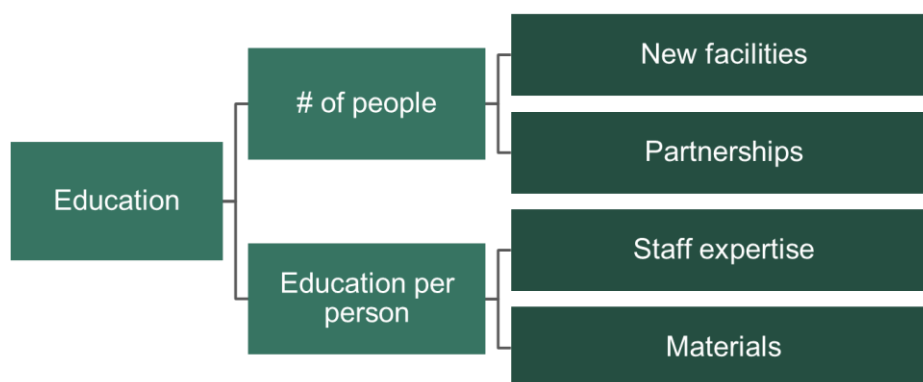


Figure 5

### 6.2.1 Number of People Served

The options to increase the number of people that receive nutrition, cooking, and farming education through the FBWP depend on the organization's current capacity. If the existing education facilities are too small when NHF grows the FBWP, the organization will need to expand to new education facilities. However, if there is excess capacity in the existing education facilities, forming partnerships with local organizations, such as schools, is an opportunity to grow and diversify the FBWP client base. These options are not mutually exclusive – they can be pursued in parallel.

#### 6.2.1.1 New Facilities

Currently, the nutrition, cooking, and farming seminars are provided at the Phoenix Press site under a large tent. This semi-permanent, outdoor structure limits the provision of education to the growing season, and does not provide adequate shelter when weather conditions are bad during the growing season. NHF will realize two benefits if it can secure a larger, indoor education facility: it will be able to serve more patients and it will be able offer education programs year-round.

Research was conducted to identify options for a new off-site facility. It was determined that it would only be feasible to secure a new facility via a partnership. Local schools, community centers, churches, and other non-profits were identified as potential partners. In addition to adequate



classroom space, a number of the partnership opportunities would provide access to a kitchen. Potential facility partnerships include:

- Common Ground High School
- Wilbur Cross High School
- Fair Haven School
- Hillhouse High School
- Yale University
- University of New Haven
- Southern Connecticut State University
- Fair Haven Community Health Center
- The Community Foundation for Greater New Haven
- Jewish Community Center of Greater New Haven

The characteristics of two promising facility partnerships are outlined below. See **Appendix 3** for additional opportunities.

#### **Facility #1: Yale University**

Yale University	
Facility Considerations	Facility Status
<b>Kitchen:</b>	No
<b>Cost:</b>	\$20 - \$70+security per hr. for classroom/auditorium space
<b>Proximity to NHF:</b>	10 minute drive, and has access to public transportation (local bus)
<b>Access:</b>	Functioning university, time of day is highly unpredictable due to classes, etc. 7:00 a.m. – 5:00 p.m. (open access) 5:00 p.m. – Midnight (access with Yale I.D. card and pre-scheduled access)
<b>Indoor/Outdoor:</b>	Primarily indoor facilities, however has possibilities for outdoor use
<b>Other Considerations:</b>	<a href="http://www.yale.edu/sfas/registrar/BldgGuidelines.html">http://www.yale.edu/sfas/registrar/BldgGuidelines.html</a>
<b>Possibilities:</b>	Classroom space/facilities, outdoor pizza oven - could grow into a programming partner - <a href="http://sustainablefood.yale.edu">http://sustainablefood.yale.edu</a>
<b>Contact:</b>	Office of the Registrar: 203 432-2330

#### **Facility #2: John S. Martinez School**

John S. Martinez High School	
Facility Considerations	Facility Status
<b>Kitchen:</b>	Yes, in the cafeteria
<b>Cost:</b>	Unknown
<b>Proximity to NHF:</b>	7 minute walk from Phoenix Press farm site
<b>Access:</b>	After school hours (8:35AM-2:50PM)
<b>Indoor/Outdoor:</b>	Indoor class rooms
<b>Other Considerations:</b>	N/A
<b>Possibilities:</b>	Grow relationship, access to kitchen, volunteers, new clients
<b>Contact:</b>	Unknown

### 6.2.1.2 *New Partnerships*

NHF can grow and diversify the FBWP client base by forming partnerships with local organizations. For example, while NHF currently serves youth through the FBWP, it could formally expand the scope of the FBWP to youth by partnering with a local school. Under such a partnership, the school would simply send kids to participate in the FBWP. This partnership could also provide NHF with access to a kitchen or education space (see New Facilities). Similar partnerships have been pursued at other urban farms. In line with this example, expanding its existing relationship with Common Ground High School (Common Ground) to form a youth program is an attractive opportunity for NHF.

Common Ground is located 20 minutes from the Phoenix Press farm site on a 20-acre plot. In addition to a high school, the site features an urban farm and environmental center. The mission of Common Ground is to “cultivate habits of healthy living and sustainable environmental practices within a diverse community of young people, adults, and families.” Common Ground’s programs include farm workshops, cooking classes, and hiking. Common Ground relies heavily on volunteers, interns, and students from Green Job Corps in order to manage their farm. Common Ground states that it is committed to sharing its work and learning from like-minded organizations, schools, and individuals, possibly indicating a willingness to collaborate on a youth program with NHF.

#### **Partner #1: Common Ground High School**

<b>Common Ground High School: 358 Springside Ave., New Haven, CT</b>	
<b>Facility Considerations</b>	<b>Facility Status</b>
<b>Kitchen:</b>	Yes, the kitchen was renovated in 2008 into a community commercial cooking facility. Donated by IKEA New Haven.
<b>Cost:</b>	Unknown
<b>Proximity to NHF:</b>	20 minute drive, and has access to public transportation (local bus)
<b>Access:</b>	Functioning high school – school day begins at 8AM - 3:20pm. After school programs run every day, except Wednesday, from 3:30 – 4:30pm.
<b>Indoor/Outdoor:</b>	Can provide both indoor and outdoor accommodations
<b>Other Considerations:</b>	Located on a 20-acre site featuring a large farm, looking to grow and expand their community/increase farm production.
<b>Possibilities:</b>	Building space, facilities/kitchen, volunteers, new clients, and other resources
<b>Contact:</b>	Betsy Sneath (203 389-4333)

## Partner #2: Wilbur Cross High School

Wilbur Cross High School: 181 Mitchell Drive, New Haven, CT	
Facility Considerations	Facility Status
Kitchen:	School cafeteria and a small cafe
Cost:	Unknown
Proximity to NHF:	10 minute drive, and has access to public transportation (local bus)
Access:	Functioning high school, school day begins at 7:30AM – 2:00pm. Not many after school activities listed on their calendar other than sporting events.
Indoor/Outdoor:	Primarily indoor facilities, however has possibilities for outdoor use
Other Considerations:	Wilbur Cross High School is the largest high school in the New Haven School district. The school provides a health and culinary department including culinary classes, creative cooking club, and student chefs.
Possibilities:	Building space, facilities/kitchen, free labor, new clients, and other resources
Contact:	Edith Johnson, Principal: 203 497-7400, Edith.Johnson@new-haven.k12.ct.us

### 6.2.2 Education per Person

The quality of education provided to each FBWP participant is a function of the expertise of the nutrition educator(s) and the education materials offered to participants. As such, improvements in either of these areas will increase the quality of education provided. Opportunities for improvement in these areas are discussed below.

#### 6.2.2.1 Staff Expertise

Formalizing staff expertise is essential to growing health impacts through education. If educators have formal training in domains such as farming and nutrition, they will be able to better communicate essential concepts to program participants. This ensures that the most accurate and relevant information is delivered and ingrained in students, so that they leave the program not just with skills to improve their health, but more context on why good nutrition leads to improved health. In identifying best practices for how to improve nutrition staff expertise, there are two clear paths forward for NHF.

The first is aligning NHF staff requirements with the requirements of diabetes self-management training programs (DSMTs), administered by the American Association of Diabetes Educators (AADE) and the American Diabetes Association (ADA). The AADE states that “...at least one of the instructors needs to be a **registered nurse, dietitian, or pharmacist**. The instructors must have recent educational and experiential preparation in diabetes education and/or a CDE [Certified Diabetes Educator]. All instructors (including a CDE) will have documentation of at least 15

*continuing education hours yearly specified as being diabetes-specific, diabetes-related, and behavior change self-management education strategies (e.g., AADE7 Self-Care Behaviors).’’<sup>26</sup>*

A second, less formal path is to replicate the approach of other organizations, such as Denver Urban Gardens. Denver Urban Gardens has designed its education programming based on the “*Colorado Academic Standards and concepts in science, literacy and comprehensive health.*”<sup>27</sup> The organization requires educators to have comprehensive knowledge of this third-party standard for health and wellness. NHF can find comparable resources, and build its staff requirements based on those resources.

### **6.2.2.2 Materials**

Improving educational materials will increase the quality of education provided, both inside and outside of the classroom, and will increase the likelihood that the education offered during the FBWP will have a lasting impact. To improve in this regard, NHF should create a nutrition and farming guide and a cookbook. Additionally, the organization should consider improving the self-service capabilities on the NHF website.

A best practice for organizations similar to NHF is to develop and distribute informational education materials, such as recipes and nutrition and farming guides. These materials can be given away or sold for fundraising. Often, organizations post these materials on their websites to avoid printing costs. However, some have created and sold physical cookbooks. In addition to fundraising, these materials can be used to extend nutrition, cooking, and farming education beyond the classroom. For example, recipes and nutrition guides can be shared among family members and neighbors after NHF has closed for the season. A cookbook could be produced at the end of each growing season, and might feature the FBWP participants’ favorite recipes. Cultural food preferences should be considered. Additionally, an annual cookbook could include pictures from the season’s FBWP, serving as a yearbook for the participants. This would involve the FBWP participants in the process and increase the likelihood that the cookbook would be used.

Groundswell Community Farm in Zeeland, Michigan, is a community-based farm that has collected and distributed recipes focusing on its CSA products. The organization published “Groundswell in the Kitchen: Seasons of Good Eating from Your Community Farm,” and posted the recipes in the cookbook online.<sup>28</sup> Vermont Valley Community Farm has developed a similar cookbook series that includes educational information about vegetables.<sup>29</sup> In addition, the Center for Ecoliteracy has published an online cookbook in both English and Spanish – given that many FBWP participants speak Spanish as a first language, NHF may consider replicating this approach.<sup>30</sup>

<sup>26</sup> American Association of Diabetes Educators. (2015). Retrieved from <https://www.diabeteseducator.org/home>

<sup>27</sup> Denver Urban Gardens. (2015). School Garden and Nutrition Curriculum. Retrieved from <http://dug.org/school-garden-curriculum/>

<sup>28</sup> Groundswell Community Farm. (2013). Cookbook. Retrieved from <http://groundswellfarm.org/more-recipes/>

<sup>29</sup> Vermont Valley Community Farm. Retrieved from <http://vermontvalley.com/cookbooks/>

<sup>30</sup> Center for Ecoliteracy. (2015). Cooking with California Food in K-12 Schools. Retrieved from <http://www.ecoliteracy.org/download/cooking-california-food-k-12-schools>

## 6.3 FINANCE AND ORGANIZATIONAL SYSTEMS

As NHF seeks to maximize its health impact through food production and education, it will need to identify recurring income sources to fund growth, formalize its workforce procedures, and continue to develop and track operational metrics. Improvements in these areas will ensure the longevity of NHF, enabling the organization to pursue its mission for years to come. This section is organized according to the focus areas discussed above: financial sustainability, workforce, and operational metrics (see Figure 6).

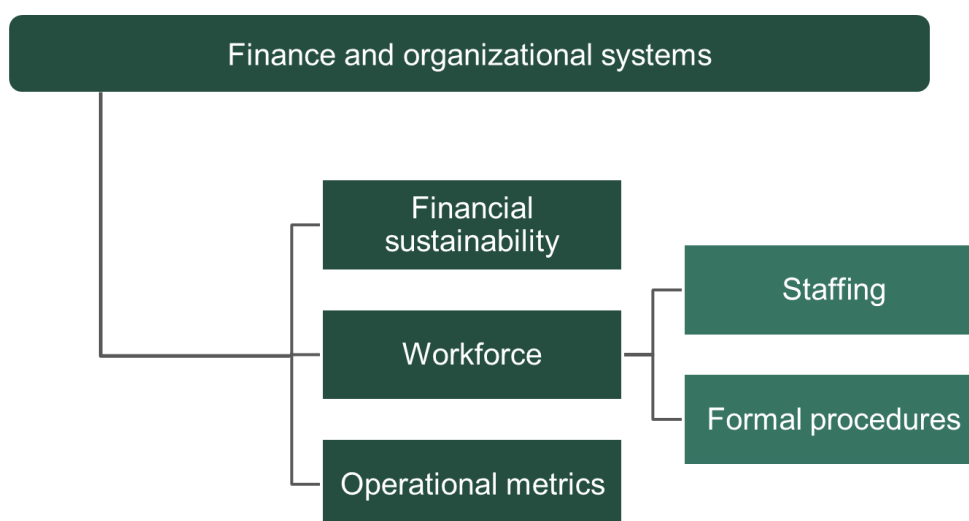


Figure 6

### 6.3.1 Financial Sustainability

To fund efforts to maximize its health impact through food production and education, NHF will need to identify sustainable sources of income. Four potential income sources were identified: grants and donations, corporate sponsorships, revenue from product sales, and health insurance. Each is described in detail below.

#### 6.3.1.1 Grants and Donations

As a community-based, non-profit organization, NHF should continue to apply for grants and seek donations to fulfill funding requirements. A number of viable grant opportunities for NHF were identified. Two examples are highlighted below. An extensive list of grant and donation opportunities is included in **Appendix 4**.

#### Farmers Market Promotion Program (FMPP)

<http://www.ams.usda.gov/services/grants/fmpp>

- **Purpose:** The purpose of the Farmers Market Promotion Program (FMPP) is to “increase domestic consumption of, and access to, locally and regionally produced agricultural products, and to develop new market opportunities for farm and ranch operations serving

local markets by developing, improving, expanding, and providing outreach, training, and technical assistance to, or assisting in the development, improvement, and expansion of, domestic farmers markets, roadside stands, community-supported agriculture programs, agritourism activities, and other direct producer-to-consumer market opportunities.” FMPP promotes direct-to-consumer activities (farmers selling products directly to consumers). FMPP funds cannot be used for farming or production activities. FMPP can only be used for direct marketing activities that sell agricultural products directly to consumers. FMPP funds cannot be used to purchase land. They can be used to lease land, but only for direct producer-to-consumer marketing activities – not farming or production. Food donations, giveaways, vouchers, and coupons are not allowed as part of FMPP projects. Funding ranges from \$15,000 to \$100,000. Any entity that has received a past grant award may apply for future grants after the current grant project has been completed. There is no match requirement or grant sub-type for FMPP.

- **Eligibility:** Domestic entities located in the United States including CSA networks and non-profit corporations are eligible for the FMPP grant.
- **Past recipients:** In 2015, Heart of the City Farmers’ Market (San Francisco, CA) was awarded \$100,000 to promote healthy eating habits in a low-income community and access to locally produced food through the use of Supplemental Nutrition Assistance Program (SNAP) benefits at the Heart of the City Farmers’ Market.
- **Relevance to NHF:** NHF could use the grant to promote product sales, either through farmers’ markets or CSAs. Similar to Heart of the City Farmers’ Market, the organization may consider enabling customers to use SNAP benefits to purchase produce.

### **Local Food Promotion Program (LFPP)**

<http://www.ams.usda.gov/services/grants/lfpp>

- **Purpose:** The Local Food Promotion Program (LFPP) was created to support the development and expansion of local food businesses, to increase access to locally-produced agricultural, and to develop new markets for farms serving local markets. There are two types of project applications accepted under LFPP: planning grants and implementation grants. Planning grants are used in the planning stages of establishing or expanding a local or regional food business. Activities can include, but are not limited to, market research, feasibility studies, and business planning. Implementation grants are used to establish a new local or regional food business, or to improve or expand an existing one. Activities can include, but are not limited to, training and technical assistance for the business and/or for producers working with the business, outreach and marketing to buyers and consumers, and non-construction infrastructure improvements to business facilities or information technology systems.
- **Eligibility:** Domestic entities located in the United States including CSA networks and non-profit corporations are eligible for the LFPP grant.
- **Past recipients:** In 2015, the Technical Assistance Partnership of Arizona was awarded \$100,000 to create a project that will create a self-sustaining community farm. The Heifer Project International was awarded \$100,000 to develop a marketing campaign for an existing multi-form CSA to increase production of locally-produced fruits and vegetables.
- **Relevance to NHF:** NHF could use this grant to support business planning and market research focused on growing the FBWP or increasing produce sales.



### 6.3.1.2 *Corporate Sponsors*

Several businesses in New Haven have charitable giving campaigns that align with NHF's mission, and therefore represent viable sponsorship opportunities. Two examples are highlighted below. Further sponsorship opportunities are outlined in **Appendix 4**.

#### **Albertson's**

- **Mission:** Albertson's is one of the nation's largest supermarket chains and operates in New Haven under the local brand Acme Markets. Albertson's community relations mission is to support hunger relief, youth and education, and health and nutrition in local schools and communities. Each division works locally to make donations to worthy organizations and initiatives. The Safeway Foundation funds non-profit organizations that strengthen neighborhoods served by the company. The foundation considers applications in the following areas: health and human services, hunger relief, education, and helping people with disabilities. Grants in a local city or state are typically between \$2,500 and \$10,000.
- **Previous sponsorship activities:** In the past, Acme Markets has been a large supporter of campaigns to fight hunger, such as Camp Out for Hunger, Coalition Against Hunger, and Neighbor Service Shelter. These organizations support community members in need by providing food and other services.
- **Relevance to NHF:** Acme Markets presents a strong sponsorship opportunity for NHF. NHF is located in a community where Acme operates, and provides health and nutrition services to low-income residents. NHF's mission clearly aligns with Acme's charitable giving goals.

#### **Stop and Shop**

- **Mission:** Stop and Shop is a large regional supermarket chain that operates in New Haven. The organization supports local communities through its "Our Family Foundation." The mission of the foundation is to help neighbors in need, and it focuses on three key initiatives: fighting hunger, improving the lives of children, and building healthy communities.
- **Previous sponsorship activities:** In 2014, the foundation donated \$29 million in cash and products to local charities and programs. In its effort to fight hunger, the foundation supports the Connecticut Food Bank.
- **Relevance to NHF:** Stop and Shop also presents a strong sponsorship opportunity for NHF. NHF is located in a community where Stop and Shop operates. NHF aims to build healthy communities through its FBWP and incubator gardens. NHF's mission clearly aligns with Stop and Shop's charitable giving goals.

### 6.3.1.3 *Revenue from Product Sales*

Increasing produce sales is another way for NHF to diversify its income, and would reduce reliance on intermittent funding sources like grants, donations, and sponsorships. NHF can sell produce through three channels: restaurants, CSAs, and farmers' markets. Opportunities across these three channels are discussed below. If implemented, the optimal combination of farming interventions

discussed above could more than double NHF's food production. This produce could be used to serve FBWP clients or sold to generate revenue. Therefore, there is an inherent tension between expanding the FBWP and increasing produce sales. The allocation of produce to these activities is a strategic decision that has been left up to NHF.

**Restaurants:** Local restaurants are a viable customer for NHF. If NHF adopts the microgreens intervention discussed above, high-end tapas restaurants will be particularly attractive potential customers, as tapas dishes often require microgreens. Microgreens have high yields (see Food Production) and can be sold at high margins. Local tapas restaurants that NHF should target include:

- Barcelona Wine Bar, 155 Temple Street, New Haven, CT
- Pacifico, 220 College St, New Haven, CT
- Ibiza Tapas, 1832 Dixwell Ave, Hamden, CT

**CSAs:** If it proves difficult for NHF to expand its own CSA program, there may be opportunities to sell excess produce to other CSAs. Depending on their target customers, these CSAs may charge higher prices than NHF, presenting an opportunity for higher margin CSA sales. Local CSA programs include:

- CitySeed (New Haven, CT)
- Hindinger Farm (Hamden, CT)
- Bodhichitta Farms (Prospect, CT)
- Barberry Hill Farm (Madison, CT)

**Farmers' markets:** NHF can generate revenue by selling produce at local farmers' markets. NHF could focus on selling specific types of produce, such as high-margin microgreens, and supplement these items with produce that is not required for FBWP clients. The organization could also sell an NHF cookbook at farmers' markets. Local farmers' markets include:

- CitySeed Indoor Winter Farmers Market (January – April)
- City Farmers' Market Wooster Square (May – December)

#### **6.3.1.4 Health Insurance**

Seeking reimbursement from health insurance providers for certain services, such as nutrition counseling, presents an opportunity for NHF to offset the cost of operating the FBWP. The vast majority of New Haven residents (86%) have health insurance.<sup>31</sup> However, the percentage of uninsured residents increases among low-income minorities, which make up a large portion of FBWP clients. Data indicate that 15% of low-income residents in New Haven do not have access to health insurance, but this figure varies by age and race: 27% of Hispanics and 37% of foreign-born residents are uninsured.

---

<sup>31</sup> Data Haven. (2013). Greater Newhaven Community Index 2013. Retrieved from [http://www.cityofnewhaven.com/uploads/2013\\_CommunityIndex%20Report.pdf](http://www.cityofnewhaven.com/uploads/2013_CommunityIndex%20Report.pdf)

With the implementation of the Affordable Care Act, the number of uninsured adults in Connecticut is projected to decrease. As a result, reimbursement via health insurance may become increasingly viable for NHF, if it is not already. To determine if health insurance reimbursement is feasible, NHF would need to survey its current and future participants to determine health insurance coverage rates. If not all FBWP clients are insured, NHF could still seek reimbursement from those that do have health insurance to subsidize provision of services to those that are not covered.

There are three major private insurance providers in New Haven: Anthem Blue Cross and Blue Shield, ConnectiCare, and HealthyCt. Requirements for reimbursement may vary by provider, and costs eligible for reimbursement may vary by the level of insurance that each patient owns. All of the main providers offer nutritional counseling under some level of insurance. However, assuming that most of NHF's patients are classified as low-income, they may qualify for Medicaid or Medicare. Again, under Medicaid, reimbursement for the FBWP will likely vary based on the level of insurance coverage. Basic Medicaid (Access Health CT) does not cover nutrition therapy services. However, the Affordable Care Act added benefits for which NHF may qualify: healthy diet and physical activity counseling to prevent cardiovascular disease for adults with cardiovascular risk factors and obesity screening and counseling for adults and children. Medicare covers medical nutrition therapy services.

To be eligible for reimbursement, relevant FBWP services would need to be provided by a registered dietician or nutrition professional who meets certain requirements. People with Part B insurance are eligible if they meet at least one of these conditions: have diabetes, have kidney disease, or have had a kidney transplant in the last 36 months. Diabetes self-management training (DSMT) is a specific covered benefit under Medicare and some other insurance policies. DSMT is a multi-week curriculum, developed by the American Association of Diabetes Educators and the American Diabetes Association. It is designed to be delivered only in a group format by trained instructors. Instructors can be licensed or credentialed health care providers or non-credentialed providers, such as community health workers. At least one instructor must be either an RD, RN, or Pharmacist.

In order to be considered for reimbursement for a DSMT program, NHF will need to achieve accreditation, and the accreditation certificate from ADA or AADE must be submitted to the local Medicare contractor's provider enrollment department. The accreditation certificate should be submitted along with the Medicare provider status and National Provider Identification (NPI) number. Once this information is received, the provider or entity will be officially recognized by Medicare to conduct a DSMT program.<sup>32</sup>

---

<sup>32</sup> State of Connecticut. (December 8, 2015). Live Well: Chronic Disease Self-Management Program. Retrieved from <http://www.ct.gov/dph/cwp/view.asp?a=3135&q=467302>

### 6.3.2 Workforce: Staffing and Formal Procedures

NHF's long-term success depends on the implementation of a robust workforce model. Doing so will require two actions: adopting an organizational structure that aligns with best practices and formalizing staffing procedures, which includes defining and documenting responsibilities and implementing a staff scheduling system. These actions – which are summarized in Figure 7 – will stabilize NHF's current operations and position the organization for growth.

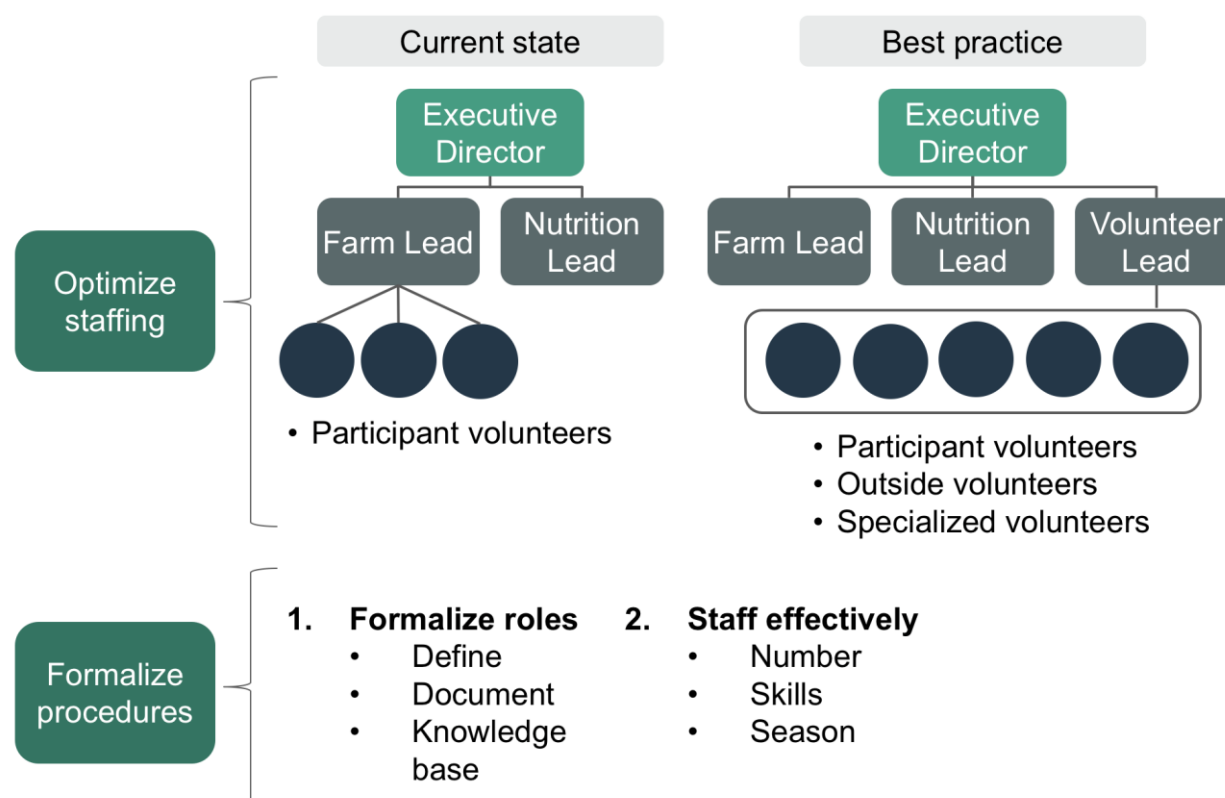


Figure 7

#### 6.3.2.1 Organizational Structure

Currently, NHF has two full-time employees, James Jenkins (Executive Director) and Jacqueline Maisonpierre (Farm Manager), and one part-time employee, Celin Garcia (Cooking and Nutrition Educator). Interviews with NHF indicated that all of these employees engage in cross-functional tasks, which restricts the time that they can dedicate to their core focus areas. For example, Jacqueline Maisonpierre (Farm Manager) often coordinates the weekly FBWP sessions, which adds to her already-demanding workload. While this informal and overlapping distribution of responsibility has worked to date, it is recommended that NHF defines discrete responsibilities for the following positions:

- Executive Director
- Farm Lead
- Nutrition Lead
- Volunteer Lead

Institutionalizing discrete positions will enable each employee to focus on his/her core responsibilities and will prevent overtime. Under this structure, a Nutrition Lead and a Volunteer Lead will need to be hired. These additions are consistent with best practices at other urban farms.

Under this structure, the Nutrition Lead will manage nutrition and cooking education, planning, and communication. The Nutrition Lead will also be responsible for implementing and overseeing a system to track health and wellness metrics (see Operational Metrics). The Volunteer Lead will be responsible for coordinating volunteer labor secured through the FBWP, as well as efforts to recruit volunteers outside of the FBWP.

As NHF grows, building a strong volunteer workforce will ensure that increased labor requirements can be met. A review of other non-profit urban farms shows that a large volunteer workforce is common. The increase in labor requirements associated with growth will not be uniform – different types of labor will be required at different times. As such, it will be important to segment volunteers into categories. For example, volunteers with farming expertise and volunteers with nutrition expertise. Defining volunteer categories will ensure that the right type of volunteers are secured at the right time.

### ***6.3.2.2 Formalizing Staffing Procedures***

After reorganizing its workforce structure, NHF should formalize the roles introduced under this new structure and implement a staff scheduling system. Formalization of roles should include defining and documenting responsibilities, for both employees and volunteers. Currently, NHF is reliant on the knowledge of two employees. This presents a risk, as the loss of either employee would result in the loss of this knowledge base. Documenting this knowledge will reduce this risk and simplify on-boarding procedures for future employees. In addition to preventing the loss of knowledge, defining and documenting responsibilities will help ensure that employees only focus on their core responsibilities. As noted, volunteer responsibilities should also be defined and documented. This should be done according to volunteer categories, such as education or farming.

Once responsibilities have been defined and documented for all roles, NHF should strive to introduce a workforce scheduling system. This will ensure that the organization is staffed in the most effective manner, meaning the right number of employees, with the right skills will be in the right place at the right time. Documented responsibilities can be leveraged when developing this scheduling system. NHF may consider using workforce scheduling software, such as TrackSmart (<https://www.tracksmart.com/>) or Planday (<http://planday.com/>).

## **Best Practice Example: The Greening of Detroit**

The Greening of Detroit's mission is to contribute to the development of healthy urban communities by building green spaces, offering food education, and creating training and job opportunities.<sup>33</sup> Staff members are organized into six departments: administration, finance, community relations and marketing, workforce development, green infrastructure, and urban agriculture. To manage these departments, The Greening of Detroit organized its leadership into four primary roles: Executive Director, Farm Manager, Nutrition and Garden Education Manager, and Training Coordinator.

The Nutrition and Garden Education Manager delivers in-school, and after-school nutrition and garden education to students, parents, and local community members, and is responsible for maintaining programming records. The Training Coordinator works with community organizations to recruit new program participants and volunteers. Under this structure, The Greening of Detroit has successfully recruited about 5,000 volunteers per year.

### **6.3.3 Operational Metrics**

Implementing a system to track operational metrics will allow NHF to set organizational goals and measure progress with respect to those goals. Doing so will help NHF quantify the effectiveness of its programs and demonstrate organizational value to potential funders.<sup>34</sup> NHF has already begun to track operational metrics – the organization has started collecting health data from participants, tracks program participation figures, and keeps a detailed inventory of produce production. This section outlines opportunities to further develop operational metrics across three areas: health and wellness, farming, and education.

#### **6.3.3.1 Health and Wellness**

Defining and tracking metrics in this area will enable NHF to quantify its positive health impact. Selected metrics should allow NHF to determine the extent to which FBWP clients have reduced their metabolic disease risk. According to the U.S. Department of Health and Human Services, there are five main indicators of metabolic disease risk:<sup>35</sup>

1. Abdominal obesity
2. High triglyceride level
3. Low HDL cholesterol level
4. High blood pressure
5. High fasting blood sugar

---

<sup>33</sup> The Greening of Detroit. (2015). About Us. Retrieved from <http://www.greeningofdetroit.com>

<sup>34</sup> Compassion Capital Fund National Resource Center. Measuring Outcomes. Retrieved from <http://strengtheningnonprofits.org/resources/guidebooks/MeasuringOutcomes.pdf>

<sup>35</sup> National Heart, Lung, and Blood Institute. (November 6, 2015). What is Metabolic Syndrome. Retrieved from <http://www.nhlbi.nih.gov/health/health-topics/topics/ms>

Body Mass Index (BMI) is also a strong metabolic risk indicator.<sup>36</sup> NHF should use these indicators to develop health and wellness metrics. Improvements across these indicators will not be seen during the 16 to 20 week duration of the FBWP. Therefore, NHF should work with clients' healthcare providers to collect this data. In addition to quantitative health indicators, NHF should consider tracking qualitative wellness metrics, such as the degree to which clients feel healthy or have a positive attitude. Such metrics could be collected through an annual survey.

### **6.3.3.2 Farming**

NHF should continue to track produce production metrics. Moving forward, the organization may consider measuring food production at the site level and farming method level, in addition to the crop level. This will enable NHF to determine opportunities for productivity improvements across its operations. Inputs into the production process should also be tracked, including labor, seeds, soil, water, and electricity. This should be done at the crop level and farming method level. Doing so will give NHF further insight into resource requirements across its operations. This data should be collected by NHF staff, and aggregated in quarterly or annual reports.

### **6.3.3.3 Education**

Education metrics should enable NHF to measure participation, effectiveness, and satisfaction in relation to the educational aspects of the FBWP: nutrition, cooking, and farming seminars. With respect to participation, attendance rates and reasons for absences should be tracked. If pursued, cookbook sales or downloads can also be used as an indicator of participation. Effectiveness can be measured through qualitative evidence of increased nutrition, cooking, or farming knowledge. It should be noted that the effectiveness of NHF's educational activities can, in part, be measured using the health and wellness indicators discussed above. Lastly, satisfaction can be measured through interviewing or surveying FBWP clients. Satisfaction metrics will give NHF insight into how the FBWP can be improved to better meet clients' needs.

---

<sup>36</sup> Diabetes in Control. (May 8, 2014). Body Mass Index and Type II Diabetes Risk. Retrieved from <http://www.diabetesincontrol.com/body-mass-index-and-type-2-diabetes-risk/>



## 7 CONCLUSION

---

Providing the foundation for a long-term strategic plan, this report outlines how NHF can maximize its positive health impact across three focus areas: food production, education, and finance and organizational systems. In reviewing these findings, NHF will have to make important decisions. For example, if implemented, the optimal combination of farming interventions discussed above could more than double food production. NHF will need to decide whether this produce should be used to serve more FBWP clients or sold to generate revenue. This is just one example of the tension between the organization's social mission and its ambition to achieve financial sustainability.

This report is not intended to be prescriptive. Rather, it gives NHF the flexibility to determine its strategic goals and provides the resources needed to achieve those goals. Ultimately, regardless of the direction that NHF decides to pursue, this report outlines practical pathways through which the organization can achieve its mission of promoting healthy living and community development via urban agriculture, today and for years to come.

## 8 APPENDICES

---

### 8.1.1 Appendix 1: Comparable Organizations

#### **The Food Project** - <http://thefoodproject.org/>

- Mission: Their mission is to create a thoughtful and productive community of youth and adults from diverse backgrounds who work together to build a sustainable food system. Their community produces healthy food for residents of the city and suburbs, provides youth leadership opportunities, and inspires and supports others to create change in their own communities.
- Location: Boston, MA
- Contact Information:  
10 Lewis Street  
Lincoln, MA 01773  
(617) 442-1322

#### **City Farm** - <http://www.cityfarmchicago.org/>

- Mission: City Farm works under the Resource Center which is an environmental education organization that strives to improve the quality of life in Chicago by finding new life and uses for underused and overlooked resources. For over 35 years the Resource Center has demonstrated innovative techniques for recycling and reusing materials. City Farm has urban farming, food-to-farm composting, and food rescue.
- Location: Chicago, IL
- Contact Information:  
1204 N Clybourn Avenue  
Chicago, IL 60610

#### **The Capuchin Soup Kitchen** - <http://www.cskdetroit.org/>

- Mission: Inspired by the life and spirit of St. Francis of Assisi, the Capuchin Soup Kitchen tends to people's basic needs, especially the need for food, strive to stimulate minds and nourish spirits, and work to understand and address root causes of social injustice in our community. The Earthworks Urban Farm is one of their many programs.
- Location: Detroit, MI
- Contact Information:  
1264 Meldrum St.  
Detroit, MI 48207  
(313) 579-2100 Ext. 204

#### **The Michigan Urban Farming Initiative** - <http://www.miufi.org/>

- Mission: The Michigan Urban Farming Initiative seeks to engage members of the Michigan community in sustainable agriculture. They believe that challenges unique to the Michigan community (e.g., vacant land, poor diet, nutritional illiteracy, and food insecurity) present a unique opportunity for community-supported agriculture. Using agriculture as a platform to promote education, sustainability, and community—while simultaneously reducing socioeconomic disparity—they hope to empower urban communities.
- Location: Detroit, MI

- Contact Information:  
7432 Brush St.  
Detroit, MI 48202  
(313) 444-6834

**ReVision Urban Farm** - <https://www.vpi.org/revision/>

- Mission: Revision Urban Farm is an innovative community-based urban agriculture project that grows produce in its own fields and provides access to affordable, nutritious and culturally appropriate food to residents of the ReVision Family Home and extended community. In association with ReVision Family Home, they also provide job training for youth and Boston's homeless.
- Location: Boston, MA
- Contact Information:  
38 Fabyan Street  
Boston, MA 02124  
(617) 822-FARM (3276)

**Food Field** - <http://www.foodfielddetroit.com/>

- Mission: Their goal is to join in the revitalization of Detroit by developing a successful, community-based business and to meet the need for local, affordable, sustainably produced food here. They believe in a triple bottom line setting environmental, social, and economic goals, all of which an urban farm contributes to. Their priority is to produce fresh, healthy, and delicious food while improving the neighborhood and creating economic opportunities.
- Mission: Detroit, MI
- Contact Information:  
Rosa Parks Blvd & Lawrence St,  
Detroit, MI 48206  
(313) 312-7235

**Hollygrove Market and Farm** - <https://hollygrovemarket.com/>

- Mission: The Hollygrove Market and Farm (HM&F) is a urban farm, local produce market, and community garden space located in the heart of New Orleans. Hollygrove Market and Farm exists to increase accessibility of fresh produce to Hollygrove, surrounding underserved neighborhoods, and all of New Orleans while promoting sustainability through support of local farmers and the local economy as well as acting as a demonstration site for environmentally sustainable practices.
- Location: New Orleans, LA
- Contact Information:  
8301 Olive St.  
New Orleans, LA 70118  
504-483-7037

**Urban Roots** - <http://www.urbanroots.org/>

- Mission: Urban Roots Community Garden Center is a consumer cooperative business whose mission is to provide quality products for gardening in the City of Buffalo and be an active and enriching member of the community. Urban Roots offers affordable, unusual,

heirloom, organic and local plants, and gardening supplies. They foster a working relationship with the greater neighborhood in order to encourage beautification and urban renewal. They engage the community through education, employment, outreach, expertise, and volunteering efforts.

- Location: Buffalo, NY
- Contact Information:  
428 Rhode Island Street  
Buffalo, NY 14213-2312  
(716) 362-8982

**Green City Growers** - <http://greencitygrowers.com/>

- Mission: Green City Growers transforms unused space into thriving urban farms, providing our clients with immediate access to nutritious food, while revitalizing city landscapes and inspiring self-sufficiency.
- Location: Boston Area, MA
- Contact Information:  
600 Windsor Pl,  
Somerville, MA 02143  
(617) 776 1400

**City Slickers Farms** - <http://www.cityslickerfarms.org/>

- Mission: West Oakland has a lack of real choice for fresh, affordable, healthy food. CSF programs have a long-term sustainable impact, changing underutilized urban landscapes into ones that provide healthy, affordable food and improve the environment for generations to come. City Slicker Farms organizes low-income communities to achieve equal access to fresh, healthy, organic food through the Community Market Farms Program, Backyard Garden Program, and Urban Farming Education Program
- Location: Oakland, CA
- Contact Information:  
1625 16th Street  
Oakland, CA 94607  
(510-763-4241)

The table below outlines staffing structures at comparable organizations:

Organization	# of Directors	# of Staff	Volunteers
<b>City Slicker Farms</b>	<ul style="list-style-type: none"> <li>• 9 (looking to expand)</li> </ul>	<ul style="list-style-type: none"> <li>• 10</li> </ul>	<ul style="list-style-type: none"> <li>• 649 volunteers, 29 garden mentors, 24 adult allies</li> <li>• 9 youth interns, 4688 hours</li> </ul>
<b>Growing Power</b>	<ul style="list-style-type: none"> <li>• 8 board members, 11 advisory board members</li> </ul>	<ul style="list-style-type: none"> <li>• 4 in Milwaukee</li> <li>• 14 FT to PT in Chicago</li> <li>• 3 in Madison</li> </ul>	<ul style="list-style-type: none"> <li>• Youth Corps – in Chicago over 300 youths annually</li> <li>• Internships</li> <li>• Volunteers</li> </ul>
<b>The Food Project</b>	<ul style="list-style-type: none"> <li>• 16</li> </ul>	<ul style="list-style-type: none"> <li>• 23</li> </ul>	<ul style="list-style-type: none"> <li>• Youth programs, 120 teenagers</li> <li>• Volunteer program</li> </ul>

### 8.1.2 Appendix 2: Optimization Model Data Sources

Model Inputs	Growing Method				
	Traditional	Outdoor vertical hydroponic	High tunnel	Indoor vertical microgreens	Hydroponic greenhouse
<b>Crop types that can be grown under method</b>	All crop types	See Food Production, Qualitative Descriptions – based on the crop types that can be grown under the suggested implementation options.	See Food Production, Qualitative Descriptions – based on the crop types that can be grown under the suggested implementation options.	See Food Production, Qualitative Descriptions – based on the crop types that can be grown under the suggested implementation options.	See Food Production, Qualitative Descriptions – based on the crop types that can be grown under the suggested implementation options.
<b>Labor requirements (hrs/sq. ft./wk)</b>	Current hours per week for farm manager/total sq. ft.	Blue Planet Consulting estimate	Assumed to be the same as traditional	Blue Planet Consulting estimate	Blue Planet Consulting estimate
<b>Production cost (\$/lbs)</b>	Current direct production costs/total production (2014)	Cost saving estimates from ZipGrow – 50% reduction in labor cost and 50% reduction in water use. Traditional used as baseline.	Assumed to be the same as traditional	The average cost (including seeds, nutrients, labor, and utilities) across four different types of microgreens from this report: <a href="http://www.slide share.net/hinkle yreport/micro-green-presentation-1-11173689">http://www.slide share.net/hinkle yreport/micro-green-presentation-1-11173689</a>	Academic research: <a href="https://www.uky.edu/Ag/CCD/introsheets/hydrolettuce.pdf">https://www.uky.edu/Ag/CCD/introsheets/hydrolettuce.pdf</a> , <a href="http://www.tandfonline.com/doi/abs/10.1300/J064v23n03_03">http://www.tandfonline.com/doi/abs/10.1300/J064v23n03_03</a>
<b>Investment required (\$/sq. ft.)</b>	N/A	Avg. of ZipGrow cost ( <a href="https://www.bri ghtagrotech.com/commercial-pricing/">https://www.bri ghtagrotech.com/commercial-pricing/</a> ) and Blue Planet Consulting estimate	Academic research: <a href="https://www.uky.edu/Ag/CCD/introsheets/microgreens.pdf">https://www.uky.edu/Ag/CCD/introsheets/microgreens.pdf</a> , <a href="http://www.hort.cornell.edu/high tunnel/business/budget.htm">http://www.hort.cornell.edu/high tunnel/business/budget.htm</a> , <a href="https://www.uaex.edu/publications/PDF/FSA-6147.pdf">https://www.uaex.edu/publications/PDF/FSA-6147.pdf</a>	Avg. of low and high estimate from Blue Planet Consulting	Avg. of low and high estimate from Blue Planet Consulting

<b>Yield (lbs/sq. ft.)</b>	Total production (2014)/total sq. ft.	2.5x increase in yield based on ZipGrow analysis ( <a href="https://www.brihtagrotech.com/zipgrow-production/">https://www.brihtagrotech.com/zipgrow-production/</a> )	Same as traditional	Assumed max stacking height of 72". Divided 72" by max height of plants grown under method (leaves, 18") to get number of plants per sq. ft. Reduced yield by 60% because baby greens weigh less than full grown greens.	Blue Planet Consulting estimates (lbs/sq.ft./yr.)
<b>Crop rotations/year</b>	Assumed to be one rotation per year	Assumed to be one rotation per year	Increase based on 3 month addition to growing season	Year-round operation: 365 days/total days per rotation for baby greens (10)	One rotation per year because Blue Planet Consulting's yield estimates were in lbs/sq.ft./yr.



### 8.1.3 Appendix 3: Education Facility Partnership Opportunities

#### **Common Ground High School - <http://commongroundct.org>**

- Urban Farm, and Environmental Education Center located on a 20-acre site. Produces over 8,000 lbs of produce, shared roughly 3,000 lbs with low-income community members.
- Five years ago, 88 kids joined in Common Ground's Kids Unplugged after-school programs. Last year— thanks to free buses, off-site programs, and financial aid—595 kids joined the after-school programs.
- Full kitchen - donated by IKEA of New Haven, after thousands of community members voted for the proposal in a citywide contest.
- Contact information:  
Address: 358 Springside Avenue, New Haven  
Assistant Director - Keith Johnston: [kjohnston@commongroundct.org](mailto:kjohnston@commongroundct.org)  
Phone: (203) 389-4333 x1215

#### **Wilbur Cross High School - <http://schools.nhps.net/wcross/>**

- Largest high school in the New Haven school district, located adjacent to East Rock Public Park - features ranger station and Trowbridge Environmental Center.
- School provides a health and culinary science academy that includes culinary classes, creative cooking club, Governor's café – student chefs with supervisions from professional chef instructors.
- Contact information:  
Address: 181 Mitchell Drive, New Haven  
Principal: Edith Johnson - [Edith.Johnson@new-haven.k12.ct.us](mailto:Edith.Johnson@new-haven.k12.ct.us)  
Phone: (203) 497-7400

#### **Fair Haven School: Pre k – 8<sup>th</sup> grade - <http://www.fairhavenprek8school.com>**

- Public school, full kitchen & classroom space
- Close proximity with NHF locations
- Located on busy street – adjacent to : 'Cherished Moments Daycare', 'C-Town supermarket', and 'Rite Aid Pharmacy'
- Contact information:  
Address: 164 Grand Avenue, New Haven, CT  
Principal: Heriberto Cordero / Assistant Principal: Jamie Ramos  
Phone: (203) 691-2600  
New Haven Public School Food Dept: <http://www.nhps.net/NHSchoolFood>

#### **Hillhouse High School (2<sup>nd</sup> largest high school)**

- The school's District Wellness Committee promotes and advises activities of the district's first ranked wellness policy and links with School Wellness Teams. The primary wellness program "healthy kids first" removed junk food and soda from school vending machines and aims to school meals and improve exercise for kids.
- Contact information:  
Address: 480 Sherman Parkway, New Haven, CT 06511  
Phone: (203) 497-7500

**Yale University** - <http://www.yale.edu/sfas/registrar/BldgGuidelines.html>

- Yale University offers classroom space to the public for a fee. Daily rates range from \$20-80 depending on the number of seats.
- Other Yale venues for rent: <http://conferencesandevents.yale.edu/venue-list>
  - Over 200 buildings, space with seating ranging from 2 – 2,500 individuals
  - Contact: Office of the Registrar – (203) 432-2330
- Sustainable food program: <http://sustainablefood.yale.edu>
  - Sustainable Food Program hosts regular workshops, conferences, and talks with visiting experts, and works to enrich and expand coursework and hands-on learning opportunities in partnership with faculty and staff across the campus.

**University of New Haven** - <http://www.newhaven.edu/events/fees/>

- University of New Haven offers classroom space to public for a fee. NHF would pay rates for Category 2 or 3 (Sponsored Groups or Non-University groups)
- Contact Information:  
Address: 300 Boston Post Rd. West Haven, CT 06516  
Phone: (203) 479-4223

**Southern Connecticut State University**

- Available Facilities: <https://www.southernct.edu/conferencing/available-facilities.html>
  - Conference/ meeting venues (ranging from 30- 300 seats)
  - Academic Classroom/Lecture halls (ranging from 20- 350 seats). Possibly free for non-profit organizations
- Contact information:  
Address: 501 Crescent Street, New Haven, CT 06515  
Phone: (203) 392 - SCSU

**Fair Haven Community Health Center** - <http://www.fhchc.org>

- Already a partner with NHF for the diabetes prevention program and bright bodies. Mel Montosa (community liaison and research manager for NHF) also works at the health center.
- Diabetes prevention program: Fair Haven Community Health Center's Diabetes Prevention Program (FHCHC DPP) has offered 1-hour healthy lifestyle class once per week for participants in the 12-week Intensive Lifestyle Intervention. The healthy lifestyle program curriculum is based on the National Institutes of Health's Diabetes Prevention Program curriculum. Classes are taught by FHCHC DPP clinicians, and are delivered in both English and Spanish. Cooking demonstrations and discussions are an experiential learning component of each class, and foods prepared each week reflect the ripe produce harvested that week from the program's garden. Between 15-20 adults attend classes on a weekly basis, and often that same group stays the next hour for a trainer-led exercise class.
- Serves roughly 17,000 individuals per yr.
- Facilities include: 10 Patient exam rooms, 3 dental operation rooms, Counseling room, Women's health room, On-site lab. Located at 50 Grand Avenue
- Contact information:  
Address: 374 Grand Avenue, New Haven, CT 06513  
Phone: (203) 777-7411

### **The Community Foundation for Greater New Haven** <http://www.cfgnh.org/>

- Mission: To create positive and sustainable change in Connecticut's Greater New Haven region by increasing the amount of and enhancing the impact of community philanthropy.
- Program: Healthy Families (New Haven Healthy Start) The program is run through a large network of State-wide and local partners, including: CT dept. of Public health, NH health dept., Yale-NH Hospital, Hospital of St. Raphael, Hill Health Center, Fair Haven Community Health Center, New Haven Family Alliance, Life Haven Inc.
- Relationship already established with NHF. The community foundation provided a small grant from the Sarah M. Ferguson Fund to help with start up costs of the Peels and Wheels compost program.
- Contact information:  
Address: 70 Audubon Street, New Haven, CT 06510-9755  
Kenn Harris – Director of New Haven Healthy Start  
Phone: (203) 777-7080  
Email: KHarris@cfgnh.org

### **Jewish Community Center of Greater New Haven**

- The JCC of Greater New Haven provides a warm, friendly atmosphere for health, thought, learning and values. Their mission is to facilitate total wellness through programs that stimulate mind, body and spirit. (largely health and wellness)
- JCC provides a common meeting ground for all segments of the community regardless of their faith, background or orientation. Facilities are open seven days a week - closed only on the three major Jewish holidays.
- CT Transit Bus B3 stop in front of the building, every day of the week
- Facilities: <http://www.jccnh.org/facilities>
  - Ranging from 20 - 500 individuals
  - Non profit prices: Community room 100+ seats = \$300 3hrs/ Auditorium 500 seats= \$1000 3hrs
- Contact information:  
Address: 360 Amity Rd. Woodbridge, CT 06525  
Phone: (203) 387-2522  
Website: [webmaster@jccnh.org](mailto:webmaster@jccnh.org)

### **Green Village Initiative -** <http://www.gogvi.org>

- Green Village Initiative is a non-profit in Bridgeport, CT whose mission is to create social, economic and environmental change through a unified network of urban farms, community gardens and school gardens.
- Contact information:  
Address: 325 Lafayette Street, Bridgeport, CT  
Phone: (203) 227-5320

### **CitySeed -** <http://cityseed.org/about-cityseed>

- The mission of CitySeed is to engage the community in growing an equitable, local food system that promotes economic and community development and sustainable agriculture.

- CitySeed organizes farmers markets around New Haven, including in Fair Haven on Thursdays. All five of CitySeed's farmers' markets accept FMNP, Senior FMNP coupons, WIC CVV and SNAP(food stamps) benefits.
- CitySeed created the SNAP at Farmers' Markets: Four Case Studies from Connecticut on the Farmers Market Resource Center found at [www.buyCTgrown.com](http://www.buyCTgrown.com) which highlights best practices of SNAP redemption at four markets in Connecticut and provides recommendations for better SNAP outreach and redemption at markets.
- Contact information:  
Address: 817 Grand Ave., No. 101, New Haven, CT 06511  
Phone: (203) 773-3736  
Email: [info@cityseed.org](mailto:info@cityseed.org)

**Cornell Scott Hill Health - <http://cornellscott.org>**

- Cornell Scott-Hill Health Center is a community health center established in a collaboration between the New Haven community and Yale School of Medicine.
- The Health Center provides wellness education groups and classes
- Contact information:  
Address: 428 Columbus Ave, New Haven, CT 06519  
Phone: (203) 503-3000

**Downtown Evening Soup Kitchen - <http://www.downtowneveningsoupkitchen.com>**

- The Downtown Evening Soup Kitchen (DESK) provides free, nutritious meals for homeless individuals and families, and the working and non-working poor of the greater New Haven area. DESK serves an evening meal 7 days a week, provides daily bag lunches, bi-weekly senior supplement food bags, and a weekly food pantry & pet food pantry.
- The Main Dining Hall & Food Pantry is located in central New Haven.
- Contact Information:  
Address: 311 Temple Street, New Haven, CT 06510  
Phone: (203) 624-6426  
Email: [downtowneveningsoupkitchennhv@gmail.com](mailto:downtowneveningsoupkitchennhv@gmail.com)

## 8.1.4 Appendix 4: Grant, Donation, and Sponsorship Opportunities

### Public Grants

#### **SARE** - <http://www.sare.org/>

- Purpose: Northeast Sustainable Agriculture Research and Education (SARE) offers competitive grants to projects that explore and address key issues affecting the sustainability and future economic viability of agriculture. The program offers various grants for educators, students, commercial farms and others, however, the grants best suited for NHF are the Partnership Grant and the Research and Education grant. The Partnership grant is for agricultural service providers, including nonprofits, who want to conduct on-farm demonstrations, research, or marketing projects with farmers as cooperators. The Research and Education grant is for outcome-based projects offering research, education, and demonstration projects that benefit farmers and explore new sustainable farm practices. Research and Education projects generally run two or three years. The maximum duration is four years. Funds from either grant can't be used for capital costs, to buy land, start a farm, or expand an existing operation.
- Eligibility: Both project grants must involve farmers and other stakeholders in planning, implementing, and evaluating a potential project. Research awards typically range from \$30,000 to \$200,000 and average \$146,000. Partnership grants are \$15,000.

#### **Food Insecurity Nutrition Incentive (FINI)** - <http://nifa.usda.gov/program/food-insecurity-nutrition-incentive-fini-grant-program>

- Purpose: The Food Insecurity Nutrition Incentive (FINI) Grant Program supports projects to increase the purchase of fruits and vegetables among low-income consumers participating in the Supplemental Nutrition Assistance Program (SNAP) by providing incentives at the point of purchase. There are three categories of projects: (1) FINI Pilot Projects (awards not to exceed a total of \$100,000 over one year); (2) Multi-year, community-based FINI Projects (awards not to exceed a total of \$500,000 over no more than four years); and (3) Multi-year, FINI Large-Scale Projects (awards of \$500,000 or more over no more than four years).
- Eligibility: All FINI projects must have the following. The project must have the support of the State agency responsible for the administration of SNAP. It must increase the purchase of fruits and vegetables by low-income consumers participating in SNAP by providing incentives at the point of purchase. It must operate through authorized SNAP retailers, and in compliance with all relevant SNAP regulations and operating requirements. It must agree to participate in the FINI comprehensive program evaluation. It must ensure that the same terms and conditions apply to purchases made by individuals with SNAP benefits and with incentives under the FINI grants program as apply to purchases made by individuals who are not members of households receiving benefits as provided in 7 C.F.R. 278.2(b). Lastly it must include effective and efficient technologies for benefit redemption systems that may be replicated in other States and communities.

## Private Foundations

### ***The Merck Family Fund*** - <http://merckff.org/>

- The Merck Family Fund has two goals: to restore and protect the natural environment and ensure a healthy planet for generations to come and to strengthen the social fabric and the physical landscape of the urban community. The fund also supports Urban Farming and Youth Leadership and welcomes proposals that: provide high quality leadership development and employment for youth, support highly productive urban farming projects and increase local access to fresh food, and engage residents in food access and food security issues in the community. Priority will be given to projects that combine all aspects above and that reside in the six New England states, New York, New Jersey and Philadelphia, PA.
- Contact Information:  
Merck Family Fund  
Address: P.O. Box 870245, Milton Village, MA 02187  
Phone: (617) 696-3580  
Email: merck@merckff.org

### ***Amelia Peabody Charitable Fund*** - <http://www.apcfund.org/>

- The Amelia Peabody Charitable Fund gives grants to qualified non-profit organizations in New England that advance the cause of health (human and animal), visual arts, land conservation and historic preservation. The Fund accepts grant proposals twice a year.
- Contact Information:  
Phone: (617) 451-6178

### ***Wallace Genetic Foundation*** - <http://www.wallacegenetic.org/>

- The Wallace Genetic Foundation supports organization focused on sustainable agriculture, farmland preservation, conservation of natural resources, biodiversity protection, and reduction of environmental toxins. Grants commonly fall in the \$25,000 to \$50,000 range.
- Contact Information:  
Address: 4910 Massachusetts Avenue, NW, Suite 221, Washington, DC 20016  
Phone: (202) 966-2932  
Email: wgfdn@aol.com

### ***The Doe Family Foundation*** - <http://www.doefamilyfoundation.org/>

- The Doe Family Foundation's mission is to improve the lives of individuals and families in need in the Greater New England area. Specifically the foundation funds organizations that support access to healthy food in addressing hunger relief, community programs that access agriculture and nutritional education for youth and adults.
- Contact Information:  
The Doe Family Foundation c/o The Strachan Group  
Address: 28 State Street, 26th Floor, Boston, MA 02109

### ***New World Foundation*** - <http://newwf.org/>

- Rooted in a long tradition of advancing an ever-expanding view of civil rights in America, the New World Foundation strengthens community-based organizations and local



leadership. As a national community foundation, NWF works from the bottom up to build coalitions around issues that converge in place, creating alliances locally and building movements nationally.

- **Contact Information:**  
New World Foundation  
Address: 666 West End Ave, Suite 1B New York, NY 10025  
Phone: (212) 249-1023  
Email: reception@newwf.org

**Jane's Trust** - <http://hembar.com/janestrust>

- Jane's Trust will make grants to address important issues in the Trust's fields of interest and areas of geographical focus. The Trustees are interested primarily in organizations and projects which benefit underserved populations and disadvantaged communities. The Trust's fields of interest include Arts and Culture, Education, Environment, and Health and Welfare.
- **Contact Information:**  
Susan M. Fish (Grants Administrator)  
Hemenway & Barnes LLP, Family Office and Philanthropy Services  
Address: 75 State Street, 16th Floor, Boston, MA 02109  
Phone: (617) 227-7940 x775  
Email: sfish@hembar.com

**Fresh Sound Foundation** - <http://freshsoundfoundation.org/>

- The Fresh Sound Foundation is interested in developing and supporting leadership that contributes to healthy communities and advocates for community development. FSF contributes to non-profits that work towards tolerant and engaged communities.
- **Contact Information:**  
Susan M. Fish (Grants Administrator)  
Hemenway & Barnes LLP, Philanthropy and Family Office Services  
Address: 60 State Street Boston, MA 02109  
Phone: (617) 557-9766  
Email: info@freshsoundfoundation.org

## **Corporate Sponsors**

**Big Y** - <http://www.bigy.com/Community>

- Big Y is a regional supermarket chain in New England. They are committed to making a difference in the communities we live and work in. Each store sponsors programs in their town. There is a Big Y market located in North Haven.

**Naked Juice Company** - <http://www.nakedjuice.com/our-purpose>

- Naked Juice Company is national bottled juice company. They sell healthy vegetable and fruit based smoothies and juices. The company also has a strong commitment to sustainability and making products that promote health and wellness. In the past Naked Juice Company has supported the Wholesome Wave organization in Bridgeport, Connecticut, an organization with the mission to inspire underserved consumers to make

healthy food choices by increasing affordable access to fresh, local and regional food. NHF's mission aligns with that of Naked Juice and could be a good partner.

**Subway** - [http://www.subway.com/subwayroot/about\\_us/Social\\_Responsibility/default.aspx](http://www.subway.com/subwayroot/about_us/Social_Responsibility/default.aspx)

- Subway is the largest restaurant chain in the world. It was founded in Bridgeport, CT and is currently headquartered in Milford, CT within New Haven County. Subway advocates for nutritional food and healthy eating. Their efforts to promote healthy habits extend beyond the restaurant walls. Supportive partnerships have been formed with health and activity based organizations like the American Heart Association, Jump Rope for Heart, Hoops for Heart, Little League, National Institute of Health, MyPyramid.gov, Produce for Better Health Foundation and the American College of Cardiology (ACC). Each year the Subway brand supports charities and philanthropic organizations through corporate donations and sponsorships to encourage healthy, active lifestyles and help make the world a better place.

**Edible Arrangements** - <https://www.ediblearrangements.com/ediblecares.aspx>

- Edible Arrangements is a national franchisor that specializes in fresh fruit arrangements. The company was founded in East Haven, CT in 1999. The company's Edible Cares program is designed to encourage health, happiness and well-being for the betterment of all, through charitable contributions and community outreach both nationally and in local communities.

**Bigelow Tea** - <https://www.bigelowtea.com/Responsibility/Community>

- Bigelow Tea is one of the largest tea companies in the world. The family owned company is headquartered in Fairfield, CT. In the company's mission statement they state "We feel an obligation to support the local communities where we reside so as to build a good working relationship as well as to contribute to worthy local and national causes. Furthermore, as a good corporate citizen, we remain committed to protecting the environment by continually striving to improve the environmental responsiveness of our packaging." Bigelow Tea gives out donations to local organizations and even has its own community garden that produces vegetables that are donated to the Bridgeport Rescue Mission.

**Bic Corporation** - <http://www.bicworld.com/us/about-bic/bic-culture/>

- Bic Corporation is an international manufacturer of pens and disposable consumer products such as lighters, razors, and printed paper products. The headquarters of the US subsidiary is located in nearby Shelton, CT. Bic's primary corporate sponsorship initiatives support education, however, in 2008 the company announced its "BIC Citizens In Action" based on the shared commitment by BIC and its employees to protect the planet and help local communities.