

DRAFT

NYC URBAN AGRICULTURE

NYC Department of City Planning

June 2019



Urban Agriculture Website

www.nyc.gov/agriculture

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Planning

NYC
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Small Business
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NYC NYC Urban Agriculture

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Farmer at work with plants, (left), image courtesy of Farm.One, Farmers at Brooklyn Grange's rooftop farms, (center), image © Brooklyn Grange, www.BrooklynGrangeFarm.com, Farmers at 117th St. & St. Nicholas community garden in Harlem (right), image courtesy of DCP.

Urban agriculture in the five boroughs provides countless benefits to New Yorkers, expanding access to healthy food, building strong community networks, improving environmental conditions in our neighborhoods, offering educational opportunities, and providing jobs.

A wide range of agricultural activities take place in the city. Many residents maintain backyard gardens and collaborate to build and care for community gardens. Schools and housing developments around the city contain hundreds of farms that are built and maintained by students and residents. Commercial agricultural businesses, including indoor farming, hydroponics, and aquaponics are producing food and developing new technologies to provide high-quality food in an urban environment.

The NYC Urban Agriculture website will connect you with opportunities to become a part of the agricultural community in the

Website Resources & FAQs

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Resources

- **Commercial farming** (Urban agriculture guide, Cornell Cooperative Extension Urban Agriculture Program)
- **Community gardens**
- **School gardens**
- **Farms at NYCHA**
- **Office of Food Policy** (additional resources for Families, Communities and Businesses)
- **Organics Collection Services**

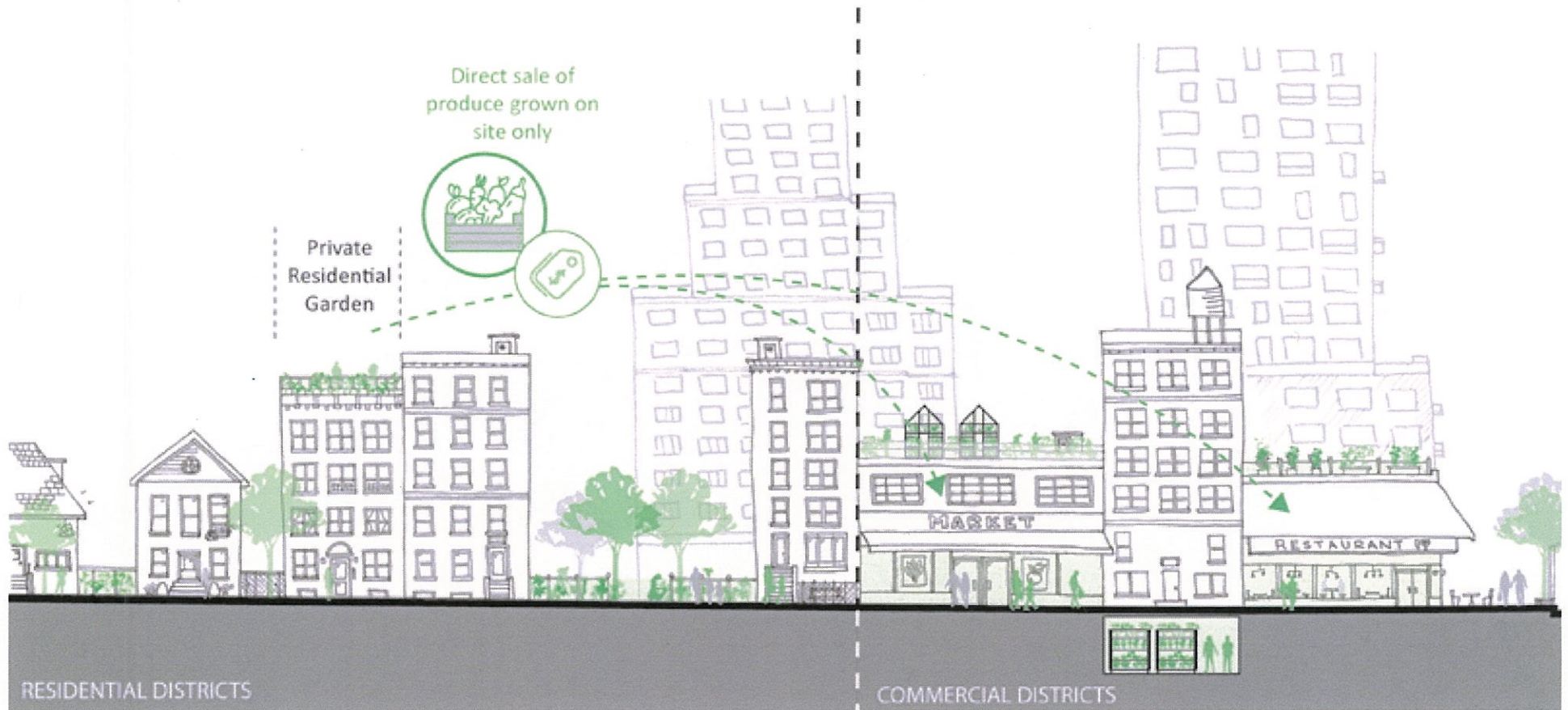
FAQs (e.g. zoning, keeping chickens and bees)

Urban Agriculture Website - Zoning



www.nyc.gov/agriculture

Urban Agriculture Website - Zoning



www.nyc.gov/agriculture

**Design Trust for Public Space Testimony
Intro #1058 in the Committee on Land Use June 11, 2019**

Thank you to the City Council Members of the Committee on Land Use for the opportunity to speak on the proposal for a comprehensive urban agriculture plan.

My name is Samira Behrooz, Program Manager at the Design Trust for Public Space, a nonprofit dedicated to the future of public space in New York City. Our projects bring together city agencies and community groups to make a lasting impact – through design – on how New Yorkers live, work, and play.

Design Trust's *Five Borough Farm* project, in partnership with Added Value, NYC Parks, and Farming Concrete, offered a roadmap to understand the cross-sector benefits of urban agriculture to our health, social capital, environment and economy, and to provide resources to grow urban farming and gardening throughout New York City.

The *Five Borough Farm* policy recommendations included the creation of an urban agriculture plan that

- Establishes goals, objectives, and a citywide land use scheme for garden and farm development
- Integrates urban agriculture into existing City plans, programs, and policy-making
- Addresses disparities in access for gardeners and farmers to funding, information, and other resources by creating more transparent and participatory processes

The proposed legislation aligns with these recommendations, however, systems of accountability are essential. The Plan must also apply to all forms of urban agriculture, not just commercial ventures, including community gardens, school gardens, permaculture gardens, and vertical farms.

**40 WORTH STREET
SUITE 603
NEW YORK, NY 10013
(212) 695 2432
@DESIGNTRUSTNYC**

DESIGN TRUST FOR PUBLIC SPACE

We urge the City Council to incorporate the following three ways to ensure **accountability** in creating and executing the Plan AND to engage **an expert in food systems** to lead an open and transparent planning process:

1. **A citywide task force**, similar to the Roundtable convened by Brooklyn Borough President Adams in 2016, with City agencies, support organizations, and gardeners and farmers
2. **Open forums** at many points in the Plan's development process, including spring gardening and farming events, such as GrowTogether and Making Brooklyn Bloom
3. **Communication** within the City and with gardening and farming support organizations and advocacy networks, including GreenThumb, NYCHA's Garden and Greening Program, and NYC Community Garden Coalition.

We've waited a long time for a Plan. Let's ensure ALL New Yorkers benefit.



OFFICE OF THE BROOKLYN BOROUGH PRESIDENT

Testimony

Brooklyn Borough President Eric L. Adams

Tuesday, June 11, 2019

I want to thank Chair Rafael Salamanca, Jr. and the Committee on Land Use for giving me the opportunity to provide comments at this public hearing. Additionally, I would like to thank Council Member Espinal for introducing this legislation on my behalf as well as his Council colleagues for co-sponsoring this important legislation.

The impetus of this legislation stems not only from the historic challenges of unsecured land tenure for community gardens throughout neighborhoods across New York City, but also from meeting time and again with urban agriculture companies during my visits to neighborhoods throughout Brooklyn. I was, and continue to be, inspired by the entrepreneurial spirit that produces fruits and vegetables in Brooklyn using new forms of tech-focused agriculture such as aeroponics and closed loop aquaponics. Unfortunately, I hear over and over again about the difficulty of receiving City agency approval for these companies, which were often being set up on rooftops and in warehouses. This frustration prompted the most logical next step, which was to bring City agencies to the table to speak with advocates and industry leaders on the issue of permits and regulations.

Two years ago, I hosted a roundtable in partnership with Council Member Espinal at Brooklyn Borough Hall with 10 City agencies and more than 20 urban agriculture companies and non-profit organizations. The takeaway was clear: Agriculture is only mentioned a handful of times in the zoning resolution, and City agencies were placing responsibility on one another to regulate this emerging industry, but no one was taking any clear regulatory responsibility. This resulted in more questions than answers for urban agriculture companies and no clear path for fresh food and job creation. While we have seen successful companies like Brooklyn Grange and Gotham Greens take root, many more companies have labored trying to get their business off the ground. Meanwhile, cities such as Atlanta, Boston, Chicago, and Newark are plowing forward with an urban agriculture revolution. Intro 1058 asks the New York City Department of City Planning (DCP) to take the first step in playing catch up with so many other cities by developing a comprehensive urban agriculture plan that addresses land use and other regulatory issues. The website created in response to our last attempt at getting a comprehensive plan passed is a nice resource, but it does not fully address the challenges facing this growing industry. We need a real plan and I support the creation of a taskforce to create and implement this plan.

Since being on my own journey with Type 2 diabetes, I have noticed how deadly our food system has become. Fast, processed foods dominate our lives. From our school lunches to our grocery stores to restaurants throughout the borough, we are killing ourselves with the foods we eat. The data amplifies the problem. According to a 2007-2010 Center for Disease Control and Prevention survey, 87 percent of adults failed to meet their daily recommended vegetable intake. That is no surprise to me considering bodegas represent 80 percent of the food source in neighborhoods in central and northern Brooklyn according to the New York City Department of Health and Mental Hygiene (DOHMH)'s analysis of their Healthy Bodegas Initiative from 2008. On average, only 10 percent of bodegas carry leafy green vegetables according to a 2006 DOHMH study. These are food deserts filled with processed foods, plain and simple. We must have equity of access for fresh, healthy food and stop flooding our neighborhoods that have the greatest need with the least healthy alternatives.

As Brooklyn's borough president, it is my job to advocate for the health and well-being of my constituents. That is why I am calling for the passage of this legislation. If we can clear the way for urban and vertical agriculture, then we can begin to sow the seeds for a food revolution that provides healthy food access to communities from Bensonhurst to Brownsville.

Through the support and expansion of community gardens and urban farming, we can reduce transportation costs, negative environmental effects, and other externalities associated with shipping logistics, while opening up job opportunities to the next generation of entrepreneurs. That is why I contributed \$1 million in capital funding to the Brooklyn Navy Yard for the establishment of an urban agriculture tech incubator so we can foster startups to crack the high energy cost and real estate code.

Looking to the future, I initiated "Growing Brooklyn's Future," committing more than \$7 million in capital funding for projects across Brooklyn. These include hydroponic classrooms in schools across the borough in partnership with NY Sun Works; a greenhouse at the Urban Assembly Unison school in partnership with Council Member Laurie Cumbo and Teens for Food Justice, as well as green roofs and rooftop gardens at other schools. This investment recognizes the need to prepare for the workforce of the future that is coming: an urban, fresh food revolution. As our young people are preparing for this future, the question remains: Will the city be prepared for them?

This legislation and the capital contribution are a win-win for Brooklyn and the City of New York. I hope this committee and the City Council pass this legislation, and send it to the Mayor for his signature, so we can begin the fresh and healthy food revolution.

Thank you.



**Testimony before the New York City Council Committee on Land Use on Int. No. 1058-2018:
Legislation to Create a Comprehensive Urban Agriculture Plan**

Nevin Cohen, Ph.D.

Associate Professor, CUNY Graduate School of Public Health and Health Policy
Research Director, CUNY Urban Food Policy Institute

June 11, 2019

Dear Committee Members, my name is Nevin Cohen, and I am an Associate Professor of Health Policy at the CUNY Graduate School of Public Health and Research Director of the [CUNY Urban Food Policy Institute](#). The CUNY Urban Food Policy Institute advances urban food equity by producing evidence-based research, collaborative solutions, and policy guidance. I have studied and written about NYC's urban agriculture system for more than a decade. I co-authored *Five Borough Farm*, the first comprehensive assessment of urban agriculture in New York City, and co-wrote the book *Beyond the Kale: Urban agriculture and social justice activism in New York City*, a study of the potential for urban agriculture to address racial, gender, and class disparities. I led an evaluation of *Farms at NYCHA*, an innovative public-private partnership that trains NYCHA youth to grow and distribute fresh produce for its residents, and am the principal investigator of a National Science Foundation study of urban agriculture in NYC and cities in the UK, Germany, Poland, and France.

In 2017, the CUNY Urban Food Policy Institute testified in support of Int. No. 1661, and today we would like to express our strong support for Int. No. 1058, the successor legislation. In the past two years the need for an urban agriculture plan has grown in importance.

- Urban agriculture is beginning to contribute to environmental goals by sequestering stormwater, to resilience by stemming flooding, and to economic growth through job training and entrepreneurship. An urban agriculture plan would identify ways to increase the co-benefits that farms and gardens produce.
- Conflicts between urban agriculture and competing land uses continue, highlighting the value of a public planning process to decide how much urban agriculture is appropriate for NYC, where new urban farms and gardens should be located, methods to protect existing gardens and farms, and a process for supporting current and new farming and gardening activities.
- As *Beyond the Kale* (Reynolds & Cohen, 2016) shows, the benefits people usually attribute to urban agriculture – fresh food, green space, job training – can mask and even exacerbate structural inequities. A planning process would involve the public in identifying and addressing disparities within the urban agriculture system, particularly disparate access to financial resources and land.
- New forms of commercial urban agriculture – practiced indoors, in shipping containers, on rooftops – require reassessing zoning and related codes and regulations to ensure that these innovations are supported while also protecting community health, safety, and quality of life, with fair wages and working conditions for farmworkers.
- Efforts to sustain regional agriculture, particularly in the Hudson Valley, have created opportunities for innovative links between peri-urban and urban farms. Incorporating regional



agriculture in the urban agriculture plan would identify common needs and opportunities for shared infrastructure and supportive policy.

Officials from the New York City Department of City Planning and the Department of Parks and Recreation have said that a plan is unnecessary because the city's zoning allows urban agriculture throughout the five boroughs, and there are no significant zoning or regulatory obstacles to growing food in the city. But there are many questions about expanding urban agriculture that a plan could answer: (1) How much land should be allocated to the activity? (2) To what extent are existing resources such as GreenThumb adequate for an expanding urban agriculture sector? (3) How can urban farms use resources like water or soil sustainably and economically? (4) How can urban farms and gardens be designed to address large issues like climate resilience and social equity?

Plans are meant to envision and guide the future. A plan would help to make urban agriculture bigger, stronger, more sustainable, and more democratic. On behalf of the CUNY Urban Food Policy Institute, I urge the Committee to pass Int. No. 1058 so that the Council can enact this important bill.



Testimony Submitted by
Gabrielle Blavatsky, Co-Founder and Policy Director, Equity Advocates
Before The New York City Council Committee on Land Use

Developing a Comprehensive Urban Agriculture Plan

June 11, 2019

My name is Gabrielle Blavatsky and I am the Co-Founder and Policy Director of Equity Advocates. Thank you to Chairperson Rafael Salamanca as well as the members of the City Council Committee on Land Use for holding today's hearing. We submit this testimony in support of the passage of Int. 1058 and the development of a comprehensive urban agriculture plan that addresses land use policy and other issues to promote the expansion of urban agriculture in the city.

Equity Advocates is a nonprofit working to ensure that all New Yorkers, regardless of race or income, can access and afford healthy food. We partner with community based food access organizations across New York and provide them with the tools they need to be more civically engaged, including policy education, advocacy training, and coalition building services. Through this work, we are helping to build a nonpartisan grassroots coalition of powerful advocates and leaders within the food movement.

Urban agriculture has a significant role to play in improving access to healthy food, health outcomes, food literacy, workforce development and food sovereignty in low income communities across New York. Int. 1058 is an important step forward in respecting and supporting the gardeners, farmers and organizations that have been leading this work in New York City for decades. Our partner, Edible Schoolyard NYC, is an incredible organization engaged in school garden efforts across the city. ESNYC supports edible education for every child in New York City by working directly with Title 1 elementary and middle public schools to cultivate healthy students and communities through hands-on cooking and gardening education, transforming children's relationship with food.

We urge the City Council to pass Int. 1058 with the recommendations below. Specifically, we urge this committee to incorporate mechanisms to ensure that the process for developing an urban agriculture plan for New York City is equitable and inclusive, and authentically includes the voices of the full breadth of the urban agriculture and gardening community that has been doing this work for decades as well as those community-based nonprofits, like Edible Schoolyard NYC, that support this valuable work across New York City.

Urban Farming and Gardening Provide Multitude of Community Benefits

Over 1.7 million New Yorkers lack access to healthy food options. This is not just a food issue; it is a complex economic and social problem that reflects issues of structural racism

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and inequality. Research shows that accessing and affording nutritious food is especially challenging for those living in lower-income neighborhoods and communities of color. Urban agriculture helps to address problems of food apartheid that exist in NYC by providing historically underserved communities with ownership over the means of food production.

According to Edible Schoolyard NYC, 94% of children in NYC do not eat enough vegetables. Two key factors contributing to a lack of healthy food access in a community are accessibility and affordability. Community gardens, urban farms and school gardens can provide families with an additional source of healthy, low-cost produce and help increase consumption of fresh fruits and vegetables. Further, research shows that students who grow their own vegetables are more likely to eat them and more willing to try new foods, which can help develop healthier eating patterns. Research published in the *Journal of Public Health* also found that community gardeners consumed fruits and vegetables 5.7 times per day, compared with home gardeners (4.6 times per day) and nongardeners (3.9 times per day). Moreover, 56% of community gardeners met national recommendations to consume fruits and vegetables at least 5 times per day, compared with 37% of home gardeners and 25% of nongardeners.¹ In addition, 75% of parents surveyed reported that their kids were eating healthier at home after participating in school garden programs.²

Results from a study conducted in Toronto suggest that community gardens were perceived by gardeners to provide numerous health benefits and social benefits including increased physical activity and improved mental health and community cohesion.³ Along with improved understanding of nutrition and its effects on health, studies and firsthand experience show that the type of experiential garden and kitchen education offered by Edible Schoolyard NYC helps students develop other critical life skills, including: 1) a sense of responsibility, agency, and ownership of their actions, 2) increased interest in physical activity, 3) improved social skills such as teamwork and leadership and 4) increased parental involvement.⁴

Community gardens also serve as sites for farming, cooking, food justice, and nutrition education, youth development, and provide valuable skills/workforce training opportunities.⁵ A 2016 study conducted by the CUNY Urban Food Policy Institute found

¹Jill S. Litt, Mah-J. Soobader, Mark S. Turbin, James W. Hale, Michael Buchenau, Julie A. Marshall, "The Influence of Social Involvement, Neighborhood Aesthetics, and Community Garden Participation on Fruit and Vegetable Consumption", *American Journal of Public Health* 101, no. 8 (August 1, 2011): pp. 1466-1473. <https://ajph.aphapublications.org/doi/abs/10.2105/AJPH.2010.300111>

² Impact. Edible Schoolyard NYC. 2019. Retrieved from: <https://www.edibleschoolyardnyc.org/impact/>

³ Wakefield, S, F. Yeudall, C. Taron, J. Reynolds and A. Skinner. 2007 *Growing urban health: Community gardening in South-East Toronto*. *Health Promotion International* 22(2):92-101; Oxford University Press. Read more at: <https://nccommunitygardens.ces.ncsu.edu/nccommunitygardens-research/>

⁴ Impact. Edible Schoolyard NYC. Retrieved from: <https://www.edibleschoolyardnyc.org/impact/>
<https://www.edibleschoolyardnyc.org/impact/>

⁵ Santo, Rancel; Palmer, Anne; Kim, Brent. *Vacant Lots to Vibrant Plots: A review of the benefits and limitations of urban agriculture*. Johns Hopkins Center for a Livable Future. May 2016. Retrieved from:

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community gardens and farms are selling their products at market prices or at a sliding-scale in cities where policies allow and that these practices have been used to support farming and gardening activities (such as purchase of seeds or garden equipment) and/or to create jobs or opportunities for self-determination in economically marginalized communities.⁶

Plan Must Consider Diverse Strategies to Protect and Expand Urban Agriculture

Given the importance and value of urban agriculture and the variety of types of community gardens, including those at schools, we recommend that Int. 1058 create an Urban Agriculture Task Force and the plan that they produce incorporate the following recommendations to protect, support and expand urban agriculture in New York City:

- **Identify solutions to ensure that all existing community gardens are protected by law**, so as not to be under threat by future development and remain spaces for community building, recreation, and food production.
- **Increase funding and support for workforce development opportunities in urban agriculture, especially for youth** as well as educational opportunities both in curricular day and after-school programming and SYEP opportunities around urban agriculture.
- **Increasing funding and access to health, nutrition, food justice and urban agriculture education and programming** both in curricular day and after school care settings.
- **Promote collective metrics to evaluate the benefits and impacts of urban agriculture in New York City.** We recommend that the city build upon the great work that has already been done through *Five Borough Farm*, a multi-phased project conducted in partnership with *Design Trust for Public Space*, *Added Value, NYC Parks*, and *Farming Concrete*. *Five Borough Farm* offered a roadmap to farmers and gardeners, City officials, and stakeholders to understand and weigh the benefits of urban agriculture, and made a compelling case for closing resource gaps to grow urban agriculture throughout the five boroughs of New York City. The group developed an urban agriculture Data Collection Toolkit as well as a Data Collection Framework that are publicly available.⁷
- **Identify and increase support for existing programs that ensure greater access to healthy and affordable produce**, as well as additional resources and incentives to procure and distribute local produce. The plan could address the possibility of expanding existing programs such as Health Bucks so that retailers and other alternative Farmer's Market programs such as GrowNYC's Food Box may accept them; Increasing funding for year round programs that incentivize the distribution

https://www.jhsph.edu/research/centers-and-institutes/johns-hopkins-center-for-a-livable-future/_pdf/research/clf_report_s/urban-ag-literature-review.pdf

⁶ Cohen, N., 2016. *Policy Brief: New Directions for Urban Agriculture in New York City*. CUNY Urban Food Policy Institute.

⁷Five Borough Farm. Design Trust for Public Space. 2015.

<http://designtrust.org/projects/five-borough-farm-ii/activities-and-outputs/>

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of affordable and locally grown produce; Increasing resources and technical development for programs such as Shop Healthy NYC and incentivize retail owners and DOE schools to procure fruits and vegetables from local sources.

Ensuring NYC's Urban Agriculture Plan is Equitable and Inclusive

Equity Advocates believes the people most impacted by an issue are the best suited to address it and should be meaningfully engaged in the policy making process. Community and nonprofit leaders, diverse families (including families of color, non-English speakers and immigrants), advocates and others should be engaged to ensure that the city's Urban Agriculture plan effectively meets the unique needs of the community. This responsibility should not be taken lightly, and requires intentional commitment and explicit work on a regular and ongoing basis.

We urge the City Council to incorporate the following four elements into local law 1058 to ensure accountability and equity in the development and implementation of the plan:

1. **Establish a city wide task force** composed of City agencies, support organizations, and at least half of the members made up of gardeners and farmers representing a variety of types—for reviewing the development and implementation of the Plan. This task force would build off of the Urban Agriculture Task Force with NYC Parks established through *Five Borough Farm*, and the roundtable convened by Brooklyn Borough President Adams in Spring 2016. The process for identifying and nominating appointees to this task force must be transparent to ensure it truly reflects the needs and goals of the community of urban agriculture practitioners.
2. **Host and promote community engagement opportunities at all stages of the task force's planning and plan development process** — beginning with understanding the community's expectations for the plan. We also recommend that the department of planning be required to identify and document how community stakeholders had been consulted as part of the development of the plan. Potential strategies to engage community voice in the city's urban agriculture plan include the following:
 - Large-Scale Public Meetings or Multi-Stakeholder Forums (open to the public, representatives of different stakeholder groups) for dissemination of information, sharing opinions, and discussion.
 - Meet People Where They Are by going out into the community to ask for feedback. This includes accessible places to find accurate and up-to-date information—online and in community spaces (e.g. libraries, places of worship, health centers, gardening and farming events)
 - Focus Groups, Small Group Meetings to elicit feedback on a particular issue
 - Online Engagement or Written Responses through web-, written-, or email-based feedback or discussion
 - Mass surveys of whole stakeholder groups or a representative sample conducted online, by telephone, or in-person, vetted by task force members

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- Designate Community Liaisons/Leaders to support engagement efforts, including educational events and dissemination of various communications
- 3. **Provide funding** to coordinate and support the task force, community engagement plans and development the urban agriculture plan.
- 4. **Regular updates to the plan** are essential and should be required to ensure that the plan continues to address the needs of different urban agriculture and community garden stakeholders over time.

Thank you for your time and consideration.

FARM SCHOOL NYC

**Testimony Submitted by
Onika Abraham
Director, Farm School NYC**

Before The New York City Council Committee on Land Use

Developing a Comprehensive Urban Agriculture Plan

June 11, 2019

Dear Chairman Greenfield, Council Member Espinal, and Committee Members,

Thank you for holding today's hearing. My name is Onika Abraham, and I am a wife, a mother, a longtime resident Bedford Stuyvesant, born and raised on the Lower East Side, a crazy plant lady, and the director of Farm School NYC.

I am grateful for this opportunity to stand before you and preach the gospel of urban agriculture in support a Comprehensive Urban Agriculture Plan. Growing up on the lower east side, I was surrounded and inspired by those community gardens – vacant lots reclaimed as places for growing food, flowers, connection, power. I remember those epic battles over land, battles that resulted in those lovely pocket gardens throughout my old neighborhood, battles that continue today.

But urban agriculture is older than those gardens, it's older than this city.

Urban agriculture is as old as the concept of city itself. And since the first plot was dug in the first city, urban agriculture has been innovated and dominated primarily by those who needed that food for survival – the money-poor, the marginalized, the immigrants, the black and brown people of color. And it still is. Even if Modern Farmer isn't profiling them, even if The Times doesn't feature them in the Style section.

Urban agriculture may be hip, but it's not new. In this city of migrants and immigrants, each new wave brought practices to this patch of land – from Italian immigrants festooning fig trees in backyard gardens to my own black and brown ancestors bringing collards and callallo to church yards.

My ancestors had generations of experience farming marginal land – the only land they could access in the South due to government policies and racism – and they brought those practices to the city, where the land they could farm was just as marginal, and worse – polluted.

But they believed that the soil could provide, and with hard work digging, hoeing, testing, amending, stewarding for the soils of this city – it did. Hundreds of thousands of pounds of food are grown in NYC farms and gardens each year – most of it on land that our residents worked hard to reclaim over generations. In restoring the city's soil, urban farmers are restorers of our communities, our families, our local economies, our bodies.

Urban agriculture has been the bedrock of food sovereignty for generations of urban poor because WE can do it – with a few seeds, the sun, the rain and the soil. We can have control of what we eat by what we grow -- we have the means of production and distribution.

Urban farms and gardens are essential. With community-based projects, the people don't have to hope that corporate social responsibility will kick in overstock produce to a local food pantry. Community-based urban agricultural projects are where the people feed themselves.

We need a multitude of solutions to create a just and resilient food system, and the land and the people will always be the heart of it.

This is something that the founders of Farm School NYC understood deeply.

Farm School NYC's origin story provides a perfect example of the importance of building community voice into the proposed urban agriculture plan.

Farm School was created by a collective of farmers, educators, and social justice activists working and living in low income communities in New York City. Our communities were so often defined by what they lacked -- access to fresh food, healthcare, economic and educational opportunity. But our founders were focused on the abundant resources they shared: over 600 community gardens and farms throughout our city and experienced growers with expertise to share. Our founders recognized the need for a comprehensive, professional-level farmer training program for adults.

So, they started one. A collective of volunteers, working out of borrowed office space, community rooms, living rooms. Together, they centered our school on social justice, believing that farming in community can be a tool for liberation and self-determination for the marginalized and the oppressed. They grounded our school in popular education techniques

developed for labor movements, particularly welcome in communities underserved by traditional hierarchical educational institutions.

When we welcomed its first class in 2010, many of those farmer / volunteers became faculty members and many still serve as teachers and board members. Since 2010, we've trained more than 400 people who are now leading farms and gardens and growing and educating in NYC and beyond. Demand for our courses far exceeds our capacity -- we have to turn away more than 70% of applicants.

Our origins as a collectively created vision by farmers, gardeners and activists is critical to the success of Farm School NYC's programming, and it is critical to the success of the proposed Comprehensive Urban Agriculture Plan. The most generative solutions will come from those living and breathing the problems, and they must be given the autonomy, the resources, the mandate to make the changes our communities need most.

You must ensure that farmers, farmworkers, immigrants, longtime community gardeners and others vital to growing food in our city's marginalized communities are in the vanguard of this plan's development and implementation.

Thank you.

Onika Abraham
Farm School NYC
(212)858.9821
onika@farmschoolnyc.org
www.farmschoolnyc.org

Urban Agriculture Hearing
Testimony
June 11, 2019

Statement of Alex Sommer, Deputy Director of the Brooklyn Borough Office of the New York City Department of City Planning, before the Land Use Committee of the City Council, on their hearing on
Int. No. 1058

June 11, 2019

Good afternoon Chair Salamanca, Councilmember Espinal, and distinguished members of the Land Use Committee. My name is Alex Sommer and I am the Deputy Director of the Brooklyn Borough Office of the New York City Department of City Planning (DCP). Thank you for the opportunity to be here today to discuss Intro 1058 regarding urban agriculture in our city. I am joined here by my colleague Alison McCabe, Deputy Counsel at DCP to testify and answer questions on this proposal. I'd like to also note my personal interest in urban agriculture – I participated in a chicken apprenticeship program and egg cooperative in a community garden in Crown Heights, which then gave me the confidence to raise three chickens with my roommates, and share free, fresh eggs with my neighbors.

Int. No. 1058 proposes a local law in relation to developing an urban agriculture plan in New York City. You may recall that former DCP General Counsel Anita Laremont testified on this topic in 2017, and we'd like to reiterate that DCP and the Administration support urban agriculture and recognize the many benefits that agriculture provides to New Yorkers, offering educational opportunities, strengthening community networks, helping to improve environmental conditions in our neighborhoods, expanding access to healthy food, and providing jobs. We continue to be very supportive of urban agriculture and eager to work with the City Council to advance urban agriculture in NYC.

As New Yorkers, we are all probably familiar with community-run gardens which provide opportunities for residents to connect with nature, improve the environment, beautify public open space, learn about growing and preparing nutritious food, and form social bonds within communities. But schools and housing developments throughout the city are now building and maintaining their own onsite farms, and larger for-profit businesses are now starting to partake in indoor farming, hydroponics, and aquaponics, developing new technologies to grow high-quality food in a dense, urban environment.

Because of the long history of urban agriculture in NYC and the significant value that it brings to our communities, the City has many initiatives and resources for community gardeners and urban farmers.

PROGRAMS

GreenThumb, the NYC Parks Department community gardening program provides technical assistance, workshops, programming, and material support to over 550 community gardens and 20,000 volunteer gardeners.

The Grow to Learn NYC initiative within GrowNYC supports more than 780 school gardens in over half of the City's schools, where children are connected to the science of growing food and essential nutrition education.

Many of our city's community programs, such as the Department of Youth & Community Development-funded afterschool sites, or Department for the Aging-funded senior centers, have gardens and offer educational programs about farming, the environment, and healthy foods.

The Farms at NYCHA initiative maintains six food-producing farms at NYCHA developments, which are constructed and operated by 18 to 24-year-old NYCHA residents and expand healthy food access to their communities.

And the small but growing number of commercial farms in NYC help increase the supply of locally sourced food and offer a unique economic development opportunity for residents and businesses.

ZONING

Regarding DCP's role in these efforts, we are proud to note that our city's zoning is extremely flexible for urban agriculture: it's allowed in every Residential, Commercial, and Manufacturing zoning district in New York City, with a minor exception for areas zoned for amusement parks.

The definition of agricultural uses within the Zoning Resolution includes farming, hydroponics, and aquaponics, and can be conducted outside or unenclosed spaces, in yards, inside of buildings, or on rooftops of buildings, and the definition is broad enough to also allow for the sale of products that are grown on-site. This includes sale of produce from commercial agricultural operations, either on-site or distributed for sale in another location. As noted earlier, this can occur in all zoning districts across the city, including in residential districts.

In addition, as part of the Zone Green initiative approved in 2012, a new City Planning Commission certification was created to allow rooftop greenhouses as a permitted obstruction. This provision creates additional flexibility in allowing greenhouses to be exempt from floor area and offering relief from the maximum building height limits set by zoning.

DCP meets regularly with residents and businesses across the five boroughs, and fields zoning questions and comments on a regular basis at our "Zoning Help Desk". We have not been made aware of any barrier in the Zoning Resolution to any urban agricultural project or of any land use regulation that would otherwise hamper a proposed agricultural project, farm, business, or development from moving forward. Of course, if there is a concern that the Zoning Resolution is creating barriers, we encourage operators and elected officials to discuss zoning challenges with us.

In response to Local Law 46 of 2018, which resulted from the bill I mentioned earlier, DCP worked with NYC Parks, the Department of Small Business Services, and DoITT to create a one-stop shop with resources, programs, and regulations related to agriculture in New York City.

The NYC Urban Agriculture website was released in June 2018 and can be found at nyc.gov/agriculture. The website includes a Resources page that links to a range of agricultural-related city programs, and an extensive FAQ section that describes the process for starting and operating community gardens and commercial agricultural businesses. The website includes descriptions of relevant sections of the Zoning resolution and several diagrams to illustrate how locally-produced food can be distributed, sold or

donated in the city. The website has been positively received by many organizations involved in urban agriculture in NYC and has been viewed more than 7,000 times since its release less than a year ago.

Local Law 46 also required the City to document City-owned spaces that are available and potentially suitable for community urban agricultural uses. This dataset was created by the Department of Parks and Recreation and is available on NYC OpenData.

During 2018, the Department of Small Business Services also created an Urban Agriculture Quick Guide that describes the typical permitting requirements, licenses, and regulations that may apply to commercial agricultural businesses in NYC.

DCP is also committed to expanding the availability of healthy food in low-income neighborhoods, one of the elements listed in the proposed bill. The FRESH program, adopted in 2009 by the City Council, facilitates the development of grocery stores selling a full range of food products in underserved neighborhoods, with an emphasis on fresh fruits and vegetables, meats and other perishable goods. The Department is actively working with the City Council's Land Use Division and individual Councilmembers to develop a proposal to update and expand the applicability of the FRESH program in appropriate areas identified by the Supermarket Needs Index. We welcome conversations with Councilmembers who may be interested in expanding the program within their district.

DCP and the Administration are encouraged by the work that is already underway across many agencies, nonprofits, community groups, and businesses to support and expand urban agriculture in NYC. We are certainly open to ideas about programmatic improvements or regulatory changes to further facilitate agriculture in NYC. However, before embarking on a comprehensive planning effort, we would first hope to learn more about any issues facing the urban agriculture community in the City and afford the new website and resources offered by agencies time to do their intended job so that we can expend city resources efficiently and effectively, focusing on any identified barriers or needs that warrant further study.

We very much appreciate the opportunity to testify and welcome further discussions with you on this matter.



June 11, 2019

Dear Councilmember Salamanca, Espinal, and other Councilmembers of the Land Use Committee,

My name is Qiana Mickie and I am the Executive Director of Just Food. Just Food is an grassroots nonprofit based in New York City with the aim to shift the power, health, and wealth of historically and economically marginalized communities - in particular Black, Latinx, other communities of color, LGBTQ, mixed income, and small- scale farmers/producers. Just Food connects NYC institutions, businesses, and individuals with sustainable small to mid-scale regional growers and trains community leaders as they work collectively toward a more economically viable and democratic food system, grounded in principles of cooperation, solidarity, and equity. Just Food currently has a network of over 120 CSAs, 30 Community-Run Farmers Markets, and has trained hundreds of community members as chefs, advocates, and managers/operators of community food projects throughout the city. We estimate over 108,000 New Yorkers have access to locally grown produce from our collaborative efforts with partners.

I submitted testimony at the last hearing in 2017 on Int. 1661 that expressed concerns that the consideration of an comprehensive urban agriculture plan. With Int. 1058-2018 being identical in all respects with the exception of the urban agriculture plan being posted on the DCP website by July 2019, while I am in support of comprehensive urban agriculture policy, I must lift up remaining concerns that Int. 1058 as it is now still misses critical key findings/evidence that grassroots groups like Just Food as well as city agencies such as DCP explored and lifted up within the past 2 years between these two resolutions that would move us closer to a comprehensive plan. These critical elements should not go unanswered and the introduction of a new bill should reflect the lessons learned to support the breadth of NYC urban ag- in particular in communities that have been the most impacted.

To ensure a comprehensive urban agriculture plan for New York City, there must be a tenet of racial, economic, and environmental equity within the legislation. As I mentioned in 2017, to have a comprehensive plan, it must include and benefit those who have worked the soil, grown food, and developed community at great expense and livelihood. Most of this work was done with little resources, much grit, sweat equity, and by folks of color. In addition, this policy must also acknowledge and leverage the inherent power of city agencies that have influence and purview of city land, water, agriculture, food, soil, and neighborhoods. Addressing equity within

systemic structures like policy must be explicit, clear, and intersectional. The need for equity within the introduction of urban agriculture plan was lifted multiple times as a critical component in the past 2 years such as at the 2017 urban ag hearing here and the 2018 Urban Ag Town Hall convened by BK Borough President Adams. This current bill, Int. 1058 still does not explicitly mention equity within the development comprehensive plan.

In my testimony today, I would like to lift up the areas in INT. 1058 around zoning, land, and enterprise that could increase equity within NYC urban ag and recommendations.

Int. 1661 required 3 city agencies to develop a urban agriculture website. That metric was met and has been a helpful resource to New York City residents eager to learn more about urban agriculture. Just Food is appreciative of the efforts of DCP to support urban ag. DCP and Just Food last fall along with Yemi Amu of OKO Farms, an aquaponics farmer in BK, collaborated together and shared information with the community on innovations of urban ag currently supported within our current zoning ordinances. Further, on the urban ag website in the information from DCP, it clearly states "Zoning allows agricultural uses in all residential districts, the vast majority of commercial districts, and all manufacturing districts. The only area where agriculture is not permitted by zoning is within C7 districts, which are intended for amusement parks. Agricultural uses include personal gardening, community gardening, commercial farming, indoor farming such as hydroponics and aquaponics, rooftop greenhouses, and more." Just Food still affirms the findings and analysis of DCP in regards to urban agriculture. There is no need to further reconsider nor change the zoning resolutions to support the breadth of urban agriculture in the city. Int. 1058 holds older language left from Int. 1661 when other vested interests in ag tech were advocating for zoning changes. This must be taken out. After much research and shared learning with DCP, it would be harmful to venture into changing the zones. This is how neighborhoods flip and are vulnerable to development, gentrification, community displacement.

On the topic of land, based on the Urban Ag survey of 2018 completed by multiple grassroots groups like Just Food and the NYC Community Garden Coalition, among others, Stephanie Alvarado a community leader and current Just Food Board member offered in her testimony that 75.4% of respondents stated the highest top garden farm need is to "ensure the continuous preservation of my garden or farm as community land". Land tenure is connected to land ownership. While the majority of NYC public growing land is under license provisions under NYC Parks & Recreation, an comprehensive urban ag plan would include policy that encourages and explores multiple forms of community land ownership. This would shift the power of land stewardship to the actual environmental stewards - the community gardeners and residents. The City has supported other community land trust legislation and Just Food feels strongly that urban ag policy like INT. 1058 and other policies in the city continue to be explicit and supportive of community land trust and other cooperatives approaches in particular to those holding arable, growing land. Vacant lots, land under new development, under utilized city land, and even community gardens should be considered opportunities for CLTs and other cooperative structures.

For an urban ag plan to be comprehensive it must acknowledge and address the inequitable power within community. Urban ag efforts are inherently inter-sectional and can amplify environmental and community resiliency. Community stakeholders need additional inroads to inform urban ag policy and future measures in conjunction with city agencies. It was reiterated at the 2018 Urban Ag Town Hall the multiple touch points urban agriculture has across city agencies. While there have been some strides in increasing community engagement by elected officials in the past 2 years, we continue to be faced with struggles to fully engage with diverse stakeholders of urban ag. Also, that urban ag efforts will need access to resources beyond the city budget.

In consideration of number 6 and 9 in INT. 1058, Just Food recommends that urban ag be seen as a critical part of addressing our city's residency, sustainability, and climate change. Just Food recommends to minimize barriers and better engage the municipal levers of power within city agencies that a director role be created for Urban Ag to handle urban ag initiatives, policy, and engage diverse stakeholders and that it live within the offices of Office of Sustainability or Office of Resiliency & Recovery. We believe it would ensure Urban Ag initiatives have access to private/public funding, the Director of Urban Ag to be direct contact with other intra- agency decision makers and be executed with cohesion with the other resilient and sustainable efforts of the offices ORR and/or OS. In addition, an Urban Policy Council or taskforce be developed that consisting of multiple seats for diverse stakeholders such as community based growing appointees, community land appointees, commercial growing appointees, youth, grassroots policy advocates, and community leaders. This groups would inform/confer with Director of Urban Ag on priorities, planning, and funding allocations.

To truly increase healthy food access in NYC -in particular to hyper locally grown food, an comprehensive urban ag plan must address enterprise of hyper local growers. Specifically, the infrastructure needed to aggregate, distribute, process,store, and sell food grown within the 5 boroughs. Currently, the infrastructure that exists has gaps in the value chain which has severely limited the enterprise of hyper local growers and producers. Community based growers on public land also face limitations on their power to fundraise and generate and allocate profit due to their lack of a business entity and also the current regulations of their licenses. Community based enterprise needs profits to cover costs beyond supplies and equipment. They need access and eligibility to capital and grants. For profit businesses and other vest ag tech groups are well resourced and funded in order to leverage financial and capital tools. This inequity can and should be addressed in urban ag policy such this initiative.

As we know the majority of urban ag growing land is under the purview of NYC Park & Recreation. While there have been revisions to the handbook and rules for growing - what is still not clear is the concept of profit and enterprise on public land. There needs to be continued efforts across city agencies and departments to ensure regulations and policy alignment in the support of urban ag production, procurement, and selling that does not unintentionally leave out public land use. Int. 1058 numbers # 7 & 8 touch on job creation, but as community based

research and policy understanding has shown - the city needs to lead the way to ensure clarity and legislation that allows public lands specific ways to generate profit and stimulate community based enterprise such value added food production and job creation. Int. 1058 should in fact include language that stimulates interagency engagement that will prioritize clarifying language across rules and jurisdictions so that community based enterprise is allowed and supported including on public land. It is not just growing food that is needed to increase food access in the city, but infrastructure such as community based food hubs, shared commercial kitchens, processing for value added products, cold/dry storage for small-scale and hyper local chefs, growers, producers, and businesses. To truly shift power and increase food access in our neighborhoods, community based groups need to be eligible and access available capital and other resources. Funding should also be considered on the city to be made available to support these efforts. Improved urban leg policy could also potentially dovetail well with other food based policy initiatives being introduced in the city such as the Good Food Local Purchasing Program. Concerted efforts through policy could ensure legislation is being written and passed that addresses equity and does not further marginalized communities, but instead can stimulate regenerative neighborhood based growth. This will build clear precedence and runway for these groups to leverage tier own collective capacity to build food based enterprise and access funds from the state and potentially federal as urban ag resources become available.

Transformative change comes from solidarity. New York City has the opportunity to authentically engage the grassroots leaders, municipal agencies, and other stakeholders to build a comprehensive urban agriculture plan that amplifies equity to the most impacted, stimulates growth, and enterprise. I urge the Committee to consider the aforementioned suggestions to ensure racial, economic, and environmental equity and resilience in the adaptation and passing of Int. 1058 and any other urban agriculture resolution.

Thank you.

Qiana Mickie

Executive Director
Just Food



Testimony of Keith Carr, Program Manager, Food Access, City Harvest

New York City Council Hearing of the Committee on Land Use

June 11, 2019

Developing a Comprehensive Urban Agriculture Plan.

Good morning Chairperson Salamanca and members of the Committee on Land Use. Thank you for holding this timely hearing on how to best develop a comprehensive urban agriculture plan in New York City. My name is Keith Carr and I am the Manager for Food Access at City Harvest.

I testify today to state our continued concern for those hungry in the communities we serve. At a time of mounting uncertainty regarding support at the federal level, we look to the city to remember the many low-income New Yorkers striving to balance food security, personal well-being, and costly housing. The need for emergency food in New York City is staggering and by itself it cannot meet the needs of all hungry and food insecure New Yorkers.

A robust, inclusive and comprehensive urban agriculture plan for our city would dramatically address the variety and amount of affordable nutritionally dense produce and eggs available in the communities that we serve and alleviate the dependence on emergency food programs by our neighbors.

Background

City Harvest pioneered food rescue in 1982 and, this year, will collect 64 million pounds of excess food (58% of which will be fresh produce) to help feed the nearly 1.3 million New Yorkers struggling to put meals on their tables. Through relationships with farms, grocers, restaurants, and manufacturers, City Harvest collects nutritious food that would otherwise go to waste and delivers it free of charge to 500 soup kitchens, food pantries and other community food programs across the five boroughs. In addition, our *Programs* work addresses long-term food insecurity through community partnerships that work to increase access to desired, nutritious and affordable and wholesome food.

Urban Agriculture Can Improve Food Security

We at City Harvest know we cannot tackle hunger in NYC alone. We look to both public and private partners to collaborate on this critical issue. Just as we partner with upstate and local agriculture to provide food for hunger New Yorkers, a significant collaboration with hyper-local urban farming will provide even more support to the emergency feeding partners we serve.

NYC has 14,000 acres of unused rooftops; the neighborhood of East New York, Brooklyn alone has more than 45,000 square feet of publicly-owned, unused land. An organized and determined approach to a comprehensive and inclusive plan to urban growing could greatly expand healthy foods availability to food insecure communities. Increasing fresh fruits, vegetables, and animal products (fish, honey and eggs) in those communities will improve local food security and nutrition.

Urban farming has grown by more than 30 percent in the United States in the past 30 years. It has been estimated that urban agriculture can meet 15 to 20 percent of global food demand.

In Cuba, over 300,000 urban farms and gardens produce about 50 percent of the island's fresh produce supply, along with 39,000 tons of meat and 216 million eggs. Most Cuban urban farmers reach yields of 44 pounds per square yard per year. 1,200 acres of land would produce 88 million pounds of vegetables—enough to provide 220 pounds per year per person to almost 400,000 residents.

The communities that we serve typically have poor traditional retail access points to fresh fruits and vegetables, particularly green leafy vegetables and usually there is very little variety among the options. Affordability is always a challenge and as the retail landscape in many gentrifying areas improves, the retailers' prices often increase and they begin stocking the shelves with more items that may be unfamiliar to longtime residents.

A common misconception in poor communities is that healthy food is too expensive and they can't afford to eat healthy. This belief is substantiated by store operators who often inflate prices on produce items that are typically inferior in quality and freshness.

The development of more farm stands, food box distributions and farmers' markets at community gardens, urban farms and hydronic farms will provide an increase to the variety and availability of green leafy vegetables and other produce that is an affordable (and in many cases) free alternative traditional retail outlets. Cooking demos and tastings at these sites are very effective in encouraging customers to purchase new items and cook them in a more healthy way.

Other benefits to the food insecure community:

- More access to and consumption of healthier green leafy vegetables and produce.
- Cost savings frees more funds available to purchase other items at supermarkets.
- Less reliance on food pantries especially during the growing season.
- Increase knowledge of where their food comes from and the benefits of hyper locally grown food

The Phoenix Community Garden (Ocean Hill, Brooklyn), The Campaign Against Hunger (Bed Stuy and Far Rockaway) and Teens for Food Justice (DeWitt Clinton High School (Bronx) and Brownsville Collaborative Middle School (Brownsville) are exemplary examples of urban agriculture's power to not just educate and feed residents but to also create community, stimulate the local economy and develop jobs. I encourage you and members of this committee to visit these farms and others.

Last year, Governor Cuomo, recognizing that community gardens provide critical opportunities for healthier lifestyles released significant funding to support the infrastructure of 22 gardens in Central Brooklyn through his Vital Brooklyn Initiative. He has also empowered the NYS Department of Ag and Markets to enhance the local food retail landscape with substantial grant funding to encourage more farm stands, markets and food box distributions at gardens and CBOs in the communities we serve.



Any plan for urban agriculture in this city must include proposals to provide for and aggregate urban growing by or in support of emergency feeding programs.

Impact of Rezoning on Food Security

As urban ag "tech" represents an exciting opportunity to feed New York and create a new job sector; it and the potential influx of speculation and funding also raise concerns that those who sowed and nurtured the community growing movement over the last 40 years may be forgotten and their communities effected to make room for this new lucrative industry, so we ask that this process be inclusive and fair.

We appreciate the Department of Health and City Planning hosting the first ever Deep Dive on the impacts of rezoning on food security in New York City in your District and we're happy to contribute to that important conversation.

It is important to consider the impact of city planning processes, including rezoning, on food security. We know that the increased rent burden that often precedes and accompanies rezoning processes exacerbates food security for families across New York City and causes many others to have to begin making trips to pantries and soup kitchens.

We also know that commercial displacement affects our bodega and supermarket partners.

Thank you for ongoing commitment to ensuring rezoning processes are done equitably and have a positive impact on food security in New York City

We welcome the opportunity to collaborate with the City and work towards creating new opportunities to move the dial on healthy food access.

Conclusion

City Harvest remains optimistic and eager to work with the Administration and support its genuine efforts to alleviate hunger for all New Yorkers. Food insecurity is not only destructive on a personal level; the ripple affect can cause lasting social and economic damage throughout the community. Thank you for your earnest determination to address the pervasive hunger that continues to threaten our great City.

Testimony by Wylie Goodman, M.R.P., New York City-based Urban Planner and Lead Author of “Will the Urban Agriculture Revolution Be Vertical and Soilless: A Case Study of Controlled Environment Agriculture (CEA) in New York City” published in March 2019 in the journal *Land Use Policy*.

Good morning.

My name is Wylie Goodman and I am an urban planner and the lead author of a recently published article in the journal *Land Use Policy* titled “*Will the Urban Agriculture Revolution Be Vertical and Soilless: A Case Study of Controlled Environment Agriculture (CEA) in New York City.*” The article, based on a far-reaching master’s thesis in City and Regional Planning (Cornell University, 2017), examines the entirety of public, private, and nonprofit activities in the CEA sector in New York City and includes a qualitative exploration of the career outcomes of young people who received CEA training at Cornell University Cooperative Extension in New York City. Prior to earning my master’s degree, I worked for four years for NYC Parks/Partnerships for Parks, where I co-led the citywide launch of People Make Parks (www.peoplemakeparks.org), an online toolkit to engage the public in NYC Parks’ capital and design process. My interest in urban green space extends to my personal life: I am a former student with Farm School NYC, a nonprofit that trains residents in urban agriculture to build self-reliant communities and inspire positive local action around food access and social, economic, and racial justice. I currently serve on the board of Earth Matter NY, a nonprofit farming center affiliated with DSNY’s New York City Compost Project.

I am here today to urge support for Councilmember Espinal’s proposed legislation (Int. No. 1058) to create a comprehensive urban agriculture plan for New York City. If passed, the plan would put New York City on par with major U.S. municipalities such as Los Angeles, Chicago, and Boston, among others (e.g., Seattle, San Francisco, Detroit, Baltimore, Cleveland) in prioritizing agriculture as a land use not merely compatible with urban life but enhancing of it.

Agriculture – defined by the U.S.D.A. as the science or practice of farming, including growing crops and raising animals for the production of food, fiber, fuel and other products – may seem antithetical to New York’s densely built environment, but as anyone who has visited any of our 550 community gardens, 30-plus educational hydroponic and soil-based, 10 and growing for-profit rooftop and indoor, and six NYCHA farms can attest, the determination to farm here has grown steadily in the last decade and appears poised for continued expansion.

Why then in this robust environment is a comprehensive urban agriculture plan needed? Isn’t it enough that community members can contact GreenThumb or search the website of 596 Acres to find vacant public and private land on which to farm or that commercial farmers can avail themselves of the NYC Urban Agriculture website, created through Int. 1661-2017 to learn the zoning regulations that apply to where farms can be sited or produce sold?

Unfortunately, no.

Because even as interest in agriculture has risen, community-based farmers, particularly farmers of color’s are still constricted in their ability to engage in safe and sustainable production due to lack of resources and information. In parallel, over 1 million food-challenged New Yorkers most in need of agriculture’s sociocultural, health, environmental, and economic benefits remain far from fully accessing these eco-services for similar reasons. And while commercial agriculture is encouraged in nearly every New York City zoning district, financial, legal, and land use obstacles reduce the degree to which entrepreneurs can consider New York as a viable location in which to build new businesses. In sum, a comprehensive UA plan could address these barriers, ensuring more of those who want to farm can do so successfully.

How would the plan accomplish this? By bringing together diverse stakeholders and city agencies (e.g., NYCEDC, DOE, DOHMH) to formulate shared goals, determine targeted strategies and, unlike many cities, measure whether objectives are achieved. In this, New York can benefit from both studying these cities’ experiences, while bringing to the process an innovative spirit synonymous with New York.

Which is why I want leave you this morning by recommending that when --- not if -- this bill passes, we use our imaginations to envision a dynamic biophilic future for NYC in which nature is interwoven into the landscape of our infrastructure, open spaces, and waterways. This 21st century New York could include everything from kelp harvesting in the East River to cricket production

in once-abandoned factories and beyond. If we plan for that eventuality, New York City can reassert its position as an urban agriculture leader and, more importantly, prepare the city's 1.1 million public school students for careers in a regional economy where the broad range of food, agriculture, natural resource, and human science (FANH) professions stand to play a critical role in our green new future.

Thank you.

Testimony to The New York City Council Committee on Land Use

Submitted by Kristin Reynolds, Ph.D.
Forest Hills, NY

June 11, 2019

Dear Council Members, Dear Committee Members:

Thank you for the opportunity to submit testimony for today's hearing on Int. 1058-2018 – A Local Law in relation to developing a comprehensive urban agriculture plan.

I am a resident of Forest Hills, Queens and co-author of two recent studies on New York City urban agriculture: *Five Borough Farm: Seeding the Future of Urban Agriculture in New York City*, a report published in 2012, documents farming and gardening throughout the city, and identifies opportunities to strengthen this practice through citywide policy. *Beyond the Kale: Urban Agriculture and Social Justice Activism in New York City*, a book published in 2016, illustrates how some urban farmers and gardeners work to advance social and economic equity, in addition to growing healthy food for their communities.

I am currently conducting research on commercial urban agriculture (CUA) and attendant policy changes in New York City and Paris. Commercial and high-tech urban agriculture are in evolution in both cities; And, policies, at city- and national scales are responding to these changes. This is logical in the United States, given that agriculture is defined at the federal level, by the US Department of Agriculture, as a commercial activity. And, it has potential ramifications for the diversity of urban agriculture and its potential to provide social, ecological, community, and economic benefits to city residents.

Today, I would like to share brief points about these evolutions from piece that my colleague Ségolène Darly and I published recently through the CUNY Urban Food Policy Institute, followed by two points specifically relevant to today's hearing:

A. From Reynolds and Darly, 2018¹

"A recent assessment estimated the potential economic value of ecosystems services (including food production) of urban agriculture, globally, between \$88 to 164 billion in 2010 dollars (Clinton et al. 2018).

¹ Reynolds, K. and Darly, S. (Equal authorship.) (2018). "Commercial Urban Agriculture in the Global City: Perspectives from New York City and Métropole du Grand Paris." *Food Policy Monitor*, 12/11/18. City University of New York Urban Food Policy Institute.

And, if investment in 'high-tech' urban agriculture suggests profitability, there is at least an expectation that the burgeoning CUA sector will produce strong economic returns.

In policy contexts in which agriculture is defined by economic activity, these expectations may already be earning (commercial) urban agriculture a seat at the agricultural and/or urban policy making table [...]

- What might policy changes for urban agriculture, in the context of an expanding 'high-tech' urban agriculture sector, mean for social justice, particularly in cities that are home to diverse urban agriculture groups with different objectives and serving different communities or clientele?
- What are the most effective processes for crafting new-, or revising existing urban agriculture policies to ensure economic equity?
- What barriers prevent such policies from being created, enacted, and implemented?
- And, because cities and regions "learn" from each other with respect to policy change, how might policies that recognize *intramuros* commercial urban agriculture in one political context inform policies in another, and how might such exchanges be used to support social justice [and equity]?

Our research on the shifting landscapes of urban agriculture examines these questions in the context of New York City and Métropole du Grand Paris, and as they pertain to creating sustainable, resilient, and equitable global cities throughout the world."

B. Specific relevance for Int. 1058-2018

New York is a Global City: It will invariably continue to embrace the technology sector, including as it pertains to urban agriculture.

Two things would strengthen the integrity of a comprehensive urban agriculture plan for New York City in this context are as follows:

1. A comprehensive urban agriculture plan for New York City must support a diverse system that enables it to support the needs and preferences of all New Yorkers.

In planning for the future of the City, New York needs a resilient community-based urban agriculture system—one that is resilient not only in terms of producing food, stewarding green spaces, and serving as green infrastructure, but also in terms of supporting the strength of all city residents and communities.

To cite one example, according to the NYC Food Policy Director's 2018 Food Metrics report, over 14% of New York City residents are food insecure.² This is *not* because there is not enough food available, whether in supermarkets or grown at urban farms, but rather, because of poverty. New technologies can, and should be part of the solution to these social problems, but they cannot be the only, or main solution if we want to realize an equitable city.

The City should be reflective in its embrace of high-tech commercial urban agriculture, particularly with regard to social equity and community self-determination.

2. Due to the diversity of interests represented in New York City urban agriculture (which I and others have documented in detail, and many more know from years of experience), **the City should formally engage informed and experienced individuals and members of the community in developing the comprehensive urban agriculture plan.**

The city of Philadelphia is currently undergoing such a process, following successful initiatives to develop urban agriculture plans and policies in several other North American cities including Toronto, Detroit, and Chicago.

New York City, with its wealth of human resources and various forms of urban agriculture expertise, should strive to do at least as well as these cities in developing a comprehensive urban agriculture plan. Doing so would help create a context in which urban agriculture serves all New Yorkers.

New York has a rich and diverse history of urban agriculture—one that is regarded around the world as a model for innovative farming and gardening. A comprehensive urban agriculture plan should live up to this reputation, making New York City a model for just and equitable urban agriculture *policymaking* in the 21st Century.

Sincerely,



Kristin Reynolds, Ph.D.
Forest Hills, NY
kristin@foodsolarshipjustice.org

² Food Metrics Report. (2018). NYC Office of the Mayor, NYC Office of Food Policy.



Will the urban agricultural revolution be vertical and soilless? A case study of controlled environment agriculture in New York City

Wylie Goodman^{a,1}, Jennifer Minner^{b,*}

^a Cornell University, Department of City and Regional Planning, Ithaca, NY, 14853, USA

^b Cornell University, Department of City and Regional Planning, 204 W. Sibley Hall, Ithaca, NY, 14853, USA

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ABSTRACT

Controlled environment agriculture (CEA) is an emerging form of farming increasingly found in cities worldwide. Advocates promote CEA as the future of food production, arguing for its potential to address challenges ranging from climate change to food insecurity. Detractors state that CEA's narrow focus on high-end produce, along with its intensive capital and energy needs, limit its meaningful contribution to the urban food system. Over the last seven years, New York City has become an epicenter for urban CEA, offering planners an in-situ setting in which to evaluate its impact. The following case study examines the current state of CEA in New York City, its composition, requirements, and future. The authors identify CEA's relative contributions, which include providing a small number of green-sector jobs and increasing access to produce in low-income communities. In parallel, they question if CEA provides sufficient benefits to warrant public-sector support. Recommendations for cities considering CEA include critically analyzing its purported benefits; evaluating the environmental, economic and social potential of projects located on publicly-owned rooftops and land; and focusing incentives on nonprofit and institutional production that show clear community benefits.

1. Introduction

Over the last decade, urban and peri-urban agriculture (referred to as 'UA' in the following article) have received increased attention from urban planners (Hodgson et al., 2011; Kaufman and Bailkey, 2000; Mendes et al., 2008; MacRae et al., 2010; Nugent, 2000; Pothukuchi and Kaufman, 1999; Pothukuchi, 2004; Pothukuchi and Kaufman, 2000; Wekerle, 2004). Interest in urban agriculture has been spurred by a confluence of factors, most notably the demographic shift leading to two-thirds of the world's population becoming urbanized by 2050 (United Nations, 2012) and concerns about how this burgeoning populace will be sustainably fed (Steel, 2012; Thomaier et al., 2015; Weber and Matthews, 2008). Threats to future food provisioning are manifold, with environmental degradation due to industrial farming (Brown and Carter, 2003; Kissinger et al., 2012; Pothukuchi and Kaufman, 2000) and erratic weather precipitated by human-caused climate change two of the most urgent challenges. Together, these concerns have led to calls for a new approach to farming (Intergovernmental Panel on Climate Change, 2007), including re-envisioning cities as settings for production-level agriculture and emphasizing growing food more efficiently and closer to where a larger

share of the world's population lives.

While the planning profession has long recognized the benefits of green space within the built environment (Lawson, 2005), planners have not historically championed the co-existence of commercial farming with city life. This is largely a byproduct of planners' pivotal role in developing modern zoning codes, which aimed to separate land uses incompatible with one another, among them industrial/manufacturing and residential housing.

The re-envisioning of agriculture as a beneficial urban land use is thus a relatively recent phenomenon, one that grew largely out of grassroots efforts by residents in low-income neighborhoods in the United States in the 1960s and '70s to put neglected vacant land back into productive use. Over time, their focus evolved into initiatives to increase food security and improve access to healthy food in places lacking grocery stores and supermarkets (Brown and Carter, 2003; Kaufman and Bailkey, 2000; Cohen, 2011; Reynolds and Cohen, 2016; Gordon et al., 2011; Saldivar-Tanaka and Krasny, 2004) and to the now-ubiquitous community gardening movement.

Although some planners initially questioned whether UA was the highest and best use of urban plots (Lovell, 2010; Mukherji and Morales, 2010), most professionals today are likely to support UA and

* Corresponding author.

E-mail addresses: wg227@cornell.edu (W. Goodman), j.minner@cornell.edu (J. Minner).

¹ Present address: 311 Columbia Street, Brooklyn, NY, 11231, USA.

acknowledge its benefits. In addition to increasing access to healthy food and improving food security (Nugent, 2000), its potential advantages include creating opportunities for millennial farmers to replace retiring rural ones (Gale, 2003; Rogus and Dimitri, 2015; National Young Farmers Coalition, 2017); reducing transportation, energy, and material expenditures along the supply chain (Blay-Palmer and Donald, 2008; Harrison, 2011; Weis, 2010); and improving the taste and quality of food by reducing post-harvest storage and handling (Gross et al., 2016).

Environmentally, UA has been associated with creating habitat for pollinators (Goddard et al., 2010); reducing the urban heat island effect (Susca et al., 2011); modulating microclimates and hydrology (Oberndorfer et al., 2007); productively redirecting wastewater, organic matter, and biosolids (Armstrong, 2009; de Zeeuw et al., 2011; Smit and Nasr, 1992); fixing atmospheric nitrogen (Herridge et al., 2008) and carbon (Beniston and Lal, 2012) that would otherwise contribute to climate change; and stemming farmland loss linked to peri-urban and suburban development (Haight et al., 2016; Pendall, 2003; Sorensen et al., 2018).

Socially, researchers have linked UA to strengthening social connections between farmers and consumers (Mincey and Dobernick, 2016) and nature and people (McClintock, 2010; Turner, 2011); improving livability (Frumkin, 2003; Turner et al., 2004), health, and well-being (Joye, 2007; Ulrich, 2006); and adoption of plant-based diets (McCormack et al., 2010) that lower chronic disease risk (Boeing et al., 2012).

Concerns about UA have been raised, but these tend to be more limited in scope. Among them are introduction of disease and agricultural pollutants to the urban ecosystem (Smit et al., 2001); conflicts over land use (Schmelzkopf, 1995); and the unnecessary addition of complicated and maintenance-intensive systems to urban infrastructure (Susca et al., 2011).

Most planning studies of UA in the Global North have examined community-led, soil-based projects (Opitz et al., 2015). Recently, however, a new kind of farm has emerged in cities – generally commercial in nature, larger in scale, and more technologically advanced – that planners have not deeply studied. Found in cities as diverse as Tokyo and Jackson Hole, these farms have sparked great excitement in the popular press (Shute, 2007; Venkataraman, 2008; Frazier, 2017) as well as fierce debate among plant scientists and horticulturalists (Mattson et al., 2015; Buckler, 2009; Albright and de Villiers, 2008). These urban farms use soilless systems, such as hydroponics, aeroponics, and aquaponics, and are collectively referred to as controlled-environment agriculture (CEA). Distinguishing them further is the fact that, rather than being sited at ground level, these farms are often found in or on top of buildings, leading to their being dubbed ‘plant factories’ in Asia (Takatsuji, 1987) and ‘vertical’ (Despommier, 2005) or ‘indoor’ farms (Despommier, 2009) in the U.S. and Europe. As evidence of their growing dominance, the vertical farm market’s size was valued at more than USD \$2 billion as recently as 2016 and is estimated to grow 27% by 2024 (Global Market Insights, 2017).

1.1. Brief history of controlled environment agriculture

Soilless farms in which crops are grown exclusively in water were described as early as the Hanging Gardens of Babylon (Cornell University, 2012). The term ‘vertical farming’ first appeared near the beginning of the 20th century (Bailey, 2015), with ‘hydroponics’ following shortly thereafter (Gericke, 1937). In subsequent decades, advancements in lighting and plastics made greenhouses, where growing conditions could be controlled, more affordable for commercial farmers. Aeroponic experiments undertaken by NASA’s Kennedy Space Center in the 1960s and ‘70s (Cornell University, 2012; Millam and Sharma, 2007), along with greater availability of LED lighting, further raised interest in controlled environment agriculture among a niche segment of home gardeners (Bridwell, 1972).

It was not until the last decade that CEA entered the mainstream. Much of the credit for that goes to Dickson Despommier, a professor of microbiology and public health at Columbia University, whose ‘Vertical Farming Project’ (2009) began as a class exercise, made its way to television (e.g., *The Colbert Report*), and eventually became a seminal book *The Vertical Farm* (Despommier, 2010). In so doing, he foreshadowed a tipping point in public interest and awareness about urban, vertical, and indoor CEA farming that continues to this day.

Despommier posited that while rural, soil-based farming was the historical norm, vertical and indoor urban farms offer the greatest potential for a rapidly urbanizing planet. Among the advantages he cites are their ability to maximize yields in small spaces; accommodate year-round production; reduce water usage, including contaminated runoff generated by commercial farms; eliminate the need for pesticides, herbicides, and fungicides; more effectively withstand pests, disease, and extreme weather caused by climate change; lessen reliance on fossil fuels; make healthier food accessible to low-income populations; lower greenhouse-gas emissions related to food transport; return land to its natural state; improve air quality; provide employment; and expand farming to non-arable regions.

Despommier’s enthusiasm for urban CEA, however, is not universally shared, most notably among plant scientists, who have taken a more cautious view of the economic and environmental viability of his farm-in-the-city concept (Albright, 2011; Ilaian et al., 2002; Mattson et al., 2015). Their concerns include indoor and vertical farming’s significantly higher startup costs (Mattson et al., 2015) and CEA’s comparatively higher energy demands, both in places with limited natural sunlight (Albright and de Villiers, 2008) as well as locations warm enough for year-round, soil-based growing (Barbosa et al., 2015). Some plant scientists also challenge CEA’s promise of disease and insect-free growing, given that even the most well-maintained greenhouses are susceptible to powdery mildew, aphids, mites, and other pests (Brechtner and Both, 2013).

1.2. A case study of how CEA operates in New York City

Given the lack of consensus about urban CEA’s economic, environmental and social impact, and the limited planning literature devoted to these farms, the authors embarked on a case study to examine how CEA is realized in a place where its footprint has grown tremendously over the last decade: New York City. The case study examines key categories relevant to planners: access to healthy, nutritious food; land use and real estate; employment; and environmental sustainability. Key research questions include: What is the state of CEA in New York City? How does produce grown using CEA methods contribute to the City’s food and nutrition needs (e.g., increasing food access for low-income residents)? What are the land use and real estate requirements for CEA and what space is available for its expansion? How does CEA contribute to the City’s economy, specifically in terms of providing employment? What is the potential for CEA to enhance sustainability efforts? In summary, this case study provides information about CEA practices in New York City that the authors believe other cities can use to inform their own approach to proposed CEA projects.

In the following section, we review the limited planning literature that references controlled environment agriculture within the context of UA. We then describe data collection methods used to understand this emerging sector in New York City with an emphasis on commercial growers. Next, we analyze the sector’s impact vis-à-vis nutrition and food access, environmental sustainability, land use/location, and employment. We conclude with recommendations other cities may wish to consider when contemplating public policies or proposals related to CEA.

2. Controlled environment agriculture and city planning

As described previously, urban CEA has been hailed in the popular

press as the future of farming (Frazier, 2017; Holden, 2017; Marginson, 2010). Enthusiasm includes its potential to use less water, pesticides, and herbicides than soil-based farms (Caplow, 2009; Astee and Kishnani, 2010); feed more people using less space (Gould, as cited in Brin et al., 2016); capture waste heat from buildings to reduce energy costs (Thomaier et al., 2014); reduce CO₂ emissions associated with long-distance transport (Rees and Wackernagel, 1996; Weber and Matthews, 2008); and grow crops in cleaner environments that reduce the risk of diseases such as E. coli (Orozco et al., 2008). Urban CEA has also been hypothesized to slow the loss of rural land to large-scale farming (Lehmann, 2010); provide a local alternative to imported food to increase self-sufficiency, especially in climate-threatened regions (Hodbod and Eakins, 2015; Rogers, 2017); stimulate green-sector employment (Jensen, 2015); and improve food access to low-income residents who live in areas labeled as ‘food deserts’ (Caldeyro-Stajano, 2004).

Simultaneously, urban CEA has been critiqued for being overly-optimistic (Hamm, 2015). Those who question it point to its high up-front capital costs (Bhanoo, 2014); the complexity of its profit model (de Nijs, 2017); the exposure of plants, even under cover, to pollutants, which can lead to contamination and health risks (Säumel et al., 2012; Alloway, 2004); and higher CO₂ externalities caused by 100% artificially lit systems, even factoring in energy costs associated with cross-country transport and crop loss due to shrinkage, which limit claims of environmental sustainability (Albright and de Villiers, 2008).

While planning research to validate UA claims has intensified in recent years, knowledge about the specific methods and technologies required for successful vertical, urban CEA have to date been largely theoretical (Januszkiewicz and Jarmusz, 2017) and only a handful of national and international studies have focused specifically on CEA within the context of urban planning (Januszkiewicz and Jarmusz, 2017).

One of the most extensive studies to include urban CEA is Thomaier et al.’s (2014) research on what she and her colleagues call Zero-Acreage Farming (ZFarming). ZFarming includes “all forms of food production related to urban buildings, including open rooftop farms, rooftop greenhouses, productive facades, and indoor farming on and in existing or newly built urban structures” (Thomaier et al., 2014, 44). Her study offers a useful overview of the ZFarming landscape in developed countries worldwide, but lacks an analysis of CEA’s measurable impacts within the context of a particular cityscape.

Dimitri et al. (2016) conducted the first systematic study of UA at the farm level in the U.S. Using primary survey data, she and her colleagues found that of 315 respondents, 18% identified as operating vertical, 8% aquaponic, and 5% hydroponic farms, an indicator of CEA’s growing presence nationwide. Dimitri also found that although the majority of UA operations had social aims, farms that used greenhouses, hydroponic systems, and high tunnels tended to be more profit-oriented and thus “reported higher sales than farms not using these types of structures” (Dimitri et al., 2016, p. 608). Similarly, she confirmed that “very large urban farms typically raise high-value crops, such as lettuce, in climate-controlled greenhouses through a hydroponic system (Dimitri et al., 2016, p. 608).” These crops compete on quality not price, and thus command higher prices at the retail level (Thomaier et al., 2015, as cited in Dimitri et al., 2016, p. 607–8). Beyond identifying where farms were located (i.e., on rooftops, in greenhouses, etc.), and examining the extent to which the primary farmer was able to “earn a living” (p. 608) from the farm, this research did not explore how many additional people UA farms employ or the nature of those jobs, leaving unanswered whether they are fulfilling on their promise of green-sector employment.

Another study (Ackerman et al., 2011) exploring UA’s potential in New York City offers a window into land availability and land use requirements to meet the City’s fruit and vegetable consumption demands. The authors determined that between 162,000 and 232,000 acres would be required to support New Yorkers’ basic produce needs,

not including tropical or warm-weather fruit. In parallel, they identified nearly 5,000 acres of vacant land suitable for growing, which they estimated could feed between 103,000 and 160,000 people “depending on whether conventional or bio-intensive food yield figures are used” (p. 195). Although acknowledging that the amount of land was insufficient to make New York City agriculturally independent, the authors speculated that for “specific high value, healthy crops suited to urban farming, localized production is actually feasible from the perspective of land availability” (Ackerman et al., 2011, p. 195). The authors cited “leafy greens and tomatoes” as examples of such crops, noting that “considerably less area would be needed for these vegetables to be grown hydroponically,” (p. 195). Ackerman et al. were particularly optimistic about UA’s potential to positively impact food security in neighborhoods with “low access to healthy food retail, high prevalence of obesity and diabetes, low median income, and comparatively high availability of vacant and other available land,” (p. 195). Yet even this New York City-focused research barely mentions how using CEA versus soil-based production might change their calculations; given that the City had only one rooftop hydroponic farm at the time, the oversight is understandable.

The same limitation is found in research conducted by Nevin Cohen, one of the most prolific planning scholars reporting on New York City’s UA landscape. In books he co-authored, among them *Five Borough Farm* (2012) and *Beyond the Kale* (2016), he mentions CEA as one of among many contributors to the City’s diverse UA offerings, but its specific characteristics and contributions are not articulated because of commercial CEA’s nascency at the time of his writing.

Gundula Proksch’s recent book on UA (Proksch, 2017) offers a brief discussion of CEA. This includes a profile of architect Weber Thompson’s conceptual design for Newark Vertical Farm, a mixed-use building incorporating commercial growing operations in Newark, New Jersey. The book provides important insights into UA generally, and points out the importance of land use laws and building codes to UA and CEA, but does not provide an in-depth evaluation of CEA as a distinct entity.

In sum, there is a dearth of information about indoor and vertical CEA in urban areas, particularly information that can help planners and policymakers understand its physical requirements and social, environmental, and economic impacts. This study, conducted between 2016 and 2018, addresses that gap with a case study in New York City that has applicability to other cities of similar diversity.

3. Research methods

This research was undertaken for Cornell University Cooperative Extension – New York City (CUCE-NYC) on the state of controlled environment agriculture in New York City and its relationship to youth workforce development.² Data was collected from publicly available sources, including federal, state, and municipal datasets (e.g., USDA, BLS); industry publications and reports (e.g., IBISWorld, ESRI); academic journals; articles in the popular press; and social media (e.g., blog, website posts). Information about the commercial sector was supplemented with data from a 2016 international survey of CEA businesses by Agrilyst, a CEA-focused software development company in New York City. Data about funding to CEA nonprofits came from information accessed through the website of The Foundation Center, a nonprofit that gathers and publishes information about philanthropy, charitable organizations, and the nonprofits they fund. To evaluate how New York City’s public sector has supported CEA, the researchers identified capital and discretionary funding from the New York City Council’s website as well as publicly available news reports about

² The focus of the entire study (Goodman, 2017) was to gather and analyze data to assess implications for CUCE-NYC in its teaching CEA to youth through its Hydroponics / Aquaponics / Aquaculture & Science, Technology and Sustainable Agriculture Education Program.

funding initiatives. Six interviews were conducted with representative individuals engaged in CEA in New York City, divided equally across the public, private, and nonprofit sectors. Data about land and building stock were assembled from publicly available sources and analyzed using geographical information systems software (ArcGIS).

4. Results

This research project yielded information about public support for CEA in New York City; the composition of the emerging CEA sector; and the location, land use, and real estate requirements of the industry and its capacity to grow. Additional information gleaned in this research highlights the range of CEA technologies, their sustainability, and the number and type of people employed in for-profit CEA ventures.

4.1. A context of public support for CEA

In New York City, interest in sustainable food systems planning emerged in a context where there was limited but growing awareness in the U.S. of the value of urban agriculture among urban planners and local government officials (Brinkley, 2013; Campbell, 2004; Kaufman, 2004; Hodgson, 2012; Hodgson et al., 2011; Raja et al., 2008). Many New York City’s officials have, over the past decade, expressed support for urban agriculture and its contribution to New York City’s social, physical, and economic health (Adams and Espinal, 2017; Brewer, 2015; Mesa and Callahan, 2015). For example, after becoming Mayor, Bill de Blasio, in his signature *OneNYC: The Plan for a Strong and Just City* report (2014), noted that urban agriculture “plays a small but critical role in communities underserved by quality, affordable, fresh food,” (Mesa and Callahan, 2015, p. 137). The report further states:

Urban farming provides opportunities for residents to engage in growing local produce, educates children about nutrition, and offers training in food preparation, gardening, and retailing skills... We will study additional emerging urban agriculture opportunities, such as vertical farming projects, to activate underutilized light industrial space and offer related community programing. (Mesa and Callahan, 2015, 135)

Among public officials, Manhattan Borough President (BP) Gale Brewer and Brooklyn BP Eric Adams have been two of the more vocal supporters of urban agriculture generally and CEA specifically. In 2015, Brewer released *How Our Gardens Grow, Strategies for Expanding Urban Agriculture*, a report that outlined urban farming’s benefits and offered recommendations for its expansion. In 2015, BP Adams initiated *Growing Brooklyn’s Future*, a \$2-million-dollar initiative to bring

hydroponic urban farming to 12 high schools in Bedford-Stuyvesant, Brownsville, Canarsie, Cypress Hills, and East New York (Harney, 2016). In 2016, Adams allocated an additional \$560,000 to support greenhouse education at four schools and announced plans to invest more than half of his Fiscal Year 2017 capital budget (\$26 million) to improve science, technology, engineering and mathematics (STEM) education initiatives in nearly 150 schools across the borough (Harney, 2016). Adams has also spoken publicly, for example at Brooklyn Law’s *Growing Greens in the Grid: The Future of Urban Agriculture in NYC*, about urban farming’s potential to revolutionize the borough’s relationship to food and the environment and create jobs in the biotech industry (Brooklyn Law School, 2017). Together with Councilman (CM) Raphael Espinal, Adams also introduced legislation calling for the New York City Department of City Planning to create a comprehensive urban agriculture plan to capitalize on the urban farming movement and use it to address community and youth empowerment, economic development, healthcare, and land use (Adams and Espinal, 2017). Although the plan has not advanced, an interim Local Law (Int. 1661-A 2017) has resulted in the creation of an official New York City urban agriculture website that serves as a landing page for interested farmers (City of New York, 2019).

Other New York City Councilmembers have also shown support for UA. The current NYCC Speaker Corey Johnson, as early as 2015, introduced a Local Law to amend the New York City Charter to create an urban agriculture advisory board. Other Councilmembers have provided discretionary and capital funding totaling over \$2.6 million to support CEA projects, many in schools. Even the general public, through the NYCC’s Participatory Budgeting (PB) process, has begun to weigh-in with its support; of 1,491 PB projects selected since 2012, 16 (1.07%) involved greenhouses and/or hydroponic gardening, representing \$5,225,000 of \$430,906,035 (1.21%) in total funding (The City of New York, 2018).

4.2. Composition of CEA in New York City

Over the last seven years, New York City has become home to six commercial CEA farm companies; five companies that sell, develop, or manufacture CEA technology or products; two restaurants that incorporate CEA as a signature feature; and one firm that specializes in CEA consulting, lobbying, and advocacy. A supermarket that maintains a hydroponic farm on its roof was the City’s first, established as early as 1995. There are also six social service agencies that use CEA to grow food for low-income clients, five youth-focused CEA nonprofits, and 133 public schools that provide hands-on CEA learning, many in collaboration with a CEA nonprofit.

Table 1
CEA Producers and Affiliated Commercial, Institutional, and Community Farms and Gardens as of June 2018. (The number of farm locations each entity operates is indicated in parentheses.).

Commercial Farms	Institutional Farms	Community Farms	Community Gardens
Edenworks (1) Eli Zabar’s Vinegar Factory (1) Farm.One (2) Gotham Greens (3) Oko Farms (1) Sky Vegetables (1) Square Roots (1) ^a	University and school-based programs: - Cornell University Cooperative Extension-NYC (26) - New York City Public Schools with CEA farm project but no known nonprofit CEA Affiliation (17) Nonprofits (many affiliated with CEA programs in schools) - Green Bronx Machine (3) - Harlem Grown (6) - New York Sun Works (72) - Seed Street (1) - Teens for Food Justice (5)	Nonprofits (and affiliated nonprofits where produce is grown or distributed): - Boswyck Farms ^b in conjunction with CAMBA, Child Development Center, Fountain House, Los Sures, Project FIND, Hamilton Senior Center (5) - Project Farmhouse, a program of Grow NYC - Oko Farms, in conjunction with the Northeast Brooklyn Housing Development Corporation	None identified.

^a Square Roots includes approximately 8 to 10 Freight Farm containers each operated by its own “Next-Gen Farmer”.

^b Although Boswyck Farms’ owner relocated to California, the organization set up partnerships with the nonprofits listed above that are still in operation.

Using *Five Borough Farm's* designated typologies (Cohen et al., 2012), which include Commercial Farms, Institutional Farms, Community Farms, and Community Gardens, the authors identified three of the four types among New York City's CEA farms and affiliated entities (Table 1).³

4.2.1. Commercial farms

Commercial Farms aim to maximize crop performance to achieve profitability while sharing the broader UA community's social goals (Cohen et al., 2012). New York City's 10 commercial CEA locations (overseen by seven companies) are located across four of the City's five boroughs: Manhattan (n = 3), Queens (n = 2), and the Bronx (n = 1), with Brooklyn having the highest concentration (n = 4).

Produce grown at Commercial CEA Farms reaches consumers in a variety of ways. Gotham Greens has the widest distribution network, one that includes online retail, wholesale provisioning to mid-priced supermarkets, high-end grocers, and Zagat-rated restaurants. Edenworks has a narrower reach that includes select Whole Foods and mid-priced groceries (e.g., Foodtown). Square Roots initially hand and bike-delivered produce to its customers, but consumers can now buy its microgreens at 24 New York City grocers. Farm.One focuses on direct sales to restaurateurs, while Sky Vegetables offers online ordering for its grocery stores and has a vendor relationship with a restaurant in Connecticut. Eli Zabar sells his rooftop-grown CEA produce exclusively at his store, the Vinegar Factory.

4.2.2. Institutional farms

Institutional Farms include those affiliated with hospitals, churches, prisons, schools, or public housing developments. Their primary mission is not food production, but they have goals UA supports (Cohen et al., 2012). There are 57 Institutional CEA locations in Brooklyn, 50 in Manhattan, 13 in Queens, 10 in the Bronx, and 1 on Staten Island, most connected to public schools. The seven associated nonprofits are based in Manhattan (n = 4), the Bronx (n = 1), and Brooklyn (n = 1); Boswyck Farms was in Queens before its founder relocated to California. Together they helped establish CEA's presence in over 130 New York City public schools. Among Institutional Farms, the most active is New York Sun Works, which has supported CEA projects in 72 New York City public schools (New York Sun Works, 2018). Except for Cornell University Cooperative Extension – NYC, which began offering CEA programs to youth in the 1970s, all others were founded in the last seven years.

While the researchers were unable to obtain a definitive list of produce grown at Institutional Farms, lettuce, herbs, and leafy greens were either reported by interview subjects or identified on organizations' websites. Institutional Farms based at schools often share their produce with students, with a smaller percentage donating excess to community partners such as food banks and homeless shelters. School-based CEA systems are sited either in classrooms or on rooftops as attached greenhouses. Our research estimates that some form of CEA programming is available at approximately four percent of New York

City's 1,878 public elementary and/or middle schools and 11 percent of its 400 public high schools.

4.2.3. Community farms

Community Farms are communal growing spaces operated by nonprofits that engage local neighborhoods in food production while providing social and educational programming (Cohen et al., 2012). Community Farms are located overwhelmingly in Brooklyn (n = 4), followed by Manhattan (n = 2) and the Bronx (n = 1). CEA can be found at six Community Farms run by nonprofits that serve low-income clients and one that serves as a demonstration indoor farm within the context of a public-facing education center (Project Farmhouse). A number of Community Farms were constructed by a CEA-focused nonprofit (Boswyck Farms) that trained receiving agencies to maintain them independently. The risks of this are evident in the fact that many later closed due to lack of succession planning following staff turnover.

The approximate amount of food produced on Community Farms is not readily available, but lettuce, herbs, and leafy greens are similarly found. CEA produce grown by Community Farms is primarily donated to clients.

4.2.4. Community gardens

Community Gardens are spaces on publicly-owned land or land trusts managed by local volunteers with the majority (80%) of space used for growing food. These gardens offer space for other activities, too, such as socializing (Cohen et al., 2012). The authors did not find any Community CEA Gardens in New York City, although Oko Farms operates a hybrid farm that sells produce and charges for aquaponics training to adults (Commercial CEA) while providing free and low-cost educational workshops and tours to youth on a publicly-owned GreenThumb lot.⁴

4.2.5. Production, volumes, sale prices and revenues

Production data for NYC's Commercial CEA Farms is somewhat limited due to the small number of farms and the proprietary and competitive nature of the market. The data below is derived from responses to questions presented by the researchers to representatives from Commercial CEA Farms as well as an anonymized international survey of commercial CEA growers conducted by the NYC-based CEA technology firm Agrilyst, which provides data monitoring and analyses to the indoor farming sector. Agrilyst collaborated with the first author to formulate some of its questions and ensure the inclusion of ones relevant to this study.

Of the seven Commercial CEA Farms in New York City, the authors found that the most frequently grown crops were lettuce greens and herbs (Table 2). The widest range of produce was grown by a company that grows niche products for chefs (Farm.One). Two companies (Edenworks and Oko Farms) raise fish or seafood in addition to produce.

Agrilyst's study found nearly similar responses from the seven Commercial CEA Farms it surveyed (Table 3).

4.2.5.1. Production volumes. Annual yields at New York City's Commercial CEA Farms are difficult to confirm and are based on company self-reports. To put their production volumes into context, the USDA reported the 2015 annual yield of head lettuce in the United States at 18.1 tons (36,200 lbs.) per acre. In contrast, New York City's Commercial CEA Farms report significantly higher yields.

Gotham Greens' Greenpoint location reports growing 50 tons (over 100,000 lbs.) on .34 acres (15,000 square feet) for an average annual

³ *Five Borough Farm* studied just over 760 farming properties, of which three were commercial farms and one a CEA farm. The report's glossary further highlights the difficulty in drawing conclusions about New York City's current CEA landscape from this document: it references aquaponics, but does not include hydroponics, aeroponics, controlled environment agriculture, or vertical or indoor farms. Along with *Five Borough Farm*, the Design Trust for Public Space, in collaboration with gardeners, created a companion website, FarmingConcrete.org, designed to gather data from community gardeners and farmers about New York City's urban agriculture. At the program's height, from June to December 2012, 105 participants entered information about their garden or farm's harvest (e.g., yield by weight and volume, food grown, methods used) as well as social and economic impact (e.g., healthy eating, market sales). However, in the years since, the number of gardeners reporting information has dropped to one or two per year, and none reported using CEA.

⁴ The GreenThumb Community Gardens program was initiated in the 1970s. The program involves the renovation of vacant lots by volunteers of all ages. The program provides support to over 550 community gardens in all five boroughs of New York City.

Table 2
Produce Grown by NYC Commercial CEA Farms.

Type of Produce	# of Farms
Lettuce Greens (including arugula)	6
Herbs (including basil)	5
Other Greens (including brassicas, mustard greens)	3
Vine Crops (including tomatoes, cucumbers)	3
Microgreens	2
Fish or Shellfish	2
Flowers (incl. edible flowers)	1
Strawberries	1
Mushrooms	0

Table 3
Produce Grown by NYC Commercial CEA Farms – Agrilyst Respondents.

Type of Produce	# of Respondents
Greens	7
Microgreens/Herbs	7
Vine Crops	3
Flowers	1
Strawberries	1
Mushrooms	1

yield of 150 tons (300,000 lbs.) per acre. At the company's Gowanus location, it reports growing 100 tons (over 200,000 lbs.) of leafy greens, herbs, and tomatoes on .46 acres (20,000 square feet) for an average annual yield of 217 tons (434,000 lbs.) per acre. At the company's largest location in Hollis, Queens, they report over 5 million heads of leafy greens on 1.37 acres (60,000 square feet). Assuming a weight of 8 ounces per head, this results in an average annual yield of 912 tons (1,824,000 lbs.) per acre.

Square Roots reports yields of 500 full lettuce heads per week in their Freight Farm containers. Based on their reported average weight of 4 to 7 ounces per head, each container could produce 4.46 tons (8,937 lbs.) per year or the equivalent of 607 tons (1,214,000 lbs.) per acre. Edenworks has recently reported average annual yields of 13 lbs. per square foot per year at their facility, the equivalent of 823 tons (566,280 lbs.) per acre (Kart, 2018).

4.2.5.2. Sales and gross revenues. Retail prices for CEA produce grown in New York City are much higher than like-kind items grown conventionally, locally, or even organically as shown in Table 4.

Our research found that lettuce grown by New York City-based Commercial CEA Farms is sold at a premium, likely making it unaffordable to middle- and low-income shoppers, even when it is carried in local supermarkets.

Annual gross revenues of New York City's Commercial CEA Farms were self-reported as part of the Agrilyst survey but not provided directly to these researchers. Although the authors cannot share segmented data due to the small number of respondents, we can report annual gross revenues ranging from \$0–\$9,999 to a high of \$5M.

4.3. Locations, land use, and real estate

Most of New York City's Commercial CEA Farms are between 8,000- to 15,000-square feet in total growing area, the equivalent of .18–.34 acres. In comparison, one of the state's largest hydroponic greenhouse companies, Intergrow in Albion, operates on approximately 60 acres (ca. 2,640,000 s.f.) in one facility and 10 acres in another, while Mastronardi Produce, owner of Backyard Farms, recently announced plans to build a 70+ acre facility in Oneida, New York, reportedly making it the largest built-at-once CEA operation in the U.S. (Schaulis, 2018). In total, approximately 3.09 of New York City's 193,689 acres (U.S. Census Bureau, 2010) are devoted to Commercial CEA, accounting

for 0.0015 percent of the City's total land mass. In terms of specific locations, five of New York City's Commercial CEA Farms are on roofs. Three are inside buildings (Farm.One) or structures such as shipping containers (Square Roots). One is both on a roof and has an indoor space (Edenworks). Oko Farms is the only Commercial CEA Farm at ground-level.

4.3.1. Example CEA real estate: the Pfizer building

To gauge the lease rates paid by Commercial CEA Farms in New York City, the authors interviewed a broker and the owner of the Pfizer building, a site that has become home to a number of UA and related food and food tech businesses. The broker initially reported lease rates ranging from \$32 to \$40 per square foot (a 10,000 s.f. indoor farm would lease for \$27,000 a month) with currently available spaces sized from 10,000 to 33,500 s.f.⁵ A follow-up conversation with the owner revealed more flexibility. "If there's something compelling about a business," he said, he has offered "sweetheart deals" on rent and even free space in exchange for investing in a business. He made these arrangements with Brooklyn Grange, a soil-based rooftop farm, as well as Verticulture, which grew basil hydroponically before shutting its operations, and Tinyfield Farms, a rooftop hops producer.

4.3.2. Suitable locations for CEA based on land cost

In addition to already-established businesses, the authors sought to assess CEA's likely expansion in New York City by evaluating factors entrepreneurs typically consider, such as lease rates and spatial factors. The authors used *LoopNet*, a popular commercial real estate website, to ascertain average per square foot rates for industrial and manufacturing spaces that offer a minimum of 20,000 and maximum of 60,000 square feet sufficient for commercial growing and located within 10 miles of current Commercial CEA Farms. According to our analysis, indoor spaces suitable for CEA were easiest to find in the Bronx and Queens, whereas Brooklyn, Manhattan, and Staten Island had less appropriate spaces and at higher rates.

Table 5 highlights representative per square foot rates for industrial and manufacturing properties not only in New York City but also in Kearny, New Jersey, where Bowery Farms – a recent entrant to the regional CEA economy – is based, and Newark, New Jersey, where one of the country's largest CEA companies, AeroFarms, has its operations. Sample lease rates in both New Jersey cities were nearly half those in New York, even before accounting for tax and other incentives provided by the State of New Jersey and the Cities of Newark and Camden.

4.3.3. Suitable commercial CEA farm locations based on zoning laws

Zoning laws in New York City before 2012 viewed rooftop greenhouses as additional occupiable space that counted toward a building's calculable Floor-to-Area Ratio (FAR) and were therefore not permitted on buildings already at or near FAR (Ackerman et al., 2012). That changed when the Department of City Planning passed a Zone Green Text Amendment (New York City Department of City Planning, 2012) that encouraged the construction of new buildings and retrofitting of existing ones to make them more energy efficient and sustainable, including renovations that encourage UA. Among the provisions in the amendment benefitting CEA were allowing a rooftop greenhouse to be considered a "permitted obstruction," exempting it from a zoning district's FAR so long as it was: a) on a building without residences; b) used primarily for plant cultivation; c) less than 25-feet high; d) mostly transparent; and e) set back from the perimeter wall by six feet if it

⁵Electricity in the Pfizer Building is sub-metered, with each tenant responsible for his/her own use; the owner purchases electricity in bulk and sells it back to tenants without a markup. Heat is included and available 24/7, based on outside temperatures. A/C is included but provided only from 6 a.m. to 6 p.m. Monday to Saturday. No tenants use solar energy. Current tenants do not pay for water, but that may change.

Table 4
Price of Representative Greens at Manhattan and Brooklyn Retail Stores.

BRAND	PRODUCT	RETAIL PRICE	PRICE PER POUND
GREEN GRAPE PROVISIONS			
Square Roots * Only Basil and Chives	2/3-ounce chives / 1-ounce Genovese basil	\$3.19 / \$.99	\$77.28 / \$15.84
Gotham Greens	Butterhead Lettuce	\$5.29	\$18.77
Radicle Farm – CEA Farm, Newark, NJ	Chef's Blend Salad Mix	\$5.29	\$15.87
WHOLE FOODS			
Edenworks (NYC)	Microgreens	\$4.99	\$39.92
Gotham Greens (NYC)	Lettuce Mixes	\$3.99	\$15.96
Organic Girl (Salinas, CA)	Super Greens	\$4.49	\$14.37
Whole Foods 365 (CA)	Baby Lettuce	\$3.99	\$12.77
Satur Farms (local - Cutchogue, NY)	Mesclun Greens	\$3.49	\$11.17
"Live" Greenhouse Grown with Roots on (CA)	Upland Cress	\$2.49	\$5.69
Unknown Non-Organic (local - NJ/PA)	Red + Green Loose Leaf	\$2.50	\$4.71
UNION SQUARE FARMERS MARKET			
No NYC-based Commercial CEA Farms @ Union Square Farmer's Market			
Farm Dog Organic CEA-Grown Microgreens (local - Hamden, CT)	Mesclun	\$5.00	\$32.00
Keith's Farm (local - Port Jervis, NY)	Organic Red + Green Loose Leaf	\$3.00	\$4.17
Hawthorne Valley (local - Ghent, NY)	Red + Green Loose Leaf (Biodynamic)	\$3.00	\$3.00
S & S O Produce Farms (local - Goshen, NY)	Non-Organic Red + Green Loose Leaf	\$1.50	\$2.09
TRADER JOE'S			
No NYC-based Commercial CEA Farms @ 14 th Street Store			
Trader Joes' Brand (Salinas, CA)	Spring Mix	\$1.99	\$6.37
Trader Joes' Brand (Monrovia, CA)	Wild Arugula	\$1.99	\$4.55

NYC-Based Commercial CEA Farms Shaded.

Table 5
Sample Commercial and Manufacturing Building Lease Rates: New York City and Kearny and Newark, New Jersey, September 2018.

Borough		Total Square Footage of Sample Space	Lease Rate for Sample Space in USD as per s.f./per year
Bronx	Property A	40,000	\$17.00
	Property B	40,000	\$15.00
	Property C	32,000	\$17.00
Brooklyn	Property A	20,000	\$28.00
	Property B	15,000	\$35.00
	Property C	16,000	\$21.00
Manhattan	Property A	86,000	\$25.00
	Property B	44,500	\$75.00
	Property C	8000	\$ 27.00
Queens	Property A	20,000	\$15.50
	Property B	30,000	\$22.00
	Property C	20,000	\$24.00
		22,500	\$16.00
Kearny	Property A	29,100	\$8.00
Newark	Property A	62,400	\$5.75
	Property B	14,000	\$10.71
	Property C	121,500	\$7.87

exceeded the district's building height (New York City Department of City Planning, 2012, n.d.).

4.3.4. Suitable commercial CEA farm locations on public land based on other criteria

New York City's Local Law 48 of 2011 mandated that City-Owned and Leased Properties (COLP) be evaluated by the City agency responsible for their disposition in terms of suitability for agricultural use. This determination must then be shared with the public, so that property suitable for UA can more easily be identified by interested parties and put to productive use. Table 6 summarizes August 2018 COLP data published by the New York City Department of Citywide Administrative Services to highlight available City-owned spaces potentially suitable for UA.

To determine if these sites were appropriate for Commercial CEA Farms specifically, the authors conducted a second analysis using criteria adapted from *Sustainable Urban Agriculture: Confirming Viable Scenarios for Production* (2012) by Kubi Ackerman and her colleagues at Columbia University. These criteria included sites with the following

characteristics:

- Buildings built between 1900 and 1970 when codes mandated greater live roof loads (50 lbs./s.f.) to ensure structural stability;
- A rooftop footprint of at least 20,000 square feet to increase economically viability;
- No more than 10-stories high to be logistically feasible;
- Not a NYC Parks or GreenThumb property to allow for commercial use.

Based on these more conservative attributes, two COLP sites, both in residential zoning districts and constituting 135,334 s.f. (3.10 acres), were deemed suitable for Commercial CEA Farms. Rejected sites fell between 1,600 and 15,820 s.f. Although these locations could be outfitted with multiple 300-square-foot shipping container farms (i.e., the Square Roots model), the authors determined the likelihood of their being put to this use at ground-level was low.

4.3.5. Suitable locations on vacant public land or private land or buildings based on other criteria

The website Living Lots (<https://livinglotsnyc.org>), created by the nonprofit 596 Acres, has conducted its own evaluation of vacant public- and private land potentially suitable for UA. Using their data, the authors identified an additional 151 sites potentially suitable for Commercial CEA Farms totaling 24,865,477 s.f. (571 acres), with the smallest at 20,000 s.f. (.46 acres) and the largest 8,117,815 s.f. (186.36 acres).

Finally, New York City's Primary Land Use Tax Lot Output (PLUTO) data was used to identify private buildings with rooftops — rather than ground-level space — adaptable for Commercial CEA Farms but not identified through COLP or Living Lots.

Table 7 summarizes the final tally of lots and buildings, while Fig. 1 situates these visually within the context of New York City's five boroughs.

In Ackerman's 2012 study, she and her colleagues looked at New York City's capacity for *all forms* of urban agriculture that could be pursued on unused and under-utilized space (e.g., New York City Housing Authority green space, surface parking). She found approximately 5,000 acres of potentially suitable growing space and estimated New York City's total land use needs for self-sufficient growing of non-tropical fruits and vegetables at between 232,215 and 162,139 acres

Table 6
Summary of Potentially Suitable Sites for Urban Agriculture in New York City from DCAS COLP Data, August 16, 2018.

COLP Description – Potentially Suitable Categories	UA Suitable Sites Number / Square Feet / Acres
Potentially Suitable 1: Site is available for a 4-year renewable license through the Parks Department's GreenThumb program contingent on program capacity	14 sites / 74,136 s.f. / 1.7 acres
Potentially Suitable 2: Site is available on an interim basis (1- or 2-year license agreements that are potentially renewable) contingent on program capacity	0 sites
Potentially Suitable 3: Site has specific instructions or conditions that limit its availability and/or use	15 sites / 234,809 s.f. / 5.39 acres
TOTAL	29 sites / 308,945 s.f. / 7.09 acres

Table 7
Land and Buildings Potentially Suitable for Commercial CEA Farms Using Ackerman's Sustainable Urban Agriculture Criteria.

Data Source	# of Sites	Estimated Square Footage / Acreage
COLP Sites (per Local Law 48 of 2011)	2	135,334 s.f. / 3.10 acres
Living Lots	151	24,865,477 s.f. / 571 acres
PLUTO	1,263	56,192,450 s.f. / 1290 acres
TOTAL	1,416	81,193,261 s.f. / 1864 acres

based, respectively, on the USDA's figures for average annual yield per acre and that of "Bio-Intensive Low" growing methods.

Our analysis, focused narrowly on CEA, suggests an available 1,864 acres of land or roofs suitable for commercial production. Based on the reported average annual yields of the most productive Commercial CEA Farms in New York City, we estimate that 1,864 acres could produce 1.757B lbs. of dark leafy greens per year, far exceeding the 210M lbs. per year estimated by Ackerman as New York City's annual dark leafy green needs. Given a minimum requirement of 20,000 square feet for commercial CEA production – with 40 to 60K s.f. preferred – New York City would need 484 rooftops to meet its dark leafy green demand. According to New York City's Department of Design and Construction (2007), roofs account for 11.5% of the City's total overall surface area or roughly 944.3 billion square feet.

The estimated annual retail value of \$1.75B in leafy green production, based on the current New York City retail price for CEA produce (average \$34.00 per pound) is approximately \$59.7B, while simply meeting the City's estimated 210M lbs. per year in dark leafy green demand equates to \$7.1B in potential revenue.

4.4. Technology and sustainability

Six of New York City's Commercial CEA Farms are on roofs and rely primarily on sunlight, with supplemental lighting used as needed; Gotham Greens is representative of this kind of farm. Four others are inside buildings or shipping containers and rely on LED or sole-source light exclusively (e.g., Farm.One, Square Roots). Aquaponic grower Edenworks grows both on a roof using sunlight and indoors using sole-source lighting. Oko Farms uses only sunlight.

Although Commercial CEA Farms were unwilling to disclose in full their back-end technologies, Gotham Greens appears to have the most advanced system. Its operations are controlled by a computer-operated weather station that monitors wind, rain, temperature, humidity, carbon dioxide, and light intensity (Collins, 2011). The data collected is then used to regulate irrigation pumps, greenhouse vents, exhaust fans, and shade curtains. Gotham Greens also maintains a solar array that generates 55 kW of energy, in keeping with the company's mission to operate sustainably with a small carbon and energy footprint. They, like many of New York City's other CEA companies, while not certified organic, use integrated pest management, beneficial insects, and other natural pesticides rather than chemical interventions to control weeds and insects (Gotham Greens, 2017).

4.5. Employment

Six Commercial CEA Farms employ an estimated 150 people, with Gotham Greens the dominant employer (66%). The Commercial CEA sector broadly (i.e., including consulting and technology firms not included in this analysis, employ an additional 50 people). The number of employees at CEA companies other than Gotham Greens ranges from a low of three (Oko Farms) to a high of 19 (Square Roots).

The table below summarizes job titles at Commercial CEA Farms as found through their websites and verified through employees' LinkedIn profiles (Table 8).

To estimate the wages of employees at New York City's Commercial CEA Farms, the authors matched CEA job titles to those outlined by the Bureau of Labor Statistics' Standardized Occupational Classification (SOC) system (Table 9). Jobs requiring forestry, agriculture, natural resources, and human science (FANH) or science, technology, engineering, or math (STEM) are highlighted because many Institutional CEA Farms seek to train youth for well-paid jobs in these fields. The wages cited are representative of like-kind workers in the New York-New Jersey metropolitan and nonmetropolitan region.. However the authors cannot verify that the exact same wages are paid to CEA workers in each respective SOC title.

The employment breakdown suggests that New York City's Commercial CEA Farms have created a diverse but limited number of green-sector jobs relative to New York City's total adult workforce. Likewise, while the percentage of FANH jobs appears to be relatively substantive (66%), the majority (83 out of 100) involve entry-level greenhouse workers who likely earn only slightly above minimum wage and require little agricultural knowledge. In contrast, higher-paying FANH and STEM jobs represent a much smaller percentage of job categories (11% each). This suggests that while it is virtuous for Institutional Farms to teach CEA to youth, the likelihood of their finding high-paying jobs in the CEA industry in the NY-NJ Metropolitan region is debatable. Employees may be needed in the regional and national CEA sector, particularly in the emerging cannabis industry (Goecker et al., 2015), but there is no evidence that youth are being prepared for this career path. More research is needed to support the hypothesis that CEA engagement in grade, middle, or high school leads to students pursuing FANH or STEM-related college degrees broadly.

5. Discussion

5.1. Access to healthy food

The produce grown by Commercial CEA Farms in New York City contributes minimally to the estimated 40,76,000,000 lbs. of fruits and vegetables consumed annually by New York City residents (Ackerman et al., 2011) or the 19 billion lbs. of food that annually reach the City's 8.4 million residents, over 60 million annual tourists, and hundreds of thousands of commuters each day (New York City Economic Development Council, 2016).

There is also little evidence that CEA produce grown in New York City is addressing food insecurity and access issues that affect nearly three million New Yorkers, especially those in low-income communities

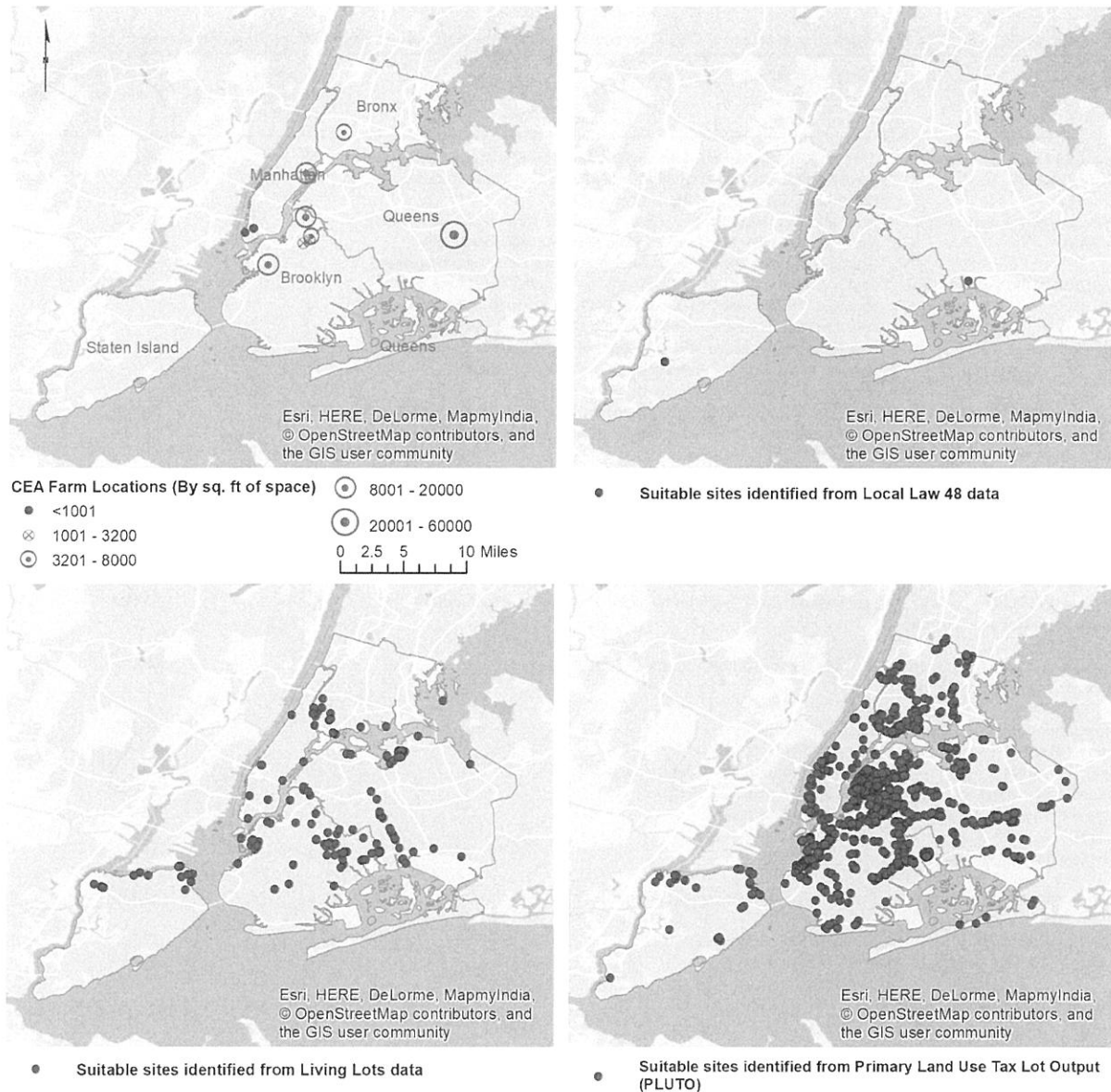


Fig. 1. Upper left panel: Map of existing Commercial CEA Farm locations. Upper right panel: Suitable sites identified from COLP, August 16, 2018. Lower left panel: Suitable sites identified from 596 acres' Living Lots. Lower right panel: Suitable sites identified from PLUTO, May 2018.

Table 8
Employment at New York City's Commercial CEA Farms.

Company	Publicly Available Job Titles at Commercial CEA Farms	# of Employees
Edenworks	CEO + Founder, Chief Design Officer + Co-Founder, Construction manager + Co-founder, CFO + COO, Farm Manager, VP of Agriculture, Senior Agricultural + Mechanical Engineer, Electrical Engineer, Product Manager, Nutrition + Food Safety, Data Scientist, Grower, <i>Freelance Sustainability Consultant</i>	12
Farm.One	CEO, Head of Operations, Head Horticulturist, Sales Manager, Engineering Manager, Shift Manager, Events Manager, <i>Systems Intern, Engineering Intern</i>	7
Gotham Greens	Co-Founder and CEO, Co-Founder and CFO, Chief Agricultural Officer, Assistant Plant Manager, Sales Manager, HR Manager, Director of Marketing + Partnerships, Hydroponic Grower + Greenhouse Manager, Customer Service + Logistics Manager, Food & Beverage Operations Director, Marketing Coordinator, Marketing + Brand Manager, Director of Finance, Data & Inventory Specialist, Marketing, Customer Service Representative, Greenhouse Assistant, Senior Facilities Manager, Greenhouse Assistant, Greenhouse Supervisor, Staff Accountant, Assistant Supervisor (Maintenance), Truck Driver, Pack house lead, Packer, Team Lead, Pack house lead, <i>Marketing Intern</i> [*The authors estimate that Gotham Greens employs an additional 73 individuals in unknown roles of which 50 are greenhouse workers]	100*
Oko Farms	Co-founder/Farm Manager, Co-Founder/Aquaponics Designer, Operations Manager	3
Square Roots	Brand Manager, Operations Manager, Head of Programming + Recruitment, Farm Operations, Finance Manager, Farmer/Entrepreneur (6), Research and Development, Head Farmer, Farm Manager, CEO, Head of Community + Communications, Research + Development Engineer, Strategic Project Manager, Full Stack Developer, <i>Mentor (4)</i>	19
Sky Vegetables	Founders (3), CEO, Head Grower, Assistant Grower, Operations Director, Laborers/Farmworkers (2), Sales/Distribution Manager	10
Total		151

Jobs in italics represent positions of a consulting, mentoring, or short-term nature that may be unpaid or similar, such as internships.

Table 9
Job Roles at Commercial CEA Farms in New York City Matched to 2017 Metropolitan and Nonmetropolitan Area Occupational Employment and Wage Estimates.

Standard Occupational Classification (SOC) Title	Role(s) at Commercial CEA Farm	# of People Employed in Role (s)	Mean Hourly Wage for Commensurate SOC Title
Farmworkers and Laborers, Crop, Nursery, and Greenhouse - FANH	Grower, Assistant Grower, Laborers/Farmworkers (2), Greenhouse Assistant, Greenhouse Assistant, Pack house lead, Packer, Team Lead, Pack house lead, Farmworker/laborers at Gotham Greens (73)	83	\$16.24
Farmers, Ranchers, and Other Agricultural Managers – FANH	Farm Manager, Head Grower, Farm Operations, Farmer/Entrepreneur (6), Head Farmer, Farm Manager, Assistant Plant Manager, Hydroponic Grower + Greenhouse Manager, Greenhouse Supervisor, Shift Manager	14	\$37.12
Chief Executives *50% of CEOs report STEM degrees - STEM	CEO + Founder, Chief Design Officer + Co-Founder, Construction Manager + Co-Founder, CFO + COO, CEO, Founders (3), CEO, CEO, Co-Founder/Farm Manager, Co-Founder and CEO, Co-Founder and CFO	13	\$121.67
Marketing Manager	Product Manager, Brand Manager, Head of Community + Communications, Director of Marketing + Partnerships, Marketing Coordinator, Marketing + Brand Manager, Marketing	7	\$93.94
General and Operations Managers	Head of Operations, Engineering Manager, Operations Director, Operations Manager, Strategic Project Manager, Operations Manager, Senior Facilities Manager	7	\$82.38
Sales Manager	Sales Manager, Sales/Distribution Manager, Sales Manager, Events Manager	4	\$96.31
Computer and Information Research Scientists - STEM	Data Scientist, Research and Development, Research + Development Engineer	3	\$65.50
Soil and Plant Scientists - STEM	VP of Agriculture, Head Horticulturist, Chief Agricultural Officer	3	\$32.97
Financial Manager	Finance Manager, Director of Finance	2	\$102.01
Human Resources Manager	Head of Programming + Recruitment, HR Manager	2	\$72.38
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	Customer Service + Logistics Manager, Data & Inventory Specialist	2	\$51.24
First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers - FANH	Assistant Supervisor (Maintenance), Shift Manager	2	\$28.92
Software Developer, Applications - STEM	Full Stack Developer	1	\$56.55
Electrical Engineer - STEM	Electrical Engineer	1	\$51.97
Mechanical Engineers - STEM	Senior Agricultural + Mechanical Engineer	1	\$45.95
Commercial and Industrial Designers - STEM	Co-Founder/Aquaponics Designer	1	\$34.14
Agricultural and Food Science Technicians – FANH + STEM	Nutrition + Food Safety	1	\$22.95
Bookkeeping, Accounting, and Auditing Clerks	Staff Accountant	1	\$22.51
First-Line Supervisors of Food Preparation and Serving Workers	Food + Beverage Operations Director	1	\$20.56
Customer Service Representatives	Customer Service Representative	1	\$20.15
Light Truck or Delivery Service Drivers	Truck Driver	1	\$18.59
Total Jobs		151	
Total FANH Jobs with Greenhouse Workers		100	
Total FANH Jobs without Greenhouse Workers		17	
Total STEM Jobs		17.5	
Percent of FANH Jobs with Greenhouse Workers		66%	
Percent of FANH Jobs without Greenhouse Workers		11%	
Percent of STEM Jobs		11%	

New York-Jersey City-White Plains, NY-NJ Metropolitan Division.

(NYC Department of City Planning, 2008). Whether this is because locally grown CEA produce is too expensive, not available in enough neighborhood grocery stores, or for reasons not yet identified, requires further study.

The produce grown in Commercial CEA Farms in New York City also tends to be of only moderate nutritional value (e.g., lettuce, basil) and therefore contributes only minimally to the goal of elected officials supportive of UA to increase New Yorkers’ consumption of healthy fruits and vegetables, especially those at-risk of obesity, diabetes, and related chronic health diseases.

Anecdotal reports from Institutional and Community CEA Farms suggest they are more successful at providing a wider range of produce to low-income consumers (Amu, 2017), which is why we posit that Institutional and Community CEA Farms offer the greatest potential for expanding year-round access to healthy food in these communities. Further study of production and consumption in these settings is needed

to support this hypothesis.

5.2. Location and land use requirements of CEA

In mapping the location of New York City’s Commercial CEA Farms, we found the majority in and near low-income communities where industrial space can still be found affordably, due to the exodus of traditional manufacturing businesses. These under-utilized spaces have also allowed CEA companies to negotiate favorable lease rates with sympathetic owners. And although even cheaper spaces exist in other cities in the Tri-state region, many Commercial CEA Farms still want a New York City address because of the marketing and logistical advantage of being able to service high-end customers and restaurateurs within hours rather than days.

In a parallel effort, New York City’s elected officials have passed legislation to stimulate the use of public land and buildings for UA

production generally, though not CEA specifically. These policy initiatives include Local Law 48, which helps the public find City-owned and leased (COLP) space to farm; Local Law 50, which encourages City agencies to purchase produce from New York State vendors; and the Zone Green Text Amendment, which relaxes zoning to allow for higher FAR for rooftop greenhouses. Such policies, however, have had little impact on the sector's growth, in part because the City has still failed to adopt a comprehensive agricultural plan to streamline the process through which Commercial CEA Farms start and expand. Funding and technical assistance to allow Community and Institutional Farms to grow at production scale for the communities they serve is also urgently needed, according to some anecdotal reports from nonprofit producers (correspondence with Elise Long, Gowanus Sky Farm, January, 2019).

While Local Law 48 makes it easier for the public to find properties suitable for growing, the database has no relationship to the map of vacant public and private land created by 596 Acres nor the niche sites (e.g., NYCHA green spaces) identified in *The Potential for Urban Agriculture in New York City* report by Ackerman, et al. (2011) at The Urban Design Lab. As such, finding land, buildings, or rooftops suitable for commercial CEA production remains unwieldy at best, with the actual acreage – somewhere between the 1,864 acres we identified and the 5,000 acres noted by Ackerman – anyone's guess. This points to the need for more dialogue between CEA entrepreneurs and politicians to ensure alignment around needs and goals and improved documentation of land and buildings, based on factors relevant to CEA, such as hours of sunlight, infrastructure (e.g. elevators, roof load), and opportunities for alternative utility schemes (i.e., capturing building waste heat).

Although the earlier identified 1,864 acres for CEA sounds promising in relation to the City's identified produce needs, continued and steady increase in new CEA businesses like the one to date seems unlikely. This is because, despite the success of a small number of well-capitalized and environmentally innovative early entrants, Round II CEA companies will face increasing pressure from peri-urban Commercial CEA Farms (i.e., Bowery Farms in Kearny) that pay lower lease rates, oversee more real estate, and have received significantly more venture capital, tax incentive, and grant funding that bolster their ability to operate at greater economies of scale (Friedman, 2014). Additionally, while early entrants such as Gotham Greens benefitted from leveraging New York State Energy Research and Development Authority (NYSERDA) funds to innovate their systems and reduce energy costs (Puri and Caplow, 2009), newer CEA companies such as Farm.One cannot, given their reliance on less sustainable sole-source electric and LED lighting. As an example, when Farm.One recently expanded to a second location, it did so by soliciting individual, private investors. Finally, future companies will face more hurdles finding affordable space, due to gentrification pressures. Thus, while vacant roofs exist in New York City, it is unclear for how long they will remain affordable if challenged by luxury residential uses.

5.3. Environmental sustainability

Commercial CEA Farms on roofs, which rely on the sun as their primary light source, perform well according to measurements of environmental sustainability, while those that use LEDs are not as energy efficient, even when compared to conventional, soil-based farms growing similar items (Barbosa et al., 2015). Community and Institutional Farms that use less capital-intensive lighting (i.e., high-pressure sodium) have a lower carbon footprint, but questions remain about even their environmental benefits as compared to simpler growing methods. For example, while soil-based rooftop farms such as Brooklyn Grange mitigate urban heat islands and reduce stormwater runoff, the same cannot be said of rooftop CEA greenhouses or indoor farms, even ones that use solar arrays. Likewise, while CEA farms use less water, pesticide, and fertilizer than soil-based farms in places such as California, there is little evidence that siting Commercial CEA Farms in New York City is necessary, especially when rural and peri-urban ones can

accomplish the same more efficiently. Furthermore, suggesting that locally grown CEA is preferable because it reduces greenhouse gas emissions from long-distance transport is highly dependent on underlying assumptions (e.g. diesel versus pick-up trucks) (Theurl et al., 2014; Albright and de Villiers, 2008; Purcell and Brown, 2005) and not always supported in reality.

As Albright and de Villiers (2008) note in their extensive study comparing energy and CO₂ emissions for fresh produce imported into New York State compared to the same grown locally, CEA makes most sense in regions with favorable climates where less supplemental heat and light is needed. Beyond that, the environmental advantages begin to shrink.

In the end, whether more of New York City's vacant roofs and/or land are used for Commercial CEA Farms will likely be driven primarily by whether market demand for the "fresh" and "local" produce segment grows (Bowman, 2017) or, more radically, whether New York City redefines "local purchasing" so that public institutions (i.e., schools, prisons, hospitals, and senior centers) are required to buy more produce from New York City-based Commercial CEA Farms rather than farms across New York State.

5.4. Employment

Commercial CEA Farms in New York City provide a small number of green-sector jobs, but this is overshadowed by the dominance of a single employer (Gotham Greens). Likewise, while Gotham Greens generates a noteworthy number of entry-level farming positions (i.e., packing and handling), their estimated pay rate is below what has been deemed a living wage for a city as expensive as New York (Glasmeier and Massachusetts Institute of Technology, 2018). More concerning, as evidenced by a recent automation grant Gotham Greens received from NYSERDA (Governor's Press Office, 2016), is the possibility of even these jobs being eliminated in order to lower costs and increase efficiency. In contrast, the number of positions the local industry has created for higher-level FANH and STEM positions is small, a concern given the large number of youth being trained at Institutional and Community Farms purportedly for these jobs. While one hopes that CEA engagement increases youth interest in FANH and STEM careers broadly, this has not yet been confirmed.

In contrast, retirement trends in the *national* greenhouse, horticulture, and farming industries do suggest a need for new workers – and a dearth of graduates to fill them (Goecker et al., 2015). More promising, but less understood, is whether small pockets of future CEA jobs might be created in New York City from new residential developments incorporating rooftop or indoor CEA as an amenity (Yemi Amu, 2017). The legalization of medical and recreational marijuana, which will create job opportunities for farm managers with greenhouse experience, may be another avenue for employment. For now, Community and Institutional Farms may offer the most diverse range of jobs, despite their small size, and in teaching and direct service positions less likely to be replaced by automation.

5.5. Recommendations

Given that Commercial CEA Farms are unlikely to replace a significant portion of a city's produce now sourced from California, Arizona, or Florida, local governments considering whether to support CEA projects through funding or policy mechanisms should first educate themselves about the technology these farms use, whether crops are of high nutritional value, if prices are affordable to low- and middle-income consumers, and how many living-wage jobs will be created.

Cities should also recognize that, due to high startup costs, Commercial CEA Farms will likely focus primarily on recouping their investment by growing high-value crops for wealthy consumers (e.g., lettuce and basil) rather than nutritional produce priced for low-income residents (e.g., spinach and kale). Produce grown by Community and

Institutional Farms are better positioned to get healthy food into the hands of those who need it, but require more financial and technical assistance to ensure their longevity. Depending on their scale, some Commercial CEA Farms may also add revenue to a city's tax base.

To the extent that cities must decide which types of CEA farms to support, those on roofs, in glass buildings/greenhouses, or on the ground that rely on solar rather than single-source lighting should take precedence. Funding for school-based projects should be done following a cost-benefit analysis of the educational opportunities afforded by capital-intensive rooftop greenhouses as compared to simpler and cheaper soil-based farms, even if the latter cannot be used year-round, to ensure the outlay is warranted.

CEA farms located in cities with high land values are best sited on roofs, so as to free street-level space for residential or commercial purposes. However, in cities where land values are low, greenhouse production at ground-level could be a viable alternative to extend growing seasons. Supplemental greenhouse lighting is still necessary in cities with fewer days of sunlight, but placing these farms outdoors on the ground will at least better connect them to local communities.⁶ More research is needed to determine if vertical farms, such as those operated by Aerofarms in Camden and Newark, which re-purpose derelict manufacturing buildings and are made possible through generous tax incentives, are justified in terms of the public benefits they offer.

In terms of profitability, rural and peri-urban CEA businesses are likely more viable than those in city centers due to lower operational costs and greater economies of scale. As such, cities may wish to consider whether offering companies large tracts of land or vacant buildings at town edges is more deserving of public funds. Gotham Greens' recently announced plans to open a 100,000 square-foot farm in Baltimore inside a 3,100-acre global logistics center that affords "access to deepwater berths, railroads, highways and storage space," is indicative of the larger footprint these companies need to be competitive (Vegetable Growers News, 2018). For planners encountering businesses that demand tax incentives or other benefits as a condition of doing business, the right response may be to require that a meaningful percentage of hires include unemployed and underemployed individuals in the identified communities, that businesses guarantee living wages for entry-level workers, and that unsold greens be donated to food banks or shelters.

6. Conclusions

While Commercial CEA Farms are predicted to grow in economic and physical prominence in cities worldwide (Wood, 2017), planners and policymakers need to look closely at what the vertical, rooftop, and indoor agricultural revolution means for their specific context. Urban agriculture has a substantial track record of positive environmental and social benefits, however CEA in its present form does not fit neatly into these earlier incarnations and its additive value to the urban landscape may be less visionary than the popular press would have policymakers and the public believe. That CEA has grown in New York City over the last seven years is the result of factors specific to that metropolis, including a large population with segments that are well to-do, easy access to investors, and built infrastructure such as large manufacturing buildings in need of new tenancy. Significantly, the substantial base of CEA nonprofits and entrepreneurs that have advocated for and received public support has helped the sector advance, if modestly, in ways it may not have been able to do otherwise.

Whether to publicly incentivize and support CEA in other cities with a different built environment, infrastructure, and regional economy is

⁶ One example is a prototype Community CEA Farm (Grow-A-Lot) developed by a multi-stakeholder consortium for the Clinton Foundation to test the feasibility of small-scale greenhouse growing on vacant land that has not yet been implemented.

an assessment planners and policymakers should consider carefully in consultation with university horticultural departments and cooperative extension offices that can serve as important thought partners. This article also outlines methods of suitability analysis that planners can use to evaluate available buildings and land for their capacity to support the requirements the CEA sector requires.

Beyond CEA's economic viability for any individual entrepreneur is determining how a Commercial, Institutional, or Community CEA Farm contributes to the health and well-being of food-insecure and economically challenged communities. Based on data gathered for this study, CEA appears most beneficial when carried out by Institutional and Community Farms that have demonstrated efficacy with soil-based growing and now want to expand to year-round production focused on nutrient-rich produce. For CEA to contribute to the sustainability of cities will require continual striving for good governance in reducing environmental and energy impacts of production and ensuring that public sector policies remain focused on supporting populations most in need. CEA may be touted as an exciting set of technologies with great promise, but it is unlikely to offer a panacea for social problems or an unqualified urban agricultural revolution.

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References

- Ackerman, K., Plunz, R., Conard, M., Katz, R., Dahlgren, E., Culligan, P., 2011. The Potential for Urban Agriculture in New York City: Growing Capacity, Food Security & Green Infrastructure. [online]. URL. (Accessed 19 August 2018). Urban Design Lab, Columbia University, New York. https://www.researchgate.net/publication/268516292_The_Potential_for_Urban_Agriculture_in_New_York_City_growing_capacity_food_security_green_infrastructure.
- Ackerman, K., Dahlgren, E., Xu, X., 2012. Sustainable Urban Agriculture: Confirming Viable Scenarios for Production. (P New York State Energy Research and Development Authority). [online]. URL. (Accessed 10 August 2018). <https://www.nyscrda.ny.gov/-/media/Files/Publications/Research/Environmental/Sustainable-Urban-Agriculture.pdf>.
- Adams, E., Espinal, R., 2017. Bring on Next-gen Urban Farming: Usher in a New Era of Food Production in New York City. July 26 [online] URL. (Accessed 10 August 2018). Daily News, New York. <http://www.nydailynews.com/opinion/bring-next-gen-urban-farming-article-1.3359066>.
- Albright, L.D., 2011. Growing Horticultural Crops Indoors vs. in a Greenhouse. [online]. URL. (Accessed 19 August 2018). <http://cea.cals.cornell.edu/attachments/Growing%20indoors%20vs%20in%20Greenhouse.pdf>.
- Albright, L.D., de Villiers, D.S., 2008. Energy Investments and CO₂ Emissions for Fresh Produce Imported into New York State Compared to the Same Crops Grown Locally. [online]. URL. (Accessed 10 August 2018). <https://www.nyscrda.ny.gov/-/media/Files/Publications/Research/Environmental/Sustainable-Urban-Agriculture.pdf>.
- Alloway, B.J., 2004. Contamination of soils in domestic gardens and allotments: a brief overview. Land Contam. Reclam. 12 (3), 179–187.
- Amu, Y., 2017. Interview by Wylie Goodman.
- Armstrong, D., 2009. A survey of community gardens in upstate New York: implications for health promotion and community development. Health Place 6 (4), 319–327.
- Astee, L., Kishnani, N.T., 2010. Building integrated agriculture utilising rooftops for sustainable food crop cultivation in Singapore. J. Green Build. 5 (2), 105–113.
- Bailey, L.H., 2015. The Holy earth. In: Berry, W., Linstrom, J. (Eds.), The Authoritative Text Centennial Edition. Counterpoint.
- Barbosa, G., Gadelha, F., Kublik, N., Proctor, A., Reichelm, L., Weissinger, E., Wohlleb, G., 2015. Comparison of land, water, and energy requirements of lettuce grown using hydroponic vs. conventional agricultural methods. Int. J. Environ. Res. Public Health 12 (6), 6879–6891. <https://doi.org/10.3390/ijerph120606879>.
- Beniston, J., Lal, R., 2012. Improving soil quality for urban agriculture in the north central U.S. In: Lal, R., Augustin, B. (Eds.), Carbon Sequestration in Urban Ecosystems. Springer, pp. 279–313. https://doi.org/10.1007/978-94-007-2366-5_15.
- Bhanoo, S., 2014. Vertical Farms Will Be Big, but for Whom? Indoor Farming Might Help Feed Millions, or at Least Make Millions. December 3. [online]. URL. (Accessed 19 August 2018). Fast Company. <https://www.fastcompany.com/3039087/vertical-farms-will-be-big-but-for-who>.
- Blay-Palmer, A., Donald, B., 2008. Food Fears: From Industrial to Sustainable Food Systems. Ashgate Publishing.

- Boeing, H., Bechthold, A., Bub, A., Ellinger, S., Haller, D., Kroke, A., Watzl, B., 2012. Critical review: vegetables and fruit in the prevention of chronic diseases. *Eur. J. Nutr.* 51 (6), 637–663. <https://doi.org/10.1007/s00394-012-0380-y>.
- Bowman, J., 2017. The Indoor Farming Salad Wars Are Coming. [online]. URL (Accessed 9 September 2018). <https://medium.com/edenworks/market-trends-affecting-indoor-agriculture-e59266fa3814>.
- Brechner, M., Both, A.J., 2013. Cornell CEA Lettuce Handbook. Cornell Controlled Environment Agriculture. Cornell University [online]. URL (Accessed 26 August 2018). <http://cea.cals.cornell.edu/attachments/Cornell%20CEA%20Lettuce%20Handbook%20.pdf>.
- Brewer, G., 2015. How Our Gardens Grow. [online]. URL (Accessed 20 August 2018). bit.ly/gardenreportpdf.
- Bridwell, R., 1972. Hydroponic Gardening: The "Magic" of Modern Hydroponics for the Home Gardener. Woodbridge Press Publishing.
- Brin, H., Fesquet, V., Bromfield, E., Murayama, D., Landau, J., Kalva, P., 2016. The State of Vertical Farming. Association of Vertical Farming.
- Brinkley, C., 2013. Avenues into food planning: a review of scholarly food system research. *Int. Plan. Stud.* 18 (2), 243–266.
- Brooklyn Law School, 2017. CUBE Event Explores Future of Agriculture in the City. Apr. 12 [online]. URL (Accessed 26 August 2018). <https://www.brooklaw.edu/newsandevents/news/2017/04-12-2017a>.
- Brown, K.H., Carter, A., 2003. Urban Agriculture and Community Food Security in the United States: Farming from the City Centre to the Urban Fringe. A Primer Prepared by the Community Food Security Coalition's North American Urban Agriculture Committee, Venice, California.
- Buckler, G., 2009. Canadian Broadcasting Corporation. Growing Crops in Buildings Proposed as Solution to World's Food Woes. Nov. 20 [online]. URL (Accessed 19 August 2018). <http://www.cbc.ca/news/technology/growing-crops-in-buildings-proposed-as-solution-to-worlds-food-woes-1.862331>.
- Caldeyro-Stajano, M., 2004. Simplified hydroponics: Urban agriculture and food security. *Practical Hydroponics & Greenhouses: The Soilless Culture & Growers' Magazine* 76, pp. 46–48.
- Campbell, M.C., 2004. Building a common table: the role for planning in community food systems. *J. Plan. Educ. Res.* 23 (4), 341–355.
- Caplow, T., 2009. Building integrated agriculture: philosophy and practice. In: Heinrich Böll Foundation (Ed.), *Urban Futures 2030: Urban Development and Urban Lifestyles of the Future*. Heinrich-Böll-Stiftung, Berlin, Germany, pp. 54–58.
- City of New York, 2019. New York Urban Agriculture. [online]. URL (Accessed 9 January 2019). <https://www1.nyc.gov/site/agriculture/index.page>.
- City of New York, The, 2018. Participatory Budgeting Projects. [online]. URL (Accessed 10 August 2018). <https://data.cityofnewyork.us/City-Government/Participatory-Budgeting-Projects/wwhr-Sven/data.jjcn>.
- Cohen, N., 2011. How great cities are fed revisited: ten municipal policies to support the New York City foodshed. *Fordham Environ. Law Rev.* 22 (3), 691–710.
- Cohen, N., Reynolds, K., Sanghvi, R., 2012. Five borough farm: seeding the future of urban agriculture in New York City. Design Trust for Public Space. Added Value.
- Collins, G., 2011. Want Fresher Produce? Leave Dirt Behind. August 2 [online]. URL (Accessed 19 August 2018). *The New York Times*. <https://www.nytimes.com/2011/08/03/dining/hydroponic-produce-gains-fans-and-flavor.html>.
- Cornell University, 2012. Controlled Environment Agriculture. [online]. URL (Accessed 20 August 2018). <http://cea.cals.cornell.edu/about/index.html>.
- de Nijs, B., 2017. Does Vertical Farming Make Sense? June 29 [online]. URL (Accessed 19 August 2018). *Hortidaily.com*. <http://www.hortidaily.com/article/35974/Does-vertical-farming-make-sense>.
- de Zeeuw, H.R., Veenhuizen, V., Dubbeling, M., 2011. The role of urban agriculture in building resilient cities in developing countries. *J. Agric. Sci.* 149 (1), 153–163.
- Despommier, D., 2005. *The Vertical Farm: Reducing the Impact of Agriculture on Ecosystem Function and Services*. Columbia University Press.
- Despommier, D., 2009. Re-greening earth. *Oz* 31, 52–55. <https://doi.org/10.4148/2378-5853.1468>.
- Despommier, D., 2010. *The Vertical Farm: Feeding the World in the 21st Century*. Thomas Dunne Books/St. Martin's Press.
- Dimitri, C., Oberholtzer, L., Pressman, A., 2016. Urban agriculture: connecting producers with consumers. *Br. Food J.* 118 (3), 603–617. <https://doi.org/10.1108/BFJ-06-2015-0200>.
- Frazier, I., 2017. The Vertical Farm. [online]. URL (Accessed 20 August 2018). *The New Yorker*. <https://www.newyorker.com/magazine/2017/01/09/the-vertical-farm>.
- Friedman, M., 2014. N.J. Approves \$40 Million in Tax Breaks for Newark Project that Will House Whole Foods. [online]. URL (Accessed 20 August 2018). *NJ.com*. http://www.nj.com/politics/index.ssf/2014/12/nj_approves_40_million_in_tax_breaks_for_project_that_will_house_newark_whole_foods.html.
- Frumkin, H., 2003. Healthy places: exploring the evidence. *Am. J. Public Health* 93 (9), 1451–1456. <https://doi.org/10.2105/AJPH.93.9.1451>.
- Gale, H.F., 2003. Age-specific Patterns of Exit and Entry in U.S. Farming, 1978–1997. *Rev. Agric. Econ.* 25 (1), 168–186.
- Gericke, 1937. Hydroponics—crop production in liquid culture media. *Science* 85 (2198), 177–178. <https://doi.org/10.1126/science.85.2198.177>.
- Glasmeyer, A.K., Massachusetts Institute of Technology, 2018. Living Wage Calculator. [online]. URL (Accessed 1 June 2018). <http://livingwage.mit.edu/>.
- Goddard, M.A., Dougill, A.J., Benton, T.G., 2010. Scaling up from gardens: biodiversity conservation in urban environments. *Trends Ecol. Evol.* 25 (2), 90–98. <https://doi.org/10.1016/j.tree.2009.07.016>.
- Goecker, A.D., Smith, E., Fernandez, J.M., Ali, R., Theller, R., 2015. Employment Opportunities for College Graduates in Food, Agriculture, Renewable Natural Resources, and the Environment United States, 2015–2020. [online]. URL (Accessed 9 September 2018). *Purdue University*. <https://www.purdue.edu/usda/>
- employment/.
- Goodman, W., 2017. The state of controlled environment agriculture in New York City. Thesis, Master of Regional Planning. Cornell University.
- Gordon, C., Purciel-Hill, M., Ghai, N.R., Kaufman, L., Graham, R., Van Wye, G., 2011. Measuring food deserts in New York City's low-income neighborhoods. *Health Place* 17 (2), 696–700.
- Gotham Greens, 2017. Our Farms. URL (Accessed 20 August 2018). <http://gothamgreens.com/our-farms/>.
- Governor's Press Office, 2016. Governor Cuomo Announces Opening of New Gotham Greens Greenhouse Facility in Queens [Press Release]. February 2 [online]. URL (Accessed 20 August 2018). <https://www.governor.ny.gov/news/governor-cuomo-announces-opening-new-gotham-greens-greenhouse-facility-queens>.
- The commercial storage of fruits, vegetables, and florist and nursery stocks. In: Gross, K.C., Wang, C.Y., Saltveit, M. (Eds.), *Agriculture Handbook* 66. U.S. Department of Agriculture, Agricultural Research Service, Washington, DC.
- Haight, D., Eyck Ten, L., Arjomand, S., 2016. Cultivate NY: An Agenda to Protect Farmland for Growing Food and the Economy. [online]. URL (Accessed 20 August 2018). *American Farmland Trust*. <https://www.farmland.org/blog/announcing-cultivate-new-york-an-agenda-to-protect-farmland-for-growing-food-and-the-economy>.
- Hamm, M., 2015. The Buzz Around Indoor Farms and Artificial Lighting Makes No Sense. April 10 [online]. URL (Accessed 20 August 2018). *The Guardian*. <https://www.theguardian.com/sustainable-business/2015/apr/10/indoor-farming-makes-no-economic-environmental-sense>.
- Harney, J., 2016. Science and Technology Education in Brooklyn Gets Major Funding Boost From Borough Hall. September 28 [online]. URL (Accessed 26 August 2018). *Brooklyn Daily Eagle*. <http://www.brooklyn.eagle.com/articles/2016/9/28/science-and-technology-education-brooklyn-gets-major-funding-boost-borough-hall>.
- Harrison, J.L., 2011. Pesticide Drift and the Pursuit of Environmental Justice. MIT Press.
- Herridge, D.F., Peoples, M.B., Boddey, R.M., 2008. Global inputs of biological nitrogen fixation in agricultural systems. *Plant Soil* 311 (1–2), 1–18. <https://doi.org/10.1007/s11104-008-9668-3>.
- Hodbod, J., Eakin, H.J., 2015. Adapting a social-ecological resilience framework for food systems. *Environ. Stud. Sci.* 5, 474. <https://doi.org/10.1007/s13412-015-0280-6>.
- Hodgson, K., 2012. Planning for Food Access and Community-based Food Systems. [online]. URL (Accessed 20 August 2018). *American Planning Association*. https://planning-org-uploaded-media.s3.amazonaws.com/legacy_resources/research/foodaccess/pdf/foodaccessreport.pdf.
- Hodgson, K., Campbell, C., Bailkey, M., 2011. *Urban Agriculture: Growing Healthy Sustainable Places*. Planning Advisory Service Report No. 563. American Planning Association, Chicago, IL.
- Holden, R., 2017. It's Called Vertical Farming, and It Could Be the Future of Agriculture. November 4 [online]. URL (Accessed 20 August 2018). *Forbes*. <https://www.forbes.com/sites/ronaldholden/2017/11/04/its-called-vertical-farming-and-it-could-be-the-future-of-agriculture/2/>.
- Ilaslan, G., White, G.B., Langhans, R.W., 2002. Insights into the Economic Viability of a New CEA System Producing Hydroponic Lettuce. [online]. URL (Accessed 26 August 2018). <http://cea.cals.cornell.edu/attachments/economic%20viability%20of%20CEA.pdf>.
- Intergovernmental Panel on Climate Change, 2007. In: Metz, B., Davidson, O.R., Bosch, P.R., Dave, R., Meyer, L.A. (Eds.), *Climate Change 2007: Mitigation of Climate Change. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press, Cambridge, UK and New York, NY.
- Janusziewicz, K., Jarmusz, M., 2017. IOP Conference Series: Materials Science Engineering 245 052094. [online]. URL (Accessed 6 September 2018). <http://iopscience.iop.org/article/10.1088/1757-899X/245/5/052094/meta>.
- Jensen, M., 2015. The birth of an agricultural revolution: controlled environment agriculture. Covering Environments - the CEAC Monthly Seminars. [online]. URL (Accessed 20 August 2018). <http://ceac.arizona.edu/events/ceac-seminar-series-1211>.
- Joye, Y., 2007. Architectural lessons from environmental psychology: the case of biophilic architecture. *Rev. Gen. Psychol.* 11 (4), 305–328. <https://doi.org/10.1037/1089-2680.11.4.305>.
- Kart, J., 2018. Edenworks touts results from growing with ecology instead of chemicals. *Forbes*. [online]. URL (Accessed 7 January 2019). <https://www.forbes.com/sites/jeffkart/2018/10/30/edenworks-touts-results-from-growing-with-ecology-instead-of-chemicals/#5ee094954b92>.
- Kaufman, J., 2004. Introduction. Special issue: planning for community food systems. *J. Plan. Educ. Res.* 23 (4), 335–340.
- Kaufman, J., Bailkey, M., 2000. *Farming Inside Cities: Entrepreneurial Urban Agriculture in the United States*. Lincoln Institute for Land Use Policy.
- Kissinger, G., Herold, M., De Sy, V., 2012. Drivers of Deforestation and Forest Degradation: A Synthesis Report for REDD + Policymakers. Lexeme Consulting, Vancouver, Canada.
- Lawson, L., 2005. *City Bountiful: A Century of Community Gardening in America*. University of California Press, Berkeley and Los Angeles.
- Lehmann, S., 2010. *The Principles of Green Urbanism: Transforming the City for Sustainability*. Earthscan, London.
- Lovell, S.T., 2010. Multifunctional urban agriculture for sustainable land use planning in the United States. *Sustainability* 2 (8), 2499–2522.
- MacRae, R., Gallant, E., Patel, S., Michalak, M., Bunch, M., Schaffner, S., 2010. Could Toronto provide 10% of its fresh vegetable requirements from within its own boundaries? Matching consumption requirements with growing spaces. *J. Agric. Food Syst. Community Dev.* 1 (2), 105–127. <https://doi.org/10.5304/jafscd.2010.012.008>.

- Marginson, S., 2010. Aerofarms Urban Agriculture System: Less Space, Less Water, and No Pesticides. [online]. URL. (Accessed 20 August 2018). <https://newatlas.com/aerofarms-urban-agriculture/15371/>.
- Mattson, N., Albright, L.D., de Villiers, D., Brechner, M., Langhans, R., 2015. Top misconceptions about CEA. *Inside Grower* 32–34.
- McClintock, N., 2010. Why farm the city? Theorizing urban agriculture through a lens of metabolic rift. *Cambridge J. Reg. Econ. Soc.* 3 (2), 191–207. <https://doi.org/10.1093/cjres/rsq005>.
- McCormack, L.A., Laska, M.N., Larson, N.I., 2010. Review of the nutritional implication of farmers markets and community gardens: a call for evaluation and research efforts. *J. Am. Diet. Assoc.* 110, 399–408.
- Mendes, W., Balmer, K., Kaethler, T., Rhoads, A., 2008. Using land inventories to plan for urban agriculture: experiences from Portland and Vancouver. *J. Am. Plan. Assoc.* 74 (4), 435–449.
- Mesa, N., Callahan, S.M., 2015. One New York: the Plan for a Strong and Just City. [online]. URL. (Accessed 20 August 2018). <http://www.nyc.gov/html/onenyc/downloads/pdf/publications/OneNYC.pdf>.
- Millam, S., Sharma, S.K., 2007. In: Vreugdenhil, D., Bradshaw, J., Gebhardt, C., Govers, F., Mackerron, D.K.L., Taylor, M.A., Ross, H.A. (Eds.), Chapter 32 - Soil-Free Techniques. *Potato Biology and Biotechnology*, pp. 705–716. <https://doi.org/10.1016/B978-044451018-1/50074-9>. <http://www.sciencedirect.com/science/article/pii/B9780444510181500749>.
- Mincyte, D., Dobernig, K., 2016. Urban farming in the North American metropolis: re-thinking work and distance in alternative food networks. *Environ. Plann. A: Econ. Space* 48 (9), 1767–1786. <https://doi.org/10.1177/0308518X16651444>.
- Mukherji, N., Morales, A., 2010. Zoning for Urban Agriculture. *American Planning Association*, Chicago, IL.
- National Young Farmers Coalition, 2017. Building a Future with Farmers: Results and Recommendations From the National Young Farmer Survey. [online] URL. (Accessed August 23, 2018). <https://www.youngfarmers.org/resource/building-a-future-with-farmers-ii/>.
- New York City Department of City Planning, 2008. Going to Market: New York City's Neighborhood Grocery Store and Supermarket Shortage. [online]. URL. (Accessed 20 August 2018). <http://www.nyc.gov/html/dcp/html/supermarket/presentation.shtml>.
- New York City Department of City Planning, Zone Green Text Amendment, 2012. [online]. URL. (Accessed 20 August 2018). https://www1.nyc.gov/assets/planning/download/pdf/plans/zone-green/adopted_text_amendment.pdf.
- New York City Economic Development Council, 2016. Five Borough Food Flow. [online]. URL. (Accessed May 31, 2018). <https://www.nycfedc.com/resource/five-borough-food-flow>.
- New York Sun Works, 2018. [online]. URL. (Accessed 20 August 2018). <http://nysunworks.org/wp-content/uploads/2017/12/NYSW-FAQs-2018.pdf>.
- Nugent, R., 2000. The impact of urban agriculture on the household and local economies. In: Bakker, N., Dubbeling, M., Gündel, S., Sabel-Koshella, U., de Zeeuw, H. (Eds.), *Growing Cities, Growing Food. Urban Agriculture on the Policy Agenda*. Zentralstelle für Ernährung und Landwirtschaft (ZEL), Feldafing, pp. 67–95. https://www.ruaf.org/sites/default/files/Theme3_1_1.PDF.
- Oberndorfer, E., Lundholm, J., Bass, B., 2007. Green roofs as urban ecosystems: ecological structures, functions, and services. *BioScience* 57, 823–833. <https://doi.org/10.1641/B571005>.
- Opitz, I., Berges, R., Piore, A., Kriker, T., 2015. Contributing to food security in urban areas: differences between urban agriculture and peri-urban agriculture in the Global North. *Agric. Human Values* 33, 341–358. <https://doi.org/10.1007/s10460-015-9610-2>.
- Orozco, L., Rico-Romero, L., Escartín, E.F., 2008. Microbiological profile of greenhouses in a farm producing hydroponic tomatoes. *J. Food Prot.* 71 (1), 60–65.
- Pendall, R., 2003. *Sprawl Without Growth: The Upstate Paradox*. The Brookings Institution, Washington, DC.
- Pothukuchi, K., 2004. Community food assessment: a first step in planning for community food security. *J. Plan. Educ. Res.* 23 (4), 356–377.
- Pothukuchi, K., Kaufman, J.L., 1999. Placing the food system on the urban agenda: the role of municipal institutions in food systems planning. *Agric. Hum. Values* 16 (2), 213–224.
- Pothukuchi, K., Kaufman, J., 2000. The food system: a stranger to the planning field. *J. Am. Plan. Assoc.* 66 (2), 112–124.
- Proksch, Gundula, 2017. *Creating Urban Agricultural Systems: An Integrated Approach to Design*. Routledge, New York and London.
- Purcell, M., Brown, J.C., 2005. Against the local trap: scale and the study of environment and development. *Prog. Dev. Stud.* 5 (4), 279–297.
- Puri, V., Caplow, T., 2009. How to grow food in the 100% renewable city: building-integrated agriculture. In: Droege, P. (Ed.), *100% Renewable: Energy Autonomy in Action*. Earthscan.
- Raja, S., Born, B., Russell, J., 2008. *A Planner's Guide to Community and Regional Food Planning: Transforming Food Environments, Facilitating Healthy Eating*. American Planning Association. http://growingfoodconnections.org/wp-content/uploads/sites/3/1970_01/PlannersGuideToCommunityRegionalFoodPlanning_PAS554Excerpt.pdf.
- Rees, W., Wackernagel, M., 1996. Urban ecological footprints: why cities cannot be sustainable—and why they are a key to sustainability. *Environ. Impact Assess. Rev.* 16 (4–6), 223–248.
- Reynolds, K., Cohen, N., 2016. *Beyond the Kale: Urban Agriculture and Social Justice Activism in New York City*. The University of Georgia Press, Athens.
- Rogers, M.A., 2017. Organic vegetable crop production in controlled environments using soilless media. *Hortic. Sci.* 27 (2), 166–170.
- Rogus, S., Dimitri, C., 2015. Agriculture in urban and peri-urban areas in the United States: highlights from the census of agriculture. *Renew. Agric. Food Syst.* 30 (1), 64–78.
- Saldívar-Tanaka, L., Krasny, M.E., 2004. Culturing community development, neighborhood open space, and civic agriculture: the case of Latino community gardens in New York City. *Agric. Human Values* 21, 399–412.
- Säumel, L., Kotsyuk, I., Hölscher, M., Lenkerit, C., Weber, F., Kowarik, L., 2012. How healthy is urban horticulture in high traffic areas? Trace metal concentrations in vegetable crops from plantings within inner city neighbourhoods in Berlin, Germany. *Environ. Pollut.* 165, 124–132.
- Schaulis, J., 2018. Mastronardi Produce Ltd. Expands Backyard Farms® Brand; Sets Record. Dec 3 [online]. URL. (Accessed 9 January 2019) <https://www.andnowuknow.com/headlines/mastronardi-produce-ltd-expands-backyard-farms-brand-paul-mastronardi/robert-schaulis/60931>.
- Schmelzkopf, K., 1995. Urban community gardens as contested space. *Geogr. Rev.* 85 (3), 364–381. <https://doi.org/10.2307/215279>.
- Shute, N., 2007. Farm of the Future? Someday Food May Grow in Skyscrapers. *U.S. News & World Report*. [online]. URL. Archived from the original on September 16, . . .
- Smit, J., Nasr, J., 1992. Urban agriculture for sustainable cities: using wastes and idle land and water bodies as resources. *Environ. Urban.* 4, 141–152.
- Smit, J., Nasr, J., Ratta, A., 2001. *Urban Agriculture: Food, Jobs and Sustainable Cities*, second ed. The Urban Agriculture Network with permission from the United Nations Development Programme, Washington, DC.
- Sorensen, A., Freedgood, J., Dempsey, J., Theobald, M., 2018. Farms Under Threat: The State of America's Farmland. [online] URL. (Accessed 1 June 2018). *American Farmland Trust, Washington, D.C.* <https://www.farmland.org/initiatives/farms-under-threat>.
- Steel, C., 2012. Sitopia: harnessing the power of food. In: Viljoen, A., Wiskerke, J.S.C. (Eds.), *Sustainable Food Planning Evolving Theory and Practice*. Wageningen Academic Publishers, Wageningen, The Netherlands.
- Susca, T., Gaffin, S.R., Dell'Osso, G.R., 2011. Positive effects of vegetation: urban heat island and green roofs. *Environ. Pollut.* 159 (8–9), 2119–2126. <https://doi.org/10.1016/j.envpol.2011.03.007>.
- Takatsuki, M., 1987. *An Introduction to Plant Factories*. Shokubutsu-kohjiyo Nyumon in Ohmu-sha, Tokyo, Japan.
- Theurl, M.C., Haberl, H., Erb, K.H., Lindenthal, T., 2014. Contrasted greenhouse gas emissions from local versus long-range tomato production. *Agron. Sustain. Dev.* 34 (3), 593–602.
- Thomaier, S., Specht, K., Henckel, D., Dierich, A., Siebert, R., Freisinger, U.B., Sawicka, M., 2014. Farming in and on urban buildings: present practice and specific novelties of zero-acreage farming (ZFarming). *Renew. Agric. Food Syst.* 30 (1), 43–54.
- Thomaier, S., Specht, K., Henckel, D., Dierich, A., Siebert, R., Freisinger, U.B., Sawicka, M., 2015. Farming in and on urban buildings: present practice and specific novelties of Zero-Acreage Farming (ZFarming). *Renew. Agric. Food Syst.* 30 (1), 43–54.
- Turner, B., 2011. Embodied connections: sustainability, food systems and community gardens. *Local Environ.* 16 (6), 509–522. <https://doi.org/10.1080/13549839.2011.569537>.
- Turner, W., Nakamura, T., Dinetti, M., 2004. Global urbanization and the separation of humans from nature. *BioScience* 54 (6), 585–590. [https://doi.org/10.1641/0006-3568\(2004\)054\[0585:GUATSO\]2.0.CO;2](https://doi.org/10.1641/0006-3568(2004)054[0585:GUATSO]2.0.CO;2).
- Ulrich, R., 2006. Evidence-based healthcare architecture. *Lancet* 368 (12), 38–39.
- United Nations, 2012. *World Urbanization Prospects*. United Nations, New York, NY.
- U.S. Census Bureau QuickFacts. New York City. [online]. URL. (Accessed 3 January 2019). <https://www.census.gov/quickfacts/fact/table/newyorkcitynewyork/LND110210#LND110210>.
- Venkataraman, B., 2008. Country, the City Version: Farms in the Sky Gain New Interest. [online]. URL. (Accessed 20 August 2018). *The New York Times*. <https://www.nytimes.com/2008/07/15/science/15farm.html>.
- Vegetable Growers News, 2018. Gotham Greens to Expand to Baltimore. [online]. URL. (Accessed 9 January 2019). <https://vegetablegrowersnews.com/news/gotham-greens-to-expand-to-baltimore/>.
- Weber, C.L., Matthews, H.S., 2008. Food-miles and the relative climate impacts of food choices in the united states. *Environ. Sci. Technol.* 42 (10), 3508–3513. <https://doi.org/10.1021/es702969f>.
- Weis, T., 2010. The accelerating biophysical contradictions of industrial capitalist agriculture. *J. Agrar. Chang.* 10, 315–341.
- Wekerle, G., 2004. Food justice movements: policy, planning, and networks. *J. Plan. Educ. Res.* 23, 378–386.
- Wood, L., 2017. *Global Hydroponics Market Report 2017-2023: Market is Expected to Grow From \$226.45 Million in 2016 to Reach \$724.87 Million by 2023 - Research and Markets*. [online]. URL. (Accessed 1 June 1, 2018). *Businesswire*. <https://www.businesswire.com/news/home/20171206006224/en/>.



NEW YORK CITY COUNCIL MEMBER

DEBI ROSE

49TH COUNCIL DISTRICT, STATEN ISLAND

Council Member Rose Statement on Bay Street Corridor Rezoning

Land Use Committee *June 11, 2019*

Thank you, Chair Salamanca.

I support this rezoning of the Bay Street Corridor in my district. The road was long, but with the guidance and the input from my constituents and many stakeholders, I have secured the necessary funding and commitments for the next chapter of the story of the North Shore.

Today, we have before us a blueprint for a well-planned future. I am pleased to be delivering several critical investments that respond to the needs of the existing community, while providing a sustainable path for the future of the North Shore.

First and foremost, I have secured a commitment to fully-affordable housing on publicly-owned property as a part of this project. The North Shore is not a gated

community, and I have maintained a commitment to ensure that no one feels shut out of their own neighborhood. The next phase of development at the Homeport site on the new Stapleton Waterfront will include approximately 600 affordable housing units that serve families with a broad range of incomes in a desirable waterfront location. We have also secured commitments to build 100% affordable housing at 539 Jersey Street, including 90 units of senior housing.

In addition, the School Construction Authority will build a brand new approximately 600 seat P.S or P.S. / I.S. school on the site as well. Along with the new waterfront school, SCA has committed to another new elementary school at the old Hungerford School Site, and to build a new annex for PS13 to provide additional seats.

To ensure that residents have access to adequate open space, we have secured the funding for 12 acres of a continuous waterfront esplanade that will include open space amenities such as: playground, basketball court, dog run, picnic area, pickle ball, and comfort stations.

The proposed Tompkinsville Esplanade has been long discussed, but is now finally funded, with \$75 Million and a completion date expected in 2023. The Tompkinsville esplanade will provide a safe pedestrian-oriented space that will close the existing gaps in the North Shore waterfront and will include resiliency measures for a safe and sustainable future – a key piece in my long-term vision for a continuous North Shore esplanade that makes the waterfront publicly accessible.

The Administration has committed to 100 vouchers for North Shore families to move out of shelters into affordable housing in the North Shore. Several agencies have also committed to dedicated legal services for residents of the North Shore who may face displacement as development occurs.

We have also secured \$15 million in necessary sewer infrastructure work along Bay Street. This funding is separate from the \$45 Million in new sewers, the realignment of Front Street, and utilities at the Stapleton Waterfront.

And finally, finally, finally, the long-delayed rebuilding of the Cromwell Recreation Center at the Lyons Pool, which was damaged beyond repair in 2010 is fully-funded. The \$92 Million in new funds will ensure that the Cromwell center will be built on the Lyons Pool site with an anticipated opening of the community center in 2025. I have guaranteed that the City will work with the community on the design and programming of the new Center as plans are finalized.

We have a series of other commitments that I don't have time to list here, but I believe my constituents will be pleased with the \$250 Million package. I fought for the City to make good on their prior commitments, fought for the best for the North Shore, and fought to respond to the stakeholders who voiced their concerns. With local stakeholder support, we have forged a roadmap for new investment in Staten Island.

Finally, I want to thank the City Council Land Use Team – Raju Mann, Amy Levitan, John Douglas, Arthur Huh, and Rosa Kelly. Without their expertise and dedication

to this project, we would not be here this morning. Thank you also to my Chief of Staff Christine Johnson for her dedication to this project as well.

I urge my colleagues to vote yes on this application, and I want to thank you Chair Moya for your support during this process.

To The Land Use Committee:

On behalf of East New York Farms!, I am testifying of support of Int. 1058 by Council Member Espinal.

East New York Farms! Has been working for over 20 years to improve food access and build community through local food production. More than a single urban farm, we are a community of hundreds of gardeners, vendors, educators, youth, NYCHA residents, and neighbors who have transformed our neighborhood.

We applaud the effort to bring a more comprehensive approach to securing and advancing urban agriculture in New York City. To do our work effectively we need to partner with a variety of city agencies, which underscores the need for more coordination on a government level. In this year alone, we have forged partnerships and signed agreements with GreenThumb, NYCHA, Department of Sanitation, Department of Transportation, Department of Health, CUNY, and the Office of Environmental Remediation. The breadth of these partnerships alone should be enough to convey the degree to which our work intersects with city policy initiatives on many different fronts.

We are excited to see urban agriculture expand into all sectors of the city and to serve a wider community, be that through gardens, urban farms, hydroponics, or rooftop farms. At the same time, we insist that any urban agriculture plan must take into account the critical role that community gardens play in this city. The majority of food production in this city happens in over 500 community gardens, many of them in low-income communities of color in the Bronx, Upper Manhattan, and Brooklyn. In addition to providing fresh produce for families, many gardens also supply farmers markets. In fact, gardeners in East New York were the first urban growers in New York State who were certified to accept the Farmers Market Nutrition Program Coupons, which serve seniors and mothers who receive WIC.

Any planning process by the Department of City Planning must incorporate the voice of low-income communities of color and must keep equity as a central focus in the process. As East New York residents, we have been disappointed in the past by the approach of DCP when it came to rezoning our community--we hope that they can do better in this process by engaging community stakeholders from the beginning.

Beyond a comprehensive urban agriculture plan, we would like to see this bill create an inter-agency task force whose mission is to protect, foster, and expand urban agriculture in New York City. The needs of the urban agriculture community are as diverse as the practitioners, and the issues have shifted over time and will continue to evolve. We want to see a coordinated effort by city agencies (including Parks, HPD, DEP, Sanitation, and others) to support the urban agriculture community and leverage city resources for community benefit.

Urban agriculture contributes to food access, community-building, safety, environmental quality, youth development, job creation, and overall quality of life for New Yorkers. We have been able to grow a strong movement with the leadership of communities and critical partnerships with city government. The time has come for more coordinated leadership on the part of city government so that we can take this movement to the next level.

Thank you for your time and consideration.

On behalf of:

East New York Farms!
United Community Centers
613 New Lots Avenue
Brooklyn NY 11207
718-649-7979

Ricky Stephens
Co-Founder | AgTech X
Director of Digital Strategy | Agritecture Consulting
Int. 1058 Public Hearing Testimony
June 11, 2019

My name is Ricky Stephens; I'm a cofounder of AgTech X and Director of Digital Strategy at Agritecture Consulting. For the sake of time and given my area of focus, I'm going to speak purely from the commercial urban agriculture standpoint. However, I would like to highlight my support for *all* forms of urban farming, and my hope is that a comprehensive plan addresses the needs of the many stakeholders who benefit from the range of environmental and socioeconomic services that urban ag provides.

In 2 years of running the city's only shared workspace focused exclusively on urban agriculture & local food system innovation, AgTech X was uniquely situated to observe and analyze the explosive popularity for these topics. We've hosted 35 coworking members, put on 100+ events including a major conference that attracted over 650 registrants, and have had more than 2500 total guests visit our small office in Brooklyn.

Using our space as a hub to gain knowledge and connections in this industry, our visitors have primarily been NYC residents, but others have hailed from places like Brazil, France, Tanzania, Japan, and Australia, to name a few. Overwhelmingly, these visitors are well-educated young professionals who are seeking jobs in a more impact-driven field, looking to create jobs here through entrepreneurship, or are looking to size up the opportunity for bringing their existing businesses to NYC.

All of these visitors consider New York to be at the forefront of innovation when it comes to food, technology, urban design, and cultural diversity: foundations to encourage positive business growth in the urban agriculture field. However, my worry is that as these innovators uncover the more hidden barriers to entry and their associated risks and costs, they will flee for greener pastures.

Chicago – in 2011; Boston – in 2013; and Los Angeles – in 2015, are just a few of the many US cities that have already adopted comprehensive urban agriculture plans or made supportive amendments to zoning policies to spur the growth of this industry. New York City has been behind the curve; let's use this bill to change that. Thank you.

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

I intend to appear and speak on Int. No. 1058-2016 Res. No. _____

in favor in opposition

Date: 6/11/19

(PLEASE PRINT)

Name: ONIKA ABRAHAM LEE

Address: 127 HANCOCK STREET

I represent: FARM SCHOOL NYC

Address: _____

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

in favor in opposition

Date: _____

(PLEASE PRINT)

Name: Keith Carr

Address: CITY HARVEST 6 EAST 32ND STREET

I represent: CITY HARVEST

Address: _____

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

I intend to appear and speak on Int. No. 1058 Res. No. _____

in favor in opposition

Date: JUNE 11, 2019

(PLEASE PRINT)

Name: ALEX SOMMER, DEPUTY DIRECTOR, BROOKLYN

Address: 120 BROADWAY

I represent: NYC DEPT. OF CITY PLANNING

Address: _____

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

I intend to appear and speak on Int. No. 1058 Res. No. _____

in favor in opposition

Date: JUNE 11, 2019

(PLEASE PRINT)

Name: ALISON MCCABE, DEPUTY COUNSEL

Address: 120 BROADWAY

I represent: NYC DEPT. OF CITY PLANNING

Address: _____

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

I intend to appear and speak on Int. No. 1058 Res. No. _____

in favor in opposition

(Urban Agriculture) Date: June 11, 2019

(PLEASE PRINT)

Name: Samira Behrooz

Address: 40 Worth St. Suite 603

I represent: Design Trust for Public Space

Address: _____

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

I intend to appear and speak on Int. No. 1058 Res. No. _____

in favor in opposition

Date: 6/11/19

(PLEASE PRINT)

Name: Wylie Goodman

Address: 6115 Palmetto Street Ridgewood 11385

I represent: _____

Address: See above

Please complete this card and return to the Sergeant-at-Arms

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

in favor in opposition

Date: _____

(PLEASE PRINT)

Name: Jordan R. Rodgers

Address: 1214 Mac Ave The Bronx NY 10453

I represent: My self

Address: 1214 Mac Ave The Bronx NY 10453

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

I intend to appear and speak on Int. No. 1058 Res. No. _____

in favor in opposition

Date: 6/11/19

(PLEASE PRINT)

Name: Alessandro Ciari

Address: 473 Central Ave. Brooklyn, NY 11221

I represent: CUNY Urban Food Policy Institute

Address: 55 West 125th St. NY, NY 10027

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

in favor in opposition

Date: June 11, 2019

(PLEASE PRINT)

Name: Gemma Garcia

Address: 438 Vermont St. Bklyn, NY 11207

I represent: East New York Farms/UECC

Address: 613 New Lots Ave Bklyn NY 11207

Please complete this card and return to the Sergeant-at-Arms

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

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I intend to appear and speak on Int. No. _____ Res. No. _____

in favor in opposition

Date: _____

(PLEASE PRINT)

Name: AZIE DEHKAN

Address: _____

I represent: NYC Community GARDEN COALITION

Address: 232 E 11th St NY NY 10003

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

[]

I intend to appear and speak on Int. No. _____ Res. No. _____

in favor in opposition

Representative Date: _____

(PLEASE PRINT)

Name: Eric Adams Bklyn Borough President

Address: 209 Jordanon street

I represent: Eric Adams Borough President

Address: _____

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

[]

I intend to appear and speak on Int. No. 1058 Res. No. _____

in favor in opposition

Date: 6/11/19

(PLEASE PRINT)

Name: Ricky Stephens

Address: 225 Dehold Ave #2, Brooklyn, NY 11205

I represent: AgTech X + Agriculture Consulting

Address: 40 Bushwick Ave, Brooklyn, NY 11211

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

I intend to appear and speak on Int. No. 1058 Res. No. _____

in favor in opposition

Date: 6/11/19

(PLEASE PRINT)

Name: Kristin REYNOLDS
Address: 67-30 Groton St. Forest Hills, NY 11375

I represent: self

Address: _____

Please complete this card and return to the Sergeant-at-Arms

**THE COUNCIL
THE CITY OF NEW YORK**

Appearance Card

I intend to appear and speak on Int. No. 1058 Res. No. _____

in favor in opposition

Date: 6/11/19

(PLEASE PRINT)

Name: Diana Mickie
Address: clo KRA Associates, Ste. 303 NY, NY 10112

I represent: Just Food

Address: _____

Please complete this card and return to the Sergeant-at-Arms