ROOTED IN RESILIENCE

Policy Recommendations for a Resilient City Landscape

Capstone Workshop in Applied Earth Systems Policy Analysis | Spring 2018

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Cover photo: *60 Water Street Roof Terrace. James Corner Field Operations (n.d.) 60 Water Street Roof Terrace. Accessed from http://www.fieldoperations.net/project-details/project/dock-street-roof-terrace.html.*

Prepared for New York City Council Member

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DISCLAIMER

This report is the final deliverable for the course ENVP U9232, The Workshop in Applied Earth Systems and Policy Analysis, the capstone requirement for the Master of Public Administration in Environmental Science and Policy at Columbia University's School of International and Public Affairs. All information contained in this report is believed to be correct and reliable as of May 2018. The views, recommendations, and opinions expressed in this report may not necessarily reflect those of Columbia University or its affiliates.

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596 Acres
AeroFarms
Agritecture Consulting
Bissel Farms
Brooklyn-Queens Land Trust
Brooklyn Grange
Citizens Committee for NYC
City Harvest
Columbia University
Community Food Funders
CUNY Urban Food Policy Institute
Earth Arts Center
East New York Farms!
Green City Force
Grow to Learn NYC
GrowNYC
Just Food
Lamont-Doherty Earth Observatory
Museum of the City of New York
New Roots Community Farm
The New School
New York Restoration Project
New York Sun Works
NY State Health Foundation
NYC Department of City Planning
NYC Department of Education
NYC Department of Sanitation
NYC Food Policy Center at Hunter College
NYC Foodscape
NYC Office of Food Policy
NYC Parks GreenThumb
Randall's Island Park Alliance
Teens for Food Justice
Tisch Food Center at Teachers College
Urban Design Lab at Columbia University
USDA, Farm Service Agency

NYC Council Committee on Land Use (October 26, 2017). Public Hearing on Int. No. 1661 http://designtrust.org/news/we-testified-urban-agriculture-legislation-vital-nyc/

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GLOSSARY

Co-Benefits: The variety of non-agriculture related benefits that result from implementing policies and strategies aimed at advancing urban agriculture. This increases the quality of interactions between stakeholders, agencies, and the community at large, which improve relationships and resource allocation that make urban agriculture a vital city service.

Commercial-Scale Urban Farm: Agricultural production areas larger than 10,000 square feet that are managed by business owners who produce food and sell it for profit.[1]

Community Gardens: Public spaces managed by member-volunteers who grow food crops and/or flowers, shrubs, and trees in individual plots and communal growing spaces for personal consumption.[2]

Community Facility Use: Defined in the New York City Zoning Code as a use that is permitted on residentially zoned lots. A community facility use is defined as something that "provides educational, health, recreational, religious or other essential services for the community it serves;" a category that community gardens fall into.[3]

Community Farm: An area managed by member-volunteers that produces food for others and sells more than $1,000 of agricultural products per year, according to the United States Department of Agriculture (important for qualifying for federal funding).[4] This is distinct from a community garden which produces food for private use, typically grown in individual plots.

Food Desert/Apartheid: The creation of geographic location which are devoid of reasonable access to grocery stores or markets which supply healthful food. However, as these spaces are not naturally occurring, rather a result of systemic segregation evident in city planning and economic development, the term apartheid is more appropriate than desert. Communities without equitable access to nutritional food occur in both rural and urban areas and are characterized by absence of supermarkets or farmer's markets, prevalence of fast food retailers, and lack of nutrition education–leading to increased levels of obesity and diabetes, known colloquially as the "Bronx Paradox."

Food Justice: Communities exercising their right to grow, sell, and eat healthy food...People practicing food justice leads to a strong local food system, self-reliant communities, and a healthy environment.[5]

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1 Cohen N, and K Reynolds (2014). Urban Agriculture Policy Making in New York's "New Political Spaces": Strategizing for a Participatory and Representative System. J Plan Educ Res: 34(2), pp. 221–234, doi: 10.1177/0739456x14526453

2 Cohen N, and K Reynolds (2014). Resource Needs for a Socially Just and Sustainable Urban Agriculture System: Lessons from New York City. Renewable Agriculture and Food Systems: 30(01), pp. 103-114, doi: 10.1017/s1742170514000210

3 NYC Planning (n.d.) Glossary of Planning Terms. Accessed from https://www1.nyc.gov/site/planning/zoning/glossary.page#community_facility_use

4 USDA, ERS (2017). Glossary. Accessed from https://www.ers.usda.gov/topics/farm-economy/farm-household-well-being/glossary.aspx

5 Just Food (n.d.). What is Food Justice? Accessed from http://justfood.org/advocacy/what-is-food-justice

Food Security: A term that has evolved over the years, today, the most widely cited definition is "when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life."[6]

Food Systems: Interconnected across borders and continents, food systems are global in scope, but have context-specific impacts that depend on localized economics, geography, and natural resource availability. For this reason, food systems are complex and affected by local environmental and socio-economic conditions in very different ways.

Hydroponics, Aeroponics, or Aquaponics: Hydroponics (the process of growing plants without soil in sand, gravel, or liquid with added nutrients); Aeroponics (the process of growing plants without soil in air suspension with added nutrients delivered as mist); Aquaponics (the process of growing plants in which the waste produced by fish supplies nutrients to the plants).[7]

Indoor Vertical Farming: The practice of producing food indoors where crops are stacked in trays on shelves and optimize production methods.8 All vertical farms use one of three soil-free systems for providing nutrients to plants—hydroponic, aeroponic, or aquaponic. Spaces used for production can include buildings, warehouses, and factories.

Resilience: The ability of system to respond, adapt, and continuously develop strategies to mitigate disturbances while maintaining necessary operations.[9] It also applies to social and economic structures, whereby cities are able to maintain core functions. In terms of urban agriculture, it refers not only to the benefits of increased green infrastructure, but also to the provision of social and economic infrastructure that include workforce development and community gathering. On a broader scale, food resilience applies to creating systems that are less reliant on national and international trade, by favoring local production.

Rooftop Farm: Using a rooftop for agricultural purposes, whether for profit or nonprofit.[10]

Suitability: in terms of urban agriculture, suitability refers to a space, such as a vacant lot or a rooftop, that is able to produce food or rear animals. Factors that must be considered include sun exposure, soil conditions, and whether government regulations allow for urban agriculture to exist. Site surveys are important and must take place on a case-by-case basis.

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6 World Food Summit (1996). Rome Declaration on World Food Security. Accessed from http://www.fao.org/docrep/003/w3613e/w3613e00.HTM

7 Lima M (2015). The Seed: Urban Vertical Farming Germinated. Thesis [advisor: Rakha T]. School of Architecture, Syracuse University. Prep. 298, pp. . https://surface.syr.edu/architecture_tpreps/298

8 Banerjee C and L Adenaeuer (2014). Up, Up, and Away! The Economics of Vertical Farming. J Agric Studies: 2(1), pp. 40-60. doi: 10.5296/jas.v2i1.4526

9 Chan J, DuBois B, and KG Tidball (2015). Refuges of local resilience: Community gardens in post-Sandy New York City. Urban Forestry and Urban Greening: 14, pp. 625-635. doi: 10.1016/j.ufug.2015.06.005

10 City of Boston (2013). Urban Agriculture Rezoning Initiative. Boston Planning and Development Agency. Accessed from http://www.bostonplans.org/planning/planning-initiatives/urban-agriculture-rezoning

Urban Gardener: A youth or adult growing food crops or ornamental plants in a community garden setting, or in an institution (e.g. school, church, jail). Gardeners may utilize their production for home consumption, sale, or donation.

Urban Farmer: A youth or adult growing food through various methods within a city (e.g. rooftops, greenhouses, indoor controlled environments, raised beds) who relies on this activity as significant source of income.

Vacant Land: Broadly defined as lots on which there are no buildings or have no other designated use.[11]

Vacant Lots of Opportunity: Underutilized lots in the five boroughs of New York City that are not currently being used by community gardeners, developers, or other groups.[12] Hundreds have been identified so there are opportunities for community organizers to put these lots to productive uses, including growing food.

11 Ackerman K (2012). The Potential for Urban Agriculture in New York City: Growing Capacity, Food Security, and Green Infrastructure). Urban Design Lab at the Earth Institute, Columbia University, New York, NY, USA, pp. 1-118. http://urbandesignlab.columbia.edu/files/2015/04/4_urban_agriculture_nyc.pdf

12 596 Acres (n.d.) Living Lots NYC. Accessed on 3/22/18 from https://livinglotsnyc.org

EXECUTIVE SUMMARY

OVERVIEW

In January 2018, Council Member Rafael L. Espinal, Jr. of District 37, in Brooklyn, asked a Workshop Team from Columbia University's Master of Public Administration in Environmental Science and Policy Program to conduct a full review of urban agriculture and suggest viable recommendations to help advance urban agriculture in New York City (NYC). The intention of the work is to inform future legislative efforts undertaken by Council Member Espinal and other local government officials.

In May 2018, the team of eleven graduate students led by a faculty advisor (The Workshop Team), completed this report for the Council Member, entitled, Urban Agriculture as Infrastructure: Policy Recommendations for a Resilient New York City Landscape.

The report's research methodology included an extensive literature review, stakeholder interviews, data analysis, and aggregation. This report provides 9 Key Recommendations to advance urban agriculture as a sector and as a tool of resilience for the City. The Recommendations include: two regarding NYC governance, four that deal with regulations, and three that address operations. All of the recommendations regarding urban agriculture are linked to the Four Visions of OneNYC, to reinforce the resilience connection. We conclude that urban agriculture is a vital city service today and contributes to NYC's resilient future.

Urban agriculture is broadly defined as the cultivation of food within a city's limit. This definition, however, does not capture the benefits of urban agriculture beyond food production. Urban agriculture allows for an intersectionality of social, economic, and environmental benefits, primarily in the form of increased food access and improved nutrition, youth involvement in Science, Technology, Engineering, Art and Math (STEAM), workforce development and college and career readiness, improved air quality, and stormwater runoff management, to name a few. Coupled with these benefits is an overarching one: Urban agriculture can help develop a renewed awareness of place and sense of interconnectedness for residents of our City, particularly for the most vulnerable among us.

Report findings and recommendations indicate that New York City's urban agriculture comprises a rich "landscape", with a long history, dating from the mid-20th century. More, the City's urban agriculture community is built through a diverse set of stakeholders, all of whom contribute to its vitality. As the team set about to understand how stakeholders interact, we worked to map out these dynamics. Across the City, ad-hoc networks of urban agriculture stakeholders have revitalized vacant lots, protected open spaces, created cultural centers and started small businesses. The result is that agriculture in NYC comes in many forms, including: Light-intensive indoor vertical farms, rain gardens, backyard or rooftop beekeeping, large scale urban farms, public school demonstration gardens, and food entrepreneurs redefining how food is grown in cities. Currently in NYC there are: 600 community gardens, 6 commercial rooftop farms, 4 commercial vertical farms, and 715 public school gardens.

Despite this diversity and richness, however, the Workshop Team also found that urban agriculture could be bolstered by articulating common goals through the lens of resilience, mitigating the existing competition for resources and funding, and providing clarity regarding City government's support for the enterprise at the community, nonprofit, and private levels.

While no one piece of legislation may fully address the needs of all our City's urban agriculture stakeholders, we offer that thoughtful policy innovations could strengthen existing networks; funnel resources to where they are needed most; and, simultaneously, advance the sector for the wellbeing of current and future generations of New Yorkers. Our nine policy recommendations are listed below, followed by the remainder of the report, and our appendices list.

POLICY RECOMMENDATIONS

In order to achieve resilience via urban agriculture as infrastructure, the team proposes the following top 10 policy recommendations to City Council:

Governance

1) Establish a coordinating governmental body [agency or division] comprising relevant public, community and private stakeholders and practitioners to advance urban agriculture policies.

2) Promote involvement and awareness for everyday New Yorkers through participatory marketing campaign around urban agriculture.

Regulations

3) Investigate the feasibility of updating specific zoning ordinances to improve the conformity of urban agriculture as it is actually practiced.

4) Establish urban agriculture as a planned community service and as a component of resilience; additionally, maintain a fair quota of community gardens per district.

5) Encourage future developers (private and public) to include urban agriculture in the project plan as either "open space" or "Privately-Owned Public Spaces."

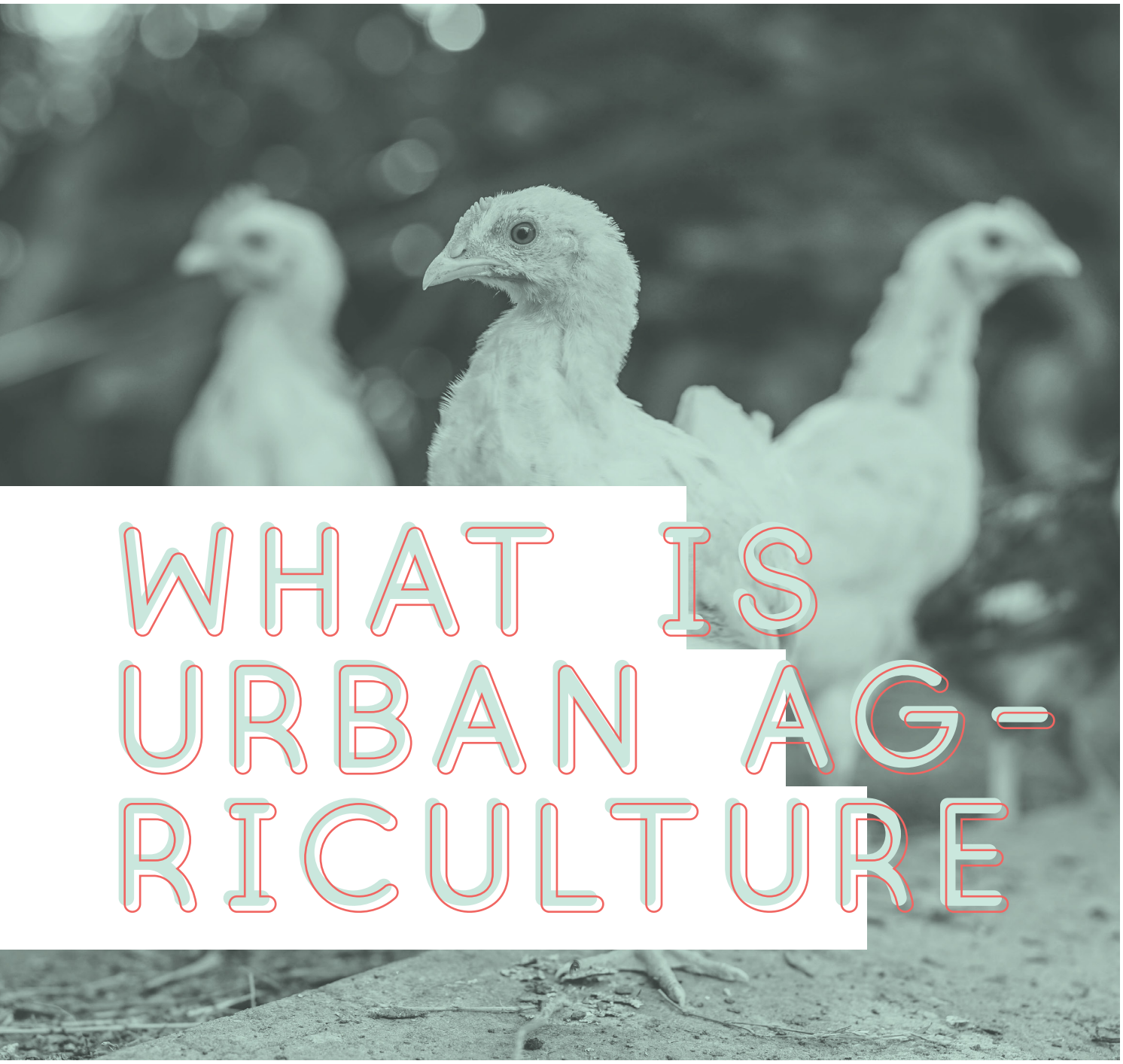
Operations

6) Create a comprehensive database of metrics, using existing data and new sources, for measuring the benefits and progress of urban agriculture.

7) Provide summer scholarships for NYC high school students to gain education and training in urban agriculture through immersive experience.

8) Qualify existing urban agriculture projects for continuing green infrastructure grants.

9) Improve urban agriculture operations through streamlining access to adequate soil and water supplies, building networks for soil distribution and providing best-practices training.



WHAT IS URBAN AG-RICULTURE

URBAN AGRICULTURE AS A TERM

One definition of urban agriculture is "any production of food within cities."[13] However, this report takes a broader view of agriculture to include non-food products (ie: flowers and bees) cultivated in urban settings. Most notably, the motivations of people who engage in urban agriculture range from cultural preservation, to improving social equity, to community engagement, to entrepreneurship. Embracing the richness of all urban agriculture activities is the first step in structuring an effective policy approach.

DIFFERENT TYPES OF URBAN AGRICULTURE IN NEW YORK CITY

That richness comes from the diversity of practitioners and stakeholders, with each as varied as the next in mission and methods. However, these practitioners can be organized into three distinct groups each with independent needs and issues:

Community Gardens: a decentralized network of organizers and neighbors with a long history; they typically grow food and flowers on underutilized spaces in NYC.

Educational Gardens: first documented in the early 1900s, its popularity exploded after a public/private partnership, Grow to Learn NYC, was established in 2010. The organization's mission is to "inspire, promote and facilitate the creation of sustainable gardens in public schools throughout NYC."[14]

Entrepreneurial and Commercial Ventures: businesses that sell products of urban agriculture, be it the actual produce, farming technologies, or capabilities. While its current practice in NYC is small (11 commercial farms currently operating), growth in this sector is promising.

Equally as important as the practitioners are the non-profit organizations, public-private partnerships, religious communities, and private enterprises that steward urban agriculture today and support its future. They provide food to their local communities, advocate for more secure access to land, petition elected officials to encourage urban agriculture activities, and ensure a future that prioritizes a equity and inclusion. Together, these organizations share a common mission to promote urban agriculture.

13 Weissman E (2015). Entrepreneurial Endeavors: (Re)producing Neoliberalization Through Urban Agriculture Youth Programming in Brooklyn, New York. Environmental Education Research: 21(3), pp. 351-364. doi:10.1080/13504622.2014.993931

14 GrowNYC (n.Grow to Learn NYC: the Citywide School Gardens Initiative. GrowNYC. Accessed from www.grownyc.org/grow-to-learn

URBAN AGRICULTURE AS A MECHANISM FOR RESILIENCE

Urban agriculture encompasses more than community gardens or green roofs. Its strength is its diversity of forms and the number of people it impacts. Urban agriculture not only improves food systems but also generates indirect benefits by developing local workforce and human capital, promoting education in science, technology, engineering, arts and mathematics (STEAM), and doubling as green infrastructure that reduces urban heat island effect and mitigates stormwater runoff.[15] In all, urban agriculture develops community cohesion while increasing biodiversity, making the city literally "greener" and more resilient.

As a world-class city, New York City participates in multiple global partnerships where resilience is core to sustainability. For example, the New York-based Rockefeller Foundation founded the 100 Resilient Cities organization—a pioneering network to help cities around the world solve sustainability issues.[16] However, in regard to recognizing and promoting the development of all urban agriculture, NYC is falling behind other major cities at home and abroad. For example, Baltimore, Boston, Chicago, Detroit, Los Angeles, San Francisco, Seattle, and Washington D.C. have promoted urban agriculture through land-use incentives, representation in city government, zoning ordinance updates, and technological investment.[17] These policy-based methods of improvement inform the recommendations contained within this report. For supplementary research and information on how urban agriculture can support resiliency in NYC, please see the Appendix.

Through the process of researching and producing this report, the Workshop Team identified urban agriculture as a central component of a resilient NYC. Resilience, in essence, is the strength, or the ability to recover from crisis. The city enacted sweeping and forward-thinking policies aimed at mitigating future climate-related crises in the wake of Superstorm Sandy. The vanguard of these policies is Mayor de Blasio's ***OneNYC*** from 2015, which "envisions how the physical city should be shaped to address a range of social, economic, and environmental issues while building on NYC's strengths."[18]

15 Lepczyk C, Aronson MFJ, Evans KL, Goddard MA, Lerman SB, and JS MacIvor (2017). Biodiversity in the City: Fundamental Questions for Understanding the Ecology of Urban Green Spaces for Biodiversity Conservation. BioScience: 67(9), pp. 799–807. doi: 10.1093/biosci/bix079.

16 100 Resilient Cities (2016). Our Cities. Accessed from http://www.100resilientcities.org/cities/

17 National League of Cities (2017). Promoting Urban Agriculture Through Zoning. Accessed from https://www.nlc.org/resource/promoting-urban-agriculture-through-zoning

18 City of New York (2015). OneNYC: The Plan for a Strong and Just City. Accessed from http://www1.nyc.gov/html/onenyc/index.html

Figure 1: *New York City, a city that continually seeks ways to become more resilient.*[19]

19 Baikovicius J (2017). Panorama New York City, Wikimedia Commons, Creative Commons License.

HOW URBAN AGRICULTURE FITS INTO ONENYC

Through its many direct and indirect benefits, this report presents urban agriculture at the nexus of OneNYC's four visions:

1) Our Growing, Thriving City

+ *Industry Expansion and Cultivation:* NYC will have the space and assets to be a global economic leader and grow quality jobs across a diverse range of sectors
+ *Workforce Development:* NYC will have a workforce equipped with the skills needed to participate in the 21st century economy
+ *Thriving Neighborhoods:* NYC's neighborhoods will continue to thrive and be well-served
+ *Culture:* All New Yorkers will have easy access to cultural resources and activities
+ *Infrastructure Planning:* NYC's infrastructure and built environment will exemplify global economic, environmental, and social leadership

2) Our Just and Equitable City

+ *Integrated Government and Social Services:* All New Yorkers will have access to high quality, conveniently located, community-based City resources
+ *Healthy Neighborhoods, Active Living:* New Yorkers of all ages will live, work, learn, and play in neighborhoods that promote an active and healthy lifestyle

3) Our Sustainable City

+ *80 x 50:* NYC's greenhouse gas emissions will be 80% lower in 2050 than they were in 2005
+ *Zero Waste:* NYC will send zero waste to landfills in 2030
+ *Air Quality:* NYC will have the best air quality among all large U.S. cities by 2030
+ *Brownfields:* NYC will clean up contaminated land to address disproportionately high exposures in low-income communities and convert land to safe and beneficial use
+ *Water Management:* NYC will mitigate neighborhood flooding and offer high-quality water services
+ *Open Space and Natural Resources:* All New Yorkers will benefit from useful, accessible, and beautiful open spaces.

4) Our Resilient City

+ *Neighborhoods:* Every city neighborhood will be safer by strengthening community, social, and economic resiliency
+ *Buildings:* The city's buildings will be upgraded against changing climate impacts
+ *Infrastructure:* Infrastructure systems across the region will adapt to maintain continued services
+ *Coastal Defense:* NYC's coastal defenses will be strengthened against flooding and sea level rise

METHODOLOGY FOR ANALYSIS

In order to complete this project, the Workshop Team divided into sub-teams focused on literature review, stakeholder interviews, and data analytics. The Workshop Team also gained invaluable exposure to the breadth and variety of urban agriculture in New York City (NYC) through conferences, events, and site visits. Overall, this multifaceted approach led to the Workshop Team holistically understanding urban agriculture and led to three categories of policy recommendations—governance, regulations, and operations—which were based on high-quality research and insightful conversations with stakeholders.

LITERATURE REVIEW

The literature review team produced an annotated bibliography to identify the quality and relevance of citations for urban agriculture within NYC and for the efforts of Council Member Espinal. Researchers reviewed an extensive list of scientific papers, policy documents, and research studies (over 70 sources were examined and 28 were selected for the annotated bibliography, which can be found in the Appendix). While some reports were recommended by urban agriculture practitioners and academics, others were found through internal team research. The selected reports covered the wide array of topics encompassed within urban agriculture, including: studies and reports on urban agriculture and food policy in NYC, sustainability and food reports produced by NYC government agencies, peer-reviewed articles that highlight some socio-economic implications, case studies from other cities that have implemented urban agriculture policy, high-tech urban farming technologies, green infrastructure benefits, zoning and commercial development policy, and intersectional topics that connect urban agriculture with food justice. Examples Include:

+ NYC food system reports; ***FoodNYC*** (Springer) and ***FoodWorks*** (Quinn)
+ ***Cities of Forests, City of Farms*** (Campbell)
+ ***The Potential for Urban Agriculture in NYC*** (Ackerman)
+ ***Urban Agriculture Policy Making in New York's "New Political Spaces"*** (Cohen, Reynolds)
+ ***Plant Factory: An Indoor Vertical Farming System for Efficient Production*** (Genhua)
+ ***Agroecological and social characteristics of NYC community gardens*** (Gregory)
+ ***Greening US cities: urban agriculture as a strategy for reclaiming vacant land*** (Carlet)

STAKEHOLDER INTERVIEWS

Urban agriculture stakeholders throughout NYC provided valuable insight and perspective to the Workshop Team's research. Before interviews started, researchers identified relevant stakeholders in coordination with the literature review team, which the Council Member approved. An outreach email was subsequently sent to the compiled list of contacts which included policy experts, government officials, farmers, community organizers, and more. Over the course of the semester, the stakeholder team conducted 36 interviews, with a fairly even distribution among stakeholders types. Throughout the project, interviewers used a semi-structured approach to collect the same categories of information from stakeholders. Researchers used standardized questions to collect information about interviewees' connection to urban agriculture, the barriers and opportunities that exist, and action needed to advance urban agriculture in NYC. However, conversations were flexible to allow for adaptability in pursuing certain ideas and topics in more detail. While most interviews were conducted over the phone or via a video call, some were conducted in-person. Qualitative analysis of the interviews has yielded critical insights that have informed the policy recommendations in this report.

CONFERENCE ATTENDANCE AND SITE VISITS

To supplement stakeholder interviews, the Workshop Team attended conferences/events and visited urban agriculture sites during this project: 6 conferences and events (34th Annual GreenThumb GrowTogether Conference, the Persist/Resist Just Food Conference in partnership with the Tisch Food Center, and the GrowNYC School Garden Social, NYC Parks GreenThumb Curriculum Development and the Garden Classroom Workshop, Toward Resilient Cities and Landscapes, and Vertical Farming: A Panel Discussion) and 6 site visits (AeroFarms, Agritecture Consulting, Earth Arts Center, East New York Farms!, NYC Office of Food Policy, and Randall's Island Urban Farm).

DATA ANALYTICS

Datasets from previous researchers and publicly available sources were vetted by the Workshop Team for usability and relevance for quantitative analyses. Data was obtained from various sources, including: NYC Open Data, NYC Department of Planning's MapPLUTO, NY State GIS Clearinghouse, 596 Acres' Living Lots NYC to assess the City's urban agriculture landscape. The analytics team statistically analyzed and visualized this information to address research questions and provide guidance throughout the semester. The analytics team's goal was to recognize spatial relationships, inform strategy, and realize the extent of urban agriculture in NYC and other cities. Examples include:

+ Determined the specific zoning classifications of vacant lots in NYC's five boroughs
+ Created a stakeholder map of urban agriculture related public-private partnerships
+ Organized grant opportunities for urban growers at the city, state, and federal level
+ Calculated the potential for expansion on urban rooftops in NYC's five boroughs
+ Tracked the amount of money NYC government dedicates to urban agriculture
+ Examined which private companies had commercial-scale farms within city-limits
+ Analyzed the finances and expenditures of the New York Restoration Project

FRAMEWORK

The Workshop Team research into urban agriculture issues across NYC revealed common characteristics, which led to classifying and analyzing recommendations into three tiers: **Governance, Regulations, and Operations**.

Governance refers to the coordinating bodies of urban agriculture in the city, namely the NYC government in which nearly 30 agencies contribute to urban agriculture.

Regulations include the policies that guide urban agriculture and controls what can occur.

Operations refers to all on the ground activities of urban agriculture, involving issues with the physical components of urban agriculture like the infrastructure, such as soil, the programs surrounding the different forms or urban agriculture, and the people engaging with urban agriculture.

THE STATE OF URBAN AGRICULTURE IN NEW YORK CITY

OVERVIEW

Urban agriculture operations in New York City (NYC) fall into three main groups: Community, Education, and Entrepreneurial. The follow sections aims to give the history and current status of each of these groups, the unique benefits they provide as well as issues, areas for improvement, and missed opportunities. This research forms the basis of the policy recommendations in the subsequent section.

COMMUNITY

HISTORY AND STATUS

Community gardens and community farms have existed for many years in NYC. In 1998, all of the nearly 700 at the time were subject to public auction and redevelopment by Mayor Rudolph Giuliani, who underestimated the influence of the gardening movement.[20] By organizing and winning a very public battle, most of the gardens were preserved in land trusts or transferred to the NYC Department of Parks and Recreation for stewardship and protection. Usually, community members build these spaces on underutilized vacant land, ignored by the agencies or organizations that own them. In NYC, the nearly 600 community gardens that exist today are under the jurisdiction of a variety of government agencies, land trusts, nonprofit organizations and private owners (Appendix A).[21] However, most practitioners interact with GreenThumb, the coordinating body that advocates for community gardens and supports them throughout the city. GreenThumb represents the first effort to organize a decentralized network of community organizers and neighbors coming together to grow food on vacant lots.

While 80% of these 600 community gardens grow food, the proportion of a garden devoted to food production ranges widely across NYC, with some producing no food and others dedicating up to three-quarters of the growing area for food production.[22] Community gardens that do not grow food range from botanical gardens to green public spaces with trees and park benches. Community gardens and community farms are largely dependent on volunteer labor and contributions, meaning that networks of volunteers are important to have for the long-term viability of a significant portion of NYC's urban agriculture.

20 Smith CM and HE Kurtz (2003). Community Gardens and Politics of Scale in New York City. The Geographical Review: 93(2), pp. 193-212. doi: 10.1111/j.1931-0846.2003.tb00029.x

21 596 Acres (n.d.) Living Lots NYC. Accessed on 3/22/18 from https://livinglotsnyc.org

22 Gittleman M, Farmer CJQ, Kremer P, and T McPhearson (2016). Estimating stormwater runoff for community gardens in New York City. Urban Ecosystems: 20(1), pp. 129-139. doi:10.1007/s11252-016-0575-8

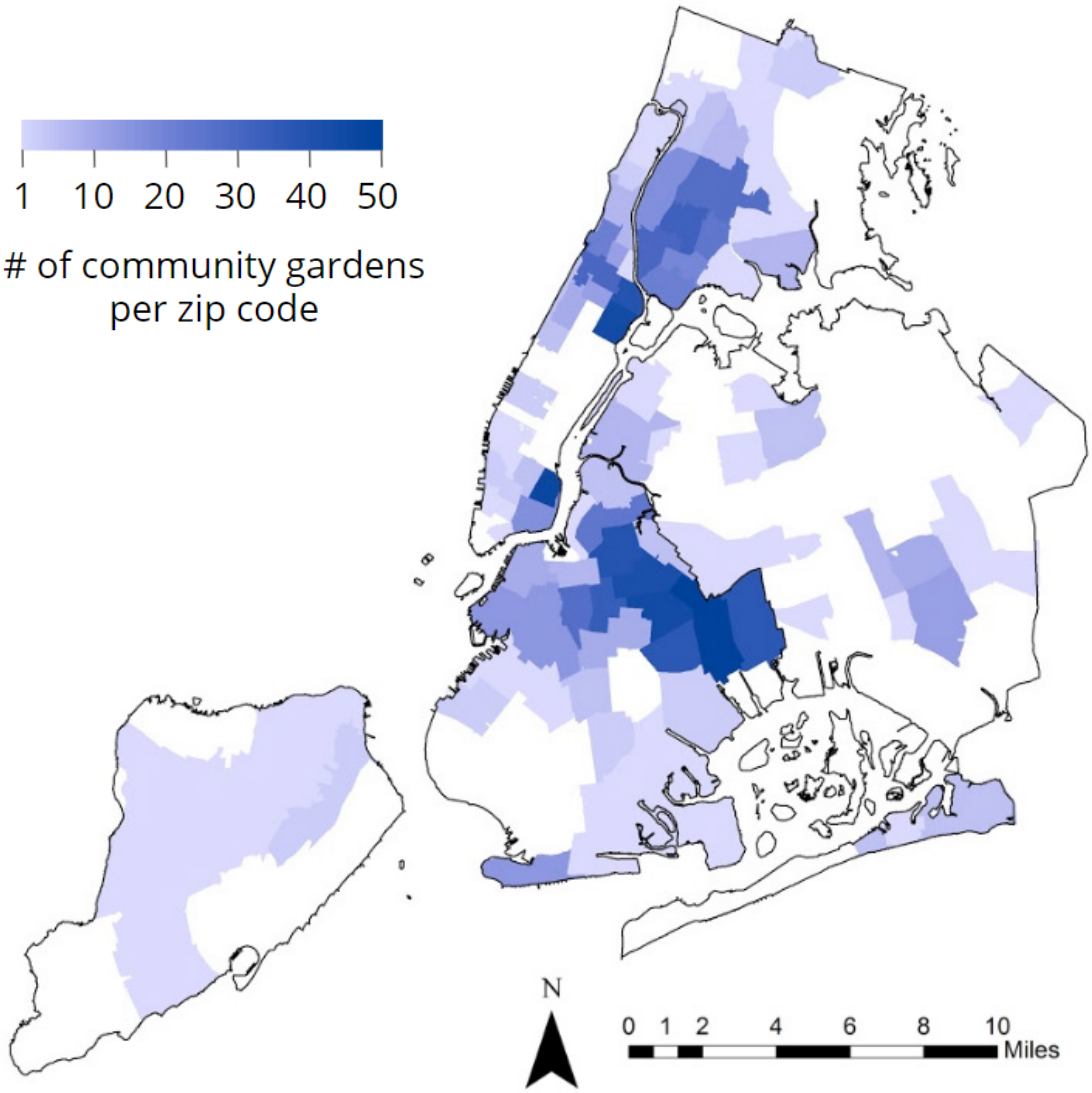


Figure 2: *Map of NYC showing the high concentration of community gardens in Brooklyn, the Lower East Side, Harlem, and the Bronx.*[23]

23 Map data from 596 Acres (n.d.) Living Lots NYC. Accessed on 3/22/18 from https://livinglotsnyc.org

BENEFITS

Community gardens and community farms serve as informal neighborhood hubs beyond agriculture activities. Neighbors share common green spaces to grow food to supplement their grocery budget, plant flowers and herbs, and beautify areas to create a mosaic of activity. Moreover, these spaces serve many of the social, resilience, and economic development goals outlined in ***OneNYC*** (see section titled "Urban Agriculture as a Mechanism for Resilience"). The gardens comprise areas where New Yorkers can interact with urban nature, contribute to public health, and social cohesion. Additionally, community gardens and community farms increase green-space access in urban landscapes, which has a direct effect on people's happiness and level of physical activity.[24] Gardens also lay a foundation for social resilience and human capital because they reinforce intergenerational relationships, are locations of community organizing, and foster relationships that depend on reciprocity and trust. This understanding led to the recommendation that the city should focus on open space set aside in new developments and incentivizing developers to construct more privately-owned public spaces (POPS) that include edible gardens (Recommendation 5).

All of these benefits are rooted in food justice, which the organization, Just Food, defines in a community-centric manner. Other benefits include giving people opportunities to express cultural heritages, strengthen residents' sense of belonging, and allow neighborhoods to see tangible reductions in crime.[25] From an environmental perspective, these gardens are porous surfaces that hold back stormwater from overburdening the sewer system. Gardens also attract pollinators in the form of butterflies, bees, beetles and ladybugs, all of which are beneficial to plant life around the five boroughs.

This decentralized network of gardens and farms has created many grassroots coalitions that help to empower community gardens and provide support to their operations. These coalitions, which provide technical support or outlets for community gardeners, include but are not limited to (listed in alphabetical order): Bed-Stuy Campaign Against Hunger; BK Farmyards; Bronx Green-Up; Community Garden Alliance; Cooperative Economic Alliance of NYC; Earth Celebrations; Green Gorillas; Just Food; La Familia Verde; Local Initiatives Support Corporation NYC; NYC Community Garden Coalition; NYC Environmental Justice Alliance; The BLK ProjeK. At the city-level, the Building Healthy Communities Initiative helps low-income neighborhoods and seeks to, "bring together a wide range of partners to build food-producing urban farms, establish farmers markets, support and build community and school gardens to increase access to affordable fresh food."[26]

24 Egerer M, Ossola A, and BB Lin (2018). Creating Socioecological Novelty in Urban Agroecosystems from the Ground Up. BioScience: 68(1), pp. 25-34. doi: 10.1093/biosci/bix144

25 Santo R, Palmer A, and B Kim (2016). Vacant Lots to Vibrant Plots: A Review of the Benefits and Limitations of Urban Agriculture. Johns Hopkins Center for a Livable Future, pp. 1-35.

26 City of New York (n.d.). Building Healthy Communities: Goals. Accessed from http://www1.nyc.gov/nyc-resources/building-healthy-communities-goals.page#2

This vast variety of diverse networks and coalitions suggests that a centralized, coordinating body might be helpful to foster partnerships and initiatives that can empower communities (Recommendation 1). At the operations level, these entities help community gardens beyond the basic needs of agriculture like soil and water; they provide networks for improvement. Community gardens wither without active and passionate members, and there are many reasons to encourage participation through these networks. For New Yorkers born in other countries, growing flowers, herbs, or crops provides a connection to one's cultural roots. For others, community gardens are a way to grow and donate food to the local food pantry or shelter.

ISSUES

The main issues that community gardens are facing today can be described as concerns over land tenure and resource inefficiencies. Concerns over land tenure are representative of imbalances in social equity within NYC. In a city already pressed for open space, community gardeners do not have long-term assurances to continue growing. Many practitioners are merely stewards of the land until another permanent use becomes viable. The city continues to view these gardens as essentially vacant land with an accessory "Community Facility Use."[27]

Besides losing members, another way a community garden can cease to exist is through eviction. Today, the Mayor's push to build 300,000 additional units of affordable housing puts many of these gardens at risk of eviction—more than 70% are located on city-owned property.[28] The issue of rising housing costs in NYC undoubtedly impacts a greater number of residents, however the quantity of land that is suitable for community gardens is scarcer than at first glance. The land-use advocacy group 596 Acres has identified about 1,375 undeveloped plots that are currently suitable for urban agriculture.[29] Already, NYC announced plans to develop 166 city-owned vacant lots into affordable housing, creating enough units to meet just 0.3% of its 2030 goal.[30] Since 2014, New York has also sold 208 of its own properties to private developers for $1 each, often with little to no input from the impacted communities.[31] Some of these could have been tomorrow's gardens.

27 City of New York (n.d.). Glossary of Planning Terms. Department of City Planning. Accessed from https://www1.nyc.gov/site/planning/zoning/glossary.page#community_facility_use

28 City of New York (2018). NYC Zoning Tax Lot Database. Department of City Planning. Accessed on 3/21/18 from NYC Open Data.

29 596 Acres (n.d.) Living Lots NYC. Accessed on 3/22/18 from https://livinglotsnyc.org

30 City of New York (n.d.). RFPs, RFQs, RFOs: NIHOP and NCP RFQ. Housing Preservation and Development. Accessed from http://www1.nyc.gov/site/hpd/developers/request-for-qualifications/nihop-ncp-rfq.page

31 596 Acres (n.d.) One Dollar Lots. Accessed on 3/29/18 from www.onedollarlots.org.

There are few (if any) legal or regulatory mechanisms available to defend a community garden when facing eviction; public protest has shown modest success. With most of the affordable housing development centered around low-income neighborhoods, the community gardens in these neighborhoods are directly threatened. Without ample organizational and political capital, some of these gardens have already ceased to exist. Along with them went the indirect social benefits mentioned previously. For those that remained in operation, they provide another powerful insight: community gardens should have more regulatory tools available to protect their legitimacy**.** Developers should also be encouraged to include urban agriculture as part of their masterplans. Without it, these indifferent policies will continue unconstrained and more resilient gardens could be lost tomorrow (Recommendations 1 and 2).

CASE STUDY 1

Green Valley Community Farm as a $1 Lot

A protective land tenure system may preserve community spaces like Green Valley Community Farm, a Brooklyn-based community farm of 20 years, in the future. This space was saved from demolition in January 2017 after Mayor Bill de Blasio cancelled the city's initial plans to sell the lot to a private housing developer for $1. In 2014, the nonprofit group, 596 Acres, discovered a list of 18 active garden sites in Brooklyn that NYC Housing Preservation and Development had proposed selling to developers for $1 each. 596 Acres actively relayed this information to the affected community groups and stakeholders. For over a year, Green Valley negotiated with the city while enduring eviction threats and legal action. However, in December 2015, Mayor de Blasio announced that 15 active garden sites would be transferred to the NYC Department of Parks and Recreation as permanently preserved community-spaces. With the Mayor's announcement in place, Green Valley continued to monitor the implementation of the transfer and after 90 days, confirmed that only 20 percent of its farm had been transferred. The remaining portion of the lot was still slated for private development. Green Valley continued their resident-led campaign and the Mayor directed NYC Housing Preservation and Development to suspend all development plans there. Today, Green Valley still exists as a 2862 square foot community garden in Brownsville and is part of the Brownsville II Urban Renewal Plan.[2]

The city's pursuit for affordable housing has created problems for community gardens on city-owned vacant lots, some of which started decades ago.[4] Nonprofits such as 596 Acres were founded to address land tenureship issues and voice the challenges facing these community gardens. Many of the most-impacted stakeholders have few opportunities for input or even know vacant lots are going to be sold. 596 Acres recognized these selling of 'dispositions' as a lack of transparency issue and subsequently created an interactive website called "One Dollar Lots" that all New Yorkers can access to increase awareness about this issue.

Figure 3: *Green Valley Community Garden in Brownsville, Brooklyn after gardeners were told to vacate. The garden had been operating on for over 20 years.*[3]

Despite existing for over sixty years, community gardens are still facing issues regularly obtaining the basic resources of agriculture: soil, water, fertilizer, and people to work the land. Access to clean soils can be especially problematic. While there are existing soil and compost giveaway projects through GreenThumb and The Department of Sanitation, numerous stakeholders have mentioned timeliness and convenience as ongoing issues. One soil giveaway event is located only on Staten Island. Yet these projects are necessary to mitigate the environmental risks of working in contaminated or barren soils. The industrial powerhouse of New York's past haunts the present as heavy metals such as lead and cadmium have deposited throughout the city's soils. Along with other contaminants such as polycyclic aromatic hydrocarbons, many community gardens require care while working around them and raised beds have become standard practice.[32] There is no perceived immediate threat as multiple studies have concluded that contaminant concentrations in NYC soils are similar to that of urban soils in New York State and across the northeastern United States.[33,34] However, due to a lack of consistent, clean soil resources in NYC, the needs of soil-based growing needed to be addressed.

Developing human capital through membership, advocacy, and financial resources have become barriers to progress. The decentralized nature of community gardens and the organizations that support them mean successes are not evenly distributed. Representation among political and financial structures depends heavily on the strength of individual gardens' network. This can lead to funding imbalances, meaning greater out-of-pocket expenses are required to keep the community farm operating. Capital investments like greenhouses, water connections, and even informational material like websites are borne upon the individuals. In low-income neighborhoods, there may simply not be enough available capital for practitioners to make necessary investments. According to interviewees, membership is declining in some areas due to these funding barriers.

Conversely, there are some popular community gardens that have long waitlists; those people unable to join are potentially being shut out of the community gardening experience. However, the lack of city-wide communication and centralization means that interested New Yorkers may not know another garden within their own neighborhood. Overall, it is unclear if the demand for garden plots meets the supply, and how much community gardens can effectively engage with their surroundings.

32 Mitchell RG, Spliethoff HM, Ribaudo LN, Lopp DM, Shayler HA, Marquez-Bravo LG, Lambert VT, Ferenz GS, Russell-Anelli JM, Stone EB, and MB McBride. (2014). Lead (Pb) and other metals in New York City community garden soils: factors influencing contaminant distributions. Environ Pollut.: 187, pp. 162-169. doi:10.1016/j.envpol.2014.01.007.

33 Marquez-Bravo LG, Briggs D, Shayler H, McBride M, Lopp D, Stone E, Ferenz G, Bogdan KG, Mitchell RG, and HM Spliethoff (2016). Concentrations Of Polycyclic Aromatic Hydrocarbons In New York City Community Garden Soils: Potential Sources And Influential Factors. Environ Toxicol Chem: 35(2), pp. 357-367. doi: 10.1002/etc.3215

34 McBride MB, Shayler HA, Spliethoff HM, Mitchell RG, Marquez-Bravo LG, Ferenz GS, Russell-Anelli JM, Casey L, and S Bachman (2014). Concentrations of lead, cadmium and barium in urban garden-grown vegetables: The impact of soil variables. Environ Pollut.: 194, pp. 254-261 doi:10.1016/j.envpol.2014.07.036

EDUCATION

BACKGROUND: HISTORY AND STATUS

The educational benefits provided by urban agriculture in New York City are present in the public school system, as well as in the classes and learning opportunities provided by community gardens, nonprofits and city agencies. Educational achievements in urban agriculture in the City include information gained on nutrition and the larger food system, fundamental ecological interaction and broader climate implications, and entrepreneurial and life skills.[3536] Schools have proved a successful and essential urban agriculture platform to engage youth and create the next generation of urban farmers and community garden stewards, and the broader scope of community and commercial gardening and farming operations provides educational opportunities to the population at large.

The first urban school garden in New York City is documented in 1902, born out of a movement by progressive educator's desire to augment traditional classroom by allowing students to gain essential knowledge of agriculture skills in an increasingly urban society.[37] Today, the ethos behind school gardens is retained as core values and currently embraces Science Technology Engineering Arts and Math (STEAM) education, critical thinking skills, experiential learning and college and career readiness. Currently 715 of the 1800 (~40%) the city's public schools have access to urban agriculture, and there has been a huge growth in recent years.

Grow to Learn NYC is the driving force behind the current success of the school urban garden/agriculture system. It is a 'Citywide School Garden Initiative' established in 2010 as a public-private partnership between GrowNYC (within the Parks Department), the Mayor's Fund to Advance New York City, and other city agencies with the mission to promote the creation of sustainable gardens in every public school.[38] Grow to Learn is instrumental in providing educational, mentoring, and financial resources ($500 - $2000 grants) to educators and advocates interested in facilitating school garden creation. There are several grassroots educational partnerships between community gardens and schools, public private partnerships with nonprofits and other government entities that support and help develop school urban agriculture, for a list of partner organizations see the Appendix.

35 Santo R, Palmer A, and B Kim (2016). Vacant Lots to Vibrant Plots Vacant Lots to Vibrant Plots: A Review of the Benefits and Limitations of Urban Agriculture. Center for a Livable Future, Johns Hopkins,9 Baltimore, MD, USA.

36 Gardner K (2015). Exploring New York City School Gardens. Master's thesis, Columbia University, Graduate School of Arts and Sciences.

37 City of New York (n.d.). History of Farm Gardens in NYC Parks. Department of Parks and Recreation. Accessed from https://www.nycgovparks.org/about/history/community-gardens/farm-gardens

38 City of New York (n.d.). Grow to Learn NYC: the Citywide School Gardens Initiative. GrowNYC. Accessed from https://www.grownyc.org/grow-to-learn

EDUCATION BEYOND SCHOOL

Educational programming on topics include soil health, composting, pest management, beekeeping, healthy eating, are carried out in the setting of community gardens or farms by either non profits or government agencies.[39] GrowNYC runs programming like ***FARMroots Beginning Farmer Program***, which educated 21 young entrepreneurs how to start businesses in 2017, or ***Learn it Grow it Eat it***, a summer internship education children and adults about gardening and nutrition.[40] GreenThumb, the coordinating body that advocates for community gardens and supports them in New York City, also continually runs workshops and programs aimed at providing education outside of school. The topics of this programming include collecting rainwater, site planning, and soil safety. In addition to this GreenThumb partners with other city agencies such as the Department of Sanitation in implementing education related to the Compost Project, pursuing Zero Waste to Landfill initiatives.[41] GrowNYC, GreenThumb as well as the organizations listed in the Appendix provide resources on for community garden stewards to implement various educational programming.

BENEFITS

Providing students with access to urban agriculture improves test scores, civic engagement and other skills, as well as providing a vital platform to engage in STEAM education.[42] Science skills that are strengthened through urban agriculture tie directly into required city and state curriculum. Hydroponic systems allow for students to learn in a lab setting, leading to improved test scores and preparation for the technological future. In addition to this, the presence of urban agriculture in schools provides for a healthier relationship with food, better eating habits, and an understanding of where food comes from and its context within the larger food system. Studies show that preference for and intake of fresh fruits and vegetables increase when students have access to these resources at school. More importantly, they take these lessons home to their families.[43]

Students benefit from access to urban agriculture over the long term. Experiential learning in agricultural spaces translates into increased knowledge of climate change, environmental stewardship, and career training when for commercial operations. Exhaustive lists of these are outlined in the **Community** (preceding section) and **Entrepreneurs** section (following section).

39 City of New York (2017). Annual Report 2017: Keeping NYC Healthy and Green. GrowNYC, pp. 1-32.

40 City of New York (2017). Annual Report 2017: Keeping NYC Healthy and Green. GrowNYC, pp. 1-32.

41 GreenThumb (2018). GreenThumb Events and Workshops. NYC Parks GreenThumb. Accessed from http://www.greenthumbnyc.org/gardenevents.html

42 Gardner K (2015). Exploring New York City School Gardens. Master's thesis, Columbia University, Graduate School of Arts and Sciences.

43 Santo R, Palmer A, and B Kim (2016). Vacant Lots to Vibrant Plots: A Review of the Benefits and Limitations of Urban Agriculture. Johns Hopkins Center for a Livable Future, pp. 1-35.

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Grow to Learn NYC has three full time employees and one GreenThumb liaison. These few employees ust oordinate educational resources, grants, and teacher training to schools currently registered through Grow to Learn NYC. The organization is massively successful but also resource constrained. Their addition of 71 schools in 2017 further increases demand. Additional resources for this program would enable the growth of urban agriculture initiatives in school through more grant funding, more administrative support, and more physical resources (Recommendation 8). By quantifying the current school agriculture operations in a more robust way (Recommendation 5) we can better predict their needs and provide for them.

While GrowNYC's Grow to Learn program supports school gardens, educators are still responsible for maintaining the gardens and using them as platforms to teach science. This could be another issue since teachers are already stretched thin in their work. The lack of project ownership presents the most prominent barriers to flourishing school gardening systems in New York: educators who start gardens may relocate, and students depart during the summer, leaving previously well-tended and productive gardens into disrepair. There is also a lack of substantial access to financial or curriculum-based resources, which translates to a decreased access to community or school gardens for kids. By recognizing urban agriculture as a community service (Recommendation 3) the consistency of school gardens will be assured.

Students and youth out of school gain skills in urban agriculture through the educational system and community gardening programming. In order to assist in transforming these skills into meaningful careers, scholarships and support (Recommendation 6) can be provided. Youth will have an opportunity to further their experience in the real world, continue with their life skills education, and make gain social connections in valuable networks for lifelong career development.

Educators and other concerned stakeholders also face difficulties gaining access to land and space for school urban agriculture. They encounter the same land access and tenure issues as outlined in the community gardening section. Currently, 40% of the city's public schools have urban agriculture on campus, falling short of the 100% goal. Community gardens are regarded as a public service in tangent with the educational system, and there is an opportunity to integrate urban agriculture more completely into the curriculum to capitalize on the benefits it provide (Recommendation 3).

CASE STUDY 2

New York Sun Works: Greenhouse Project[5]

Manhattan-based nonprofit New York Sun Works envisions creating a new generation of environmental innovators. Today, they are a prime example of beneficial "cross-pollination" that can occur between stakeholders, like schools and high-tech farming. Their Greenhouse Project is a program dedicated to improving environmental science education through a hands-on integrated curriculum designed to inspire students in thinking critically, make inferred predictions, and design viable solutions. Through the Greenhouse Project, Sun Works has built 70 labs, trained over 250 teachers on STEAM curriculum and has estimated to reach over 26,000 students. These state of the art hydroponic science labs provide a platform for students to learn about nutrition, water resource management, climate change, biodiversity, waste management and sustainable development. These labs are becoming cost-effective options for schools that cannot start their own outdoor garden.

Figure 4: *NY Sun Works project gives students hands-on interactions with their food system.*

ENTREPRENEURS

BACKGROUND: HISTORY AND STATUS

Farming is one of the world's oldest professions, and food production remains a source of income for 1 in 3 workers on the planet.[44] In the United States, however, agriculture is shrinking as a source of employment and occupies barely 1.5% of the total workforce.[45] Still, the United States remains an overall net exporter of agricultural products as "factory farms" operate due to incredible investments in GPS-guided equipment, irrigation projects, and genetic engineering. Despite technological advancements, social justice issues pervade the farming and food processing industry; a large number of farms are staffed with a vulnerable class of migrant labor, and rural areas have stagnated economically, leading to increased societal disorders.[46]

These and other factors have begun altering consumer appetite—the number of farmers' markets has more than doubled nationwide in the past ten years.[47] Through the Mayor's Office of Food Policy and support of GrowNYC's programs, New York City has remained committed to developing its own local food economy filled with small-scale entrepreneurs and conscious consumers. As the "local" food movement has become mainstream through national grocers like Whole Foods, it is only logical for agricultural producers to be as local as possible. Therefore, now is the critical time to closely examine the city's regulations that might hinder innovative New Yorkers interested in becoming food producers.

Entrepreneurship in urban agriculture takes on a fascinating range of projects, scales, and appearances; it is difficult to point to an exemplary prototype. There are large-scale, high-tech ventures that aspire for the high production of factory farms, and jobs created by these farms help the local economy. On the small-scale, there are individuals who farm off of raised beds in the local garden and are proud of the high-quality or rare product that they desire to bring to market. In between this variation in production is any combination of farming methods of farming from high-tech hydroponics to rooftop cultivation. Despite the wide variety of possible paradigms available to entrepreneurs, there are only 11 total commercial farming companies in operation within New York City.[48] For example, Gotham Greens produces on average 66.8 kg/m^2/yr of produce on its 95,000 square feet of growing space in its 3 locations across Brooklyn and Queens.[49]

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44 FAO (2015). FAO Statistical Pocketbook: World food and agriculture. Accessed from http://www.fao.org/3/a-i4691e.pdf

45 Bureau of Labor Statistics (2017). Employment by major industry sector. Accessed from https://www.bls.gov/emp/ep_table_201.htm

46 Thompson G (2017). Chasing the Harvest: Migrant Workers in California Agriculture. Verso, Voice of Witness, London, UK; New York, NY, USA, ISBN: 9781786632210

47 USDA (2018). Trends in U.S. Agriculture: A Walk Through the Past and a Step Into the New Millenium. National Agricultural Statistics Service (NASS).

48 Web research by the Workshop Team from various sources.

49 Gotham Greens (n.d.). Our Farms. Accessed from http://gothamgreens.com/our-farms/

Figure 5: *While commercial-scale farms managed by for-profit companies exist mainly in Brooklyn, NY, restaurants that grow food on their rooftop or yard are concentrated in Manhattan, NY.*[50]

BENEFITS

Many successful companies started from humble roots; many of the nation's largest grocers began with one local general store. For example, the founders of WholeFoods were homeless and living in their only store before expanding and becoming an Amazon subsidiary.[51] New York City has historically been a hotbed for entrepreneurial ingenuity in the food space, especially with such companies like Gotham Greens**.** Urban agriculture can be a new source of socially and environmentally conscious entrepreneurs.

As a successful business, Bronx Hot Sauce partners with GrowNYC, Bronx Green-Up, and over 30 community gardens in the area. The company sources its peppers from local gardeners, paying market value on a per pound basis.[52] These peppers aresent to Bronx Green-Up, where a local chef produces them into hot sauce, which is distributed and sold in markets across the country. While Bronx Hot Sauce represents an encouraging example of local business, the decentralized network of community gardens makes this the exception rather than the rule of garden entrepreneurship in New York.

50 Web research by the Workshop Team from various sources.

51 Whole Foods Market (n.d.). Whole Foods Market History. Accessed from https://www.wholefoodsmarket.com/company-info/whole-foods-market-history

52 Bronx Hot Sauce (n.d.) About Us. Accessed on 3/29/18 from https://bronxhotsauce.com/

ISSUES

Several other companies are headquartered within city limits but cannot sustain farm operations. In a city with 1,375 vacant lots and 1,300 acres of available rooftops (see Figure 6), there is an opportunity for urban agriculture to expand.[53] Other city agencies across the United States are already accommodating regulations for commercial rooftop greenhouses—just one of the many forms commercial urban agriculture can take. The Zone Green Text Amendment updated the zoning and building codes in 2012 to include provisions for greenhouses. Other forms of urban agriculture deserve the same review.[54]

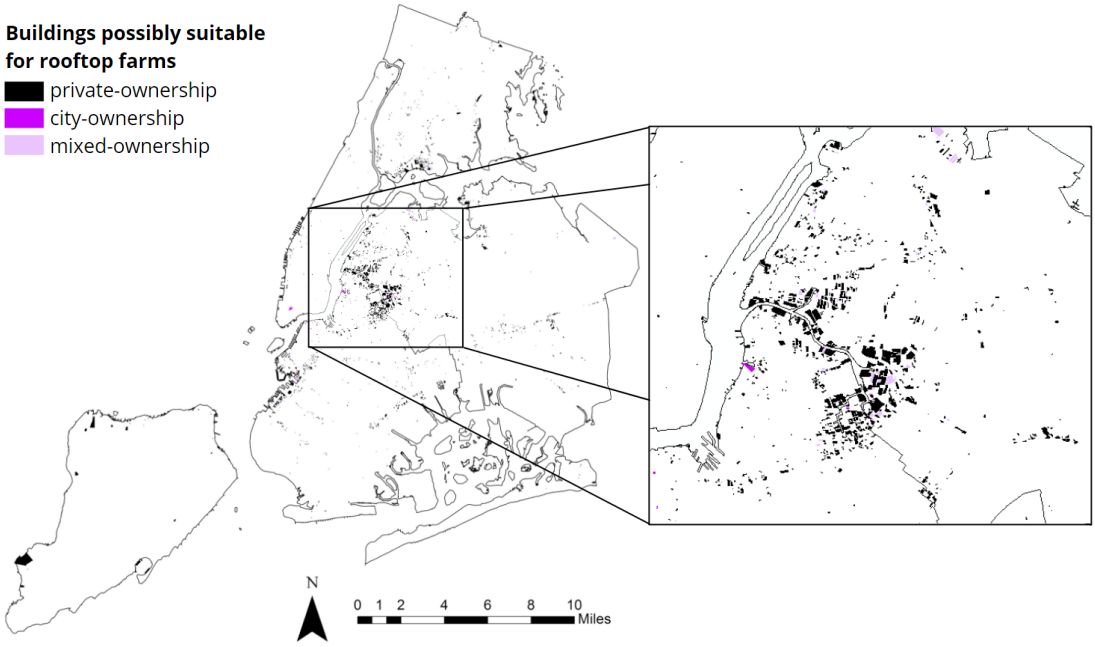

Figure 6: *Buildings in New York City that are potentially suitable for commercial-scale rooftop farms based on a certain set of criteria (must be commercial, manufacturing, or office buildings that are less than 10 floors, built before 1968, and have a roof area that is larger than 10,000 sq. ft.). These rooftops equate to about 1300 acres of space across the five boroughs, with a large concentration of buildings in the Newtown Creek area along the border of Brooklyn and Queens.*[55,56]

53 596 Acres (n.d.) Living Lots NYC. Accessed on 3/22/18 from https://livinglotsnyc.org and NYC Planning (last updated 1/17/18). MapPLUTO. Accessed from https://www1.nyc.gov/site/planning/data-maps/open-data/dwn-pluto-mappluto.page

54 City of New York (n.d.). Zone Green. Mayor's Office of Sustainability. Accessed from http://www.nyc.gov/html/gbee/html/codes/zone.shtml

55 NYC Planning (last updated 1/17/18). MapPLUTO. Accessed from https://www1.nyc.gov/site/planning/data-maps/open-data/dwn-pluto-mappluto.page

56 Berger D (2013). A GIS Suitability Analysis of The Potential for Rooftop Agriculture in New York City. Master's Thesis [advisor: Elliott S]. Department of Urban Planning, Columbia University, pp. 1-31 doi:10.7916/D85T3SN1.

Through the team's literature review, many reports cited "zoning issues" as a potential barrier for promoting urban agriculture, but few elaborated its fine details.[57] The team aims to develop a practical and strategic approach towards understanding what language within the regulations is not aligned with the way urban agriculture is currently practiced throughout the city and which items are incompatible with common practices of urban agriculture entrepreneurs elsewhere. The goal is to enable any New Yorker a clear and attainable path for establishing businesses, co-operatives, and partnerships with the products of urban agriculture. Zoning should not be a barrier to entrepreneurial venture, from the small scale farmer on residential plots to commercial scale entrepreneurs to the industrial-scale enterprises looking to transform the food industry (Recommendation 2).

57 Wooten H and A Ackerman (2011). Seeding the City: Land Use Policies to Promote Urban Agriculture. NPLAN and ChangeLab Solutions, pp.1-40.