

**AN EVALUATION OF FOOD SYSTEMS EDUCATION AND
INTERPRETATION IN U.S. PUBLIC GARDENS**

by

Erin L. Kinley

A thesis submitted to the Faculty of the University of Delaware in partial fulfillment
of the requirements for the degree of Master of Science in Public Horticulture

Spring 2017

© 2017 Erin L. Kinley
All Rights Reserved

**AN EVALUATION OF FOOD SYSTEMS EDUCATION AND
INTERPRETATION IN U.S. PUBLIC GARDENS**

by

Erin L. Kinley

Approved: _____
Brian W. Trader, Ph.D.
Professor in charge of thesis on behalf of the Advisory Committee

Approved: _____
Robert Lyons, Ph.D.
Chair of the Department of Plant and Soil Sciences

Approved: _____
Mark Rieger, Ph.D.
Dean of the College of Agriculture and Natural Resources

Approved: _____
Ann L. Ardis, Ph.D.
Senior Vice Provost for Graduate and Professional Education

ACKNOWLEDGMENTS

I would like to thank Longwood Gardens and the University of Delaware for offering me this opportunity and for their support throughout this endeavor. I am eternally grateful for the unparalleled education that I have received through this program.

I would also like to thank my thesis committee, led by Dr. Brian Trader, Interim Director of the Longwood Graduate Program, for their wisdom and guidance: Ms. Sarah Beck, American Public Gardens Association; Ms. Elise Benveniste, Benveniste Consulting; and Ms. Carrie Murphy, University of Delaware. I truly appreciate the time and expertise you have dedicated to this project.

I would like to thank Dr. Brian Trader again as well as Marnie Conley, LGP Co-Lead, for being incredible mentors and fearless leaders of this program.

I am also indebted to everyone who participated in the survey, phone interviews, and on-site observations for this project. You were all so generous with your time and information, and this thesis would not have been possible without you.

Finally, I would like to thank my family and friends who have supported me throughout the past two years, especially my classmates in the LGP Class of 2017. You all deserve Gold Stars for being the most outstanding colleagues and inspirational group of women I have ever had the pleasure of working with.

DEDICATION

This thesis is dedicated to my beloved grandparents, whose stories and wisdom have always inspired me.

TABLE OF CONTENTS

LIST OF TABLES	viii
LIST OF FIGURES	ix
ABSTRACT	x

Chapter

1	LITERATURE REVIEW	1
	Challenges to Global and U.S. Food Systems	1
	Critical Food Literacy and the Need for Food Systems Education	3
	Resources and Institutions for Food Systems Education	4
	Current Food Systems Education in Public Gardens	6
	The Need for Additional Research	8
2	MATERIALS AND METHODS	10
	Initial Survey	10
	Phone Interviews	11
	On-Site Observations.....	14
3	RESULTS	16
	Content Guide.....	16
	I. Survey Results.....	18
	II. Phone Interview and On-Site Observation Results by Category	19
	A. Classes and Lectures.....	19
	i. Development.....	19
	ii. Future Planning	23
	iii. On-site Observation	25
	iv. Classes and Lectures Summary	26
	B. Garden Displays and Exhibits	27
	i. Development.....	27
	ii. Future Planning	31
	iii. On-site Observation	32
	iv. Garden Displays and Exhibits Summary.....	36
	C. Training Programs	37

i.	History and Structure	37
ii.	Future Planning	42
iii.	On-Site Observation	44
iv.	Training Programs Summary	48
D.	Production-focused Farms	48
i.	History and Structure	49
ii.	Future Planning	51
iii.	On-site Observation	53
iv.	Production-focused Farms Summary	56
E.	Underrepresented and Challenging Topics	57
i.	Food-related Research and Food Crop Collections or Seed Banks	57
ii.	Food Policies	58
iii.	Underrepresented Production-Related Activities	59
iv.	Sharing Information on Challenging Topics	60
v.	Underrepresented and Challenging Topics Summary	62
4	DISCUSSION	63
	Analysis of Results	63
	Improving Food Systems Education in Public Gardens	68
	Program-Specific Opportunities	72
	Overall Food Systems Education Opportunities	74
	Conclusions	74
	REFERENCES	76
Appendix		
A	INITIAL SURVEY	82
B	IRB APPROVAL LETTERS	95
C	EMAIL TO AMERICAN PUBLIC GARDENS ASSOCIATION MEMBERSHIP ANNOUNCING FOOD & AG SURVEY	98
D	PHONE INTERVIEW QUESTIONS	101
E	EMAIL REQUESTING PHONE INTERVIEW	106
F	INFORMED CONSENT FORM	108
G	ON-SITE OBSERVATION SCOPES OF WORK	112
H	EMAIL REQUESTING ON-SITE OBSERVATION	117

I	SURVEY DATA	118
J	WINDY CITY HARVEST APPRENTICESHIP PROGRAM 2017 OUTLINE.....	123
K	EXAMPLE FOOD SYSTEMS SIGNAGE FROM THE UNIVERSITY OF BRITISH COLOMBIA BOTANICAL GARDEN	125

LIST OF TABLES

Table 1	Gardens that participated in the phone interview, classified by most prominent food systems education program.....	12
Table 2	Question topics for each phone interview question section	13
Table 3	Representatives interviewed at each garden.....	14
Table 4	Supplementary information for on-site observations	15
Table 5	Primary formal learning events discussed by each garden.....	19
Table 6	Primary garden displays and exhibits at interviewed gardens.....	27
Table 7	Cross-departmental programming created for garden displays and exhibits	30
Table 8	Overview of community gardener training programs at public gardens .	39
Table 9	Structure and primary components of agriculture/green industry job training programs at interviewed gardens.	40
Table 10	Comparison of the farms' initiatives and core structures	49

LIST OF FIGURES

Figure 1	DBG vegetable garden	26
Figure 2	Interpretive signage for THBG’s vegetable display garden	33
Figure 3	Free brochures offered near the THBG vegetable garden.....	34
Figure 4	Tags on each tree give variety name, origins, and uses for fruit.	35
Figure 5	Interpretive signage at the Frank L. Harrington, Sr. Orchard.	36
Figure 6	WCH Signage at CBG.....	45
Figure 7	Multiple sizes of aquaponics systems are available for hands-on learning at WCH’s main site at the Arturo Velasquez Institute.	46
Figure 8	Example WCH urban farm sites.....	47
Figure 9	View from inside the QBG farm, looking out to the garden’s arboretum.....	54
Figure 10	Signage outside the farm at the compost education station.....	55
Figure 11	Composting at the QBG Farm.....	55
Figure 12	Sign displayed at fruit and vegetable scrap drop-off sites.....	56

ABSTRACT

The primary goals of this research were to 1) determine how public gardens are addressing food systems education, 2) discern what information gardens communicate about challenges facing food systems, and 3) identify barriers to including challenging and underrepresented topics in food systems education at gardens. The research found that although most gardens include aspects of food systems in their programming, how these aspects are interpreted to the general public varies. In other cases, programs that focus solely on food and agriculture topics are not always well integrated with other garden programming to share this knowledge with broader garden audiences. Phone interviews also found that most gardens informally discuss challenges to food systems in their programming, but few directly share information about these topics. Lack of expertise, relevance to mission, and perceived audience interest appear to be the primary barriers to including challenging and underrepresented topics in gardens' food systems education. Overall, few gardens are using their food-related programming to increase critical food literacy among their visitors. As trusted resources for plant education, public gardens have the infrastructure to become leaders in food systems education, but this research found that gardens will need effective partnerships, creative collaboration, and reimagined interpretation to achieve critical food literacy success.

Chapter 1

LITERATURE REVIEW

Challenges to Global and U.S. Food Systems

Today's food systems are larger and more complex than ever before. Food systems reach beyond production to encompass the processing, distribution, retail, and consumption of food (Ericksen, Ingram, & Liverman, 2009) as well as politics, environmental impacts, and nutrition (University of Oxford, n.d.). Our modern food system is beginning to face some of its greatest challenges, at the heart of which is our rapidly growing population. Estimates project the world population to be 9.7 billion by 2050, over two billion more than our current population of 7.3 billion (United Nations, 2015). In the coming years, food production will need to increase by 70% using only 20% more arable ground while addressing climate change and a declining rate of growth in yields for cereal crops (Food and Agriculture Organization, 2009). Our current food system also contributes almost a third of annual greenhouse gas emissions globally (Vermeulen, Campbell, & Ingram, 2012), and agriculture as a whole is estimated to cause 80% of deforestation worldwide (Kissinger, Herold, & De Sy, 2012). In addition, nearly a third of all food is either lost or wasted along various stages of the supply chain, which not only exhausts the resources used to produce it but is also a huge detriment to the millions of people facing food insecurity (Gustavsson, Cederberg, & Sonesson, 2011). Food insecurity is defined as "the limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways" (USDA

ERS, 2016b). While the overall rate of global food insecurity has decreased in the last two decades, it is estimated that 795 million people, or one in nine of the world's population, are still undernourished (FAO, 2015).

Even developed nations like the U.S. are not immune to these challenges, and they often present their own unique complexities. While 12.7% of Americans were food insecure in 2015 (Coleman-Jensen, Rabbitt, Christian, & Singh, 2016), recent reports estimate that 36.5% of adults and 17% of youth are obese (Ogden, Carroll, Fryar, & Flegal, 2015). However, there is a significant overlap in these two groups, as research has shown that food insecure households are more likely to be overweight or obese (Food Research and Action Center, 2015; Holben & Taylor, 2015). This can be partially attributed limited resources and lack of access to healthy, affordable food for low-income individuals and families (Food Research and Action Center, 2015).

The U.S. food system is also rife with labor issues (Ribera & Knutson, 2013), particularly the abuse of migrant labor through H2-A visas which have been compared to government-sanctioned slavery (Southern Poverty Law Center, 2013). Fruit and vegetable production in particular is highly dependent on foreign-born hired labor (Ribera & Knutson, 2013). However, U.S. produce growers must keep prices low to compete with imported fruits and vegetables from other countries (Ribera & Knutson, 2013). Compounding this, the 2010 Dietary Guidelines for Americans have called for a vast increase in fruit and vegetable availability, as much as 133% for fruit and 114% for vegetables, which will either need to be imported or competitively produced by U.S. growers (Ribera, Yue, & Holcomb, 2012).

Critical Food Literacy and the Need for Food Systems Education

Given the complexity of these issues, to create a more sustainable food system we must start by improving critical food literacy in the American population. Critical food literacy can be defined as the ability to understand the multiple perspectives and larger sociopolitical contexts involved with food to take action towards a more just and sustainable food system (Yamashita & Robinson, 2016). Yamashita and Robinson argue that “citizens who develop and demonstrate critical food literacy can participate in public, democratic discourse about food systems” and can advocate for structural changes to improve the current system (2016). Building on this idea and the previously discussed definition of food systems, for the purposes of this paper, food systems education is that which acknowledges or addresses the many aspects of today’s food supply and seeks to build critical food literacy in its audiences.

However, most Americans lack even basic knowledge about food systems; 72% of consumers report knowing very little about how food is even produced (U.S. Farmers and Ranchers Alliance, 2011). Americans have become increasingly distant from their food systems since the industrialization of agriculture in 20th century, where rapid improvements in farm mechanization continued to increase farm productivity while using less and less labor (Dimitri, Effland, & Conklin, 2005). This allowed more people to move to cities and seek employment in other sectors (Dimitri et al., 2005), further removing them from the process of food production so that today over 80% of the U.S. population lives in urban areas (U.S. Census Bureau, 2011) and less than 10% are employed in agriculture-related fields (USDA ERS, 2016a).

Resources and Institutions for Food Systems Education

A lack of reliable resources for the general public to learn about their food may be exacerbating this disconnect between people and food systems. While elementary and secondary education are considered a key place for food education, with only 3.3 percent of high school and community college students enrolled in formal food and agriculture education (Mercier, 2015), it is critical to find other ways to educate the American population about their food. Land grant universities, with agricultural education as a core part of their mission (Association of Public and Land-Grant Universities, 2012), may seem like a natural fit for this type of education, but their primary education focus remains on outreach for workers in agriculture and rural communities (National Research Council, 1996).

Free-choice learning institutions have a unique opportunity to fulfill this need for food systems education in the U.S. Free-choice learning institutions are places where learning is ‘self-directed, voluntary, and guided by individual needs and interests’ (Falk & Dierking, 2002), and include museums, zoos, aquaria, public gardens, science centers, and other similar establishments such as national parks and historic homes (Falk & Dierking, 2013). Sixty percent of the U.S. population is estimated to attend these types of institutions each year (Falk & Dierking, 2013). However, a recent study suggests that agriculture is rarely referenced in science museums, and of the museums sampled in the study, none used the word ‘agriculture’ in the titles or descriptions of their exhibits despite 40-45% of them being clearly, probably, or skills-related to agriculture (Stofer, 2015). Even with the success of exhibits like the New York Museum of Natural History’s “Our Global Kitchen: Food, Nature, Culture”, food is still relegated to just a supporting role in most museums and historic sites (Moon, 2016). To improve the connections between science, history, and

agriculture, the USDA has partnered with the Association of Science-Technology Centers to provide resources for more agricultural science programming in science centers and museums (U.S. Department of Agriculture, 2015). Representing food in some of these institutions has limitations, though. For example, history museums frequently demonstrate that food once required constant hard labor, but because they often do not show the costs of an industrialized food system, they can give the inaccurate message that today's food systems are easier and better for society (Moon, 2016). Paradoxically, food history can also be misinterpreted to make past food systems appear as a pastoral ideal that we must return to for healthier, more sustainable living (Moon, 2016). Both of these situations result in incomplete stories about today's food systems.

Because of their unique role as living museums, public gardens offer an ideal setting to help the American public understand where their food comes from (Miller et al., 2015). Plants are the basis of every food system, from the fruits and vegetables we eat to the plant-based diets of livestock, and even the ethanol used in fuel to transport food all over the world. Public gardens are already trusted sources for plant education and have both the infrastructure and expertise to engage visitors about the relationship between plants and food (Novy & Dotson, 2015), giving them a distinct advantage over other types of institutions. For example, gardens have the opportunity to educate their audience about both traditional and innovative methods of agricultural production through interactive plant displays and educational programs (Miller et al., 2015). In addition, gardens have all the tools for conserving, preserving, and researching crop diversity and crop wild relatives (Miller et al., 2015), something that

is critical for building strong food production systems and could provide a number of educational opportunities for visitors.

Current Food Systems Education in Public Gardens

Food systems programming has been making its way into public gardens for several years now. Two years ago, Botanic Gardens Conservation International conducted a survey that investigated how gardens worldwide are addressing food security. Few reported being actively or consistently engaged with the public on food security issues, but in regards to another area of food systems, eighty percent of the 88 international gardens that responded to the survey thought that working with local communities to enhance food production was important or very important (Sharrock, 2013). The survey was published in an issue of BGJournal that also showcased the work of several international gardens that have made significant efforts to include aspects of food systems in their programming. These ranged from the VertiCrop exhibit at the Paignton Zoo in the United Kingdom to Kitsantu Botanical Gardens' conservation and native food plant education programs in Bas Congo (Botanic Gardens Conservation International, 2013).

In the U.S., many gardens have either built extensive food programming or are working to include more food-related activities. The most prominent of these may be efforts towards home food gardening, with 64% of public gardens in the U.S. currently offering or planning to offer food gardening-related programs to their visitors (Vogel, 2011). Most gardens that offer these programs feel it is related to their mission or believe the topic is something their audience is interested in (Vogel, 2011). This belief appears to be well-founded, considering that 98% of respondents to a survey of U.S.

food gardeners thought that public gardens should offer resources related to food gardening (Vogel, 2011).

Culinary programs, representing the consumption aspect of food systems, have also become an increasingly popular engagement tool at public gardens (Fochs, 2016). These programs often focus on “ideas of healthy eating, growing one’s own food, or eating locally sourced food,” but for many institutions, these programs are designed to attract new audiences rather than created as a tool for food systems education (Fochs, 2016).

In some gardens, programs are addressing food systems by teaching participants how to grow food in urban environments. For example, Chicago Botanic Gardens’ Windy City Harvest started its first urban agriculture site over twelve years ago to improve the lives of underserved communities (McCullough, 2014). Today it includes a Youth Farm with several locations, an apprenticeship program, and a program for justice-involved youth (Chicago Botanic Garden, 2016). Denver Botanic Gardens has its own Community Supported Agriculture program (Denver Botanic Gardens, n.d.b), while Cleveland Botanical Garden operates Green Corps, an initiative that educates and hires teens to work at their many urban farm sites (Sharrock, 2013). Three New York City-area botanic gardens also maintain substantial urban agriculture education programs, with the Edible Academy at New York Botanical Garden, Brooklyn Botanic Garden’s GreenBridge program, and the Queens Botanical Garden Farm (Brooklyn Botanic Garden, 2016; New York Botanical Garden, 2016; Queens Botanical Garden, n.d.).

Other institutions offer food education through preserving the genetic diversity of certain crops. Fairchild Tropical Botanic Garden in Miami has the world’s largest

mango collection, which holds a wealth of genetic diversity for the crop and is highlighted by the garden's annual International Mango Festival (Fairchild Tropical Botanic Garden, 2016a). This two-day event features a mango tree sale, cooking demonstrations, and other mango-related activities (Fairchild Tropical Botanic Garden, 2016b). Similar collections and programs can be found in National Tropical Botanical Garden's Breadfruit Institute, which promotes the conservation of breadfruit, and Denver Botanic Garden's extensive coffee research in their Center for Global Initiatives (Denver Botanic Gardens, n.d.a; National Tropical Botanical Garden, 2016).

Still, these programs appear to be missing key aspects of food production in the U.S., such as the large-scale, conventional production of commodity crops that are staples in the American food system. In 2016, 228.6 million acres in the U.S. were planted to corn, soybeans, and wheat (National Agriculture Statistics Service, 2016), but very few gardens could be found that include information about these crops in their programming. This could be the result of many factors, such as lack of expertise on commodity crops or difficulty connecting this topic to other garden programming. The U.S. Botanic Garden currently seems to be the leader in creating these types of exhibits; in 2014, the garden featured an exhibit on wheat called "Amber Waves of Grain", followed by "Exposed: The Secret Life of Roots" in 2015, which highlighted key agriculture production areas like tallgrass prairies and economic crops like potatoes (National Association of Wheat Growers, 2014; U.S. Botanic Garden, n.d.).

The Need for Additional Research

From this, it is clear that many public gardens are educating visitors about some aspects of food systems. USBG's recent exhibits have highlighted commodity

crops, and the argument could be made that programs like Windy City Harvest are attempting to address food security. However, there are many complicated layers to understanding food systems, from the basic idea that food comes from farms to concepts of global trade and farmworker rights, and the extent to which gardens are educating visitors about this complexity is unclear. Little research or documentation exists on food systems programming in these institutions, which gives rise to the question: How are public gardens addressing food systems education? To determine this, it is essential to identify which gardens are engaging in food systems education, the types of programs offered, what aspects are being included, and the target audiences for these programs. In addition, in light of the challenges facing food systems, it is important to know what information, if any, is being communicated about these issues. Finally, if a majority of gardens are not addressing food systems, or if certain aspects of food systems are underrepresented, barriers to including these in public garden programming should be identified.

The general public needs accessible, reliable resources to learn more about their food, and as such, public gardens may have the potential become leaders in food systems education. With more comprehensive data on these programs, best practice recommendations can be made to help gardens guide their conversations about food and educate the American population in making critical decisions about our food systems.

Chapter 2

MATERIALS AND METHODS

Initial Survey

A survey was developed to research information on food systems education in public gardens (Appendix A). The survey was prepared in Qualtrics and designed in collaboration with Benveniste Consulting and the American Public Gardens Association (the Association) as part of a larger study being conducted by the Association.

The survey used multiple choice, check-all-that-apply, Likert scale, and built-in logic questions to survey participants about food-related programming at their gardens. Questions were focused in three areas: program overview, program content, and program impact. The program overview section surveyed general information about food education at participants' gardens through questions on program age, food-related programs offered (classes, lectures, exhibits, etc.), primary audiences, program goals, and resources needed. Program content questions surveyed aspects of food systems, production-related subjects, and challenging topics included in food-related programming at participants' gardens. United States Department of Agriculture (USDA) information was used to determine the answer choices for production-related subjects (Gold, 2007). For clarity and consistency, USDA definitions were also included for answer choices in the questions on aspects of food systems and production-related subjects (Gold, 2007). The third section on program impact gathered data on food program budgets, garden diversity, fundraising goals, sustainability operations, media coverage, external partnerships, and barriers to developing food-related programs.

Before distribution, the survey was submitted to the University of Delaware Human Subjects Institutional Review Board (IRB) and granted “Exempt” status. (All IRB approval letters can be found in Appendix B.) The Association made the survey available to its membership for 22 days, from February 3 to February 25, 2016. The email announcing the survey can be found in Appendix C.

Phone Interviews

As a follow-up to the survey, phone interviews were conducted to research detailed information on barriers to initiating food-related programs, program structure, growth and goals, and underrepresented topics. (Underrepresented topics were those addressed by less than 20% of gardens who responded to the survey.) A matrix was developed to identify gardens with the most comprehensive food-related programs based on survey results. The matrix scored all survey respondents based on their answers to four key questions about 1) food-related activities, 2) aspects of food systems, 3) production-related activities, and 4) challenges to food systems. Each of these questions had check-all-that apply answer banks; the matrix gave respondents a point for each answer checked. Respondents with the 20 highest scores were chosen for further review and for potential phone interviews. Additionally, respondents with a distinct physical site and a unique identity were considered to be eligible for the phone interview, which narrowed the list to 17 gardens.

The 17 gardens were categorized to gather detailed information on specific types of food systems education and to improve consistency when analyzing data for themes in program structure. Using survey responses, online information, and data from the Benveniste Consulting study, each garden was placed into one of four categories based on what appeared to be its primary food-related programming: 1)

garden displays and exhibits, 2) classes and lectures, 3) training programs, and 4) production-focused farms (Table 1). One garden was placed into two categories because of its two distinct but separate food-related programs.

Table 1 Gardens that participated in the phone interview, classified by most prominent food systems education program

Garden Displays and Exhibits	Classes and Lectures	Training Programs	Production-Focused Farms
Missouri Botanical Garden	Desert Botanical Garden	Chicago Botanic Garden	Denver Botanic Garden
Tower Hill Botanical Garden	Los Angeles Arboretum and Botanic Garden	Denver Botanic Garden	Queens Botanical Garden
United States Botanic Garden	Minnesota Landscape Arboretum	Franklin Park Conservatory and Botanical Gardens	
University of British Columbia Botanical Garden	The New York Botanical Garden	Toledo Botanical Garden	

Interview questions (Appendix D) were written to each address a specific research objective and split into three sections: 1) program impetus and structure, 2) goals and evaluation, and 3) underrepresented and challenging topics (Table 2). Program impetus and structure questions were further adapted for each of the four categories.

Table 2 Question topics for each phone interview question section

Question Section	Question Topics
Program Impetus and Structure	<ul style="list-style-type: none"> • Program History • Program development • Sources of information • Incorporation with other garden programming
Goals and Evaluation	<ul style="list-style-type: none"> • Primary goals • Tracking progress • Evaluation methods
Underrepresented and Challenging Topics	<ul style="list-style-type: none"> • Research and food crop collections/seed banks • Food policies • Underrepresented production-related activities • Communicating challenging topics

Interview questions and procedures were submitted to the IRB and approved after expedited review (Appendix B). After IRB approval, a representative from each candidate garden was contacted via email to request the phone interview (Appendix E). Representatives were chosen based on survey data, recommendations from other garden professionals, and relevance to the programs being explored. Of the 17 gardens contacted, 13 agreed to participate in the phone interview (Table 3). As required by IRB policy, participants were asked to sign informed consent forms before participating in the interview (completed forms in Appendix F). Interviews were conducted from July – September 2016.

Table 3 Representatives interviewed at each garden

Garden	Representative(s) Interviewed	Title
Chicago Botanic Garden	Angela Mason	Associate Vice President of Urban Agriculture and Windy City Harvest
Denver Botanic Garden	Josie Genter, Jamie Winkler	Farm Program Manager, Veterans Farm Coordinator
Desert Botanical Garden	Angelica Elliot, Nicolas de la Fuente	Adult Education Program Development Manager, Community Garden Coordinator
Franklin Park Conservatory	Mark Miller, Bill Dawson	Education Manager, Growing to Green Program Coordinator
Los Angeles Arboretum and Botanic Garden	Ted Tegart	Education Manager
Minnesota Landscape Arboretum	Laura Vogel	Adult Education Program Manager
Missouri Botanical Garden	Sheila Voss	Vice President of Education
The New York Botanical Garden	Toby Adams	Edible Academy Director
Queens Botanical Garden	Gina Baldwin	Farm Educator
Toledo Botanical Garden	Yvonne Dubielak	Toledo GROWS Manager
Tower Hill Botanical Garden	Joann Vieira	Director of Horticulture
United States Botanic Garden	Ari Novy, Devin Dotson, Susan Pell	Executive Director, Public Affairs & Exhibits Specialist, Science & Public Programs Manager
University of British Columbia Botanical Garden	Tara Moreau	Associate Director of Sustainability and Community Programs

On-Site Observations

On-site observations for this project were intended to visually document examples of program implementation for each category, observe audience interactions with programming, and reinforce themes identified through phone interviews. Gardens were chosen for visits based on location, site size, and information collected during the phone interview phase. Specific questions and a scope of work (Appendix G) were developed for each on-site observation based on program category and information

discussed during phone interviews. Gardens were contacted via email (Appendix H) to arrange visit logistics. Visits occurred between November 2016 – January 2017.

Table 4 Supplementary information for on-site observations

Garden	Location	Category	Visit Date
Tower Hill Botanic Garden	Boylston, MA	Garden Displays and Exhibits	November 4, 2016
Queens Botanical Garden	Flushing, NY	Production-focused Farms	December 5, 2016
Desert Botanical Garden	Phoenix, AZ	Classes and Lectures	December 9, 2016
Chicago Botanic Garden	Glencoe, IL	Training Programs	January 4, 2017

Chapter 3

RESULTS

Content Guide

- I. Survey Results
- II. Phone Interviews and On-site Observations
 - A. Classes and Lectures
 - i. Development
 - Topic and Content Generation
 - Target Audiences
 - Instructor Selection
 - Price Determination
 - Integration with Other Garden Programming
 - ii. Future Planning
 - Evaluation
 - Challenges
 - Goals
 - iii. On-site Observation
 - iv. Classes and Lectures Summary
 - B. Garden Displays and Exhibits
 - i. Development
 - Theme Selection and Content Generation
 - Target Audiences
 - Integration with Other Garden Programming
 - ii. Future Planning
 - Evaluation
 - Challenges
 - Goals
 - iii. On-site Observation
 - iv. Garden Displays and Exhibits Summary
 - C. Training Programs
 - i. History and Structure
 - History and Initiatives
 - Current Structure
 - Key Individuals and Staffing

- Resources
 - Integration with Other Garden Programming
- ii. Future Planning
 - Evaluation
 - Challenges
 - Goals
- iii. On-Site Observation
- iv. Training Program Summary
- D. Production-Focused Farms
 - i. History and Structure
 - History and Initiatives
 - Key Individuals and Staffing
 - Resources
 - Farm Programming
 - ii. Future Planning
 - Evaluation
 - Challenges
 - Goals
 - iii. On-site Observation
 - iv. Production-focused Farms Summary
- E. Underrepresented and Challenging Topics
 - i. Food-related Research and Food Crop Collections or Seed Banks
 - ii. Food Policies
 - iii. Underrepresented Production-Related Activities
 - iv. Sharing Information on Challenging Topics
 - v. Underrepresented and Challenging Topics Summary

I. Survey Results

The survey gathered baseline information about food systems education in public gardens and resulted in 104 complete responses from the American Public Gardens Association's (The Association) 584 member institutions, yielding an 18% response rate. Survey data was originally published in the report "Food Programming in Public Gardens" by The Association (Benveniste Consulting, 2016). Tables and figures from the report can be found in Appendix I.

Of the gardens that responded to the survey, 80% currently offer food-related activities. Respondents without food-related activities indicated that the most important barriers to offering this type of education are limited staff, limited financial resources, and the perception that food-programming is not relevant to their mission. Gardens with food-related activities primarily offer this programming through garden displays and classes while engaging the least in food-related training programs and research. Production and consumption are the most common aspects of food systems addressed by these activities (95% and 69%, respectively), while food policies are addressed by less than a quarter of respondents. Of the 79 respondents with activities on food production, 94% offer programming related to home food gardening but less than a fifth include education on conventional farming, hydroponics, and aquaponics. Most respondents also address challenging topics related to food, primarily organic versus non-organic production, food systems' impact on the environment, and food security.

II. Phone Interview and On-Site Observation Results by Category

A. Classes and Lectures

Four gardens were interviewed for their food-related classes, lectures, and other structured formal learning events. Interview participants primarily discussed classes; lectures were rarely mentioned, but although one participant also highlighted food-related summits hosted by her garden (Table 5).

Table 5 Primary formal learning events discussed by each garden.

Garden	Location	Formal Learning Events Discussed
Desert Botanical Garden	Phoenix, AZ	<ul style="list-style-type: none">• Home food gardening classes for desert landscapes• Culinary classes featuring local cultures
Los Angeles County Arboretum and Botanic Garden	Arcadia, CA	<ul style="list-style-type: none">• Home food gardening for drought conditions• Culinary classes
Minnesota Landscape Arboretum	Chanhassan, MN	<ul style="list-style-type: none">• Healthy Foods Summit• Schoolyard Gardens Conference• Home food gardening classes
New York Botanical Garden	Bronx, NY	<ul style="list-style-type: none">• The Edible Academy• Children's gardening classes• Culinary programs

i. Development

Topic and Content Generation

For the four gardens interviewed in this category, planning new food-related classes and lectures is primarily led by each garden's education team. Current trends and audience demand guide this process, as well as benchmarking with both local

institutions and other botanical gardens; networking in particular was also frequently cited as a means for generating content. New York Botanical Garden (NYBG) conducts focus groups with audience members to gauge interest in new programming, while the Los Angeles County Arboretum and Botanic Garden's (LACABG) Education Manager will seek opinions from part-time garden staff, who have more opportunities to interface with the local community. As another example, the two gardens located in water-challenged areas—Desert Botanical Garden (DBG) and LACABG—have adapted their home food gardening classes to meet community demand for limited-water gardening techniques. Two gardens also mentioned social media as a tool for gauging audience interest in certain topics. DBG's Adult Education Program Development Manager Angelica Elliot has experienced significant success using Pinterest for generating new vegetable gardening and cooking classes:

“You know, we're like Pinterest freaks here. We're always looking at Pinterest to see what people are interested in and what they're posting... and a lot of times Pinterest is pretty right on because when we offer these classes, a lot of those then sell out. It's kind of crazy, to think of Pinterest as a place to find inspiration for new classes.”

As part of a land-grant university, the Minnesota Landscape Arboretum (MLA) places a high value on research-based content and will engage professors with Extension appointments for expert information when needed. In addition, MLA will assemble planning committees with topic experts to guide the development of their food-related summits; these groups often include representatives from local food-related businesses, food co-op executives, and even farmers.

Target Audiences

Target audiences are very specific to the type of program being offered. NYBG's Edible Academy is dedicated almost entirely to children and families, while MLA designs their annual food summit for people interested in making change in the food system. As a whole, however, interviewed gardens are interested in reaching younger or more diverse audiences. DBG and LACABG have tried adjusting class times, cost, and program offerings (such as offering evening mixology classes), but neither reported significant changes in audience. DBG voiced that they often have difficulty reaching new audiences, as most of their marketing is directed towards membership.

Instructor Selection

Instructors for food-related classes are often identified through the class developer's personal networks or from within the garden's staff. In other cases, community members will independently approach the garden with ideas for classes they would like to teach. DBG often experiences this and has developed a proposal form that potential new instructors must fill out as part of their screening process. MLA has had success with using professors with Extension appointments, as these professors are often experts in food-related subjects and required to dedicate a portion of their time to teaching. As another example, NYBG recognizes that most of their programming is targeted towards children and will hire school teachers as their summer seasonal education staff.

Price Determination

To determine price, participants said they primarily aim to cover materials, facility use, and instructor fees. For cooking classes, this sometimes includes the cost of food handling and safety permits. Some gardens also add a mark-up to generate a small amount of income, which in some cases was then used to cover costs for other programs like children's education. NYBG's Edible Academy recognizes that even when certain classes are priced only to cover expenses, the cost can still be restrictive to families with limited budgets. To offset this, the garden awards scholarships for their season-long gardening program to make it more accessible to low-income families, and also offers many open-access programs and cooking demonstrations on days that garden's admission is free. As another example, the Minnesota Landscape Arboretum uses sponsorships to cover costs for their food-related summits, lowering the registration fee for participants.

Three out of the four gardens noted that class participants often complain of high prices, but have found that their prices are comparable to similar programs when benchmarking with other organizations in their communities. MLA has found through surveys that even with people wanting cheaper classes, there is still a large number of participants that say they would take another class through the arboretum. On the other hand, DBG believes that high prices may be what is keeping younger and more diverse audiences from taking classes at their garden.

Integration with Other Garden Programming

All four interviewed gardens expressed that their food-related classes and lectures are not successfully incorporated with other programming at their gardens.

DBG does provide cultural culinary classes and demonstrations during certain events, such as the garden's Dia de los Muertos festival, but otherwise struggles to use even their on-site vegetable demonstration garden for gardening classes. None of the gardens specifically articulated why their programs lacked alignment with other elements of the garden, although NYBG mentioned not wanting to detract audiences from their garden's other initiatives.

ii. Future Planning

Evaluation

Surveys distributed to participants after taking a class are the primary method of evaluation for this type of food-related programming. NYBG will perform pilot program tests to evaluate new class models before making them fully available to the public. When asked how they would evaluate if resources were unlimited, most gardens expressed a strong desire to track the long-term impacts that classes have had on participants. One garden expressed that it would also be useful to have focus groups to determine why participants choose certain classes, how the classes meet their expectations, and how it fits with their perception of the garden.

In addition, interviewees believe that their food-related classes and lectures have been quite successful in comparison to other garden programs in terms of attendance, although all claimed that this evidence is anecdotal. Despite hesitance to directly claim the success of food programs over other programs, three out of the four gardens are currently creating new facilities dedicated to food-related programming. Both DBG and NYBG are adding new buildings with demonstration kitchens, classrooms, and space outside for vegetable gardening classes, while MLA is in the process of securing funding for an entire campus dedicated to agricultural education.

Challenges

While each garden reported a number of unique obstacles, marketing and communications frequently came up as challenges for three of the gardens. LACABG expressed that the community primarily associates them with garden-based classes and doesn't always think of them for other food-related programming, and NYBG mentioned that they are always working on communicating what the Edible Academy does and why they do it. In contrast, MLA specifically said that they don't have difficulty with communicating their dedication to food-related programming because people associate that type of education with them as part of a land grant university, but added that this may be a challenge for gardens traditionally known for ornamental horticulture.

Goals

Interviewed gardens generally expressed goals related to helping audience members understand their food beyond consumption. Health and wellness were emphasized as part of this goal, as well as environmental impacts, using local produce, and helping audiences understand where their food comes from. However, despite the desire to connect audiences with other aspects of food systems, food gardening and culinary classes still appear to be the primary type of food-related formal instruction offered by three of the institutions.

Course evaluations are the primary tool for measuring progress towards these goals. However, MLA's Adult Education Program Manager Laura Vogel expressed

the difficulties of measuring progress and long-term outcomes for adult class participants:

“For adults, the problem is, we self-select for the extracurricular activities and things that we do. It can be hard to get yourself in a situation where you're not preaching to the choir because adults aren't forced onto a school bus and taken to a place where they don't really want to be at. When we have free time, we choose what we're doing. So I think the difficulty with that, with being able to measure progress towards [our] goal is that...numbers are skewed because of self-selection for adults.”

iii. On-site Observation

The on-site observation at Desert Botanical Garden occurred from December 8-9, 2016 and included meeting with instructors from gardening and culinary classes, touring the garden campus, and visiting the garden's new off-site incubator farm. Although primarily advertised for home food gardening and cooking, instructors use their own expertise and personal experiences to add elements of other aspects of food systems topics to their individual classes, such as organic food production, cultural significance of food, and interpreting history through food. The garden currently has no plans to include programming regarding the garden's new off-site incubator farm, which is working to address farm worker rights and improve food access in an underserved community in south Phoenix (see Section E).

In terms of utilizing the current garden campus, implementing the vegetable demonstration garden in classes can be difficult as most of these classes are offered at night, and also because the garden was designed as a general audience display and not for hands-on learning (Figure 1). One instructor of Native American descent has reached beyond the vegetable demonstration garden and used the garden's collection of prickly pear cactus to teach classes on traditional Native American rituals for

harvesting and cooking the plant. This has helped share authentic cultural practices of local indigenous peoples with the garden's primarily-white audience base.



Figure 1 DBG's vegetable garden is primarily designed for display and not for hands-on learning.

iv. Classes and Lectures Summary

Food-related classes are often developed based on perceived audience interest and tend to focus on home food gardening and culinary topics. Individual class content is often influenced by instructors, who are usually identified from program managers' personal networks. In addition, they are not always well-incorporated with other elements of garden programming and often have difficulty with communicating to new audiences. Although classes may be easier to evaluate than other types of education, self-selecting audiences make it difficult to measure education progress.

B. Garden Displays and Exhibits

Four gardens were interviewed as having garden displays or exhibits as their most prominent food systems education. Conversations focused specific displays or exhibits at each of the participants' gardens (Table 6).

Table 6 Primary garden displays and exhibits at interviewed gardens

Garden	Location	Primary Garden Displays and Exhibits Discussed
Missouri Botanical Garden	St. Louis, MO	Kemper Center for Home Gardening Foodology: Dig In! Exhibit William L. Brown Center Corn Research Exhibit
Tower Hill Botanic Garden	Boylston, MA	Vegetable Display Garden Davenport Collection of Heirloom Apples
United States Botanic Garden	Washington, D.C.	Amber Waves of Grain Exhibit Exposed: The Secret Life of Roots Exhibit
University of British Columbia Botanical Garden	Vancouver, BC	Vegetable Display Garden

i. Development

Theme Selection and Content Generation

Overall, garden displays are typically designed on a yearly basis by horticulture staff, and exhibits are created on a case-by-case basis through collaborations between departments at the interviewed gardens. Themes for displays and exhibits are closely tied to the organization's mission, history, or values. MBG's food-related exhibits frequently highlight the organization's commitment to science and research, while USBG's food-related exhibits fulfill the area of their mission to teach audiences about economically important plants. Tower Hill Botanic Garden's

(THBG) diverse vegetable display garden and heirloom apple collection are connected to the garden's roots with the Worcester County Horticultural Society. Themes also often reflect current events in agriculture; for example, USBG designed its Amber Waves of Grain Exhibit in conjunction with the 100th anniversary of Norman Borlaug's birth. In addition, the University of British Columbia Botanical Garden (UBCBG) has used United Nations observances to theme their garden displays, such as the International Year of Soils and the International Year of Pulses, providing visitors with local examples of global initiatives. UBCBG will also soon be including interpretive signage in their display about the story of Nikolai Vavilov and his work with food crop wild relatives.

In addition, garden displays are frequently designed to showcase the diversity of garden vegetables and new gardening techniques, and two gardens mentioned using information from their seed suppliers to find new and unique varieties to display. Exhibits often display more scholarly content and look to research entities (such as the United States Department of Agriculture) and topic-specific scientists for information. USBG's Executive Director Ari Novy discussed the importance of outside scientific expertise in developing their food-related exhibits:

“...with Amber Waves of Grain, we got a lot of our information directly from USDA, from the institution that Borlaug founded, the International Center for Wheat and Corn Breeding, in some cases retired scientists we used to work with... we have them look through some of our more technical stuff and make sure it's correct... We absolutely will go outside of the botanic garden to get expertise where we don't have it.”

Participants also referred to staff expertise as a key component for generating ideas and developing content for both garden displays and exhibits. The United States Botanical Garden (USBG) in particular has an exhibits committee that reviews ideas

from both outside parties and staff members, and the Missouri Botanical Garden's (MBG) education team has been approached by other departments with ideas for exhibits. Sheila Voss, Vice President of Education at MBG, described a recent example at her garden:

“...We did a corn exhibit last year on origins of corn and wild relatives of corn...that was the brainchild of our William L. Brown Center for Ethnobotany. [The Brown Center] has a lot of really cool [research] going on and they were the ones that were really behind, ‘Hey let's try this thing about corn.’...And then once that happened, the Kemper Center and Education was able to help a little bit as far as ok, ‘How do we pull that off to engage visitors?’”

Target Audiences

Most gardens described general audiences as the target for their garden displays and exhibits, with a few variations. First, garden displays are primarily angled towards home gardeners. As a more targeted example, THBG markets most of their heirloom apple orchard programs to homeowners and orchardists. To build new audiences, UBCBG uses their vegetable display and other areas of the garden to offer sustainability-focused leadership training for business groups. Tara Moreau, the garden's Associate Director of Sustainability and Community Programs, described this as a way to “help us reach this group of the population who don't really go out on their own and spend their own time and money and volunteering effort...thinking about environmental and social issues.”

In addition, several gardens mentioned additional demonstration gardens where children, teens, or families can plant and tend seasonal garden plots, but these were always described as separate from other garden displays and as having their own individual programming. For example, both MBG and THBG have children's/youth

edible gardens with specialized programming that are not part of their traditional vegetable garden displays.

Integration with Other Garden Programming

Garden displays and exhibits were frequently offered with related programming, such as classes, lectures, tours, and festivals. These are often developed as a collaboration between multiple garden divisions, such as education, horticulture, and research, or even with outside partners (Table 7).

Table 7 Cross-departmental programming created for garden displays and exhibits

Garden	Garden Display or Exhibit	Example Programming	Entities Involved
Missouri Botanical Garden	Foodology: Dig in!	Science lectures on global food stories	Education Division Research Division
Tower Hill Botanic Garden	Davenport Collection of Heirloom Apples	Annual Fall Fest	Programs & Audience Engagement Division Horticulture Division
United States Botanic Garden	Exposed: Secret Life of Roots	Potato-growing classes	Education Division Exhibits Committee
University of British Columbia Botanical Garden	International Year of Soil Garden Display	Taste of Terroir Dinner	Sustainability and Community Programs Division Local restaurants

ii. Future Planning

Evaluation

The four gardens interviewed conducted evaluations of garden displays and exhibits differently. Two have implemented exit surveys for select exhibits, and the other two have no formal evaluations. As an informal evaluation method, MBG has started recording staff interactions with visitors in the children's edible garden. When asked how they would evaluate if given unlimited resources, most responded that they would conduct more visitor surveys and would also like to track long-term impacts.

Challenges

Most gardens' challenges were unique to their specific situations, but most centered on limited staff time, difficulty coordinating with other garden areas and departments, and funding. As a specific challenge discussed by an interviewee, most design expenses must be absorbed up front, and unless an extra fee is charged at admission, it can be difficult to recover those costs, especially for free-entry gardens.

Goals

Overall, gardens listed goals connected to increasing general public awareness of specific topics related to food plants. Garden displays focused on education related to home food gardening with an emphasis on showcasing vegetable crop diversity and promoting sustainable growing practices. Most gardens also emphasized a goal to create displays and exhibits that are accessible to a wide range of audiences. As Sheila Voss expressed,

“...exhibits are going to be in places that are open to the public, they are not specific classes. We know that specific classes are going to be for specific audiences with that level of interest or background. For public exhibits, we know that the audience really we have to design for is general public. So I think what we try to do there is make sure that messages are such where there's something for everyone.”

iii. On-site Observation

The on-site observation to Tower Hill Botanic Garden occurred on November 5, 2016. Through a tour of the entire garden site, it was clear that both the vegetable garden and orchard had been designed to fit with the garden's overall aesthetic, giving a sense of cohesiveness and flow between food-related displays and other areas of the garden.

The vegetable display had been winterized for the season, but the bed layout, some interpretive signage, and materials distributed during the growing season were still available. The Frank L. Harrington, Sr. Orchard was also still open to the public. During the growing season, produce from the gardens is used in the garden's café or donated to a local food bank.

Interpretation for the orchard is offered through signage and seasonal tours. Interpretive signage is clearly written in accessible language and highlights learning opportunities for home gardeners (Figures 2 and 3). However, it does not link these messages to other food system concepts. For example, tags on apple trees describe each variety's history and use (Figure 4), but none of the orchard's signage expresses the importance of preserving food crop genetic diversity (Figure 5).

As a whole, the orchard and vegetable garden demonstrate THBG's core values of learning, stewardship, and sustainability through their management practices and commitment to education, and also embody their mission to "inspire the use and appreciation of horticulture" (Tower Hill Botanic Garden, n.d.).



Figure 2 Interpretive signage for THBG's vegetable display garden



Figure 4 Tags on each tree give the variety name, origins, and uses for the fruit.



Figure 5 Interpretive signage at the Frank L. Harrington, Sr. Orchard describes the heirloom apple collection, their grafting program, and their goal to preserve historic varieties.

iv. Garden Displays and Exhibits Summary

Food-related garden displays and exhibits focus on providing education for the general public and showcasing food in a way that represents individual gardens' missions and values. Garden displays showcase home food gardening techniques and garden vegetable diversity, but temporary exhibits have the opportunity to give detailed information about specific food systems topics. Because most visitors are self-guided through these spaces, accessible interpretation is crucial for sharing information with people of all ages and backgrounds. Staff experience and cross-

department collaboration are important for designing both displays and exhibits, while exhibits tend to also bring in outside expertise. Both broaden their impact by working with education staff to generate related programming such as tours, children's activities, and lectures.

C. Training Programs

Four gardens were interviewed with training programs as their most developed food-related education. Most gardens reported offering multiple types of training programs with varying levels of direct food systems education. Two types of training programs emerged from the data—community gardener training (Table 8) and agriculture/green industry job training (Table 9).

i. History and Structure

History and Initiatives

All types of training programs began as a response to a community need. In nearly all cases, community groups or individuals initially approached gardens for their expertise in horticulture and outreach to help solve or address local issues. For community gardener training programs, both Toledo and Columbus community gardens were in need of a central organizer to improve the sustainability of grassroots garden efforts, leading to Franklin Park Conservatory's (FPC) Growing to Green program and Toledo Botanical Garden's (TBG) Toledo GROWs. Job training programs like Chicago Botanic Garden's Windy City Harvest (WCH) and Denver Botanic Gardens' Veterans Training Program (VTP) began with outside funders approaching the gardens to start programs for underserved or at-risk populations.

Current Structure

Community gardener training programs typically focus on providing resources and assistance for local people and groups starting or running community gardens. As a whole, they are not formally-structured training programs, although both Growing to Green and Toledo GROWS offer formal classroom-based programs as a part of their available resources, such as FPC's Urban Garden Academy and TBG's Master Urban Gardener certification (Table 8). Other components offered through these programs are conferences, seed swaps, tool sharing, and access to professional expertise.

Job training programs are almost entirely devoted to underserved populations. One important exception to this is WCH's Youth Farm and Apprenticeship programs, which use a peer-model system to mix at-risk individuals with other community members interested in urban farming. Because of their focus on job placement in food or farming-related careers, programs like WCH and the VTP specifically screen for individuals passionate about getting a job in agriculture.

All job training programs involve a balance of hands-on field training, classroom learning, and 'soft skills' training (i.e. coming to work on time, professional communication, etc.) (Table 9). All programs offer some form of stipend or hourly pay and focus on job placement upon completion. While youth-oriented programs focus less on job placement, they do tend to include activities that promote job skills and leadership development. (Table 9)

Table 8 Overview of community gardener training programs at public gardens

Community Gardener Training Programs			
Garden	Training Program	Components	Length
Franklin Park Conservatory	Growing to Green	We Dig Ohio! Summit, hub gardens, Urban Garden Academy	Ongoing
	Urban Garden Academy	Hands-on based classroom learning	8 weeks
Toledo Botanical Garden	Toledo GROWs	Workshops, community seed swap, Master Urban Farmer Program, urban training farm	Ongoing

Table 9 Structure and primary components of agriculture/green industry job training programs at interviewed gardens.

Agriculture/Green Industry Job Training						
Garden	Training Program	Description	Target Audiences	Components	Length	Outcomes
Chicago Botanic Garden	Windy City Harvest Corps	Urban ag and green industry job training	Justice-involved youth, adult-ex-offenders	80% hands-on training, 20% classroom learning	14 weeks	Job skills, job placement, completion certificates
	Windy City Harvest Youth Farm	Urban ag leadership development program	Underserved youth, college-bound and vocational students	Classroom learning, team building activities, field work	Part time, May-Oct	Life skills, leadership skills
	Windy City Harvest Apprenticeship	Advanced urban ag training	Corps and Youth Farm graduates, adults, dislocated workers	75% field training, 25% classroom learning	9 months	College credit, industry-specific certificate, job placement
Denver Botanic Gardens	Veterans Training Program	In-soil farming program to connect veterans with careers in farming	Military veterans	50% hands-on field training, 50% classroom learning, off-site farm tours	10 weeks	CSU Building Urban Farmers credit, certification from Denver Botanic garden
Franklin Park Conservatory	Green Corps	Job training for careers in green, environmental, and agricultural industries	Individuals interested in green jobs, underserved populations	50% hands-on field training, 50% classroom learning	10 weeks	Pesticide applicator's license, graduation certificate, job placement
	Teen Corps	Life and work skills development through horticulture and urban ag	14-18 year olds, generally from nearby underserved neighborhoods	Hands-on urban farm and entrepreneurship training, culinary classes	8 weeks	Jobs skills, job placement (if applicable)
Toledo Botanical Garden	Community Integration for Training and Employment (CITE)	Job and life skills training through Toledo GROWs	Justice-involved youth	Community service, community garden maintenance, culinary classes	Ongoing	Job skills, job placement

Key Individuals and Staffing

Key staff members for all training programs had either significant horticulture or education experience. In most cases, these are two different roles within programs: someone with horticulture experience to oversee the production and management of the farm sites used for training, and another staff member to manage education and programming. Job coaches or job directors were also important for programs focused on employing trainees, and programs working with at-risk or underserved populations emphasized the importance of either having social workers on staff or partnering with social service agencies to help meet the unique needs of these participants.

Resources

All gardens listed partnerships with other local organizations or businesses as essential in maintaining their training programs. Local Extension offices, area urban agriculture associations, and networking with nearby farms and employment partners are primary examples of resources used by these programs. In comparison to categories like Classes and Lectures and Exhibits and Garden Displays, Training Programs rely more on local, agriculture-based resources for developing and maintaining program content, comparable to resources for Production-Focused Farms (see Section D).

Integration with Other Garden Programming

Most training programs operate as outreach at off-site locations, which can give them a broader impact in the community but can also lead to a disconnect between the programs and their parent gardens. In some cases, the programs are

difficult to represent to audiences visiting the gardens' main campuses, which are generally focused on ornamental horticulture and leisure. However, as an opposite example, Angela Mason, Vice President of Urban Agriculture and Windy City Harvest (which has over 10 urban farm sites throughout Chicago) noted that, "Everyone knows and recognizes the Chicago Botanic Garden, and a lot of people know and recognize Windy City Harvest, but oftentimes they don't realize Chicago Botanic Garden is our parent." To increase visibility, some training programs hold Community Supported Agriculture (CSA) share pick-ups or farmers markets at their main garden campuses to sell produce grown by trainees.

FPC avoids these challenges in two different ways. First, their Community Garden Campus is located on-site with the main garden site and acts as a hub for Growing to Green, helping connect outreach to other garden audiences. In addition, Green Corps trainees work with the garden's horticulture department for their hands-on training, directly integrating the program into the garden.

ii. Future Planning

Evaluation

Similar to resources for maintaining programs, some gardens use benchmarks with local relevant industries and associations as an evaluation tool to ensure that their programs are staying current with the latest standards and technologies. Both community gardener and job training programs also emphasize check-ins with individual trainees to give and receive feedback on progress and areas for improvement. Job training in particular has the opportunity to evaluate curriculum content and student progress through pre- and post-tests for trainees. When asked how they would evaluate if resources were unlimited, all gardens expressed that they would

like to do more long-term evaluation of health outcomes for individuals and communities impacted by the programs, with an emphasis on tracking long-term career success for graduates of training programs.

Challenges

Keeping up with growth and identifying funding were the two key challenges discussed by most gardens. Funding challenges in particular raised two different issues. Because many of these programs focus on outreach to low-income or underserved communities, almost all funding must come from other sources, such as sponsors, grants, or the parent garden itself. Furthermore, maintaining mission-based funding can be difficult as well. As Angela Mason of Windy City Harvest described,

“We’ve been approached by entities that are not focusing on sustainable agriculture practices in the past and they’ve come with large sums of money and we’ve had to turn them down... because they didn’t align with our sustainability goals. And that’s hard to do when you’re looking at what you could do with the money, but you can’t, you want to be...driven by your mission not by a funding opportunity.”

Goals

For both community gardener and job training programs, three out of the four gardens highlighted goals related to improving food access, self-sustainability, and healthy outcomes in urban communities. Job training programs in particular emphasized connecting people to careers in agriculture or the green industry as another specific goal. To measure progress towards these goals, community gardener programs usually track the longevity and pounds of food produced by gardens fostered through their training, while job training programs monitor job placement numbers.

iii. On-Site Observation

The site visit to Chicago Botanic Garden and Windy City Harvest (WCH) occurred from January 3-4, 2017. WCH operates three different training programs: Corps, Youth Farm, and an Apprenticeship (Table 9). Although the Chicago Botanic Garden campus features a large garden display for fruit and vegetable production, a self-guided tour showed little evidence of the WCH program (Figure 6), supporting the lack of visibility between training programs and other garden programming discussed by gardens in the phone interviews.

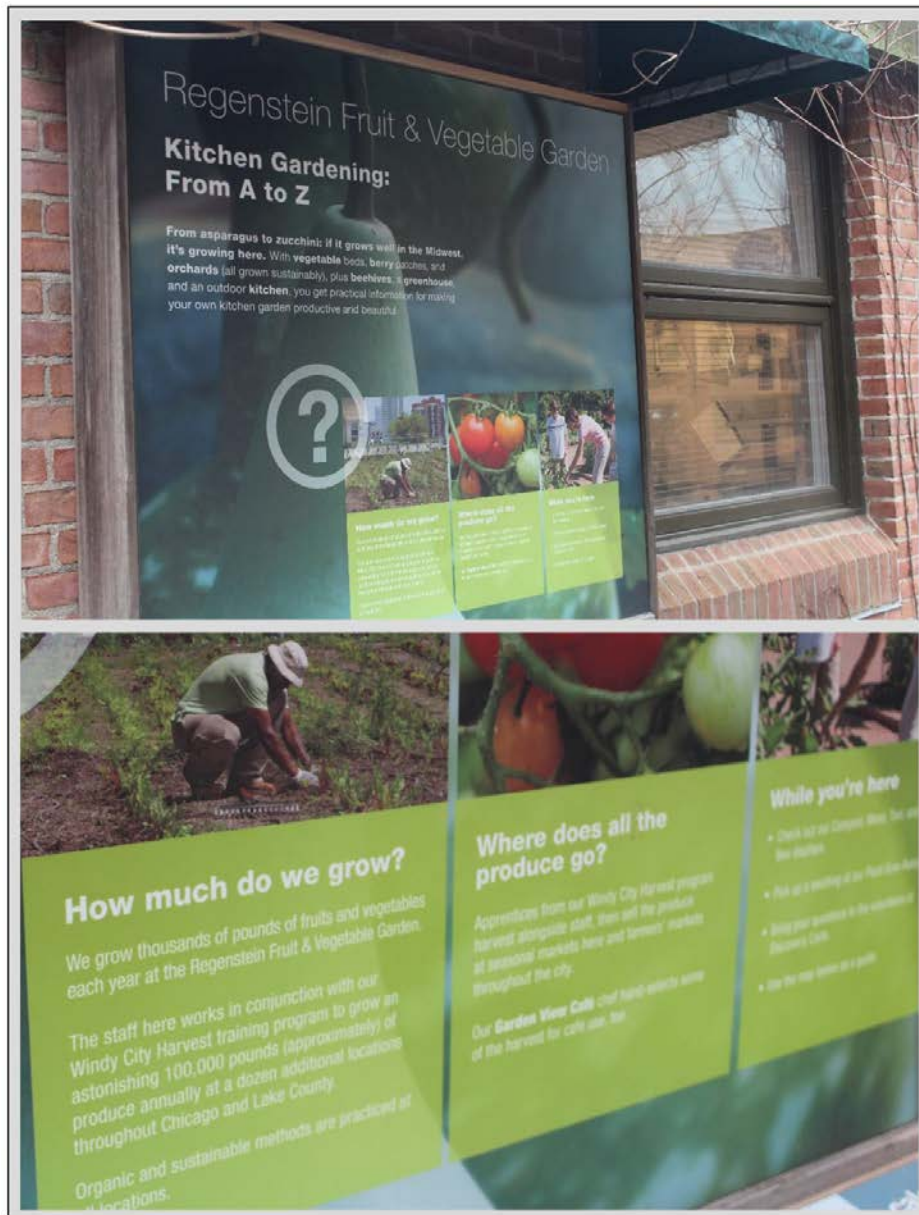


Figure 6 WCH Signage at CBG. Only one sign in the Regenstein Fruit and Vegetable Garden recognizes Chicago Botanic Garden's Windy City Harvest.

While CBG is located in a suburb north of the city, the WCH sites are primarily scattered around central Chicago. The main site is located at the Arturo

Velasquez Institute, one of the City Colleges of Chicago, where the program has access to a greenhouse for starting seeds, space for several small aquaponic demonstration systems (Figure 7), and classrooms for lessons. The WCH curriculum uses these facilities to cover a wide range of production-related food systems topics (An example week-by-week outline for the Windy City Harvest Apprenticeship program can be found in Appendix J).



Figure 7 Multiple sizes of aquaponics systems are available for hands-on learning at WCH's main site at the Arturo Velasquez Institute.

The urban farm site at the college is primarily managed by the Apprenticeship program; the Apprenticeship and Youth Farm programs each have their own urban farm sites, while Corps participants provide assistance for all sites. Farm sites were located in a variety of places, from tight residential spaces to large open lots (Figure 8). Although the sites are not regularly open to the public and have little direct interaction with their communities, the WCH programs sell produce throughout the

surrounding areas and are one of the few places for gainful employment in many of these neighborhoods.



Figure 8 Example WCH urban farm sites (a) Rodeo Farm, located across the street from the Cook County Department of Corrections; (b) Youth Farm at North Lawndale, adjacent to the Central Park ‘L’ Station; (c) Youth Farm at Washington Park, located between the park and the Walter H. Dyatt High School for the Arts; (d) PCC Austin Family Health Center Garden, located in a residential area of the South Austin neighborhood.

iv. Training Programs Summary

All training programs were created to address community needs. These programs focus less on traditional food systems education, and instead use food and agriculture as a tool for improving communities. Community gardener training programs help community members revitalize neighborhoods, while agriculture/green industry job training programs provide job skills for at-risk populations and improve food access in underserved communities. For job training programs specifically, it is important for program managers to network with local farms and businesses to ensure that their education stays relevant to the industry. However, off-site locations can make it difficult to connect training programs with other garden programming and share this education with general garden audiences.

D. Production-focused Farms

Two gardens were interviewed for their production-focused farms. Although opposite in many ways, Denver Botanic Gardens' Chatfield Farms CSA and the Queens Botanical Garden (QBG) Farm hold many similarities (Table 10).

Table 10 Comparison of the farms' initiatives and core structures

	Chatfield Farms CSA	QBG Farm
Location	Off-site, edge of Denver, CO	On-site, integrated with garden
Size	5.5 cultivated areas	< 2 acres
Age	6 years	4 years
Initiative	Grant from Kaiser Permanente to bring more local, nutritional foods to Denver	Sponsored by the NYC Compost Project to showcase the use of compost and urban agriculture
Outlet for Farm Products	Sold through CSA shares and also at farmers markets in underserved communities	Given to staff and volunteers, bulk donated to local food banks
Staffing	Separate roles for programming/education and farm management, reliance on seasonal labor during growing season	Separate roles for programming/education and farm management, reliance on volunteers and interns during growing season
Programming	Work with education department for tours and classes, also has site-specific programming	Work with education department for tours and classes, also has site-specific programming

i. History and Structure

History and Initiatives

Both the Chatfield Farms CSA and the QBG Farm were both created through the influence of outside sources. Denver Botanical Gardens' Chatfield Farms, a 700+ acre site at the edge of Denver that the gardens used as an arboretum and event space, started the CSA in 2011 as part of a grant offered by Kaiser Permanente, a locally-based health care company, to bring more local, nutritious foods to Denver. The CSA currently has 270 shares and also sells discounted produce in low-income Denver communities. The QBG Farm, in the heart of Flushing, NY, arose from the New York

City Compost Project (NYCCP), a project by the city's Department of Sanitation that has partnered with botanic gardens throughout the city for over 20 years to compost organic food waste. As part of their commitment to sustainability, and to engage audiences' growing interest in urban agriculture, QBG expanded their partnership with the NYCCP to create the farm in 2013, which showcases uses for compost and techniques for urban farming. Almost all produce grown by the Farm is donated to local food banks.

Key Individuals and Staffing

Both farms divide labor into farm education and farm management. Farm educators have backgrounds in programming and outreach, while farm managers have prior farming and horticultural experience. This division of labor is similar to that for Training Programs, many of which use urban farms for their programming. In terms of seasonal labor demand, both farms rely on seasonal workers, although Chatfield has a paid farm crew while the QBG Farm utilizes volunteers and interns. Josie Hart, Chatfield Farm Program Manager, discussed two difficulties with seasonal labor—long summer hours, and lack of winter funding to carry more year round staff:

“...all of our staff go into it thinking, knowing that they're going to be very very exhausted and are going to work very hard in the summer and then everyone has that built in downtime throughout the winter. So it's just kind of one of those things that you approach... I wish that we could have more year-round opportunities for our staff. We have a lot of amazing, highly qualified staff that work with us, and it's really a shame that a lot of them have to get laid off in November when the growing stops, because there's certainly a lot of administrative and planning and data input and analysis that could take place over the winter and we certainly could use the help but the way that the budget works, we have really enough to income to cover the bare bones staff throughout the winter and that's it.”

Resources

Both farms highlighted networking with other area farmers and Extension as their primary resources for help with farm management, planning, and troubleshooting. The Chatfield Farms CSA in particular networks with regional farming associations, such as the Denver Producers and the Rocky Mountain Farmers Union, for idea sharing and accessing educational opportunities like workshops. Gina Baldwin, QBG, emphasized how important networking is for her institution:

“...we also draw advice from mentors and peers and urban agriculture in the city...[for example] we were building raised beds and so we reached out to other urban farmers in the city, like, ‘What kind of raised beds did you build that are at your farm?’ and ‘How is it going and would you recommend doing it that way again?... What did you learn that we could learn from?’”

Farm Programming

The Chatfield Farms CSA works with the garden’s education department to host classes on gardening and processing vegetables in addition to developing its own site-specific programming such as the Veterans Training Program (see Section C). The QBG Farm also works with their garden’s education department, primarily for hosting tours and school groups, and maintains site-specific programming through soil care workshops and their Master Composter classes.

ii. Future Planning

Evaluation

As a market sales-based program, the Chatfield Farms CSA evaluates their progress through in-depth surveys with CSA shareholders and farmers market customers. The Chatfield Farms CSA has a distinct advantage in evaluation, as Denver

Botanic Gardens has a garden-wide formal evaluator on staff who assists with processes such as evaluating farm stands. The QBG Farm, while not market-driven, prepares monthly quantitative reports of farm productivity and education for the NYCCP and then compiles the reports to review seasonal progress. The QBG Farm also relies on anecdotal feedback from volunteers and interns to update those particular programs.

When asked how they would evaluate if resources were unlimited, each farm gave a very different response. Because they already have access to a formal evaluator for external programs, the Chatfield Farms CSA would like to do an internal audit to evaluate how staff roles contribute to their central goal. The QBG Farm, however, would be interested in assessing behavior changes of those educated at the farm.

Challenges

Both farms emphasized keeping up with growth as their biggest challenge. The QBG Farm, in its third season at the time of the interview, has experienced primarily infrastructure growth during its initial years and must now focus on program growth to maximize use of the space. The Chatfield Farms CSA has experienced the opposite; now in its sixth year, high demand for programming has made it difficult to set aside resources for infrastructure improvements.

The Chatfield Farms CSA also discussed some of the challenges of being a nonprofit farm. The farm doesn't directly pay for expenses like water, land, or employee benefits, and as Josie Hart expressed, "...we encounter the sort of contentious age-old conversation that farmers don't understand nonprofit farms. They see nonprofit farms as kind of having an unfair advantage in the marketplace." To

offset the for-profit/nonprofit disparity, the farm uses their advantages to serve a social mission. Because small family farms cannot sell their produce at reduced rates and maintain profitability, the farm places most of their farm stands in low-income neighborhoods and offers a 50% discount for customers using EBT cards. This improves fresh food access to low-income audiences, a target market that small family farms cannot always afford to serve.

Goals

Both farms expressed their primary goals as showcasing farming and agriculture to the general public. Farms also discussed additional goals specific to their institutions. For the Chatfield Farms CSA, their goal also includes improving nutritious food access in Denver, particularly for underserved communities. For the QBG Farm, their goal is to highlight the food cycle by creating compost through food waste and building soil health through compost. Both farms rigorously track production and education numbers to track progress towards their goals and to also maintain accountability with their funders.

iii. On-site Observation

The on-site observation to the QBG Farm occurred on December 5, 2016. Located in one of the most diverse counties in the U.S., the garden and farm offer a peaceful place for education in their vibrant community. Most signs are printed in three different languages, and the farm is working to include more culturally-relevant crops in their planting plans.



Figure 9 View from inside the farm, looking out to the garden's arboretum.

The farm itself is surrounded by a low chain-link fence (Figure 9) and easily visible to visitors, although not directly open to the general public. Because of the farm's partnership with the NYCCP, compost education is a clear goal for the space. Signage is dual-branded with both QBG and NYCCP logos, and most programming involves compost (Figure 10). The farm's bulk composting facilities are not directly accessible to visitors, but an interactive compost education station is adjacent to the farm (Figure 11).



Figure 10 Signage outside the farm at the compost education station.



Figure 11 Composting at the QBG Farm. Bulk composting facilities out-of-view from the public (left) in comparison to the compost education station that visitors can interact with (right).

While such an intensive focus on one topic may seem restrictive, the QBG Farm uses it as a tool to connect food waste, soil health, urban ecology, and sustainable food production (Figure 12).



Figure 12 Sign displayed at fruit and vegetable scrap drop-off sites.

iv. Production-focused Farms Summary

The two farms interviewed showcase small-scale vegetable production for garden visitors while also fulfilling community needs. Chatfield Farms CSA improves local food access by selling discounted produce in low-income Denver neighborhoods, while the QBG Farm addresses both food waste and soil health in New York City

through their composting program. Farms significantly rely on outside partnerships to achieve their goals, such as corporate and city sponsors for funding or networking with other area farms to stay current with the industry. Visibility, accessible interpretation, and farm-specific programming are all important elements for educating the public about their work, but high demand for farm education has made it difficult for both farms to keep up with growth.

E. Underrepresented and Challenging Topics

Survey results identified food-related research, food policies, and specific production-related activities as underrepresented topics in food systems education at public gardens. Underrepresented topics were those addressed by less than 20% of survey respondents. Although they did not meet the criteria for underrepresented topics, food crop collections or seed banks were also included in this category because internet research found very little evidence of these types of programs at gardens that reported having them in the survey. To gather more information, they were grouped with the question on food-related research during phone interviews.

i. Food-related Research and Food Crop Collections or Seed Banks

Food-related research and food crop collections or seed banks fit into three categories based on phone interview responses: unknown, informal, or excellent. For gardens categorized as unknown, interviewees were unfamiliar with these types of programs at their gardens, suggesting that research or seed banking initiatives are not well communicated within their institutions. Gardens considered to have informal food-related research or collections either had accessioned collections of food plants

primarily used for display or acted as facilitators of seed distribution by acquiring massive amounts of seed for food plants from outside sources (such as local seed companies) and distributing them to community gardens and home food gardeners. Two gardens with accessioned collections of food plants will also distribute plant material from these collections to interested parties upon request.

Gardens considered to have excellent programs actively research and maintain food crop collections and regularly share this information with the public. These programs were the Minnesota Landscape Arboretum (MLA), Missouri Botanical Garden (MBG), and Denver Botanical Gardens, all gardens located in or bordering the Midwest. As part of the University of Minnesota, MLA is home to school's Horticultural Research Center, a regional leader in fruit breeding, and they also feature an apple house where visitors can buy varieties of apples developed by the center, such as Honeycrisp and Sweet Tango. MBG's research division, the William L. Brown Center, works on many projects related to food (see Section II, Part B) through their ethnobotany program. Interpretive signage in the garden highlights the Center's research, and scientists are frequently asked to give public lectures. Denver Botanic Gardens uses space at Chatfield Farms for their research and trial garden, which includes food crops collected from around the world. Varieties that perform well can be introduced into farm production and sold with other produce to the Chatfield Farms CSA shareholders.

ii. Food Policies

For the ten interviewed gardens that address food policies in their programming, over half engage actively with local food policy councils and initiatives. These councils and initiatives primarily work with the city to advocate for policies to

support community gardens and urban agriculture. Three gardens also address policies related to healthy food access, primarily through promoting the use of SNAP benefits at farmers markets. When asked about barriers to addressing food policies, many gardens discussed issues unique to their own situations, such as perceptions of urban ag in their communities or adapting policy work to fit their mission. More significantly, most gardens reported struggling with the red tape and bureaucracy that surround food policies in their area, such as zoning laws, safety regulations, and health codes.

For the three gardens not currently addressing food policies, two explained that nothing prevents them from doing so and that it simply has not yet been a focal point for their programming. The third garden, however, discussed the legalities of nonprofit advocacy as a barrier to addressing food policy and explained that while most forms of advocacy are permitted, many gardens are not familiar with the technicalities and often refrain from advocacy altogether as a result, limiting the extent to which some gardens may be willing to engage in food policy.

iii. Underrepresented Production-Related Activities

Three themes emerged from discussions on barriers to addressing conventional farming, hydroponics, and aquaponics in food systems education: 1) limited space, resources, or expertise, 2) irrelevance to mission, and 3) perceived lack of audience interest.

The majority of interviewees who brought up limited space, resources, or expertise discussed the high cost and intensive labor associated with hydroponic and aquaponic systems, while lack of space was generally described as a barrier to demonstrating the scale of conventional cropping systems.

Six out of the thirteen gardens felt that education on conventional farming, aquaponics, and hydroponics would not be relevant to their missions. One interviewee expressed that many gardens focus on ornamental horticulture and rely on land grant universities to educate the public on topics like conventional farming. As a contradiction, though, two gardens that currently address these topics spoke of them as directly relevant to their missions. As an example, Missouri Botanical Garden feels that addressing aquaponics, hydroponics, and conventional farming embodies their core value of sharing science-driven, accessible information about plants with the general public.

Gardens that described a perceived lack of audience interest believed that visitors are more interested in learning about organic and sustainable gardening methods instead of these topics. From an urban standpoint, a representative from Queens Botanical Garden expressed that, “A lot of people have never seen a food plant growing let alone seen what a monoculture or a huge agricultural plot of land looks like,” making it difficult to teach concepts like conventional agriculture to their audiences.

iv. Sharing Information on Challenging Topics

As the final question in the phone interview, participants were asked to describe how they share information about challenging food-related topics with their audiences. Responses primarily fell into six different categories: 1) special events, 2) demonstrating by example, 3) exhibit interpretation, 4) training program classes, 5) website content, and 6) informal discussions.

For the ten out of thirteen gardens using special events to communicate challenging topics, most specifically hold lectures to present this information, while

other types of events included summits, conferences, and fundraisers. These events are usually stand-alone activities and not typically integrated with other garden programming.

Aside from special events, the other categories suggested that most garden communication about food-related challenging topics is done indirectly or informally. Gardens that discussed examples of demonstrating by example usually said that they do not always explicitly provide education on these topics but prefer to showcase them through using organic and sustainable gardening practices on-site. Furthermore, gardens that use their websites to share information about challenging topics do not typically incorporate it into their programming, and informal discussions were not a formal part of curriculum and primarily carried out between garden staff and small audiences such as tour or volunteer groups. Responses related to exhibit interpretation and training programs offered a more direct approach to communicating challenging topics but were specific to the gardens with these types of activities as their most developed type of food systems education.

As an important addition, two gardens found unique ways to communicate issues regarding living wage for workers in food systems. To address living wages for food service workers, for special events Tara Moreau at UBC Botanical Garden prefers to use a catering company that hires low-income individuals and pays them a living wage, which she then discusses with event attendees. Desert Botanical Garden addresses living wage for workers in food production by sponsoring new incubator farm in South Phoenix, which hires aspiring farmers and pays them a living wage for their work as they develop skills to eventually start their own farms.

v. Underrepresented and Challenging Topics Summary

Most gardens choose informal methods to educate audiences about challenges facing food systems. Many prefer to actively engage with these topics without directly communicating them to garden visitors; for example, by participating on local food policy councils, utilizing organic practices in their gardens, or engaging in food crop research. When gardens do provide direct education on these topics, it is typically done through specific events, such as lectures, that are not integrated with other garden programming. Lack of access to expertise appears to be a significant barrier to providing more education on challenging and underrepresented topics, as well as limited space and resources. Some gardens feel that it is part of their mission to educate the public about certain food systems topics, but more feel that it is not directly relevant to their mission or that their audience is not interested.

Chapter 4

DISCUSSION

Analysis of Results

Overall, garden displays and exhibits appear to be the most effective category for food systems education. Using both internal and external expertise, exhibits produced meaningful, accessible interpretation about creative food-related topics for general public audiences. Despite citing collaboration as one of their biggest challenges, Missouri Botanical Garden (MBG) and the United States Botanic Garden (USBG) were able to design effective exhibits with complementary programming on corn genetic research and commodity wheat production, respectively, through partnerships between horticulture, education, and research departments. Programs in this category also placed a high value on scientific expertise; MBG utilizes scientists at their William L. Brown Center for Ethnobotany, while USBG regularly reaches out to independent research institutions when planning exhibits, such as the International Center for Wheat and Corn Breeding for their exhibit *Amber Waves of Grain*. Dr. Tara Moreau, who was interviewed on the garden displays at the University of British Columbia Botanical Garden, was specifically hired for her agricultural expertise. This reflects the National Association for Museum Exhibition's guidelines for content development, which emphasize accuracy, relevancy, and up-to-date topic knowledge for exhibit interpretation (American Alliance of Museums, 2012). Although garden displays and exhibits had the most difficulty evaluating their success, research has shown that similar programs at science centers have had positive, lasting impacts with improving science literacy in their communities (Falk & Needham, 2011). This

suggests that food-related exhibits at public gardens could have great potential for improving critical food literacy in their own audiences.

In contrast, there are unique challenges for delivering food systems education through classes and lectures. First, program managers rely on personal networks to find instructors for classes on topics determined by estimated audience interest instead of seeking experts on current food issues, which could limit the depth of class content. One important exception to this is the Minnesota Landscape Arboretum (MLA), which leverages its ties with the University of Minnesota to feature Extension professionals and food research in its programming. As another challenge, class participants are often self-selecting audiences (in this case, people already interested in specific food-related topics), making it difficult to share important messages about food with the general public. Some studies involving food and environmental education classes have noted that it can be hard to build new audiences for this type of education, but none have offered solutions (Fochs, 2016; Storksdieck, Ellenbogen, & Heimlich, 2005). Other research on classes at free-choice learning institutions is limited; Mark Farley, Manager for the Free Choice Learning Lab at the Hatfield Marine Science Center, noted that there is limited funding for studying these programs and in his experience has found class-style learning to be a relatively ineffective method of education (personal communication, March 24, 2017). However, for public gardens, classes and lectures appear to be the most responsive to the public's increasing interest in food and have documented the most program growth for food systems education out of all the categories researched. This success suggests that these programs could play an important role in expanding food systems education at public gardens.

Training programs and production-focused farms present more complicated situations. These programs are both often developed directly with information from networks of farms and local agricultural industries, but their messages are not always connected to challenges facing food systems or interpreted for general garden audiences. Farms and training programs located off-site especially have difficulty connecting their activities to other garden programming. As a whole, training programs focus less on traditional food systems education and instead use food and agriculture as a tool for improving communities. This appears to be common for agriculture training programs; although not associated with a public garden, The Food Project in Boston is one of the most widely-recognized food-related training programs in the U.S. but chooses to define itself as a youth empowerment organization that “engage[s] young people in personal and social change through sustainable agriculture” (The Food Project, n.d.). Many of these programs focus on developing participants’ “soft skills” (such as showing up to work on time or customer service) and enabling them to find employment in many different fields. For job training programs that specifically seek to place graduates in agriculture-related positions, program developers should be mindful that workers in food-related careers are more likely to be food insecure than workers in any other industry (Food Chain Workers Alliance, 2016). The reasons for the food worker/food insecurity paradox is beyond the scope of this research but should be an important consideration when helping graduates choose a career.

Production-focused farms, despite serving social missions, run the risk of inaccurately representing U.S. systems. Both farms expressed their primary goal as showcasing farming and agriculture to the general public, but neither are true

representations of farms where the majority of U.S. food is grown. On average, U.S. farms total 434 acres (USDA, 2014) and primarily grow corn, soybeans, and wheat (Alberta Agriculture and Forestry, 2015) in non-organic monoculture cropping systems, while the farms interviewed were less than 6 acres and grew over a dozen different varieties of fruit and vegetables. However, in a recent conversation, a farm education manager for a Delaware-based public garden (which was not included in this research) very strongly expressed that discussing conventional agriculture was not part of their mission because conventional agriculture practices do not align with their farm's values (personal communication, March 17, 2014). This is similar to sentiments expressed by interview participants and may represent a missed opportunity for building critical food literacy, which relies on representing diverse perspectives and allowing learners to then make their own informed choices (Yamashita & Robinson, 2016).

When comparing content across all categories, survey results and phone interviews suggest that home food gardening-themed garden displays and classes continue to be the most common forms of food systems education offered at public gardens (Vogel, 2011). While several of the interviewed gardens said they actively engage with local food policies, none of them educate visitors about national or global policies that affect food systems. Furthermore, programs that claim to be addressing food security may not be aware of its root causes or understand the barriers to improving health in underserved communities. Several training programs and production-focused farms promote fresh food availability in low-income neighborhoods, although research has shown that increasing access to healthy food does not improve overall health outcomes for those in poverty (Aggarwal et al., 2014;

An & Sturm, 2012; Boone-Heinonen et al., 2011; Lee, 2012). Instead, poor health is more likely caused by biological responses to the long-term social and environmental stresses associated with poverty (McEwen & Seeman, 2009). Gardens did not discuss how their programs alleviate these other stresses but in the future may want to consider how their programs can be adapted to address the unique needs of underserved communities.

Barriers to all types of food systems education as well as to challenging and underrepresented topics were primarily lack of expertise, limited staff resources, and the perception that certain food topics were not mission-relevant. As discussed earlier, some programs have been able to form external partnerships to fill expertise gaps, but other programs are still struggling to make these connections. Limited staff resources were also identified as a challenge to achieving food systems education goals in a 2016 report on food-related programming in public gardens (Benveniste Consulting, 2016), and given the general public's increasing interest in food education, it may be worthwhile for gardens to consider adding staff for these types of programs.

The question of mission relevance is more complicated and hints toward a dichotomy in U.S. public gardens. True botanical gardens are defined as “institutions holding documented collections of living plants for the purposes of scientific research, conservation, display and education,” which emphasizes the importance of accessioned collections and science (Botanic Gardens Conservation International, 2000). Not all public gardens fit this definition, though, and can range from arboreta and zoo gardens to historic homes and urban greening organizations (American Public Gardens Association, n.d.). Because of this, botanical gardens such as MBG and USBG may find it easier to accommodate the science of food plants in their

programming while places like pleasure gardens, for example, may have more difficulty making such a connection. This is reflected in the phone interview participants themselves; of the thirteen gardens that qualified for and participated in the phone interviews, twelve title themselves as botanical gardens, and the remaining garden, MLA, is the arboretum of a land-grant university renowned for fruit breeding. Moving forward, gardens will need to think critically and be creative about how food systems education can advance their mission. For gardens that decide to prioritize food systems education, this may call for leadership-level discussions to decide how critical food literacy themes can align with the organization's vision and values.

Improving Food Systems Education in Public Gardens

Minor changes or additions to existing education and interpretation could enhance messages about food systems and foster critical food literacy in current programming. As an example, garden displays that highlight diverse varieties of fruit and vegetable crops could add interpretative signage about the importance of crop genetic diversity. In addition, training programs that sell produce may want to consider adding a farmer's market or CSA pick-up at their parent garden to improve visibility with general audiences. To foster critical food literacy in class settings, current research recommends group discussions of materials that focus on underrepresented topics and challenge current knowledge of food systems, such as readings on farmworker rights (Yamashita & Robinson, 2016). This idea could also be adapted to exhibits by writing interpretive signage to represent diverse perspectives on challenges facing food systems (Yamashita & Robinson, 2016).

Even with a heightened focus on critical food literacy in other programming, food gardening programs can still be an important element of food systems education at public gardens. Research has shown that increased interest in home and community food gardening has historically occurred during periods of social and economic crisis and can fill many roles in response to individual and community needs (Pudup, 2008). In recent decades, food gardening has been a means for subsistence food production, resistance to gentrification, improving people-plant connections (horticultural therapy), and environmental activism through urban greening (Pudup, 2008). Public garden training programs, many of which were created in response to community need, reflect these ideas through their focus on urban food production, neighborhood revitalization, and job skills training for underserved populations. Home food gardening programs could broaden their impact by adjusting interpretation and marketing strategies to extend these benefits to a more diverse range of individuals and homeowners.

To advance their food systems education, public gardens will need a variety of creative partnerships. First, additional expertise from outside sources will be key to building program content. Land grant universities are often experts on these topics because of their strong focus on agricultural research and education (Association of Public and Land-Grant Universities, 2012), and public gardens could follow MLA's example and partner with these institutions to fill gaps in their own agricultural expertise. As MLA's Adult Education Program Manager Laura Vogel discussed, university faculty and staff with Extension appointments can be particularly useful for this as they are required to spend a percentage of their time teaching and doing public outreach. Partnerships with local farmers and related associations were also shown to

be successful resources for food-related training programs and production-focused farms and may provide another potential source of expertise. In addition, technical colleges could be a valuable source of instructors to teach hands-on skills for innovative food production practices. Leveraging partnerships within an organization will also be essential for implementing new ideas for food systems education. As demonstrated by garden displays and exhibits, cross-department collaboration promotes integration between types of programs and institution-wide commitment to food education. This allows different divisions to contribute their different skills and perspectives for building programs that engage a variety of audiences and levels of learning.

As another approach, gardens could implement formal evaluation methods to create more targeted strategies for improving critical food literacy in their audiences. For example, the Institute of Museum and Library Services recommends using Outcomes Based Planning and Evaluation (OBPE) to establish participant learning outcomes when developing new programs (Shaping Outcomes, 2015). Although this logic model notes that tracking long-term impacts can be time-consuming and difficult, planning programs based on desired short-, medium-, and long-term learning outcomes can ensure specific goals and community needs are being systematically addressed (Shaping Outcomes, 2015). OBPE may also be helpful for gardens that expressed a desire for better evaluation and outcome-tracking methods and could be especially useful when designing interpretation for Garden Displays and Exhibits, which had difficulty with measuring progress towards goals. It is important to consider, though, that audiences at free-choice learning institutions come with varying levels of prior knowledge and may only pay attention to certain facts and messages,

which can skew learning outcomes (Storksdieck et al., 2005). Gardens should anticipate these different levels of prior knowledge when planning programming and account for audiences' indirect learning outcomes (such as incidental, general knowledge, and re-affirmation) when assessing programs (Storksdieck et al., 2005).

If done correctly, food systems education stands to become a valuable asset for public gardens. Demand for food education is on the rise, and Millennials in particular have expressed the need for unbiased, engaging education about healthy and sustainable food (International Food Information Council, 2013). Food programming could be a tool for connecting with this young, diverse audience that has previously eluded public gardens (Benveniste Consulting, 2016; Fochs, 2016). Prior research has also found that food-related programming positively impacts garden fundraising efforts, sustainability operations, and media coverage (Benveniste Consulting, 2016). Furthermore, food systems education may be able to help gardens address the ongoing talent shortage for horticultural jobs (Wisniewski, 2014). Gardens with food-related programming could partner with the growing number high schools that feature agricultural education to bring more students into public gardens, connecting them with the field of horticulture and encouraging them to pursue it as a career.

Based on information here as well as in the Results chapter, this research has identified the following opportunities for strengthening food systems education at public gardens. Program-Specific Opportunities provide suggestions for each category of programming, while Overall Opportunities refer to potential garden-wide strategies.

Program-Specific Opportunities

Classes and Lectures

- Reach out to local food systems experts for potential class instructors.
Examples include Extension agents, land-grant university faculty and staff, and instructors at technical colleges with agriculture programs.
- Use social media sites such as Pinterest to identify audience interests.
- Collaborate with your garden's marketing team to identify strategies for promoting classes to new audiences.
- Recognize that audiences are primarily self-selecting, and consider designing class material to build off of students' prior knowledge.

Garden Displays and Exhibits

- Partner with both external and internal experts and scientists to generate theme ideas and interpretation content, and consider modeling themes around recent or upcoming events in food and agriculture.
- For existing displays, adapt interpretation to include information about broader food systems concepts, such as crop genetic diversity or challenges facing food systems. An outstanding example of this can be found in Appendix K.
- Ensure that interpretation is both scientific and accessible for all audiences.
- Collaborate with your garden's education team to create programming featuring these displays and exhibits.

Training Programs

- Evaluate community needs, and consider how your garden's resources can best address them.

- Design curriculum to match current industry standards, and be mindful of national trends in horticulture, agriculture, and related fields (i.e. food insecurity among food workers).
- Think critically about special staffing needs for your program.
 - For programs with sizable urban farms, consider splitting programming/education and production positions.
 - For job training programs, consider engaging a job coach or a social worker to meet the unique needs of trainees.
- Ensure that off-site program efforts are visible on-site.
 - Consider adding a CSA pick-up at your parent garden site with educational materials about your training programs, or if space allows, add a garden space or facility for on-site training.
 - Work with on-site education teams to create educational materials and identify opportunities for sharing information about training programs with general garden audiences.

Production-Focused Farms

- Consider partnering with city initiatives or local foundations for funding, identifying community needs, and goal-setting.
- Network with other local growers for advice on best growing practices and to stay current with industry trends and innovations.
- Partner with garden education staff to create farm-specific programming and to ensure that the farm is included in general garden programming.

- Create a strategic plan for sustainable growth that addresses both infrastructure and programming needs.
- Acknowledge and discuss different methods of food production to help audiences understand the range and scope of U.S. food systems.

Overall Food Systems Education Opportunities

- Start conversations at your garden about how food systems education can support your mission, vision, and values, and consider how current programming can be adapted to build critical food literacy.
- Partner with land grant universities, research institutions, and technical colleges for additional food systems expertise.
- Collaborate between departments to create dynamic programming for a united and more cohesive approach to food systems education throughout your garden.
- Consider using a formal evaluation method appropriate to program type in order to increase effectiveness and track progress towards food systems education goals.

Conclusions

Planning programs based on outcomes, adjusting current program content, and leveraging both internal and external expertise could lead to significant improvements in food systems education at public gardens. With 92% of gardens currently offering or considering adding food-related activities to their programming, it is important to ensure that these institutions have the resources to create accurate and accessible education that also promotes critical food literacy. As trusted sources for plant

education, public gardens have the infrastructure to also become leaders in food systems education (Miller et al., 2015; Novy & Dotson, 2015), but this research has shown that gardens will need effective partnerships, creative collaboration, and reimagined interpretation to achieve critical food literacy success.

The need for food systems education and critical food literacy is dire. Climate change continues to threaten global food security (Vermeulen, Campbell, & Ingram, 2012), and preserving crop wild relatives worldwide will be key for breeding food crops that can withstand extreme environmental conditions. On a national level, proposed changes to immigration laws and the North American Free Trade Agreement could have tremendous impacts on the U.S. food supply and cause fruit and vegetable prices to skyrocket (Galarza & Filloon, 2017). We must prepare our citizens to make educated decisions and advocate for just, sustainable food systems, and with the right resources, public gardens can be the perfect place to start these conversations.

REFERENCES

- Aggarwal, A., Cook, A., Jiao, J., Seguin, R., Moudon, A., Hurvitz, P., & Drewnowski, A. (2014). Access to supermarkets and fruit and vegetable consumption. *American Journal of Public Health, 104*(5), 917.
- Alberta Agriculture and Forestry. (2015). US crops - where are they grown? Retrieved from [http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/sis5219](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/sis5219)
- American Alliance of Museums. (2012). Standards for museum exhibitions and indicators of excellence. Retrieved from <http://name-aam.org/about/who-we-are/standards>
- American Public Gardens Association. (n.d.). What is a public garden? Retrieved from <https://publicgardens.org/about-public-gardens/what-public-garden>
- An, R., & Sturm, R. (2012). School and residential neighborhood food environment and diet among california youth. *American Journal of Preventive Medicine, 42*(2).
- Association of Public and Land-Grant Universities. (2012). The land-grant tradition. Retrieved from <http://www.aplu.org/library/the-land-grant-tradition/file>
- Benveniste Consulting. (2016). *Food-related programming in public gardens*. American Public Gardens Association.
- Boone-Heinonen, J., Gordon-Larsen, P., Kiefe, C., Shikany, J., Lewis, C., & Popkin, B. (2011). Fast food restaurants and food StoresLongitudinal associations with diet in young to middle-aged adults: The CARDIA study. *Arch Intern Med, 171*(13).
- Botanic Gardens Conservation International. (2000). *International agenda for botanic gardens in conservation*.
- Botanic Gardens Conservation International. (2013). Botanic gardens and food security. *BGJournal, 10*(2).
- Brooklyn Botanic Garden. (2016). Green bridge. Retrieved from <http://www.bbg.org/greenbridge>
- Chicago Botanic Garden. (2016). Urban agriculture. Retrieved from <https://www.chicagobotanic.org/urbanagriculture>

- Coleman-Jensen, A., Rabbitt, M., Christian, G., & Singh, A. (2016). *Household food security in the united states in 2015*. (No. ERR-215). U.S. Department of Agriculture, Economic Research Service.
- Denver Botanic Gardens. (n.d.a). Center for global initiatives: Coffee research. Retrieved from <http://www.botanicgardens.org/outreach/center-global-initiatives/coffee-research>
- Denver Botanic Gardens. (n.d.b). Chatfield farms CSA. Retrieved from <http://www.chatfieldcsa.org/>
- Dimitri, C., Effland, A., & Conklin, N. (2005). *The 20th century transformation of U.S. agriculture and farm policy*. (No. EIB-3). U.S. Department of Agriculture, Economic Research Service.
- Ericksen, P. J., Ingram, J. S. I., & Liverman, D. M. (2009). Food security and global environmental change: Emerging challenges. *Environmental Science & Policy*, 12(4), 373-377.
- Fairchild Tropical Botanic Garden. (2016a). Fairchild's tropical fruit collection. Retrieved from <http://www.fairchildgarden.org/science-conservation-/plant-collections/tropical-fruit-collection>
- Fairchild Tropical Botanic Garden. (2016b). International mango festival. Retrieved from <http://www.fairchildgarden.org/events-community-outreach/international-mango-festival>
- Falk, J. H., & Dierking, L. D. (2002). *Lessons without limit: How free-choice learning is transforming education*. Walnut Creek, CA: AltaMira Press.
- Falk, J. H., & Dierking, L. D. (2013). *The museum experience revisited*. Walnut Creek, CA: Left Coast Press, Inc.
- Falk, J. H., & Needham, M. D. (2011). Measuring the impact of a science center on its community. *TEA Journal of Research in Science Teaching*, 48(1), 1-12.
- FAO and WFP. (2015). *The state of food insecurity in the world 2015. Meeting the 2015 international hunger targets: Taking stock of uneven progress*. Rome: FAO.
- Fochs, M. (2016). *Exploring culinary arts programs at public horticulture institutions*. (Unpublished Masters of Science). University of Delaware.

- Food and Agriculture Organization. (2009). *How to feed the world in 2050*. United Nations.
- Food Chain Workers Alliance. (2016). *No piece of the pie: Food chain workers in 2016*. Food Chain Workers Alliance and Solidarity Research Cooperative.
- Food Research and Action Center. (2015). Understanding the connections: Food insecurity and obesity. Retrieved from http://frac.org/pdf/frac_brief_understanding_the_connections.pdf
- Galarza, D., & Filloon, W. (2017). You'll pay more for these foods if trump taxes mexican imports. Retrieved from <http://www.eater.com/2017/1/26/14402944/mexico-food-produce-imports>
- Gold, M. V. (2007). *Sustainable agriculture: Definitions and terms. Related terms*. National Agricultural Library, United States Department of Agriculture.
- Gustavsson, J., Cederberg, C., & Sonesson, U. (2011). *Global food losses and food waste: Extent, causes, and prevention*. Food and Agriculture Organization of the United Nations.
- Holben, D. H., & Taylor, C. A. (2015). Food insecurity and its association with central obesity and other markers of metabolic syndrome among persons aged 12 to 18 years in the United States. *Journal of the American Osteopathic Association*, 115(9), 536-545.
- International Food Information Council. (2013). Views toward nutrition and healthy eating among millennials.
- Kissinger, G., Herold, M., & De Sy, V. (2012). *Drivers of deforestation and forest degradation: A synthesis report for REDD+*. Vancouver, Canada: Lexeme Consulting.
- Lee, H. (2012). The role of local food availability in explaining obesity risk among young school-aged children. *Social Science and Medicine*.
- McCullough, L. (2014). *Windy city harvest a force in Chicago's local food and urban farming efforts*. Food Tank.
- McEwen, B., & Seeman, T. (2009). Allostatic load and allostasis. The John D. and Katherine T. MacArthur Foundation, University of California-San Francisco.
- Mercier, S. (2015). *Food and agricultural education in the United States*. AGree: Transforming Food and Ag Policy.

- Miller, A. J., Novy, A., Glover, J., Kellogg, E. A., Maul, J. E., Raven, P., & Jackson, P. W. (2015). Expanding the role of botanical gardens in the future of food. *Nature Plants*, 1, 15078.
- Moon, M. (2016). *Interpreting food at museums and historic sites*. Lanham, MD: Rowman and Littlefield.
- National Agriculture Statistics Service. (2016). *Acreage, June 2016*. (No. ISSN: 1949-1522). U.S. Department of Agriculture.
- National Association of Wheat Growers. (2014). National festival highlights wheat. Retrieved from <http://www.wheatworld.org/news-events/2014/06/national-festival-highlights-wheat/>
- National Research Council. (1996). *Colleges of agriculture at the land grant universities: Public service and public policy*. Washington, D.C.: National Academy Press.
- National Tropical Botanical Garden. (2016). The breadfruit institute. Retrieved from <http://ntbg.org/breadfruit/>
- New York Botanical Garden. (2016). Retrieved from <http://www.nybg.org/education/edible-academy/>
- Novy, A., & Dotson, D. (2015). Botanical gardens are well positioned to share agriculture with the public. *CSA News, August*, 40-41.
- Ogden, C., Carroll, M., Fryar, C., & Flegal, K. (2015). *Prevalence of obesity among adults and youth: United states, 2011–2014*. (No. 219). Centers for Disease Control, National Center for Health Statistics.
- Pudup, M. B. (2008). It takes a garden: Cultivating citizen-subjects in organized garden projects. *Geoforum*.
- Queens Botanical Garden. (n.d.). QBG farm and compost. Retrieved from <http://www.queensbotanical.org/Education/QBGFarm>
- Ribera, L. A., & Knutson, R. (2013). *Labor issues in agriculture*. Southern Risk Management Education Center, University of Arkansas Cooperative Extension.
- Ribera, L. A., Yue, C., & Holcomb, R. (2012). Geographic impacts on U.S. agriculture of the 2010 dietary nutrition guidelines. *Choices: The Magazine of Food, Farm and Resource Issues (Online)*, 27(1).

- Shaping Outcomes. (2015). *Outcomes based planning and evaluation*. Institute of Museum and Library Services and Indiana University Purdue University Indianapolis.
- Sharrock, S. (2013). Botanic gardens and food security—the results of BGCI’s survey. *BGJournal*, 10(2).
- Southern Poverty Law Center. (2013). *Close to slavery: Guestworker programs in the United States*.
- Stofer, K. A. (2015). Connecting to agriculture in science centers to address challenges of feeding a growing population. *Science Education and Civil Engagement*.
- Storksdieck, M., Ellenbogen, K., & Heimlich, J. E. (2005). Changing minds? reassessing outcomes in free-choice environmental education. *Environmental Education Research*, 11(3).
- The Food Project. (n.d.). What we do. Retrieved from <http://thefoodproject.org/what-we-do>
- Tower Hill Botanic Garden. (n.d.). History and mission. Retrieved from <http://www.towerhillbg.org/history-and-mission/>
- U.S. Botanic Garden. (n.d.). Exposed: The secret life of roots. Retrieved from <https://www.usbg.gov/exposed-secret-life-roots>
- U.S. Census Bureau. (2011). 2010 census urban and rural classification and urban area criteria.
- U.S. Department of Agriculture. (2015). *USDA announces partnership with association of science-technology centers*. USDA Office of Communications.
- U.S. Farmers and Ranchers Alliance. (2011). The food dialogues: Nationwide surveys reveal disconnect between Americans and their food. Retrieved from <http://www.fooddialogues.com/2011/09/22/nationwide-surveys-reveal-disconnect-between-americans-and-their-food>
- United Nations. (2015). World population projected to reach 9.7 billion by 2050. *World Population Prospects: The 2015 Revision*.
- University of Oxford. (n.d.). The oxford martin programme on the future of food: What is the food system? Retrieved from <http://www.futureoffood.ox.ac.uk/what-food-system>

- USDA. (2014). *2012 census of agriculture preliminary report highlights: U.S. farms and farmers*. USDA National Agriculture Statistics Service.
- USDA ERS. (2016a). *Agriculture and its related industries provide about 10 percent of U.S. employment* U.S. Department of Agriculture, Economic Research Service.
- USDA ERS. (2016b). Food security in the U.S.: Measurement. Retrieved from <https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/measurement/>
- Vermeulen, S. J., Campbell, B. M., & Ingram, J. (2012). Climate change and food systems. *Annual Review of Environment and Resources*, 37(1), 195-222.
- Vogel, L. (2011). *Homegrown vegetables: Opportunities for public gardens in an age of agricultural disconnect*. (Unpublished Master of Science). University of Delaware.
- Wisniewski, N. (2014). Is horticulture withering? *Grower Talks*. <http://ballpublishing.com/GrowerTalks/ViewArticle.aspx?articleid=20591>
- Yamashita, L., & Robinson, D. (2016). Making visible the people who feed us: Educating for critical food literacy through multicultural texts. *JAFSCD Journal of Agriculture, Food Systems, and Community Development*.

Appendix A
INITIAL SURVEY

Block 1

Welcome to the Public Garden Food and Agriculture Education Survey!

This survey should be answered by *one individual at each institution, preferably one who knows most about your garden's engagement in food-related research, programming and exhibits.*

What is the name of your garden?

Block 2

Does your garden currently offer food related programming? For the purposes of this survey, food related programming includes the following: growing food, distributing food, teaching about food nutrition or culinary arts, as well as agricultural environmental impacts, agrobiodiversity, and food policy.

- ☐ Yes
- ☐ In the past, but not currently
- ☐ Not currently, but maybe in the future
- ☐ No, and no plans to do so

How important are the following factors in why your garden has not developed food related programs to date?

			Neither		
	Not at all	Very	Important nor	Very	Extremely

3/13/2016

Qualtrics Survey Software

	Important	Unimportant	Unimportant	Important	Important
Food programming is not currently relevant to our mission	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Limited staff resources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Limited financial resources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Limited space	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other (please specify)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Why would you decide to offer food related programs in the future?

	Very Unlikely	Unlikely	Undecided	Likely	Very Likely
To fulfill an area of our mission	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To attract new audiences	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Current audience expressing interest	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other (please specify)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How important are the following factors in your garden's decision not to offer food related programming?

	Not at all Important	Very Unimportant	Neither Important nor Unimportant	Very Important	Extremely Important
Food programming is not relevant to our mission	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Limited staff resources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Limited financial resources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Limited space	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other (please specify)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How important were the following factors in your garden's decision to discontinue food related programming?

<https://login.qualtrics.com/ControlPanel/Ajax.php?action=GetSurveyPrintPreview>

2/12

	Not at all Important	Very Unimportant	Neither Important nor Unimportant	Very Important	Extremely Important
Food programming is not relevant to our mission	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Limited staff resources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Limited financial resources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Limited space	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other (please specify)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please tell us why your institution decided to discontinue its food related programming?

Block 3

Please select all the food related activities that your Garden offers.

- | | |
|---|--|
| <input type="checkbox"/> Garden displays | <input type="checkbox"/> Exhibits |
| <input type="checkbox"/> Classes | <input type="checkbox"/> Training programs |
| <input type="checkbox"/> Lectures | <input type="checkbox"/> Culinary programs |
| <input type="checkbox"/> Research | <input type="checkbox"/> Other (please specify) <input type="text"/> |
| <input type="checkbox"/> Food crop collections or food seed banks | |

Please select the primary audience for your garden displays.

- | | |
|--|---|
| <input type="radio"/> General Audience | <input type="radio"/> Seniors |
| <input type="radio"/> Families w/ children | <input type="radio"/> Teens and adolescents |
| <input type="radio"/> Young professionals | <input type="radio"/> Other (please specify) <input type="text"/> |

Please select the location or locations of your garden displays.

☐ At the garden☐ At offsite location

Please select the primary audience for your classes (select all that apply).

☐ General Audience☐ Seniors☐ Families w/ children☐ Teens and adolescents☐ Young professionals☐ Other (please specify)

Please select the location or locations of your classes.

☐ At the garden☐ At offsite location

Please select the primary audience for your lectures.

☐ General Audience☐ Seniors☐ Families w/ children☐ Teens and adolescents☐ Young professionals☐ Other (please specify)

Please select the location or locations of your lectures.

☐ At the garden☐ At offsite location

Please select the primary audience for your research (select all that apply).

☐ General Audience☐ Seniors☐ Families w/ children☐ Teens and adolescents☐ Young professionals☐ Other (please specify)

Please select the location or locations of your research.

☐ At the garden☐ At offsite location

Please select the primary audience for your food crop collections or food seed banks (select all that apply).

☐ General Audience☐ Seniors☐ Families w/ children☐ Teens and adolescents☐ Young professionals☐ Other (please specify)

Please select the location or locations of your food crop collections or food seed banks.

☐ At the garden☐ At offsite location

Please select the primary audience for your exhibits.

☐ General Audience☐ Seniors☐ Families w/ children☐ Teens and adolescents☐ Young professionals☐ Other (please specify)

Please select the location or locations of your exhibits.

☐ At the garden☐ At offsite location

Please select the primary audience for your training programs (select all that apply).

☐ General Audience☐ Seniors☐ Families w/ children☐ Teens and adolescents☐ Young professionals☐ Other (please specify)

Please select the location or locations of your training programs.

☐ At the garden☐ At offsite location

Please select the primary audience for your culinary programs (select all that apply).

☐ General Audience☐ Seniors☐ Families w/ children☐ Teens and adolescents☐ Young professionals☐ Other (please specify)

Please select the location or locations of your culinary programs.

☐ At the garden☐ At offsite location

Please select the primary audience for your other
\${q://QID52/ChoiceTextEntryValue/9} program (select all that apply).

☐ General Audience☐ Seniors☐ Families w/ children☐ Teens and adolescents☐ Young professionals☐ Other (please specify)

Please select the location or locations of your other
\${q://QID52/ChoiceTextEntryValue/9} program.

☐ At the garden☐ At offsite location

How long has your garden offered these food related activities?

☐ Less than 5 years☐ 6-10 years☐ 11-20 years☐ 21+ years

What aspects of food systems do your programs include? Please check all that apply. (Hover over each choice for additional definitions and examples if needed).

- ☐ Production
- ☐ Processing
- ☐ Distribution
- ☐ Consumption
- ☐ Food policies
- ☐ Environmental impacts

Which production-related subjects do your activities address? Please check all that apply. (Hover over each choice for additional definitions or examples if needed).

- ☐ Agrobiodiversity
- ☐ Aquaponics
- ☐ Hydroponics
- ☐ Home food gardening
- ☐ Conventional farming
- ☐ Integrated Pest Management (IPM)
- ☐ Organic agriculture
- ☐ Permaculture
- ☐ Soil health and fertility
- ☐ Other (please specify)

Do your garden's food related programs address any of the following challenges or topics related to local, regional, and global food systems? Please check all that apply.

- ☐ Feeding a growing population
- ☐ Food security
- ☐ Food systems' impact on the environment
- ☐ Biotechnology
- ☐ Organic vs non-organic production

- ☐ Agrobiodiversity
- ☐ Other (please specify)
- ☐ Our food systems education does not include these topics

Does your garden use food or agriculture related curriculum in its education programs?

- ☐ No
- ☐ Yes

Would you be willing to share this curriculum with APGA?

- ☐ No
- ☐ Yes. Please contact me for more information

Thank you! Please provide your name and email address so we can follow-up.

Name

Email address

Re enter email address

Please describe the most important goals for your food related programming.

How important are the following resources in achieving these goals?

	Not at all Important	Very Unimportant	Neither Important nor Unimportant	Very Important	Extremely Important
--	-------------------------	---------------------	---	-------------------	------------------------

Additional staff resources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Financial resources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Garden space	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other (please specify)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="text"/>					

Block 4

Please tell us how many staff your garden employs for food related programming?

Full-time year-round staff	<input type="text" value="0"/>
Part-time year-round staff	<input type="text" value="0"/>
Seasonal staff	<input type="text" value="0"/>
Total	<input type="text" value="0"/>

What is the annual budget for your garden's food related programming?

- ☐ Less than \$2,000
- ☐ \$2,001 - \$15,000
- ☐ \$15,001 - \$35,000
- ☐ \$35,000 - \$75,000
- ☐ \$75,000 or more

How has food system programming impacted the diversity of your garden's visitors or program participants?

- ☐ Increased diversity
- ☐ Reduced diversity
- ☐ No impact
- ☐ Don't know

What are the goals of your food related programs? Please check all that apply.

- ☐ Workforce development (skills training programs for underserved audiences)
- ☐ Community outreach
- ☐ Youth leadership education
- ☐ Adult continuing education
- ☐ Improving food access
- ☐ Exhibit-based general visitor education
- ☐ Food crop research
- ☐ Other (please specify)

Is your food related programming an asset to your garden's fundraising goals?

Yes

☐

Maybe/Don't know

☐

No

☐

How have your food related programs impacted the sustainability operations of your garden?

- ☐ Positively
- ☐ Negatively
- ☐ No impact
- ☐ Don't know

How as your food related programs impacted media coverage of your garden?

- ☐ Positively
- ☐ Negatively
- ☐ No impact
- ☐ Don't know

Have your food related programs expanded relationships with outside organizations?

- ☐ Yes
- ☐ No
- ☐ Don't know

Please select the types of organizations with which you communicate or collaborate

- ☐ Local, state and federal agencies
- ☐ Health or human service organizations
- ☐ Private or corporate foundations
- ☐ Academic or research institutions
- ☐ Community groups (eg. community gardens, youth organizations)
- ☐ Religious organizations
- ☐ For-profit businesses
- ☐ Gleaning organizations

Block 5

Please share any additional thoughts or comments in the space below.

Would you be willing to answer follow-up questions related to this survey?

- ☐ No
- ☐ Yes. you may contact me for follow-up questions

Thank you! Please provide your name and email address so we can follow-up.

Name

3/13/2016

Qualtrics Survey Software

Email address

Re enter email address

Block 5

Thank you for taking the time to respond to this survey!

The results will be shared at the upcoming Annual Conference June 6-10, 2016 in Miami and made available through the American Public Gardens Association website.

Appendix B

IRB APPROVAL LETTERS



RESEARCH OFFICE

210 Hulihan Hall
University of Delaware
Newark, Delaware 19716-1551
Ph: 302/831-2136
Fax: 302/831-2828

DATE: June 7, 2016

TO: Erin Kinley
FROM: University of Delaware IRB

STUDY TITLE: [917171-1] Phone Interviews for an An Evaluation of Food Systems
Interpretation and Education in U.S. Public Gardens

SUBMISSION TYPE: New Project

ACTION: DETERMINATION OF EXEMPT STATUS
DECISION DATE: June 7, 2016

REVIEW CATEGORY: Exemption category # (2)

Thank you for your submission of New Project materials for this research study. The University of Delaware IRB has determined this project is EXEMPT FROM IRB REVIEW according to federal regulations.

We will put a copy of this correspondence on file in our office. Please remember to notify us if you make any substantial changes to the project.

If you have any questions, please contact Nicole Famese-McFarlane at (302) 831-1119 or nicolefm@udel.edu. Please include your study title and reference number in all correspondence with this office.

cc:



RESEARCH OFFICE

210 Hulihan Hall
University of Delaware
Newark, Delaware 19716-1551
Ph: 302/831-2136
Fax: 302/831-2828

DATE: January 22, 2016

TO: Erin Kinley
FROM: University of Delaware IRB

STUDY TITLE: [852573-1] An Evaluation of Food Systems Interpretation and Education in U.S. Public Gardens

SUBMISSION TYPE: New Project

ACTION: DETERMINATION OF EXEMPT STATUS
DECISION DATE: January 22, 2016

REVIEW CATEGORY: Exemption category # (2)

Thank you for your submission of New Project materials for this research study. The University of Delaware IRB has determined this project is EXEMPT FROM IRB REVIEW according to federal regulations.

We will put a copy of this correspondence on file in our office. Please remember to notify us if you make any substantial changes to the project.

If you have any questions, please contact Nicole Famese-McFarlane at (302) 831-1119 or nicolefm@udel.edu. Please include your study title and reference number in all correspondence with this office.

cc:

Appendix C

EMAIL TO AMERICAN PUBLIC GARDENS ASSOCIATION MEMBERSHIP ANNOUNCING FOOD & AG SURVEY



**American
Public Gardens
Association**

PublicGardens.org

FOOD & AGRICULTURE

Your Garden's Opportunity to Impact
a New Professional Section

Dear xxx,

Public Gardens are playing an important role in educating the public about food – and our visitors are increasingly interested in learning about where their food comes from. Please consider participating in the following survey to help shape the direction of a new "Food & Agriculture" Professional Section that will offer a home base for agricultural and food system research, exhibits, and programmatic activity that is of interest to a growing number of public gardens.

The survey should be answered by **one individual at each institution**, preferably the person who knows most about your garden's engagement in food-related research, programming and exhibits. If your garden does

not do any of these things, we would still like to hear from you via a shortened form of the survey.

[Take the Survey here.](#)

(Survey will close Wednesday, February 17)

It is our hope that the information gathered through the survey and follow-up conversations will help this professional section serve as an important resource for educating audiences about plant biodiversity loss, the ecosystem impacts of agriculture, and the rich benefits of research and outreach programs based in the food system.

Results from the survey will benchmark our gardens' progress and will also additionally support *An Evaluation of Food Systems Interpretation and Education* in U.S. Public Gardens, the Master's Thesis of Erin Kinley, a Longwood Graduate Program Fellow.

Thank you so much for your participation. This information will inform and shape our future activities, including professional training, best-practice sharing and conference sessions.

Sincerely,

Two handwritten signatures in blue ink. The first signature on the left is 'D. Sclar' and the second signature on the right is 'Sarah Beck'.

Casey Sclar, Ph.D.	Sarah Beck
Executive Director	Program Manager, Current and Future Initiatives

American Public
Gardens Association

*This survey is made possible through the valuable expertise of
Benveniste Consulting, with generous support from an
anonymous donor.*

Appendix D

PHONE INTERVIEW QUESTIONS

CLASSES AND LECTURES

Program Impetus and Structure

1. What guides the planning for your garden's classes and lectures on food systems?
 - a. What and who determines topic selection?*
 - b. How do you choose instructors and lecturers?*
 - c. How do you identify target audiences?*
 - d. How is class/lecture price determined?*
 - e. What are your most important sources of information when planning new classes and lectures?*
2. How does your garden incorporate these classes and lectures into its other educational programming?
3. How would you compare the enrollment rates between your food systems activities and other types of classes or lectures?
4. What is (or has been) the biggest challenge for these activities, and how is it being overcome?

Goals and Evaluation

5. What is the primary goal of your classes and lectures?
 - a. How do you measure progress towards this goal?*
6. Do you evaluate your classes and lectures? If so, how?
 - a. When are evaluations done, and what methods are used?*
 - b. How do you evaluate enrollment and price?*
 - c. If resources were unlimited, how would you evaluate?*

GARDEN DISPLAYS AND EXHIBITS

Program Impetus and Structure

1. What guides the design of your garden's displays and exhibits on food systems?
(examples: visitor surveys, specific donor request, staff interests)
 - a. How do you determine what to include in these displays or when to feature an exhibit?*
 - b. How do you identify target audiences?*
 - c. What resources or sources of information are the most important in creating your exhibits and garden displays?*
2. How does your garden incorporate these displays or exhibits with its other educational programming?
3. What is (or has been) the biggest challenge for your displays and exhibits, and how is it being overcome?

Goals and Evaluation

4. What is the primary goal of your garden displays and exhibits?
 - a. How does your garden measure progress towards this goal?*
5. Do you evaluate your garden displays and exhibits? If so, how?
 - a. When are evaluations done, and what methods are used?*
 - b. If resources were unlimited, how would you evaluate?*

PRODUCTION-FOCUSED FARMS

Program Impetus and Structure

1. Could you describe the history and evolution of your garden's farm?
 - a. What was the initiative for the creation of the farm?*
 - b. How was the location chosen, and who owns the land?*
2. Who are the key individuals in running this program, and what are their backgrounds?
 - a. How do you balance seasonal labor demand with the need to prevent staff burnout?*
 - b. Who helps carry out most of the labor for the farm?*
3. What are your most important sources of information for farm management, planning, and troubleshooting?
4. How is the farm utilized in programming and training?
5. What are the outlets for products grown or raised on the farm?
 - a. Are products sold, donated, or kept in-house?*
 - b. If products are sold, what is the revenue used for?*
6. What is (or has been) the biggest challenge for this farm, and how is it being overcome?

Goals and Evaluation

7. What is your garden's primary goal for its farm?
 - a. How do you measure progress towards this goal?*
8. Does your garden evaluate the farm? If so, how?
 - a. When are evaluations done, and what methods are used?*
 - b. If resources were unlimited, how would you evaluate the farm?*

TRAINING PROGRAMS

Program Impetus and Structure

1. Could you describe the history and evolution of your garden's training program?
 - a. What was the initiative for the program?*
2. What is the current structure of your training program?
 - a. What are the primary components (such as classes and hands-on training), outcomes (certifications, college course credit), and recruiting techniques for the program?*
 - b. Who are the key individuals involved in running this program, and what are their backgrounds?*
 - c. What resources or sources of information are the most important in maintaining your training program?*
3. How does the training program align with your garden's other programming?
4. What is (or has been) the biggest challenge for this program, and how is it being overcome?

Goals and Evaluation

5. What is your garden's primary goal for its training program?
 - a. How do you measure progress towards this goal?*
6. Do you evaluate your training program? If so, how?
 - a. When are evaluations done, and what methods are used?*
 - b. If resources were unlimited, how would you evaluate this program?*

UNDERREPRESENTED AREAS AND CHALLENGING TOPICS

1. [In the initial survey, your garden indicated having food crop collections or seed banks. Could you briefly describe this program?

a. How does your garden distribute or promote this information?]

2. [In the initial survey, we identified food policies as an underrepresented area of food systems education at public gardens. Your garden responded that you do currently include food policies in your programming.

a. What types of policies is your garden addressing, and how does it communicate about them to its audiences?

b. What barriers does your garden encounter in including this in its food systems education?]

3. In regards to production-related activities, we found that conventional farming, aquaponics, and hydroponics were addressed by less than one-fifth of gardens that responded to the survey.*

a. What barriers do you think exist to addressing these activities in food systems education at public gardens, and how can they be overcome?

4. In the survey, your garden indicated that it included challenging topics in its food programs, including [responses marked on corresponding question in survey]. What information does your garden communicate about these topics, and how is it shared with the garden's audiences?

[Questions 1 and 2 included based on survey responses]

*For context, over 2/3 of survey respondents that include food production in their programming are addressing home food gardening, soil health, organic agriculture and IPM, and about a third address permaculture and agrobiodiversity.

Appendix E

EMAIL REQUESTING PHONE INTERVIEW

Gardens previously interviewed by Benveniste Consulting:

Dear _____,

I hope this email finds you well. My name is Erin Kinley, and I am a Fellow in the Longwood Graduate Program for Public Horticulture at the University of Delaware. For my thesis, I am collaborating with the American Public Gardens Association to do an evaluation of food systems education in public gardens.

Earlier this year, __[garden name]__ participated in a survey and phone interview on food and agriculture in public gardens. We truly appreciate the time and information that you have shared with us, as it has been instrumental in building the Association's new Food and Agriculture Professional Section and creating a foundation for my research.

As a follow-up to the survey and phone interview, I would like to invite you to participate in an additional phone interview that will take a closer look at specific types of food-related programs as well as challenges for food education. The interview will last 30-40 minutes and is designed to gather additional information about your food-related __[specific program]__. In addition, there will be a small section of questions related to under-represented topics in food education at all gardens. Not only will this information support my research, but it will also be used to create resources on best practices for food education in public gardens. When completed, these resources will be made available through the American Public Gardens Association to assist gardens looking to establish or improve their food-related programming.

If you are willing to participate, please send me a reply email so we can set up a time for the interview and I can send you a draft of the questions to help you prepare.

I look forward to hearing from you!

Best,

Erin Kinley

For gardens not previously interviewed:

Dear _____,

I hope this email finds you well. My name is Erin Kinley, and I am a Fellow in the Longwood Graduate Program for Public Horticulture at the University of Delaware. For my thesis, I am collaborating with the American Public Gardens Association to do an evaluation of food systems education in public gardens.

Earlier this year, __[garden name]__ participated in a survey on food and agriculture in public gardens. We truly appreciate the time and information that you have shared with us, as it has been instrumental in building the Association's new Food and Agriculture Professional Section and creating a foundation for my research.

As a follow-up to the survey, I would like to invite you to participate in an additional phone interview that will take a closer look at specific types of food-related programs as well as challenges for food education at public gardens. The interview will last 30-40 minutes and is designed to gather additional information about your food-related __[specific program]__. In addition, there will be a small section of questions related to under-represented topics in food education at all gardens. Not only will this information support my research, but it will also be used to create resources on best practices for food education in public gardens. When completed, these resources will be made available through the American Public Gardens Association to assist gardens looking to establish or improve their food-related programming.

If you are willing to participate, please send me a reply email so we can set up a time for the interview and I can send you a draft of the questions to help you prepare.

I look forward to hearing from you!

Best,

Erin Kinley

Appendix F
INFORMED CONSENT FORM

INFORMED CONSENT TO PARTICIPATE IN RESEARCH

Title of Project: An Evaluation of Food Systems Interpretation and Education in U.S. Public Gardens

Principal Investigator: Erin Kinley, Longwood Graduate Fellow

You and your institution are being invited to participate in a research study. This consent form tells you about the study including its purpose, what you will be asked to do if you decide to take part, and the risks and benefits of being in the study. Please read the information below and ask us any questions you may have before you decide whether or not you agree to participate.

WHAT IS THE PURPOSE OF THIS STUDY?

The purpose of this study is to learn more about food systems education programs at public gardens. The study is also part of the principle investigator's Master's thesis research. Data collected will be used to create informational resources for food systems education programs at public gardens.

Your garden will be one of approximately 17 institutions participating in this study. Your institution was selected because it indicated having extensive food systems education programs in the survey.

WHAT WILL YOU BE ASKED TO DO?

As part of this study you will be asked to complete one 30-40 minute phone interview about the history, structure, goals, evaluation practices, and content of your garden's food systems education programs.

WHAT ARE THE POSSIBLE RISKS AND DISCOMFORTS?

The research team does not expect your participation in this study to expose you to any risks different from those you would encounter in daily life.

WHAT ARE THE POTENTIAL BENEFITS?

You will not benefit directly from taking part in this research. However, the knowledge gained from this study will help build better resources for food systems education at public gardens.

HOW WILL CONFIDENTIALITY BE MAINTAINED? WHO MAY KNOW THAT YOU PARTICIPATED IN THIS RESEARCH?

Your name and institution will be identified with your interview. The interview will be audiotaped, and recordings will be saved for a minimum of three years after the interviews have been transcribed. Interview transcripts will be included in the researcher's final thesis, and quotes from the interview may be used in other published materials.

For any reason, you may request to have your identity remain confidential, in which case only your institution will be identified with your transcript and in published materials; your name and position within the institution will not be included. If you choose to keep your identity confidential, the confidentiality of

your records will be protected to the extent permitted by law. Your research records may be viewed by the University of Delaware Institutional Review Board, which is a committee formally designated to approve, monitor, and review biomedical and behavioral research involving humans. Records relating to this research will be kept for at least three years after the research study has been completed.

USE OF DATA COLLECTED FROM YOU IN FUTURE RESEARCH:

The research data we will be collecting from you during your participation in this study may be useful in other research studies in the future. Your choice about future use of your data will have no impact on your participation in this research study. Do we have your permission to use data collected from you in future studies? Please write your initials next to your preferred choice.

_____ YES

_____ NO

WILL THERE BE ANY COSTS TO YOU FOR PARTICIPATING IN THIS RESEARCH?

There are no costs associated with participating in this study.

WILL YOU RECEIVE ANY COMPENSATION FOR PARTICIPATION?

You and your institution will not be compensated for participating in this study.

DO YOU HAVE TO TAKE PART IN THIS STUDY?

Taking part in this research study is entirely voluntary. You do not have to participate in this research. If you choose to take part, you have the right to stop at any time. If you decide not to participate or if you decide to stop taking part in the research at a later date, there will be no penalty or loss of benefits to which you are otherwise entitled. Your decision to stop participation, or not to participate, will not influence current or future relationships with the University of Delaware.

If, at any time, you decide to end your participation in this research study, please inform our research team by emailing the researcher, Erin Kinley, at ekinley@longwoodgardens.org.

WHO SHOULD YOU CONTACT IF YOU HAVE QUESTIONS OR CONCERNS?

If you have any questions about this study, please contact the Principal Investigator, Erin Kinley, at (402) 469-2779 or ekinley@longwoodgardens.org, or Dr. Brian Trader, btrader@longwoodgardens.org.

If you have any questions or concerns about your rights as a research participant, you may contact the University of Delaware Institutional Review Board at hsrb-research@udel.edu or (302) 831-2137.

Your signature on this form means that: 1) you are at least 18 years old; 2) you have read and understand the information given in this form; 3) you have asked any questions you have about the research and the questions have been answered to your satisfaction; and 4) you accept the terms in the form and volunteer to participate in the study. You will be given a copy of this form to keep.

____ I give permission for the researcher to identify and quote me and my institution in the interview transcript and in published materials. Published materials include but are not limited to journal articles, presentations, and the researcher's final thesis document.

____ I do not give permission for the researcher to identify or quote me in the interview transcript or in published materials. Only my institution will be identified in transcripts, quotes, and published works.

Printed Name of Participant

Signature of Participant

Date

Person Obtaining Consent

Person Obtaining Consent

Date

(PRINTED NAME)

(SIGNATURE)

Appendix G

ON-SITE OBSERVATION SCOPES OF WORK

Erin Kinley
Thesis Research
On-Site Observations Scope of Work
October 12, 2016

Thesis Overview

Thesis Title: An Evaluation of Food Systems Interpretation and Education in U.S. Public Gardens

Committee Members:

Dr. Brian Trader (Thesis Advisor), Longwood Gardens, University of Delaware
Sarah Beck, American Public Gardens Association
Elise Benveniste, Benveniste Consulting
Carrie Murphy, University of Delaware Extension

Research Question: Are public gardens adequately addressing food systems education?

Research Objectives:

- Identify gardens with food systems-related programming
 - Aspects of food systems that they address
 - Barriers to initiating programs
 - Program growth and goals
- Identify common themes in program structure and content
- Determine best practices for food systems education in public gardens

Primary Methods:

- Initial survey (done in collaboration with the American Public Gardens Association and Benveniste Consulting), February 2016
- Phone interviews, June – October 2016
- On-site observations, October – November 2016

On-Site Observations

On-site observations for this project were determined based on information collected during the phone interview phase. (Phone interviews were performed with gardens identified as having extensive food systems education based on data from the initial survey.) For both the phone interviews and on site-observations, the selected gardens were categorized based on

their most prevalent food systems-related programming and placed into one of four groups: garden displays and exhibits, classes and lectures, training programs, and production-focused farms.

The on-site observations are intended to visually document examples of program implementation for each category, observe audience interactions with programming, and reinforce themes identified through the phone interviews. Specific questions have been developed for each site visit based on program category and information discussed during phone interviews.

Scope of Work:

Chicago Botanic Garden – Windy City Harvest

Chicago Botanic Garden was identified as a garden with extensive food systems education through the initial survey and chosen for a follow-up phone interview. Phone interviews (for all gardens) were divided into categories; Chicago Botanic Garden was placed in Training Programs because of its Windy City Harvest (WCH) programs, which offers urban agriculture training for a variety of underserved audiences. Angela Mason, Associate Vice President of Windy City Harvest, was interviewed in July about how these training programs are used for food systems education.

Windy City Harvest was further chosen for an on-site observation because of the variety of programs it offers, its target audience, and off-campus outreach initiatives.

Based on information from the Training Program phone interviews, the on-site observation at Chicago Botanic Garden and Windy City Harvest is intended to address these five questions:

- How is WCH represented and used to promote food education on the Chicago Botanic Garden campus?
- How are the multiple WCH urban farm sites managed and used to support the different training programs?
- What impact have the WCH outreach sites had on their surrounding communities?
- (if available) What aspects of food systems are addressed during training program classes?

Researcher Erin Kinley will answer these questions by visiting Chicago Botanic Garden, touring the different WCH outreach sites, and (if available) sitting in on a training program class. She will also do a self-guided tour of the Chicago Botanic Garden campus and meet with appropriate staff to discuss any follow-up questions.

Scope of Work:

Desert Botanical Garden

Desert Botanical Garden was identified as a garden with extensive food systems education through the initial survey and chosen for a follow-up phone interview. Phone interviews (for all gardens) were divided into categories; Desert Botanical Garden was placed in Classes and Lectures because of its wide variety of food systems-related classes, including desert vegetable gardening and local cultural history. Angelica Elliot, Program Development Manager for adult education, was interviewed in August about how these classes support food systems education for their audience. Based on a recommendation from Angelica, Nic de la Fuente, Desert Botanical's Community Garden Director, was also interviewed in September for the question section on challenging and underrepresented topics in food systems education.

Desert Botanical Garden was further chosen for an on-site observation based on its strong community relationships, creative program generation, and critical food literacy themes.

Based on information from the Classes and Lectures phone interviews, the on-site observation at Desert Botanical Garden is intended to address these four questions:

- What information or aspects of food systems would be most apparent to a general audience person attending these classes?
- How do these classes and lectures fit with other forms of food systems education at the garden?
- How do these classes help the garden connect with its community?
- How will the upcoming incubator farm be used to improve critical food literacy in the garden's audiences?

Researcher Erin Kinley will answer these questions by visiting Desert Botanical Garden, attending a food systems-related class, and meeting with appropriate staff to address any follow-up questions. She will also meet with staff involved with developing the incubator farm to discuss their plans for programming and interpretation in the new space.

Scope of Work:

Queens Botanical Garden

Queens Botanical Garden was identified as a garden with extensive food systems education through the initial survey and chosen for a follow-up phone interview. Phone interviews (for all gardens) were divided into categories; Queens Botanical Garden was placed in Production-Focused Farms because of its QBG Farm, an on-site vegetable farm developed as part of the garden's participation in the New York Department of Sanitation's Compost Project. Gina

Baldwin, QBG Farm Educator, was interviewed in July about how the farm is used for food systems education in the garden.

Queens Botanical Garden was further chosen for an on-site observation based on its unique partnership with the city, location, and creativity in addressing challenges for food systems.

Based on information from the Production-Focused Farms phone interviews, the on-site observation at Queens Botanical Garden is intended to address these five questions:

- What are the main components of a typical work day at the farm, and how do those change based on the season?
- How visible is the partnership between the QBG Farm and the New York Department of Sanitation, and how does it affect the farm?
- How do general audience members interact with the farm?
- What interpretation is provided in and around the farm for general audience visitors, and what aspects of food systems are addressed?
- How does the farm fit with the garden atmosphere and aesthetic?

Researcher Erin Kinley will answer these questions by visiting Queens Botanical Garden and working with staff on the farm for a day (season permitting). She will also do a self-guided tour of the garden and areas of the farm that are accessible to the public and meet with appropriate staff to discuss any follow-up questions.

Scope of Work:

Tower Hill Botanical Garden

Tower Hill Botanical Garden was identified as a garden with extensive food systems education through the initial survey and chosen for a follow-up phone interview. Phone interviews (for all gardens) were divided into categories; Tower Hill was placed in Garden Displays and Exhibits because of its vegetable display garden and heirloom apple orchard. Joann Vieira, Tower Hill's Director of Horticulture, was interviewed in July about how these displays are used for food systems education at the garden. Tower Hill was further chosen for an on-site observation based on its vision, unique collections, and location.

Based on information from the Garden Displays and Exhibits phone interviews, the on-site observation at Tower Hill Botanical Garden is intended to address these four questions:

- What interpretation is provided in the vegetable display garden and heirloom apple orchard?
- How do these displays fit with the garden atmosphere and aesthetic?
- What information or aspects of food systems would be most apparent to a general audience guest visiting these displays, and the garden overall?
- How do other departments, such as Education, incorporate these spaces into their programming?
- How do these displays support the mission, vision, and values of this organization?

Researcher Erin Kinley will answer these questions by visiting Tower Hill Botanical Garden and performing a self-guided tour of the garden, with a special focus on the vegetable display garden and heirloom apple collection. She will also meet with appropriate staff to address any follow-up questions after the tour.

Appendix H

EMAIL REQUESTING ON-SITE OBSERVATION

Hi [contact name],

I hope all has been going well for you! Since we last spoke in [month of interview], I have been conducting phone interviews with public gardens across the country about their food systems education programs. As the last step in my research, I will be visiting a select few of the institutions I interviewed as a way of visually gathering some final details. I would love to come visit your garden as one of my on-site observations!

My thesis committee had me develop a Scope of Work to formalize what I am looking for at each garden—I have attached a draft of questions that I would be hoping to answer through a visit to [garden name].

Let me know what your thoughts are—I look forward to hearing from you!

Best,

Erin Kinley

Appendix I

SURVEY DATA

Tables originally appeared in the report “Food Related Programming in Public Gardens” by the American Public Gardens Association¹.

¹ Benveniste Consulting. (2016). “Food Related Programming in Public Gardens”. American Public Gardens Association.

Table 6-2: Number of Gardens that Do and Do Not Offer Food-Related Activities (Question #2)

Offer Food-Related Activities?	# of Gardens	%
Yes	83	80%
In the past, but not currently	4	4%
Not currently, but maybe in the future	13	12%
No, and no plans to do so	4	4%
Total	104	100%

Figure 6-1: Food-Related Activities Offered by Gardens
(Question #8)

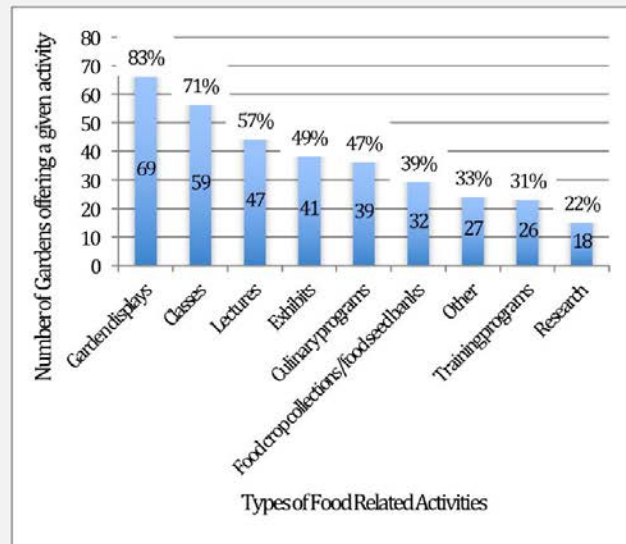


Table 6-3: Tabulated Short Answer "Other" Responses to Activities Offered by Gardens' Food Programs (Question #8)

# of Gardens	Self-described "Other" activities
7	Have community gardens
4	Practice charitable food distribution
4	Sell harvested food at markets, and two of those gardens explicitly stated selling at markets in food deserts
7	Offer community outreach and education activities that include the following: job training, summer camp education, university education, veteran job training and rehabilitation, and teaching gardens at urban housing developments.
3	Produce food for processing, sale, and onsite consumption

Table 6-4: Aspects of Food Systems Included in Garden Food Programs (Question #28)

Food system aspects	# of Gardens	%
Production	79	95%
Consumption	57	69%
Environmental impacts	47	57%
Processing	34	41%
Distribution	28	34%
Food policies	21	25%

Table 6-5: Production-Related Activities that Gardens' Food Programs Address (Question #29)

Production-related activities	# of Gardens	%
Home food gardening	74	94%
Soil health and fertility	59	75%
Organic agriculture	58	73%
Integrated Pest Management (IPM)	52	66%
Permaculture	27	34%
Agrobiodiversity	23	29%
Conventional farming	14	18%
Hydroponics	8	10%
Other (please specify)	8	10%
Aquaponics	7	9%

*% of the 79 gardens that responded to this question.

Table 6-7: Challenges and Topics that Gardens' Food System Programs Address (Question #30)

Challenges & Topics Addressed	# of Gardens	%
Organic vs. non-organic production	41	49%
Food systems' impact on the environment	38	46%
Food security	38	46%
Agrobiodiversity	25	30%
Feeding a growing population	22	27%
Our food systems education does not include these topics	18	22%
Biotechnology	9	11%
Other (please specify)	4	5%

*% of the 83 gardens that responded to this

Appendix J

WINDY CITY HARVEST APPRENTICESHIP PROGRAM 2017 OUTLINE

CHICAGO BOTANIC GARDEN

Windy City Harvest

2017 WCH Apprenticeship: Sustainable Urban Agriculture Weekly Outline Spring and Summer

This course meets 16 hours per week and is 75 percent hands-on with a 14-week full-time paid summer internship.

- Week 1: Intro to WCH Program; Intro to Urban and Sustainable Farming; Roots of Success: Fundamentals of Environmental Literacy
- Week 2: General Botany: Plant Parts and Processes; Roots of Success: Fundamentals of Environmental Literacy continued and Water
- Week 3: Greenhouse Production: Concepts, Seeding; Roots of Success: Health, Food and Agriculture
- Week 4: General Botany: Plant Reproduction and Seeds; Roots of Success: Social Entrepreneurship and Community Organizing
- Week 5: Greenhouse Production; Watering in Agriculture; Aquaponics Overview; WCH Food Safety, Harvest and Market Training
- Weeks 6-8: Outdoor Production: Site Planning, Vegetable Cropping Systems, Crop Specifics and Resources, Tilling, Transplanting, Building and Other Techniques
- Week 9: Soil Physical Properties; Soil in Chicago: Practicalities, Land Access, and Aesthetics in Urban Agriculture
- Week 10: Compost & Vermicompost; Soil Ecology
- Week 11: Soil Chemical Properties; Reading Soil and Compost Reports; Identifying Plant Deficiencies
- Week 12: Plant Health Care: Integrated Pest Management; Insect Pests and Beneficial Insects
- Week 13: Plant Health Care: Managing Plant Pathogens
- Week 14: Ecological Weed Management; GAPS Training; Small Farm Food Safety
- Week 15: Harvest Efficiency and Post-Harvest Handling Revisited; Intro to Beekeeping
- Week 16: Urban Farm Reports;
- Weeks 17-30: Full time, paid internship & mentorship at CBG or partner urban farm site
IPM assignment: Complete weekly IPM assessment and logging of a particular bed/crop/pest
- Weeks 31-36: Crop planning project and other topical lectures.



Appendix K

EXAMPLE FOOD SYSTEMS SIGNAGE FROM THE UNIVERSITY OF BRITISH COLOMBIA BOTANICAL GARDEN

Reference: UBC Botanical Garden. 2017. Educational signage for UBC Botanical Garden. <http://botanicalgarden.ubc.ca/>

Wild Food Crop Relatives

Understanding the origins of food plants was the lifetime work of Russian scientist, Nikolai Vavilov (1887-1943).

Centres of Diversity

Vavilov is credited with associating wild crop relatives with geographic centres of food diversity and with the history of domesticating food plants. His goal was to feed the world's growing population. Vavilov's knowledge of the basic genetics of food crops was the same as what most students are taught today. However, the USSR dictated an alternate view of genetics, one with little evidence to support it. Vavilov refused to "lose the party line" and fell out of favour with the state. Imprisoned in 1940 by the USSR, he died of starvation in 1943.

Nikolai Vavilov in 1933
Photo credit: United States Library of Congress



Vavilov identified where most food crops were first domesticated. Dry areas on maps show regions of these food crops often still used in these centres of origin.



Genes from wild crop relatives continue to help in improving modern grains and seeds.

Seed Security

Prior to his arrest, Vavilov led the Research Institute of Plant Industry, one of the world's first seed banks, located near Leningrad (St. Petersburg). During the 28-month Siege of Leningrad in WWII, Vavilov's colleagues took shifts keeping watch on the seed bank. Despite widespread famine in Leningrad, they refused to eat the grains, nuts, and other edible seeds stored in the institute. By the end of the siege, nine had died of starvation.

Modern gene banks are repositories of genetic material, including seeds, used in breeding and conservation. In an attempt to avoid loss of genetic diversity, a network of gene banks has been established which now holds seed samples of over one third of the world's food crop varieties. These banks are backed by secure facilities such as Svalbard Global Seed Vault, Millennium Seedbank, and the International Centre for Agricultural Research in Dry Areas. Today, Vavilov's Plant Industry seed bank is home to the largest collection of European fruits and berries and a partner in the world-wide network of gene banks.

Food Diversity and Plants

Over 200 different plant families are consumed by humans. In some families, there is an exceptional diversity of edibles.



Helianthus tuberosus
(Jerusalem artichoke or sunchoke)



Cynara cardunculus var. *scolymus*
(globe artichoke)



Brassica oleracea (Crucifera Group) 'Mallory',
a type of Savoy cabbage



Phaseolus vulgaris
'Taylor Hericatural', a drying bean



Cicer arietinum 'Desi',
a cultivar of chickpea

Asteraceae

The sunflower family includes plants like sunflower, safflower, stevia, Jerusalem artichoke, lettuce, globe artichoke, and wormwood. Oils, sweeteners, edible tubers, edible leaves and leaf bracts, and flavourful spirit ingredients are among the foods and food products from this family.

Brassicaceae

From the mustard family, edible roots, leaves, buds, and flowers as well as oils and flavourings are among the foods and food products harvested or extracted. Plants in this family include radish, turnip, cabbage, arugula, kale, Brussels sprout, broccoli, canola, and the namesake mustard.

Fabaceae

The bean family includes bean, pea, lentil, chickpea, fava, mesquite, soybean, tamarind, and liquorice. Foods and food products consumed or used include edible fruits and seeds, edible young plants, oils, and flavourings.

Brassica oleracea (Crucifera Group)
'Tide Cross', a cultivar of Brussels sprout

Global Food Issues

Exploring current failings and future threats to the food system quickly reveals numerous complex issues.



A preference for perfect food results in waste along the food supply chain.



Plant-based diets are an economical way to achieve food security.



Water in Metro Vancouver comes from three watersheds: Capilano, Seymour, and Coquitlam.

Food Waste: One-third of all the food produced in the world is lost or wasted between farm and fork (UN FAO). With one in nine people malnourished globally, food waste is an undesirable result within food systems after the investment of money, growing spaces, human energy, and resources. Inadequate food distribution systems, lack of suitable storage, and human behaviour contribute to food waste.

Culucubers is the landfill. Food waste in landfills is a source of methane, a potent greenhouse gas.

Food Insecurity: Food security exists "when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life" (World Food Summit, 1996). Food insecurity has long-term social and health impacts; people cannot reach their potential when they are concerned about where their next meal will come from.

Water Scarcity: There is no life without water. Vancouver's access to clean drinking water and to water necessary for food production is seldom recognized for its critical importance to this region. Globally, a lack of water is a persistent and rapidly growing problem.

Climate Change: Climate change has a direct effect on our ability to produce food. Ironically, agriculture is a major contributor to climate change. It is a source of greenhouse gas emissions from fertilizers, fermentation of organic matter (including manure), and combustion of fossil fuels. Reducing emissions while simultaneously increasing agricultural production to feed a growing populace represents a significant challenge.

Food Garden

Agriculture in the Fraser Valley

Fraser Valley's favourable soils and climate make it one of Canada's most productive agricultural regions.



The BC Agricultural Land Reserve (4.6 million hectares)



Cranberries are one of the few crops harvested by flooding fields.

With over a million people projected to be added to British Columbia's population between 2016 and 2036, the Fraser Valley and other arable lands are critical for food security. BC's Agricultural Land Reserve (ALR) protects these arable lands. However, the need for additional housing and infrastructure often encroaches upon the ALR, leading to conflicts about land use and agricultural practices like manure-spreading and pesticide use.

Raspberry crops are sometimes grown under plastic hoop houses.

Other conflicts with agriculture exist. Two hundred years ago, the Fraser Valley consisted primarily of floodplains and forest, teeming with wildlife. While the introduction of agriculture helped propel BC to its present-day productivity, this came at a cost to nature.

Over 260 species in the South Coast region of BC (stretching from the Sunshine Coast to Hope, with the Fraser Valley at its core) were provincially and federally listed as threatened or endangered in 2016. Practices are in place to help preserve remaining biodiversity in the area, but they can be at odds with feeding an ever-increasing population.

Advancements in Agriculture

Humans have been significantly altering the genetic characteristics of plants since crop agriculture began, some 10,000 years ago.



In Thailand, a man gathers rice in the rainy season.



Tomato seeds can be saved for future plantings.



Almost all life on Earth carries the blueprint (genes) for future generations in deoxyribonucleic acid (DNA) molecules.

Agriculture's Origins

For millennia, indigenous peoples have selected and sown specific plants to increase yields, alter flavors, and remove undesirable traits (e.g., bitter taste). Due to traditional roles in most cultures of child-rearing and cooking, indigenous women in particular are responsible for developing food plants.

Tried and True

Conventional plant breeding also includes the selection of favorable characteristics, but it is often done on a large scale. Depending on the crop, greenhouses or multiple field sites are used. Hybridization and cross-breeding through multiple generations of plants are also used to stabilize or magnify desirable traits.

Modern Techniques

UBC and other research universities continue to advance our understanding of the genetic blueprints of life. Increasing yields, nutritional value and disease-resistance are now also possible through genetic engineering (GE). However, inserting the genes of unrelated species into crops raises some concerns. Is the use of GE in agriculture ethical, safe, and sustainable? Without it, can the world be fed?

Domesticated varieties are much larger than their wild progenitors.

Staple Foods and Agricultural Crops

“A food staple is a food that makes up the dominant part of a population’s diet. Food staples are eaten regularly—even daily—and supply a major proportion of a person’s energy and nutritional needs.” National Geographic



Rice is the number one food crop globally.



Cotton, a leading fiber crop, is ready for harvest.



A balanced diet includes a diversity of foods.

Agricultural Crops

Agricultural crops can be divided into six categories based on use:

- Food crops (rice, potatoes)
- Feed crops (corn, alfalfa)
- Fiber crops (cotton, hemp)
- Oil crops (soybean, safflower)
- Ornamental crops (poinsettia, cut flowers)
- Industrial crops (tobacco, canola)

Cassava is the third most important source of food carbohydrates in the tropics.

What’s for Dinner?

Carbohydrates in food provide the fuel humans need to perform daily activities. Globally, the majority of these carbohydrates come from only a dozen or so crops. These staple crops include:

- Beans
- Cassava
- Maize
- Millet
- Plantain
- Potatoes
- Rice
- Sorghum
- Soybeans
- Sugar cane
- Sweet potatoes
- Wheat

Human Nutrition

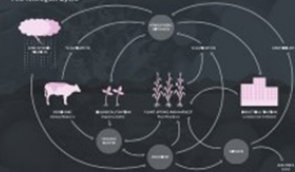
Sustaining a healthy body and mind requires adequate nutrition. What constitutes a proper diet? Though experts do not always agree on proportions, a diet that includes some mix of grains, fruits, vegetables, proteins, and high calcium foods is recommended.

Nearly one in nine people globally are malnourished, even though sufficient food is grown worldwide. Challenges include food distribution, climate change, and food waste. UBC’s Faculty of Land and Food Systems encourages students to tackle the issues surrounding sustainable agricultural practices and human nutrition for an increasing population.

Simple and Sustainable Practices

How food is grown and managed has a significant impact on crop yields, natural resources, biodiversity, and human health.

The Nitrogen Cycle



Nitrogen is an essential plant nutrient, required for building proteins in living things. Farm inputs can supplement soil nitrogen from atmospheric and other sources, and there are three types.



Crops such as lettuce are grown in the same space only once every three years in the Food Garden.

Organic Agriculture

Organic agriculture and gardening employ natural products and techniques to manage pests and improve crop productivity. Cultivating crops using organic techniques has been shown to increase biodiversity, enhance ecosystem health, and improve soil biological activity. UBC Botanical Garden follows organic gardening practices.

Crop Rotation

The system of cycling through a series of different crops in a garden bed or field is known as crop rotation. Rotating crops can improve soil fertility and organic matter content while simultaneously disrupting weed, pest, and disease life cycles. A seven-year rotation is used in UBC's Food Garden: root crops and leafy green crops are cycled with members from the mustard, squash, tomato, pea, and onion families.

Soil Health

Nurturing the soil improves its long-term health and boosts crop quality and yield. Cover cropping is an effective method for protecting the soil. Winter rains leech nutrients from the soil, but a winter-growing cover crop draws soil nutrients that would otherwise be lost into growing tissues. In early spring, the crop is uprooted or cut down and left to act as a weed-suppressing mulch. The nutrients are slowly returned to the soil as the cover crop decays, becoming available for summer plantings.

An expertly managed food garden can yield a bountiful harvest while nurturing both the garden and natural surroundings.

Espalier: Training Fruit Trees

Espalier is a highly productive, ornamental style of pruning that dates to the 1400s or earlier.

Espalier has come to mean a compact style of training fruit trees, but its original meaning in Italian (spalliera) refers to the framework on which the trees are trained. Legend suggests that many of these techniques were perfected in 17th century France by Father Legendre, but much earlier records are known from paintings.

Espaliered trees are normally grafted on "dwarfing" rootstocks and trained as young plants along wires or stakes. Designs include a three-dimensional vase, pyramid and goblet shapes, and the more common two-dimensional cordons, fans, and horizontals.



Figs are commonly grown as espalier, trained south-facing walls in Vancouver.

Historic illustration of espaliered trees, 17th century, UBC Botanical Garden.

The young trees you see here represent a renewal of UBC Botanical Garden's espalier collection. The new selections were chosen on the basis of greater adaptability and disease resistance when compared with trees in the original collection.

