

Perceptions of Campus Farm Missions at Liberal Arts Institutions: An Exploratory Case Study of
the Ivy Plus Sustainability Working Group and Duke Endowment Schools

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Executive Summary

In recent years interest in sustainable agriculture and food systems has grown at US higher education institutions. Traditionally campus farms and agricultural education are associated with land-grant institutions established to provide education in conventional farming practices. Today, an increasing number of campus farms are established in liberal arts spaces where food and agriculture are not a major component of the institution's mission. The Duke Campus Farm, part of an elite, liberal arts institution, is one such campus farm that has developed into an established component of the university. To provide the Duke Campus Farm and broader liberal arts community with insights from peer institutions, the goal of this project was to understand how students and staff view the missions and goals of campus farms at their liberal arts institutions.

We determine students and staff perceptions through a multi-case, exploratory study where cases include institutions within the Ivy Plus Sustainability Working Group and The Duke Endowment. These groups provide a sample of 17 private, liberal arts schools and Duke is a member of both groups. Interviews, a web-based search, and surveys provided data on campus farm characteristics, operations, missions, and staff and student perceptions of the missions. For each campus, staff was interviewed by phone and students participated in an online written survey. Data was analyzed by conducting thematic analysis for interview and open-ended survey questions in NVivo and descriptive statistics were used for the student survey.

Our results showed that:

- The official missions provided by each institution aligned with the perceptions that staff and students held and fell under three different themes: education about food production and food systems, community engagement, and production for the university. Overlap among themes was present at some institutions.
- Campus farm missions can be limited in reaching their potential by a lack of personnel and resource support.
- Farm staff members seek to better integrate farm activities with university academics as well as integrate with the broader farming community.
- Campus farms attract students from diverse programs across the university, and for diverse reasons, mainly personal well-being, community engagement, and experiential learning. Students generally are not motivated to engage with the farm for career aspirations.
- In contrast to farms at land-grant institutions, where mission focus is on education, community within and beyond the university plays an important role in farm missions and student motivations for farm engagement at liberal arts schools.

Based on our findings, we make the following recommendations for the Duke Campus Farm and for the broader liberal arts farm community:

- The Duke Campus Farm should engage with other campus farms that successfully incorporate course curriculums into their missions, that they increase their campus outreach,

advertising, and accessibility. These activities will help the Duke Campus Farm engage with more students and focus on the educational goals of their mission.

- The broader liberal arts campus farm community should create a campus farm conference to provide a networking and information sharing space. We also recommend that farms collect student feedback, look into methods for financial diversification, and identify how community fits into the farm experience at their institutions. These activities will help campus farms develop and support their missions.

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Introduction

Recently, interest in food, farming and sustainable agriculture at higher education institutions in the US has grown. Colleges and universities are offering a new range of food related courses, majors, and programs to meet interest and demand from students. These new programs are diverse in discipline and connect with food through cultural, environmental, social, and economic lenses (Holt 2015).

In parallel with this interest is the increase in campus farms and gardens seen across the country. Between 1990 and 2013, the number of US campus farms and gardens has grown from 23 to over 300 (LaCharite 2015). While traditionally associated with land-grant institutions as a means for conventional farming instruction and experience, campus farms have expanded into the liberal arts space at institutions where farming and food systems may not be a primary component of the mission or history (Committee on the Future of the Colleges of Agriculture in the Land Grant System 1995) . In these contexts, the motivations for establishing a campus farm are diverse and less evident.

Because campus farms have only recently expanded into liberal arts schools, few studies have been developed to understand the missions and perceptions of these farms among farm staff and students. Our goal is to determine how students and staff view the missions and goals of the campus farm at their liberal arts institution in an effort to provide the Duke Campus Farm and broader liberal arts community with insights from peer institutions. We accomplish this through a multi-case, exploratory study where cases include institutions within the Ivy Plus Sustainability Working Group (Ivy Plus) and The Duke Endowment (TDE) grantees.

Surveys and interviews were conducted with campus farm and/or sustainability staff at participating schools to collect data on their perceptions of the campus farm's mission, activities, and future endeavors. Surveys were administered to students to gather their perception of the campus farm's mission as well as motivations for engaging with the farm, educational takeaways and recommendations. Through thematic analysis, we determined themes among campus farm missions and staff and student perceptions of the mission. We evaluated alignment between student perceptions of the campus farm mission, staff perceptions of the campus farm mission and the official missions at each campus farm. Further analysis identified broader themes among responses that allowed for recommendations to our client, the Duke Campus Farm, and a better understanding of campus farms at liberal arts schools.

[Campus farms within the broader context of sustainable food in higher education](#)

Among higher education institutions, sustainability has become a common theme in operational and academic objectives. Growing interest in sustainability has led to numerous new college rankings, including Princeton Review's "2015 Guide to 353 Green Colleges," and formal sustainability tracking initiatives. Campuses aim to decrease their environmental footprints and increase awareness of environmental issues among students. Campus sustainable food projects have emerged as part of these sustainability efforts. A 2011 study by Peggy Bartlett outlined four components of campus sustainable food projects: dining service innovations in procurement and operations, academic and co-curricular programs, direct marketing opportunities, and hands-on experience at campus farms and gardens. All or parts of these components are increasingly addressed by higher education institutions as part of a push for sustainable practices and education (Bartlett 2011).

The strong connection between campus food projects and sustainability has earned recognition in the “Sustainability Tracking, Assessment & Rating System” (STARS). STARS provides tiered sustainability ratings for higher education institutions meeting self-reported sustainability goals in a variety of categories. STARS awards credit for having co-curricular sustainability programs including gardens, farms, community-supported agriculture (CSAs), and urban agriculture projects. The subcategory “Food and Dining” also awards credit for institutions supporting sustainable food systems. This subcategory is further divided into “Food and Beverage Purchasing,” involving sustainable purchasing from outside vendors for dining halls and other campus dining areas, and “Sustainable Dining,” which involves minimizing the impact of the institution’s dining operations by sourcing locally, preventing food waste, providing low impact food options and educating customers (“STARS Technical Manual” 2016). National ratings, like STARS, provide additional motivation for incorporating a campus farm or garden into the institution beyond student, faculty, and staff interest.

The “Real Food Challenge” is another nationwide effort that puts higher educational institutions at the center of sustainability and change in the food system. The program aims to shift university food budgets towards local, fair, humane, and environmentally sustainable choices through student activism. Participating universities make a commitment to purchase more “real” food, provide greater transparency, and foster increased engagement and discussion with students, peer institutions and other stakeholders around food related issues (“About Real Food Challenge” 2016).

[Movement towards a sustainable food system](#)

The surge of interest in sustainable food projects is partly attributed to increasing concern over current farming practices (Barlett 2011). The conventional model of agriculture, which includes

large-scale monocultures, dominates the US food system. The establishment of land-grant institutions, the USDA, and agribusinesses has moved farming to higher production capacity and specialization. Since the 1920s, advances in mechanization, chemical inputs, and plant breeding have increased yields and intensified land use (Lyson 2000). Recently, globalization has played a role in agricultural intensification as large food companies have vertically integrated production for efficient final product generation and distribution to meet growing global demand (Godfray et al. 2010).

The conventional agricultural system has led to great economic success and prosperity in food production, but not without environmental and social costs. Intensified agriculture has contributed to destructive land practices, proliferation of chemical pest controls, unfair labor practices, and loss of biodiversity among other ecological and human impacts (Horrigan, Lawrence, and Walker 2002). In the 1960s, Rachel Carson's "Silent Spring" brought attention to the negative impacts of pesticides on the environment and is often cited as a powerful driver of the environmental movement (Griswold 2012). The concept of agroecology emerged as a more ecological, system-based approach to agriculture in the 1980s as a scientific discipline, agricultural practice and social and political movement (Wezel et al. 2009). A trend towards sustainable, local farming began to take shape.

Concern for both consumer health and environmental quality has driven the local food movement and demand for sustainability and transparency within the food system. The industrial agricultural model which dominates today strives for quantity and efficiency in crop production, while the sustainable model takes a more system-based approach, with consideration of the environmental and social aspects of food production in addition to the economic aspects (Gomiero, Pimentel, and Paoletti 2011). Locally sourced food is seen as a solution to many environmental and

social issues related to conventional systems, as consumers are increasingly aware of where their food comes from and looking for alternative, sustainable food sources. Direct-to-consumer marketing increased from \$551 million in the late 1990s to \$1.2 billion in 2007. The number of farmers' markets rose from 2,756 in 1998 to 5,274 in 2009 and the number of farm to school programs and community supported agriculture (CSA) programs increased as well (Newman 2016). This local food movement is reflected in higher education institutions, as previously mentioned, and has been a strong motivator for student interest and the establishment of campus farms, as well as the establishment of sustainable farming programs at land-grant institutions (Parr et al. 2007).

[Campus farming at land-grant institutions](#)

Campus farms are traditionally associated with land-grant institutions where farming is part of the schools' historic roots. In 1862, Congress passed the Morrill Act which gave public lands to states in order to sell and use the profits to establish a public university that would teach agricultural and mechanical arts (Committee on the Future of the Colleges of Agriculture in the Land Grant System 1995). These institutions of higher learning were meant to increase access to practical education during a time when higher education focused on abstract, liberal arts curriculum and the industrial social class was growing ("The Land-Grant Tradition" 2012). Land-grant institutions traditionally offer instruction in conventional agricultural practices with a focus on increasing yields, although many now offer research and curriculum in sustainable practices (Parr et al. 2007). Although land-grant universities have expanded their disciplinary reach beyond agriculture, their agricultural roots can still be found at many schools in the form of a College of Agriculture ("The Land-Grant Tradition" 2012).

Agricultural education and experiential learning

Much of the literature on campus farms focuses on land-grant institutions and assesses the pedagogical significance of campus farms and their role in sustainable agriculture and food systems (SAFS) education (Parr and Trexler 2011). Experiential learning is commonly explored as a theme in this research. As a philosophy of education, experiential learning theory defines learning as “the process whereby knowledge is created through the transformation of experience” and “Knowledge results from the combination of grasping and transforming experience” (Kolb and Kolb 2005). For the campus farm experience, this refers to working in the field and the farming community, appreciating the uniqueness of place and location specific farming challenges and solutions (Francis et al. 2011).

Some studies have assessed the pedagogical significance of campus farms at land-grant institutions through student perspectives and case studies. By inquiring into students’ perspectives on effective learning approaches, motivations for going to student farms, and how the campus farms were integrated into their formal education, Parr and Trexler (2011) establish a strong link between students’ learning preferences and experiential learning theory. Students suggested that the most effective learning of SAFS was through balancing classroom learning with hands-on learning in the field. In their study, the primary motivation for students to use the student farms is to gain practical knowledge of agricultural production and marketing. Ultimately, the study provides evidence that shows the value of experiential learning at student farms and the potential of student farms to advance SAFS education at land-grant institutions (Parr and Trexler 2011).

Another perspective in understanding the pedagogical role of campus farms is that of the faculty. In recognizing the increasing popularity of campus farms, a study by Monaghan et al. (2015) aimed to understand the link between campus farms and curriculum. Various models of higher

education curriculum integration with campus farms were summarized into four educational typologies: enhancement (farms are not essential, but expand on classroom teachings), competency (farms are essential in teaching technical concepts), exploration (farms allow exploration of broader social, economic and environmental concepts) and foundation (farm allows for personal and professional development through problem solving activities). These typologies were developed from insights from faculty members who integrate the campus farms into their curriculums and understanding why and how they use the farms. An interesting finding from this study indicated that professors at land-grant institutions emphasized hands-on, practical learning in line with more technical learning objectives, such as calculating fertilizer application rates. This study illustrates the diverse paths for farm and curriculum integration and enhances the understanding of the role of campus farms in academics.

Additional studies on campus farming have incorporated both land-grant and non-land-grant schools. A 2011 survey of student farm managers at 80 US campus farms revealed diverse operational characteristics, student activities, and funding challenges (Leis et al. 2011). Also, Sayre and Clark (2011) documented campus farm efforts at both land-grant and non-land-grant universities across the US and Canada through a series of essays. The essays, written by campus farm managers and others involved with campus farms, exhibit diverse efforts to provide hands on learning of agriculture and knowledge of the food system to students. The farms profiled vary in production, from farm size to the types of crops and livestock produced, and activities, from crop production to engaging with academic courses.

While many studies focus on campus farms at land-grant institutions, there is a need for a better understanding of campus farms at liberal arts institutions, where, unlike a land-grant institution, schools may not have a focus on or academic program for agriculture. Campus farms

have the potential to serve campus sustainability efforts and to build networks of food-educated students (Barlett 2011). Thus, it is important to understand their development in different institutional contexts. An example of such institutions, and the focus of our study, includes the Ivy Plus Sustainability Working Group schools and The Duke Endowment grantees.

Purpose and Research Questions

Campus farms at land grant institutions were commonly established with the mission of providing students with technical experience in agricultural production and management. But at liberal arts institutions, the mission of a campus farm is not evident. The Duke Campus Farm, part of an elite, liberal art's university, has a mission to “Inspire and empower the Duke community to catalyze food system change” and they are striving for increased academic engagement. Mission is important to the Duke Campus Farm as a developing liberal arts farm, and understanding how their mission, and the missions of peer institution farms, is perceived and realized is of interest.

Our study aims to identify the missions of campus farms within two groups of liberal arts institutions, the Ivy Plus Sustainability Working Group and The Duke Endowment, and determine if and how their stated missions align with campus farm staff and student perceptions of the missions. The study is guided by the following research questions:

How are student and staff perceptions of campus farm missions aligned with each other and the official missions of these farms?

- a. How do campus farm staff view the campus farm mission?
- b. How do students view the campus farm mission?

Answering these questions will provide a better understanding of campus farms at liberal arts institutions and how their missions are realized within the liberal arts space. Our results will inform

recommendations to our client, the Duke Campus Farm, on maintaining and advancing their mission, as well as provide broader recommendations for the Ivy Plus and The Duke Endowment campus farms.

Research Methods

Using qualitative methods, we conducted an exploratory, multiple case study. We began our study focusing on the 17 institutions of the Ivy Plus and TDE groupings (Table 1, below), but focused in on nine schools after determining which ones are relevant to our study and willing to participate. O’Leary (2005) defines a *case* as “a bounded system, or a particular instance or entity that can be defined by identifiable boundaries.” Additionally, O’Leary defines a *case study* as “A method of studying elements of the social through comprehensive description and analysis of a single situation or case. For example, a detailed study of an individual, setting, group, episode or event.” Campus farms are excellent case studies because they are a unique part of their campuses with organizational boundaries. Using the Ivy Plus and TDE groups adds additional weight to this method, as these universities are brought together by similarities. In the case of TDE schools, they are similar in that they received specific funding from TDE to start a campus farm. The Ivy Plus schools and TDE schools are similar in that they are all elite, private colleges and universities that have made strides towards campus sustainability. With Duke University overlapping both groups, we are able to gain better access to the contacts for these schools.

We used survey and interview techniques to gather data through three phases:

Phase 1: Staff Survey

Phase 2: Staff In-depth Interviews

Phase 3: Student Surveys

The first phase of our research, a preliminary survey, was sent to sustainability and farm staff members. The second phase comprised of a phone interview with specific respondents to the initial survey. The third phase was a student survey that was distributed to students at the schools we interviewed.

Because the project includes survey and interview data from human subjects, our project proposal and description of methods were submitted to and approved by the Duke Institutional Review Board in September 2015 in compliance with Human Subjects Research protocol.

[The Ivy Plus Sustainability Working Group and The Duke Endowment](#)

The Ivy Plus Sustainability Working Group and The Duke Endowment schools (Table 1) have taken on sustainability goals and projects in recent years, including those related to food and agriculture. Together they include 17 private schools mostly concentrated on the East Coast.

Table 1. The list of Ivy Plus and The Duke Endowment schools.

Ivy Plus Schools	The Duke Endowment Schools
Brown University	Davidson College
Columbia University	<i>Duke University</i>
Cornell University	Furman University
Dartmouth College	Johnson C. Smith University (JCSU)
<i>Duke University</i>	
Georgetown University	
Harvard University	
Johns Hopkins University (JHU)	
Massachusetts Institute of Technology (MIT)	
Princeton University	
Stanford University	
University of Chicago	
University of Pennsylvania	
Yale University	

The Duke Endowment is a philanthropic trust established in 1924 by James B. Duke. The Duke Endowment aims to help communities in North and South Carolina by "...nurturing children, promoting health, educating minds, and enriching spirits." The Endowment is a large 501(c)(3) private foundations and delegates grants to the four program areas: Higher Education, Health Care, Rural Churches, and Child Care. Higher Education receives 43% of the endowment's grants ("About the Endowment," 2009).

In 2008, TDE designated grant money towards campus sustainability efforts at the four universities in North Carolina and South Carolina that are supported by TDE. These universities (see Table 1) expressed interest in starting sustainable campus farms. In 2012, TDE awarded \$247,625 to each university to support their campus farms and an additional \$75,000 in 2013. The funding helped establish the infrastructure for these farms and support research and community engagement efforts ("Growing Sustainable Food and Farming Efforts on College Campuses," 2016).

The Ivy Plus Sustainability Working Group was founded in 2007 and includes the 14 schools listed under Ivy Plus in Table 1. The group aims to lead a unified effort in addressing challenging sustainability issues in higher education by sharing solutions, engaging scholars and educating future leaders in sustainability ("Ivy Plus" 2016). The primary focus of the group is to share solutions among campuses in a commitment to reducing greenhouse gases ("Ivy Plus Sustainability Working Group" 2016). These schools provide a sample of universities similar to TDE schools as elite private, liberal arts schools that may or may not have a campus farm. Cornell University is a private/statutory land-grant institution and Massachusetts Institute of Technology (MIT) is a private land-grant institution; both schools were included in the study for comparison

Data Collection

Phase 1: Staff Survey

In October 2015, the preliminary survey (Appendix I) was administered to campus sustainability faculty and/or campus farm managers at all Ivy Plus and TDE schools in order to (1) identify schools with campus farms and (2) gain a preliminary understanding of the farms operations and activities at the schools. The survey was administered online using Qualtrics Survey Software. Because many campus farms are connected to a sustainability office, we surveyed

both sustainability staff and farm managers in order to maximize response rate from relevant respondents. Contacts for sustainability managers were provided by the Duke Sustainability Office and campus farm contact emails were provided by the Duke Campus Farm or found through online searches. We reached out to a total of 28 contacts between the 17 schools in the Ivy Plus and TDE groups. The survey questions were designed to gauge the types and relative importance of services and educational activities offered by the campus farm, as well as inquire about the farms' origins and operations. We sent reminders via e-mail to all contacts twice to increase response rate.

From response to this survey, we were able to identify schools with farms and gain a sense of the variety of farm types and varying degrees of student and university engagement, ranging from volunteer activities to course curriculum. Of the 17 schools surveyed, we received responses from 13 schools, four of which had two respondents including farm managers, sustainability staff or faculty. Ten schools reported that they have a campus farm (or a food-producing garden). Although this initial survey asked specifically about "campus farms", we did not provide a definition for "campus farm". We received responses from Johns Hopkins University and Harvard University clarifying that they have gardens. We chose to include both schools in our study as the staff survey respondents identified the difference as purely semantic, and the difference was not considered further. We proceeded by requesting interviews with schools that replied "Yes" to "Does your campus have a campus farm?" Princeton University representatives did not respond. The nine schools in table 2 comprised our selection for closer study through in-depth interviews.

Table 2. Liberal arts institutions surveyed. Ivy Plus and The Duke Endowment school responses to the initial survey.

School	TDE or Ivy Plus	Campus farm present
Brown University	Ivy Plus	No
Cornell University	Ivy Plus	Yes
Dartmouth College	Ivy Plus	Yes
Davidson College	TDE	Yes
Duke University	Both	Yes
Furman University	TDE	Yes
Harvard University	Ivy Plus	Yes
Johns Hopkins University	Ivy Plus	Yes
Johnson C. Smith University	TDE	Yes
Princeton University	Ivy Plus	Yes
The University of Chicago	Ivy Plus	No
University of Pennsylvania	Ivy Plus	No
Yale University	Ivy Plus	Yes

Phase 2: Staff Interviews

The second phase of data collection involved semi-structured phone interviews (Appendix II) of farm managers or sustainability staff from the schools identified from the initial survey in Table 2. We were able to secure interviews with sustainability staff or farm managers at nine of the ten schools (Table 3).

Table 3. The list of schools interviewed and the role of the interviewee at each school.

School	Interviewee role at the university
Cornell	Organic Farm Coordinator
Dartmouth	Sustainability Staff Member and Farm Manager
Davidson	Farm Manager
Duke	Assistant Program Manager
Furman	Program Coordinator at the David E. Shi Center for Sustainability
Harvard	Food Literacy Project Coordinator
JHU	Student Gardening Coordinator
JCSU	Biology Faculty/Sustainability Staff Member
Yale	Program Manager for International and Professional Experience at the Yale Sustainable Food Program

The interviews lasted approximately 30-40 minutes and allowed a more in depth discussion about each campus farm’s mission, development, activities, and future goals. Phone calls were made through the audio call function in the FaceTime app on a MacBook Air laptop (compatible with iPhone), and recorded using QuickTime Player. Interviews were conducted in mid-December 2015 and early February 2016. Since we are also interested in the stated missions of the campus farms, some interviewees followed up with an e-mail containing the farm's mission. For other schools, we did a web-based search to find the farm's mission on the school or farm's website.

Phase 3: Student Surveys

The third phase of data collection was a student survey (Appendix III), which we administered online through the Duke Qualtrics Survey Software account. The survey was pretested with a freshman seminar class at Duke in order to receive feedback and clarification for our questions. Because we are interested in students who have engaged with the farm at our sample schools in some capacity at any time, we relied on our interviewee contacts to distribute the survey to relevant students. This snowball sampling method, which is a non-random sampling method used when the respondents of interest are difficult to identify (Rea and Parker 2005), allowed us to reach students of interest. The survey link and brief descriptive paragraph were distributed to each of the interviewees with instructions to forward the survey to all students at their institution who had engaged with the farm at any time. This survey included questions concerning demographics, personal background, campus farm engagement, knowledge of and interest in food and farming, and several open-ended questions. Survey respondents include undergraduate students who engaged with the farm. Non-undergraduate students, such as professional or graduate students, were also allowed to take the survey, although they were not the target population.

Data Analysis

We transcribed interviews using a program called oTranscribe and used thematic analysis to evaluate the transcripts using NVivo 10 software. Thematic analysis allowed us to identify and analyze major themes among responses from staff members as well as the official farm missions. This was completed by conducting text analysis, a method of closely reading and extracting high-quality information from text (Lacity and Janson 1994).

To evaluate trends in student responses, we used descriptive statistics and thematic analysis for open-ended questions in NVivo. A framework matrix was developed to better compare the responses within schools and at different schools. The number of students with responses within identified themes were totaled for each school to determine how schools compare across themes. Trends and results from all colleges were compared based on their varying campus farm models and initiatives to draw further conclusions on the relative agreement of student perceptions of campus farms with staff perceptions of campus farm missions and initiatives. The analysis allowed us to develop conclusions and recommendations for the Duke Campus Farm and similar campus farms as they continue to develop in the liberal arts space.

Limitations

Qualitative Data Analysis, or QDA, is a challenging form of inquiry because it relies on the thoughts and observations of those who perform it (O’Leary 2005). The perceptions of the researchers can vary widely, as different people interpret things in different ways. We recognize that we bring our own biases to this study as students at Duke University, one of the schools of interest in this study. Furthermore, our experiences on the Duke Campus Farm have shaped our perceptions of what a campus farm is, however we strived to maintain objectivity throughout this study. Strong teamwork and frequent discussion were necessary to keep both team members aligned with project goals. Interviews were closely managed by the student researchers to ensure that they stayed within the desired time limits and roughly followed the interview guide. Not all campus farms offer the same programs, or have the same facilities, so not all questions were relevant to all farms.

We were also limited in our sampling methods for the student survey. In order to complete the study within the timeframe required and at no cost, we used the snowball sampling method to identify student respondents for our Phase 3 survey. We relied on interviewees to distribute the

survey to students. We gave the option of sending contacts to us, so that we could distribute the survey and follow up with reminders, but all interviewees preferred to send the survey themselves as a logistical preference. Although we acquired student responses from all schools surveyed except for two, it is possible that our response rate would have been higher if we were able to directly contact respondents and send survey reminders. Therefore, student survey results are not representative of the entire campus farm-engaged student population at the schools included in this study. Their responses are nonetheless valuable and allow us to use this sample as a means to collect meaningful data and produce insights into student perceptions of campus farms.

During the course of our study, we use the term “campus farm” to refer to a space in association with a higher education institution which produces food or herbs and is open to student engagement. This is in close agreement with Sayre and Clark’s definition of “student farms” (Sayre and Clark 2011). However, we realized during the staff survey that two schools classify their campus farms as campus gardens. At the time, Johns Hopkins University and Harvard University both indicated that they have a campus farm, but clarified in a comment box that their space is a garden. We proceeded with the study including these two gardens as the difference is purely semantic. For the purposes of this study, the term “campus farm” refers to both campus farms and gardens of the schools of interest. We do, however, recognize that in using the term “campus farm” in our initial survey, it is possible that campuses with gardens indicated “No” to “Does your campus have a campus farm?” and were left out of our study.

Additionally, as this is not a strict study of pedagogical significance, our assessment of knowledge and learning is limited. This is relevant in student surveys in which our characterization of student knowledge relies on the students’ own perceptions of their knowledge. This study does not delve into the intricacies of learning theory or attempt to distinguish between true knowledge and

awareness of a subject. Thus, interpretations of student knowledge and learning indicate the presence of this knowledge rather than the depth of this knowledge.

Results

Results are presented in four sections corresponding to the three phases of our methods and the results found for stated missions. Results from Phase 1, the survey to farm and sustainability managers, are included in the first section. The second section covers the official missions of the farms from our web-based search and interviews. The third section covers staff perceptions of campus farm missions through themes identified within the interviews during thematic analysis. The final section includes demographics and characteristics of the student respondents and the themes found across student responses for their perceptions of their campus farm's mission, motivations for engaging with the farm, educational takeaways, and recommendations for the farm.

Preliminary Staff Survey

The initial survey sent to farm and sustainability managers resulted in 18 responses representing 13 of the 17 schools (Table 1). Of the 13 schools with responses, three of the schools do not have a campus farm (Table 2). All four Duke Endowment schools and nine additional schools from the 14 Ivy Plus schools responded.

Responses came from individuals holding different positions at the schools surveyed including sustainability managers, campus farm managers, food program coordinators, and faculty. Tables 4 and 5 display summaries of campus farm operations. Most schools are providing produce for either a CSA or campus dining (Table 4), and some donate to local food banks and shelters. A majority of campus farms also engage with classes at some level with many engaging with more than three (Table 5). Campus farms are both young and old in these groups and are mostly found

within sustainability departments. Most farms have a permanent staff member, and less than three paid positions (Table 5).

Table 4. Food outlets at campus farms. Information on what is done with the produce from the farms based on responses to the staff survey.

School	CSA	Food supplied to campus dining
Cornell University	Yes	Vegetables
Dartmouth College	No	Vegetables
Davidson College	Yes	Vegetables
Duke University	Yes	Vegetables
Furman University	Yes	Herbs
Harvard University	No	Herbs
Johnson C. Smith University	No	n/a
Johns Hopkins University	No	n/a
Yale University	No	Special Events: Vegetables, Fruits

Table 5. Campus farm physical characteristics and organization. A comparison of information about campus farms' operations at the Ivy Plus and TDE schools interviewed.

	Cornell	Dartmouth	Davidson	Duke	Furman	Harvard	JHU	JCSU	Yale
Age (years)	19	20	3	5	7	5	4	3	12
Size (acres)	2	0.5	2	1	0.25	0.25	0.4	0.25	1
Financial support	Fundraising, grants, Cornell University Ag Experiment Station	Sustainability office	TDE	TDE, Duke Dining, Office of the Executive Vice President, Nicholas School of the Environment, CSA	TDE, Shi Center for Sustainability	Five campus institutions to start, donations	Grants, student groups, donations, fundraising	TDE, Blue Cross Blue Shield North Carolina	Grants, fundraising
Overseeing organization	Student run, overseen by Organic Farm Manager	<i>Originally Outdoors Program; currently Sustainability</i>	Stand alone business	Sustainability Office	Shi Center for Sustainability	Student run, overseen by Dining Services and Food Literacy Program	Student-run with committee	Center for Renewable Energy and Sustainability, Sustainability Village	<i>Originally Sustainability; currently Yale College</i>
Who is in charge of managing the farm?	Organic farm coordinator; Students	Farm manager; Students; Sustainability Office Staff	Farm manager	Farm manager	Farm manager/Students	Students	Students; Committee of students, faculty, staff, and community members	Students	Farm manager; Students/Volunteers
# of paid staff	>3	2	1	>3	1	1	0	0	> 3

Campus Farm Stated Missions

Based on the information gathered from a web-based search of campus farm missions and stated mission provided to us during interviews, we used thematic analysis to determine three elements commonly found to be part of campus farm missions: education, community, and production. Table 6 offers a summary of how the official missions are split across the themes identified.

Table 6. Campus farms' stated missions divided into identified themes. Duke's mission was identified as spanning across all three themes.

	Cornell	Dartmouth*	Davidson	Duke	Furman*	Harvard	JHU	JCSU*	Yale
Community	Foster community, empower students; open to anyone			Inspire and empower the Duke community to catalyze food system change	Engagement on campus and with local farmers in greater community	Engagement with general public in food related activities	Building long-term and meaningful relationships at JHU & with Baltimore residents	Bring sustainable solutions to community members	
Education	A place for experiential learning, group collaboration, research, and outreach	Enhancing student experience	Enhance educational opportunities, create a collaborative and innovative environment for activities that support ethics based agriculture		Research and teaching to support sustainability	Educate community on importance of local food and agriculture with sustainable urban farming practices and hands-on learning opportunities	A space to learn, teach, and practice safe and sustainable food production methods		Create a generation of food-literate leaders
Production		Advancing Dartmouth's leadership in the world as a sustainability leader at the institutional level	Provide natural products to dining services						

*Mission falls under mission of sustainability office

The schools with asterisks do not have a separate mission for their campus farm and instead adopt the mission of the sustainability office from which the farm is housed under. All campus farms have some educational component in their official mission, from providing hands on, or research based learning of sustainable agriculture to more food systems based knowledge and leadership. Community refers to an effort to build the campus community or engage with the greater community within which the campus is situated around sustainable agriculture and food systems. Production refers to farms which provide for campus eateries or other efforts in contributing to campus sustainability through production. Dartmouth and Davidson are the only schools with a production component as Davidson's mission is to provide produce to the dining halls and Dartmouth's mission is to contribute to campus sustainability through local, sustainable food production.

Staff In-depth Interviews

A total of nine interviews were conducted with staff from the campus farm or the sustainability offices at each school. In one case, we had a student interviewee because the farm is entirely student-run (JHU, Blue Jay's Perch Community Garden). We spoke with sustainability managers from Furman, JCSU, Dartmouth, and campus farm managers or food programming staff from Duke, Davidson, Yale, Harvard, Dartmouth, Johns Hopkins, and Cornell. Some schools did not have a position titled Campus Farm Manager, rather, they had an Organic Farm Coordinator or Assistant Program Manager (Table 3). These titles, and similar ones, are considered to be campus farm staff positions. For all but one school, the role of respondents from the initial survey matched the interviewee role. The Dartmouth interview was conducted with two individuals, the sustainability manager and the campus farm manager.

We identified four themes from interview responses including (1) the role of the farm within the university, (2) meeting the mission, (3) challenges, and (4) the vision for the future. The following sections detail the text analysis of the interviews.

The farm's role within the university

Six out of the nine farms in our study have clearly outlined their place within the university community. Davidson's campus farm is a production-driven enterprise, and the farm manager works hard to ensure that her production goals are met and the campus dining services are getting the produce they order. The role of the Davidson farm is clearly defined as production-based. In contrast at Yale, the farm strives to be seen as a place to learn, similar to a museum or a library (although a tactile and verbal experience is encouraged).

One way that we understand the farm is that the farm is a space that is a lot like a museum or a library on campus. It's a space that's meant to, uh, to connect with what you're learning on the classroom and be a resource for that. If you're thinking about the way that institutions in general operate, it's we're most akin to a library or a museum. (Yale, 2015)

For the other farms we interviewed, identifying their role within the university community is an area of continuous development. Three of the interviewees mentioned that they would like to find their 'place' in the organization of the university. In 2014, Duke Campus Farm released a Five-Year Strategic Plan that defines their mission as "catalyzing positive change in the food system" and outlines their plans to meet their mission over the next five years ("Duke Campus Farm: Five Year Strategic Plan" 2015). Using a strategic plan to work towards a desired outcome indicates that the Duke Campus Farm knows where they would like to be in several years, and that they have a timeline in place to achieve their goals. Harvard has also implemented the beginning stages of its strategic plan. At Johns Hopkins, the campus farm exists as its own entity, acknowledged but not

funded by the school. This might potentially harm the availability of invested leadership over the coming years, so the current volunteer force is working hard to ensure that the farm survives. Two of the farms had to move to a different organizational structure to find their place. Dartmouth's farm started out under the expectations that the farm would produce enough revenue to sustain itself, rather than needing funding from the university to operate. After a few unsuccessful seasons, the leadership realized that the farm would not be able to operate in this way, and they made some organizational changes to place the farm within the Dartmouth sustainability office that allowed the farm to become a more holistic learning environment. The Yale farm started out within the Operational Services division, which included Sustainability. This imposed hard-to-attain sustainability metrics on the farm, which required a certain amount of energy and resources to operate. Because of this and other limitations, the Yale farm moved divisions and now operates under Yale College. At Davidson, the farm is its own auxiliary, similar to how their campus bookstore is its own auxiliary. The Davidson farm works on its own due to its strong production model, but other farms may not be able to survive in the same way.

[Staff perceptions of campus farm missions](#)

All interviewees were asked how they viewed the mission of their campus farm, and how they went about meeting those missions. With these responses, we categorized each farm as either education, production, or community, following the same themes identified in the official missions. In the event that farms listed more than one element as part of their mission, we categorized them by what they identified as primary to their mission.

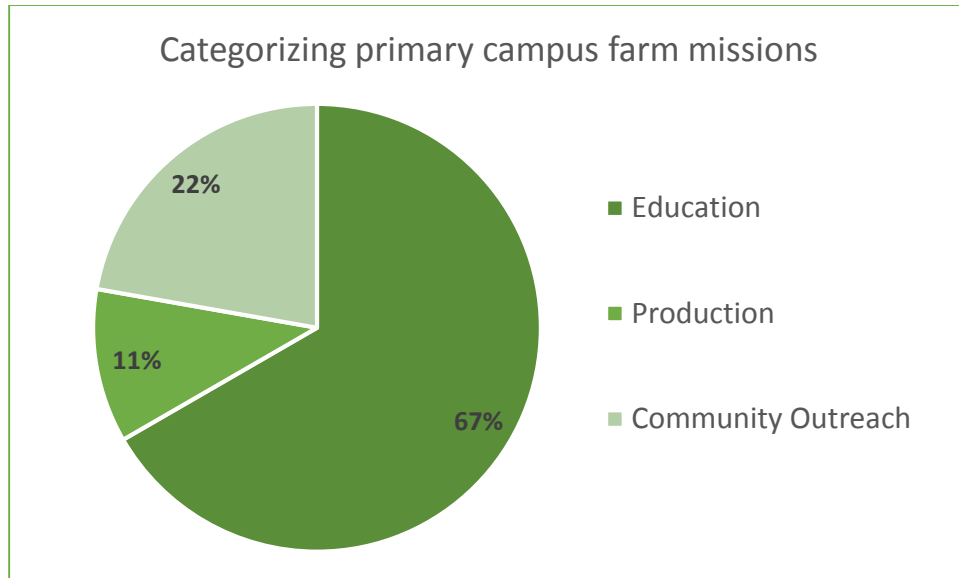


Figure 1. Categorizing Campus Farm Missions: Where do they primarily see themselves? Each farm was asked to identify what their primary mission was. The responses ranged in length and content, but all farms were able to be categorized into one of three categories: education, production, or community.

Each interviewee was asked what they did in order to meet their missions. The school with the production-based mission, Davidson, mentioned that they used to hold regular volunteer workdays, but no longer do so because it was difficult to manage. The farm manager said that many one-time volunteers do not have any previous experience, and need to be taught and then monitored when using equipment or performing tasks. The farm manager is the only employee, so organizing volunteer workdays and trying to bring new and inexperienced students to the farm takes away from her ability to fulfill her mission of getting her produce to the dining halls. A core group of student volunteers does spend time at the farm, but they are all individuals who are knowledgeable about the needs and uses of the farm and its tools.

For community outreach oriented farms, JCSU and JHU, events that fulfilled their mission were held both on the campus and in the community. JHU's farm is a destination for school trips, and some students from the local high school would come after school to volunteer and work in the

community garden area. They also open farm plots up to the Baltimore community to learn and grow their own produce. Produce that was grown in the community garden area was also donated to local shelters and soup kitchens. At JCSU, the farm partners with the local Meals on Wheels organization to provide healthy, fresh produce options to local citizens in need, and they allow neighboring community members to come to the garden and take any food they need. Community members only need to record the weight of the produce they took so that JCSU can keep an accurate tally of how much they produce and how much is used by community members. At JCSU community outreach is also global, as they recently helped build an aquaponics system in a community in Haiti that was nearly destroyed by the 2010 earthquake.

Educational farms (Cornell, Dartmouth, Duke, Furman, Harvard, and Yale) listed many student-centered teaching activities and social events as their main method of abiding by their mission. Every farm said that they either had classes visiting the farm, or wanting to visit the farm. At the Yale campus farm, a pizza oven brings big crowds on Fridays. The Duke Campus Farm holds contra dances, student work days, and workshops. At Harvard, the staff hopes that students feel so comfortable in the space to come and enjoy their lunch at the centrally located picnic tables. Other events include movie screenings, farm formals, hosting capstone projects for undergraduates, hosting fellows (graduates and undergraduates) and participating in CSAs or farmers' markets. Although their primary objective is not production, some farms still produce enough food to contribute to CSAs or markets (Table 5), and often choose those routes to ensure that their produce does not go to waste.

Challenges

Challenges identified by farm or sustainability staff were both internal and external to the university, and came in a variety of fashions. For example, Dartmouth mentioned that they

experienced challenges finding their place within the local community of farmers. In their area, they have six thriving farmers' markets, and they found it difficult to integrate into any of them without stepping on local producers' toes. Duke acknowledged this as well, saying,

...in some respect it feels ridiculous to talk to people who come from a straight up farming world about financial woes because we're always really careful to say that of course at campus farms we're highly subsidized in our own way. It's why for example we've always had a philosophy of like, we don't sell at farmers' markets because we don't feel like we're fairly competing in exactly the same kind of way that your average farmer who's running a business with no inputs from the university paying their two full time staff to run the space. (Duke, 2016)

As with many school programs, funding has potential to be a major challenge for campus farms. When asked if they had experienced significant funding issues, three respondents said yes and six said no (Table 7). The six schools that said no either stated that they had minor funding issues or had not yet experienced significant funding challenges. The Duke Endowment schools received two grant sums of money in the early stages of development, but most of the interviewees in the Ivy Plus community are dependent on private donations, grants, fundraising, or university funding. At JHU for example, the farm is dependent on grant writing and the generosity of an anonymous benefactor. While the University allows them to use their student group banking system, they do not receive any additional funding from the school, and have only recently become better known on campus.

Table 7: Campus farm funding. Presence of significant funding challenges at schools. Respondents were allowed to define "significant" themselves.

Group	School	Challenges
Ivy Plus	Cornell	No
	Dartmouth	Yes
	Harvard	Yes
	JHU	Yes
	Yale	No
TDE	Davidson	No
	Duke	No
	Furman	No
	JCSU	No

Some schools identified the small amount of space as a limiting factor, while others said they needed more staff or more funding to accomplish all that could be done with their space. For example, the Davidson farm’s land is over 100 acres in size, yet only three acres are in production. At Yale, the farm is built on a hill and physically bounded by other parts of campus. They have struggled to find a way to maximize diverse learning opportunities with the space and production ability of their farm. Johns Hopkins operates in a fenced-in area on an urban campus, so they have been careful when planning to engage their students and community members with their location and limited space.

Additionally, interviewees identified location and campus culture as a possible challenge. When the farm is not in the main section of campus, it can be difficult for some students to access if there is no public transportation available to take the students to their farm. The Harvard staff interviewee indicated that the strongly academic campus culture can sometimes limit student participation with the garden. Campus culture was also cited as a challenge at JHU, along with location. Even though the farm is on one of the sections of campus, it’s about a 15-minute walk from the main part of campus. The Student Garden Coordinator said:

I don't think the Hopkins culture is that great for that kind of thing. Our longest classes are like an hour and a half long. So even if you got a bus to take you to the gardens you could only have an hour to do anything, and most professors are going to want to teach for that amount of time not take kids on a field trip. And then when you ask students to do things outside of class, for class- even if they're super passionate about it, they're too busy. It's a cultural thing. (JHU, 2015)

For a campus farm to engage students, students must be able to physically get to the farm. If the location of the farm and/or the culture of the school prevent that access, then the farm may find this is a significant challenge in meeting their mission.

Vision for the future

Several recurring themes appeared among responses when asked about the future of the farm. All interviewees said they would like to see more class collaborations, more people coming to events and workshops, and more integration with the local community. JCSU was adamant that they wanted to see their students take the lessons learned at the farm and continue to use them, even when they left campus.

Well, look, if we can have a more global impact, that's the best thing that we'd be aiming for. If our students can go out and make an impact in our community in where they live, that is what we are aiming to do. (JCSU, 2016)

When asked if they had plans to expand their farms, only Furman and JHU said they had intentions of expanding. Furman would like to increase its composting program, but not add additional land for production. JHU is limited by the physical, urban space they have, but would like to add more partner plots that can be used by individual JHU staff and community members. Many of the larger and older farms in our study mentioned that they were not interested in acquiring more land or necessarily producing larger volumes of food. It may be that these more established farms have found the delicate balance that younger farms are now beginning to seek. The interviewees

were also asked if they thought their missions would need to change or expand if the farm expanded. Many responded that if they were to expand, they would likely expand their missions to increase or better balance the focus of the mission to address other goals within production, education, or community, but that expansion would be difficult, costly, and time consuming.

Student Survey

Student demographics

A total of 49 students from 7 of the 9 universities interviewed responded to the student survey. We received no responses from JCSU and Yale students. Although 49 students responded, some respondents left non-response items, particularly for questions involving text entry.

Of the schools represented in student results, 29% are Duke students and 27% are Davidson students (Figure 2). College sophomores represent 32% of the respondents and 23% are seniors (Figure 3). The “Other” category for Figure 3 represents graduate students and alumni. 68% of student respondents are female (Figure 4). Table 8 shows the diverse degree programs represented, with many biology and environmental studies majors but a variety of other disciplines as well.

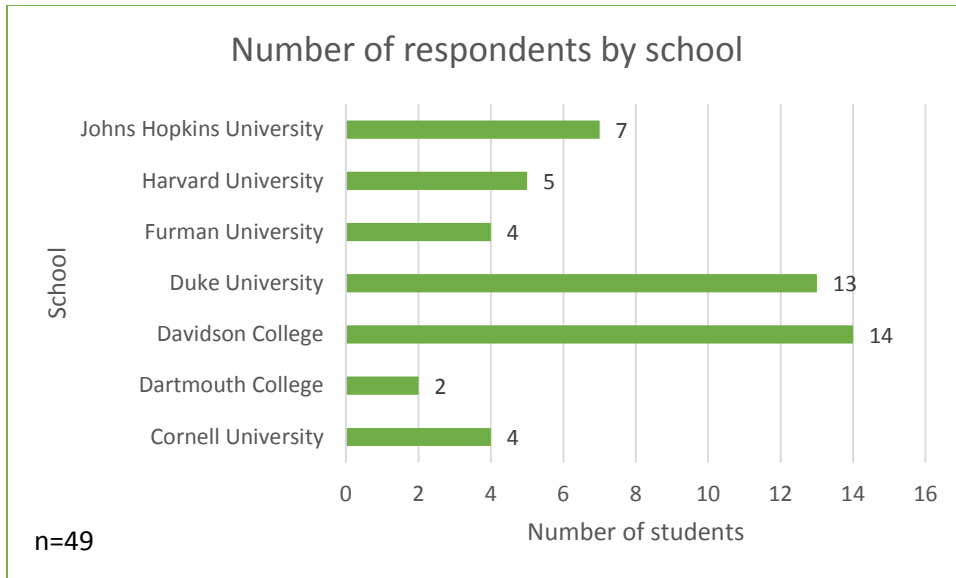


Figure 2. The number of student respondents represented in the student survey by school.

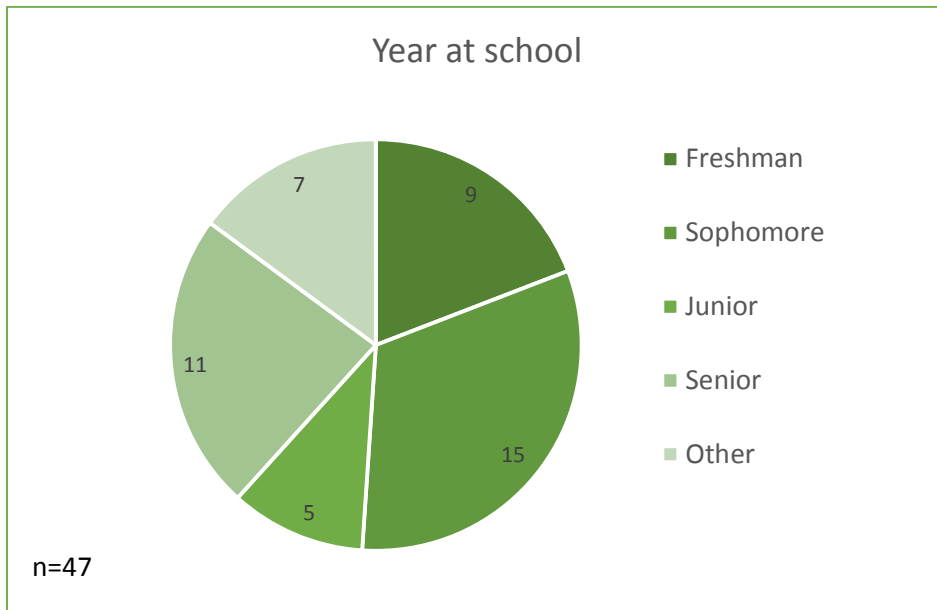


Figure 3. Class years represented by survey respondents. The “Other” category includes graduate students and alumni. Numbers indicate the number of student respondents.

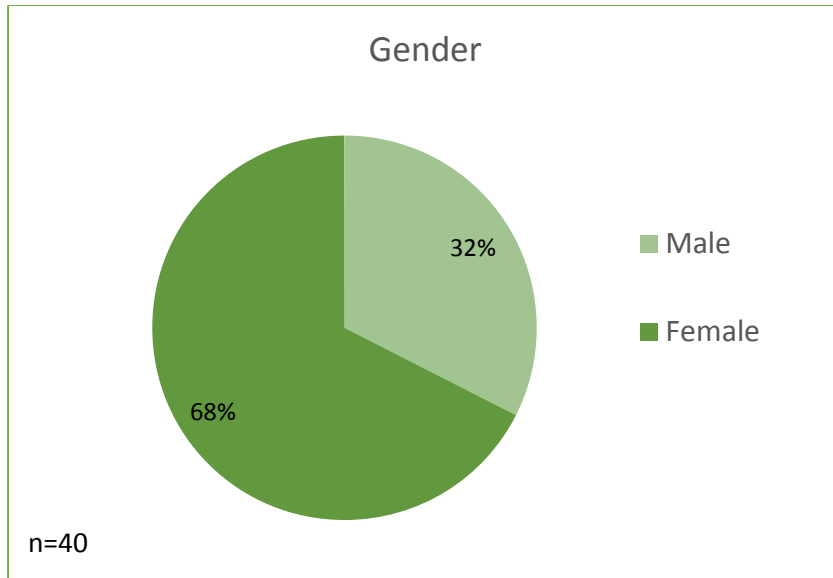


Figure 4. Student survey respondents by gender. In order to be inclusive, three options were presented: Male, Female, and Other (please indicate): _____. No students in this sample group chose the third option.

Table 8. Undergraduate majors and degree programs indicated by student respondents. Some students are counted twice in different categories as double majors.

Degree Program	Number of Students
Biology	8
Environmental Studies	7
English	4
Sustainability	4
Public Health	3
Anthropology	2
History	2
Mathematics	2
Political Science	2
Agricultural Science	1
Animal Science	1
Computer Science	1
Engineering	1
Environmental Management	1
Industrial and Labor Relations	1
Religion	1
Studio Art	1
Women, Gender, and Sexuality	1

Although students sometimes engage in multiple activities on the farm, many are involved through volunteer activities. Students most frequently visit the campus farm once a week or 2-3

times a week (Figures 5 and 6). The “Other” category in Figure 5 represents students involved as coordinators, steering committee members and fellowships. Those answering “Other” in Figure 6 noted that the frequency of their visits varies with the seasons and their jobs on the farm.

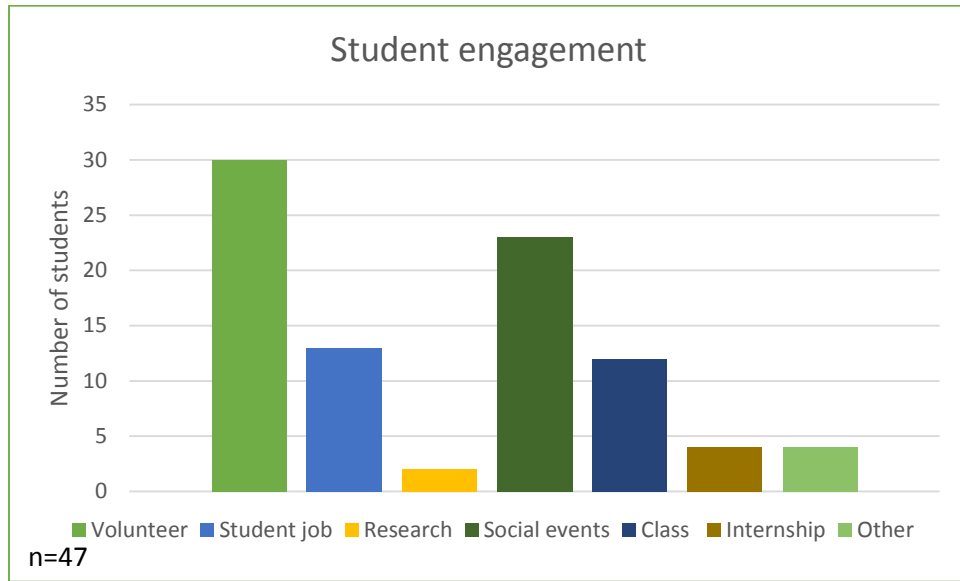


Figure 5. Type of student involvement at campus farms. Students could check more than one option.

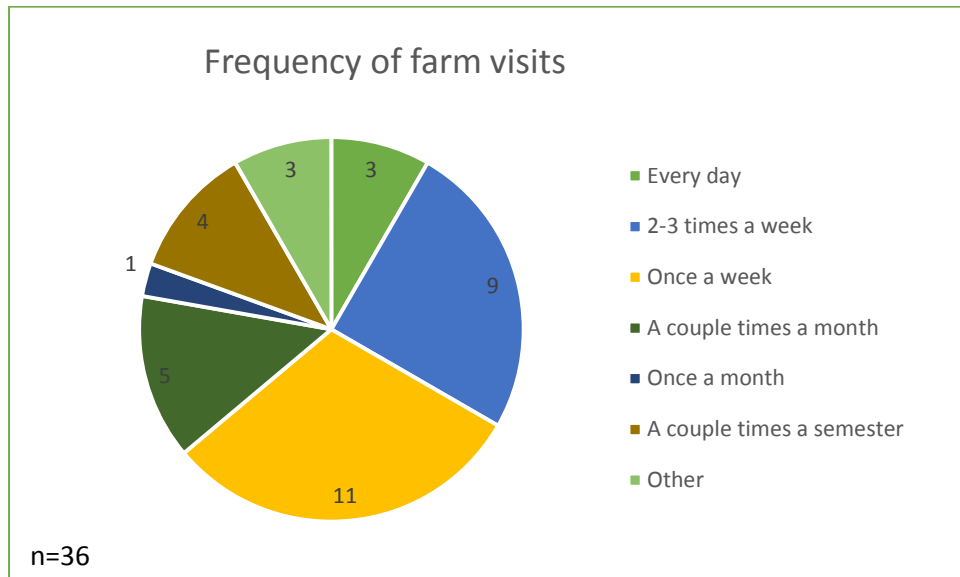


Figure 6. Frequency of student visits to the campus farm or garden. Numerical labels indicate the number of students.

In order to gauge students' knowledge and interest in food and agriculture, we designed Likert scale questions. Figure 7 shows students' evaluations of their knowledge of food and agriculture according to different topics. Students are mostly somewhat knowledgeable about all topics. Students showed greater interest in topics related to food including the environment, local food, and farming (Figure 8). Students consider the campus farm and conversations with others as some of the most important contributors to their knowledge of food and agriculture on campus, as shown in Figure 9. Those who included "Other" consider their jobs and independent study as other contributions to their knowledge. On a scale of one to ten, with ten being strong agreement, the majority of students indicated that the campus farm ranked a ten in improving their understanding of the food system (Figure 10).

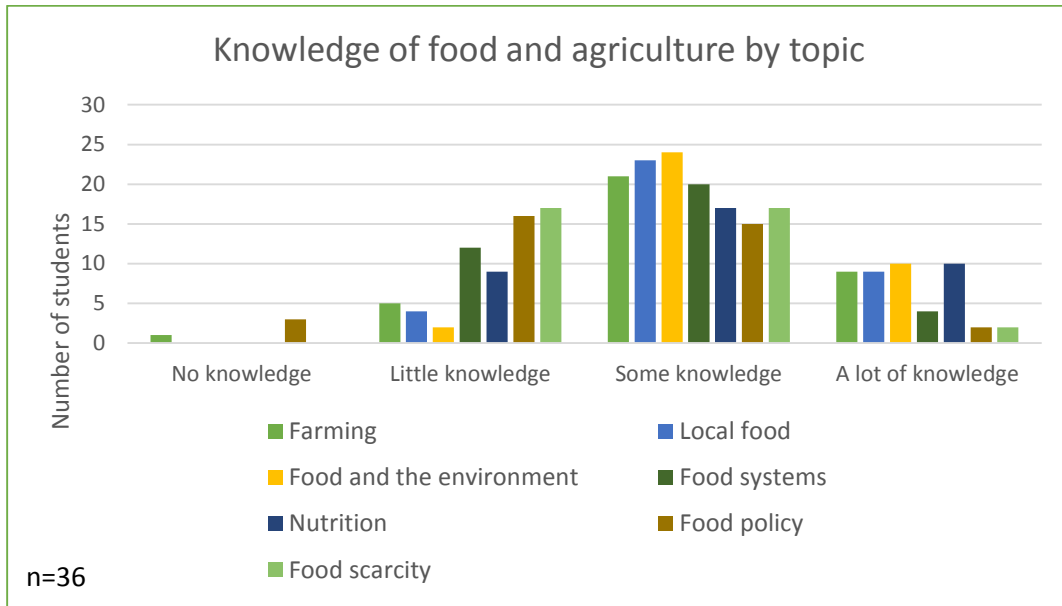


Figure 7. Student assessments of their knowledge of food and agriculture according to different topics.

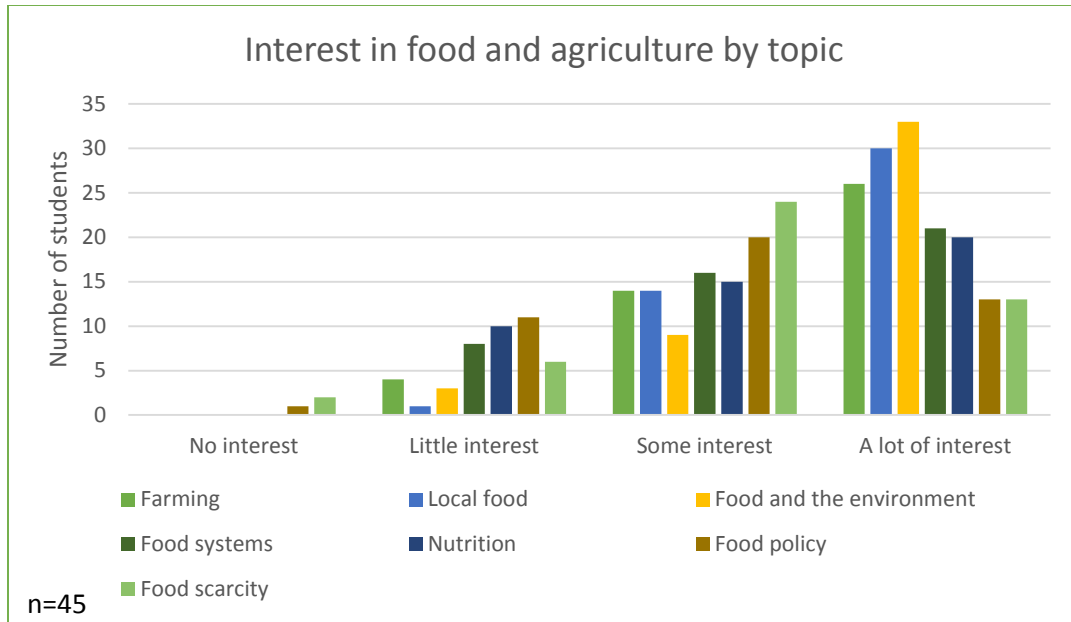


Figure 8. Student interest in food and agriculture according to different topics.

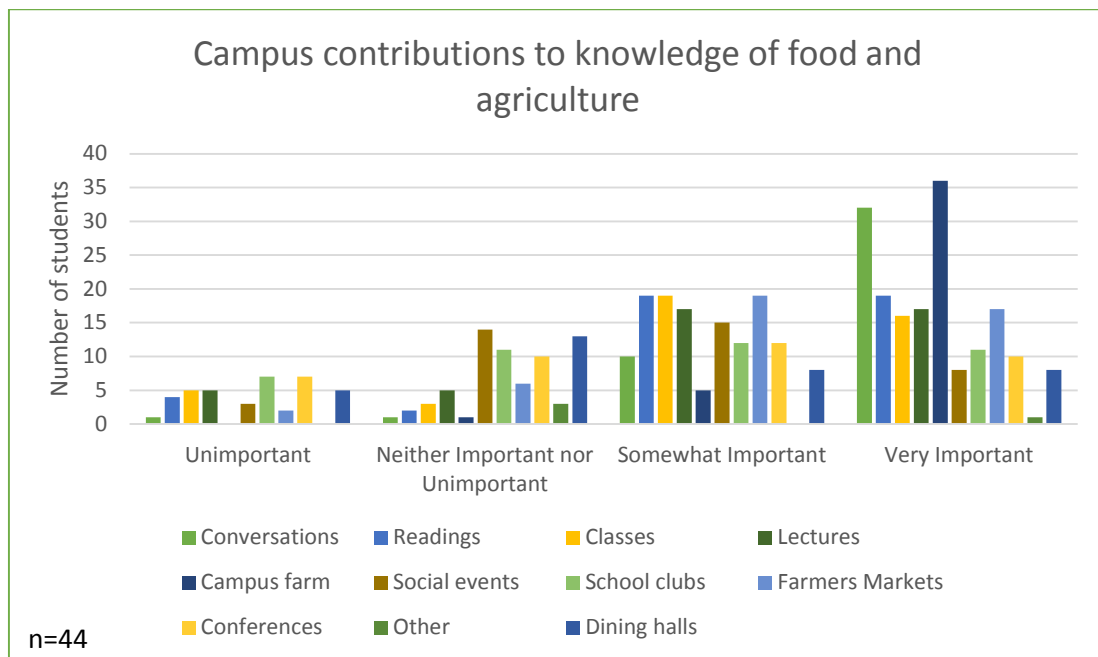


Figure 9. Importance of various on campus offerings to student education in food and agriculture.

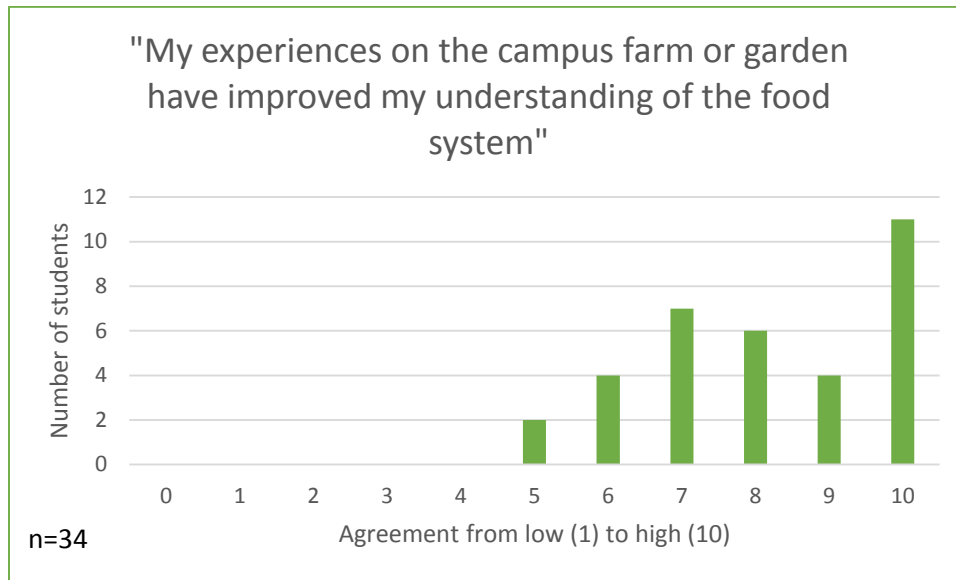


Figure 10. Agreement with the statement "My experiences on the campus farm or garden have improved my understanding of the food system" with 1 being little agreement and 10 being high agreement.

These responses offer a profile of student demographics, knowledge, and interests which help frame our qualitative survey results. They also provide insights into the diversity of students engaging with campus farms at liberal arts institutions, especially in academic program area.

[Student perceptions and the student experience](#)

The open ended questions from the student survey characterized student perceptions of campus farm missions and provided additional information about the student experience at the Ivy Plus and TDE schools. These questions elicited responses regarding student motivations for going to the farm, what the students believe they are learning from the farm, and their recommendations for the farm.

Campus farm purpose or mission

We asked students about their own view of the campus farm's mission and similar themes of education, community, and production emerged. Education emerged as the primary theme, and community building and outreach were also common among responses. As shown in Table 9, at every school except JHU, education was the primary mission indicated by 84% of students. Some students refer to the campus farm's mission as educating the students and others see the farm's mission as educating a broader university and local community. The purpose of education is found both in a technical sense and in a larger food systems sense, with some students viewing the campus farm as an avenue for shifting food production to a sustainable model. Students at Cornell viewed this educational mission in terms of more technical, hands on, or research experience while students at Duke and Davidson especially emphasized education surrounding food systems knowledge.

Community building comes from a belief that the mission of the campus farm is to make connections with communities beyond the university and teach and supply food to these communities. All students at JHU and Furman recognized community as a primary mission for their campus farms. Students also recognize the interconnectedness of the campus farm and university sustainability as they see the farm's primary purpose as supplying sustainable food to the university. Although six of the farms supply produce to campus eateries or run CSAs and farmers' markets, Davidson students see production and campus sustainability as a strong part of the campus farm mission, with 64% of students referring to production as a role in the mission. Less Duke and Furman students recognize production as a part of the mission (25% and 33% of students respectively).

Table 9. A summary of themes for student perceptions of campus farm missions. Some student responses referenced more than one theme. “Food system” is a theme within “Education.”

Campus farm mission	Cornell	Dartmouth	Davidson	Duke	Furman	Harvard	JHU	Total
n=	3	2	11	4	3	2	6	31
Community	33%	50%	9%	25%	100%	-	100%	42%
Education	67%	100%	91%	100%	100%	100%	50%	84%
Food system	-	50%	18%	75%	-	50%	17%	26%
Production	-	-	64%	25%	33%	-	-	29%

At Cornell, students see the mission as education focused, particularly in reference to education around sustainable agriculture and techniques. At Dartmouth, both students see education as the primary mission, with one indicating food systems education and another indicating community as another mission focus. Harvard students all agreed education is the primary mission of the farm.

Motivation: Why do students go to campus farms?

Students are motivated to engage with campus farms by different and sometimes multiple factors. The themes found within student motivations are summarized in Table 10. The top three motivations include personal well-being, community, and experiential learning. These motivating factors are discussed further below.

Table 10. Student motivations for engaging with campus farms. Some student responses referenced more than one theme. The theme of “Community” includes references to a general community as well as “Campus Community” and “Outside Community” in some cases.

Motivations	Cornell	Dartmouth	Davidson	Duke	Furman	Harvard	JHU	Total
n=	3	2	12	4	3	2	6	32
Career aspirations	33%	-	-	-	33%	-	-	6%
Community	100%	50%	33%	75%	100%	100%	100%	69%
<i>Campus community</i>	<i>100%</i>	-	<i>25%</i>	<i>25%</i>	<i>100%</i>	<i>100%</i>	<i>67%</i>	<i>50%</i>
<i>Outside community</i>	-	-	-	-	<i>67%</i>	-	<i>50%</i>	<i>16%</i>
Experiential learning	100%	-	17%	25%	33%	-	17%	25%
Food production	-	-	33%	25%	33%	-	-	19%
Food system	-	-	8%	25%	-	-	-	6%
Personal well-being	33%	100%	100%	100%	33%	50%	67%	78%
University impact	-	-	42%	-	-	-	17%	19%

A main motivating factor for student farm engagement is personal well-being. This theme emerged through students expressing their interest in the farm as a place of tranquility, a break from studies, and a reason to be outdoors. One student plainly said “I need to get off campus sometimes or I will lose it.” Another student expressed the multiple motivations for working at the farm for personal well-being:

...to spend time outdoors, get my hands dirty, do physical and practical work after studying in the library most of my day. I also go for the quiet and solitude. Also, when working with four or five other people it is a very personal social experience, as the work at hand is really the only distraction, and it often is a great time to get to know someone. I would go in the evenings sometimes as well to simply sit by the fields and read. (Davidson, 2016)

The campus farm is seen as a relaxing environment to de-stress from a regular academic schedule. The students also enjoy growing food that they can take home and the general pleasant and beautiful environments of the farm.

Among the reasons students visit and engage with the farm, community was another main theme. Students cited either community cultivated within the university and among their peers or the community beyond the university. Many respondents enjoyed the community aspects of spending time with other individuals with similar interests in agriculture, but also enjoyed the diversity of interactions with those outside of their course of study. This sense of community extended on to the university community beyond those who work directly with the farm, as one student wrote:

What I like most about the campus farm or garden is how it brings people together in both working the land and enjoying its produce. The people working at the farm are great people, and they link together the grounds staff, the farmers, the college food services staff, faculty and students. (Davidson, 2016)

Students at universities that offer community engagement beyond the university found that to be a motivating factor in their participation with the farm. Engagement outside of the university offers an opportunity to interact with people who the students would normally never see on campus:

Our garden allows community members to use plots free of charge. There is a real level of inclusivity and I think that is why I keep coming back to the garden.
(JHU, 2016)

Students also go to the farm out of a desire for hands-on, or experiential learning. Experiential learning refers to students who described the campus farm as a place where they could apply classroom knowledge. Students with experiential learning motives also wanted to be better connected to food and the food system by engaging in hands-on-learning. The theme of “Food production” refers to students who seek opportunities to learn how to grow food and take care of the crops while “Food systems” refers to students desires to be better connected to broader food systems learning and the environmental, social, and economic impacts of farming.

At Cornell, experiential learning and campus community were the main motivators for campus farm engagement. At Dartmouth, Davidson, and Duke, most students are motivated for personal well-being. Furman and Harvard students both seek a sense of campus community, while at JHU community is another motivating factor split more evenly among within campus and beyond campus community. Only one student at Cornell and one student at Furman indicated a desire to engage with the farm out of career or future aspirations of running a farm. Another motivation for campus farm involvement seen at Davidson and JHU was student interest in making an impact on the university. For Davidson, this impact referred to university sustainability. For JHU, the impact referred to supporting JHU’s role and reputation in the community.

Educational takeaway

Because all schools have an element of education within their campus farm mission, it is important to understand what students are learning from their time on the farm. Students were asked questions regarding three things they learned from their time engaging with the campus farm and how the farm contributes to their education. The main themes that emerged for students’ educational experiences are summarized in Table 11.

Table 11. A summary of themes indicated by what students say they are learning at the campus farm. Some students indicated more than one theme in their responses.

Education	Cornell	Dartmouth	Davidson	Duke	Furman	Harvard	JHU	Total
n=	3	2	12	4	3	2	6	32
Diverse interactions	33%	50%	33%	25%	-	50%	67%	38%
Experiential learning	67%	100%	8%	25%	67%	-	83%	41%
Farming	33%	50%	92%	100%	100%	100%	100%	94%
Effort	-	-	42%	-	-	-	-	16%
Food system	100%	50%	92%	100%	67%	50%	50%	78%
Project management	67%	-	50%	-	67%	-	17%	34%
Personal well-being	67%	50%	25%	25%	67%	-	17%	31%

The four main emerging themes are knowledge about farming, knowledge about food systems, experiential learning, and learning from diverse interactions. Students also mentioned that personal-wellbeing was a contributing factor to their education in the sense of a mental break from studies. The theme of effort refers to students who learned how much hard work goes into running a farm. Only Davidson responses referenced an understanding of the amount of work it takes to run a farm as one student wrote:

It's always important to remember how much hard work goes into running a farm, working on one gives you a better appreciation for what your food is actually worth. Working with passionate people on the farm also helps remind me that farms are necessary and needed. (Davidson, 2016)

Project management refers to learning how to manage a farm operation, a research project, or personnel.

'Farming' includes responses about the more technical side of growing food, such as what different crops are and how to grow them. For students engaged with the farm, this was a common element given that most forms of engagement with the farm will touch on some technical aspect of growing and harvesting crops and other technical elements of crop production. These responses range from the most basic level of learning about a new vegetable type to more complex levels of learning about different composts and sustainable pest management techniques. Students also mentioned that the farm helps them learn about their local environment, such as local soil conditions.

Knowledge about food systems is represented in student responses across all schools. Food systems knowledge, as defined for our analysis, is knowledge of farming from a broader lens and understanding the processes of food production, such as farm to fork, and food's connection to other disciplines. Most commonly this theme was developed through references to learning about how the

food moves from farm to market, and the social and environmental impacts of farming. Students are learning about social topics, including food scarcity.

Being involved with the campus farm allowed me to actually be a part of the food system. Over the season of being a manager at the farm I was able to provide food for myself, provide to the community, donate to local food banks, and explore other outlet opportunities. Seeing these interactions first hand really allowed me to feel in touch with how food is produced and how it gets to the people. I enjoy feeling that connection that I wasn't really in touch with before. (Cornell, 2016)

Students also access experiential learning on the farms. Some students are able to use the farms to apply knowledge learned in classes. While some food systems learning comes through conversations, students allude to the actual experience of seeing where food comes from as contributing to their knowledge of food systems through experiential learning. One student ties this together in the following response:

I began to see interconnections between environmental sustainability, social well-being, healthy food, etc. in the real-world. I was able to apply lessons about composting and nutrient recycling, for instance, through learning how to properly manage our compost pile. When talking about integrated pest management in classes, I was then able to experiment with such approaches when we had pest infestations during the peak summer times. (JHU, 2016)

The farms also offer diverse interactions that students find educationally valuable.

As an English major, it broadened my experience and gave me an exposure to an agricultural field I would not have had in my academic experience. (Davidson, 2016)

Students at some schools are also able to engage with community members, broadening their understanding of the food system as it affects their local, non-campus community.

Meeting community members in food-insecure situations has driven me to pursue research into food system issues and policies that have created the systemically broken food system we have today. (JHU, 2016)

Looking at the student responses by school, Davidson, Duke, Furman, Harvard, and JHU all indicate farming as a central educational theme, with Duke and Davidson also showing strong support for food systems education. At Cornell, food systems was the central takeaway and at Dartmouth, experiential learning. Almost half of student respondents at Davidson gained knowledge of the effort needed to run a farm. Cornell, Davidson, Furman, and JHU students indicated knowledge of project management and personal well-being was considered part of the educational experience at all schools except Harvard.

Ideas for improvement

When asked for future ideas for the farm or recommendations for improvement, 39% of students suggested more opportunities for student engagement, 19% suggested increasing the size or production capacity of the farm, 16% suggested greater university outreach, and 16% suggested more educational opportunities (Table 12). Students are interested in more opportunities for volunteering, classes and workshops, or other ways to integrate the farm with academic credits. In regards to production, students see the potential for greater production and contribution to university dining.

The only thing I would change is to make it larger, which it is in the process of doing. The farm has the potential to produce a lot more produce, and the college has the need for more food. (Duke, 2016)

Students are also concerned with funding and other forms of operational support in order for farms to meet their mission. Through their engagement with the farms, students recognize the

amount of work and time needed to run a farm and they see the value in building personnel and funding support. This was especially true at younger universities such as Davidson and JHU, with one student at JHU writing:

I wish the University would invest more in the garden. Our community garden was completely student and faculty started and now maintained. Because of this, we are limited in our capacity to create a great learning environment. (JHU, 2016)

Table 12. Common student recommendations for campus farms. Some students indicated more than one theme in their responses.

Recommendation	Cornell	Dartmouth	Davidson	Duke	Furman	Harvard	JHU	Total
n=	3	2	12	3	3	2	6	31
Community outreach	-	-	-	-	-	-	50%	10%
Educational opportunities	33%	-	-	33%	33%	100%	-	16%
Funding	33%	-	17%	-	-	-	17%	13%
Personnel support	-	-	25%	-	33%	-	-	13%
Proximity to campus	-	-	-	33%	-	-	-	3%
Increase size	33%	-	17%	-	33%	-	33%	19%
Student opportunities	33%	100%	33%	-	100%	50%	17%	39%
University outreach	-	-	8%	-	67%	50%	17%	16%

Discussion

Mission Alignment

The strongest consistent theme from campus farm missions, staff perceptions, and student perceptions is education (Table 13). However, many of these campus farms have a multi-pronged mission indicated in both the stated missions and the student perceptions. While staff touched on multiple mission elements, this study's focus on their view of the primary mission offered insights into how the mission is realized, supported, and translated to students. Our analysis and the themes that emerged between the stated missions, staff perceptions and student perceptions reveal intricate trends of interest regarding how these farms operate and maintain their missions.

Two of the farms showed some variations between the stated mission, staff perception and student perception (Table 13). First, Davidson's stated mission includes production and education. Although Davidson offers social events, volunteer opportunities and class engagement, the staff perception revealed a strong alignment with production goals. In contrast, a majority of Davidson students indicated the mission as being focused on education, and 64% also indicated production as a main component of the mission (Table 9). The dissimilar perceptions of mission between staff and students relates to challenges voiced by staff. As the only campus farm running under a business model, Davidson has high production pressures. With a staff of one managing the farm and many of the student activities, personnel support could be a primary reason for mission variation and a strong focus on production from staff. This challenge is recognized by Davidson students who made recommendations to improve personnel support on the farm. Despite these challenges, students still recognize the educational component of the mission.

Table 13. A comparison of perceptions of the campus farm mission among staff and students and the stated mission at each school. Student perceptions are ranked according to percentage of students making reference to the particular theme of education, community or production (see Table 9).

School	Official Mission	Staff Perceptions	Student Perceptions
Cornell	Education Community	Education	1. Education 2. Community
Dartmouth	Education* Production*	Education	1. Education 2. Community
Davidson	Production Education	Production	1. Education 2. Production
Duke	Education Community Production	Education	1. Education 2. Community 3. Production
Furman	Community* Education*	Education	1. Education 2. Community 3. Production
JCSU	Community*	Community	-
JHU	Community Education	Community	1. Community 2. Education
Harvard	Education Community	Education	1. Education
Yale	Education	Education	-

**Mission falls under mission of sustainability office*

Similarly, JHU has an official mission of both community engagement among JHU and the greater Baltimore community as well as education. However, community engagement was a primary theme among staff and student perceptions. JHU places great emphasis on engaging with the Baltimore community and students recognize this as both part of the mission and one of their

primary motivations for engaging with the farm. Data shows that students also perceive education as a main mission. According to their educational takeaways, they indicate experiential learning, farming, and diverse interactions as primary education takeaways, with the highest percentage of students learning from diverse interactions than any other school. Even though students see the farm as an education space, the staff perception was that more time is spent supporting community engagement than educational endeavors. This is likely due to the campus culture as discussed earlier as well as a lack of personnel or funding as it is run by students.

Although the farm at Furman does not have a formal stated mission, it falls under the mission of the sustainability office, which focuses on building a campus and wider community around sustainability. Our interviewee said that the mission of the farm was mainly a teaching mission to increase knowledge of food issues and farming practices. All Furman student respondents saw community as a central theme to the mission, in addition to education and production, which aligns well with the community emphasis of the stated mission and the staff perception of an educational mission. Students perceived the farm as having a mission for production as well, which was not identified in the stated mission or staff perception, indicating that students recognize importance in the CSA or contributions to campus eateries.

Exploring the educational missions, we found that Cornell, Harvard, and JHU's stated missions focus on experiential learning of agricultural practices, where farm participants are encouraged to learn about sustainable agricultural practices and techniques. Staff interviewees at most schools indicated a focus on food systems level knowledge within their missions, with Cornell maintaining more of an emphasis on practical, sustainable agricultural education. Given that agricultural education at land-grant institutions focuses on technical agricultural teachings and instruction, this result for Cornell could be a reflection of its land-grant origins and influence from

the College of Agriculture (Parr and Trexler 2011). Students at Dartmouth, Davidson, Duke, and Harvard especially indicated that the campus farm's educational mission went beyond learning sustainable agricultural practices and focused on education around the food system even though Duke is the only school with more direct references to food systems education in the stated mission. However, some or all of the student respondents from all schools indicated some food systems level knowledge; students are interacting with the farms beyond a technical level regardless of the missions' nuances and staff perceptions. From the student survey, 20 of 36 student respondents indicated some knowledge in food systems and 21 indicated a lot of interest in food systems which shows that the students are interested in improving their understanding of food systems even though it was not found to be a primary motivator for campus farm engagement in open-ended responses.

At Cornell, students perceived the mission to focus more on sustainable agriculture practices and techniques, similar to the staff perception, but indicated broader food systems level educational takeaways. The emphasis on sustainable agricultural practices and techniques in stated, staff and student perceptions could again be a consequence of Cornell's land-grant status. This distinction between perceptions of educational missions at liberal arts schools with Cornell reflects a distinction between campus farms at liberal arts and land-grant institutions and shows the diversity in campus farm education.

Trends

Interviews with staff members gave us insight into the perceptions and thoughts that they had about their farms and the students who engaged with their farms. While the operational model for each farm is different, there were several overall trends that we saw among farm staff, operations, and future plans. All interviewees identified increasing student involvement as one of their main goals for the future. This includes the trend of wanting to get more classes to the farm as well as

wanting to increase the number of student workers they hire for internships and work study positions. Students are interested in different components of food and agriculture (Figure 8) and 25% indicated their motivation for going to the farm is for experiential learning. Providing innovative ways of engaging different departments in learning on the farm creates opportunities for students who may not have an immediate interest in formal agricultural education to explore the connection between their discipline and food and agriculture. Having more student engagement will allow the farms to increase their reach on campus and further engage the educational component of their missions.

As shown in the interview responses, the majority of farms are operated out of the schools' sustainability office, but where the farm operates can vary depending on the mission fits into the institutional boundaries. Two campus farms have moved to different departments since establishment in order to better develop and fulfill their missions. Dartmouth's farm, originally established to cover its own costs, eventually moved to the Outdoors Programs Office but soon saw a need to make an additional move to the Sustainability office where they were given more support to foster their educational mission. Yale was once operated within the sustainability office, but found that their academic mission could be better pursued through an academic college. As newer farms continue to develop with potential for missions to change, the question of where a campus farm exists within the university structure is important to consider.

Understanding how to integrate with the farming community outside of the university was another trend seen at multiple schools. At Dartmouth and Duke, the campus farms were searching for meaningful ways to integrate themselves within the local foods community without taking the market share from local producers at farmers markets. One way of approaching this is to sell through markets and CSAs for the university community only, so as not to infringe upon outside markets. At

JCSU, JHU and Harvard, the farms look for ways to help provide fresh produce to people in the local community who don't have access to it rather than sell to the general public. Furman makes a special effort to involve local producers in their farm tours and sells at two different farmers markets, and wants to increase the farm programming that could be applicable to local farmers. Harvard partners with a local homeless shelter run by Harvard students to donate the majority of their produce.

Although our results are not representative of all students engaged with the campus farms at all schools in the study, they do reflect some aspects of the student experience. As far as trends in student responses, we see that the majority of students are coming to the farms from non-agricultural disciplines with some motivations for learning experiences but mostly seeking personal well-being and community experiences. These students have high interest in food and farming as well as some knowledge likely gained from their time on the farm, as 36 of 47 students indicated the campus farm as very important to contributing to their knowledge of food and agriculture. Students also indicated that conversations with others were very important to their understanding of food and agriculture. Conversations are part of the campus farm experience, so it is evident that these spaces are valuable and unique in their educational offerings and importance to students' knowledge of agriculture and food at liberal arts institutions.

While only a few students indicated any sort of career aspirations or interest in farming after graduation, evidence from survey responses shows that students are learning how to "connect the dots" in agriculture, from production to consumption, and learning about the impacts beyond the field. This is important given that students are coming from diverse disciplines and likely will take the knowledge gained from their time on the campus farm into their future careers and choices, despite the lack of immediate relation to agriculture. Some critics of the development of agriculture

in education have suggested that if liberal arts schools originally included agriculture in their teachings, the agricultural system today would be one that considers the political, ecological, and cultural components of agriculture, not just the economic (Parr et al. 2007). The interdisciplinary interactions occurring on liberal arts farms reflects this idea. A study by LaCharite (2014) focused on Yale Farm and the University of Montana in determining the impact of campus farms on students' connection and perception of nature. The study found that experiences on campus farms motivate pro-environmental behaviors specific to food and farming, which reinforces the positive impacts campus farms can have on students despite their background. While 11 of 17 undergraduates at University of Montana and three of the six Yale students expressed a desire to work in agriculture after graduation, students with no intention of working in agriculture expressed the same positive behaviors. Unlike campus farms used within an agricultural course of study at a land-grant institution, where students will likely have a career in some aspect of agriculture, campus farms at liberal arts institutions offer a different and equally important relationship between students and agriculture whether the focus of the mission is on education or not. Students at liberal arts institutions are motivated by themes such as personal well-being and community engagement, and they enjoy learning about agriculture while spending time outdoors with their peers. However, beyond these motivations they are absorbing aspects of an agricultural and food systems education they might otherwise miss without access to a campus farm, and this exposure could have an impact on their future choices and the future of our food system.

Community was a common theme among student responses in both their motivations and perceptions of the campus farm mission and an important aspect of some campus farm missions. This is in contrast to land-grant institutions, where the campus farm missions are focused on education and farms are meant to be a space for experiential learning for farming practices (“The

Land-Grant Tradition” 2012). While some farms have a prominent focus on community building and engagement, staff often did not refer to community as a central component of the mission. Yet, students are motivated to come to the farm for the community, either within the university or outside of the university. This community component is important to the educational mission as well, as students indicated learning from diverse interactions on the farm either from their peers in different disciplines of study or with the outside community. Students feel that conversations are important to learning about food and agriculture at their institutions and the campus farm offers a space for that. The way in which community is woven into the campus farm experience is important in keeping students engaged and indicates that shared experiences are valued. Many of the farm activities are inherently community oriented, as multiple people work within the same space, but the nature of this engagement at liberal arts institutions, with diverse disciplines, interest, and backgrounds, is unique and offers an opportunity to foster education and positive behavior in our food system.

Recommendations

Based on our survey and interview responses and the analysis of this data, we developed the following recommendations for the Duke Campus Farm and broader Ivy Plus and TDE communities to better fulfill their missions and achieve the goals of their farms:

Recommendations for the Duke Campus Farm

1. Engage with liberal arts campus farms with a high degree of or interest in curriculum engagement

As the Duke Campus Farm continues to develop their educational mission, guidance for how to do this could be gained from interactions with farms of similar interest. Yale, Dartmouth, Cornell and Furman indicated interest in further curriculum engagement and

integration into the academic fabric of the university and could be good resources for Duke's interest in curriculum engagement. Two key factors emerged from this study that indicate potential barriers to advancing missions: personnel support and institutional oversight. Personnel support is critical to meeting a mission with multiple, diverse goals such as education and production or community outreach. For example, at schools that have a CSA, sell at a farmers' market, or produce for dining services, having a manager or dedicated student workforce for production and another manager for educational goals allows for greater balance and maintenance of goals. The other factor, institutional oversight, was seen as a barrier to mission development at two schools, resulting in a move into a different institutional space. A deeper analysis of schools with a high degree of integration with university academics and barriers to development could provide better insight into pursuing this goal.

2. Increase campus outreach

Because the Duke Campus Farm is located about a fifteen-minute drive off campus, this presents a barrier for student engagement. Increasing outreach through social media and on campus advertising could improve student knowledge of the farm and its offerings. Putting more students in touch with the farm will help catalyze the change the Duke Campus Farm seeks in meeting its mission, and could also present opportunities for further classroom engagement and university support. Campus outreach would also involve research into transportation to and from campus, as suggested by a student in the student survey, since the Duke Campus Farm is located off campus. While proximity to campus cannot be changed, having a reliable method of transportation to and from the farm could increase student engagement especially among students without a car. Increasing and diversifying production

for the campus dining halls also ties into campus outreach. Again, through the student survey students suggested increasing production to fill more local food needs in the dining hall and increase awareness of the campus farm through this local advertising.

Recommendations for the broader campus farm community

1. Increase Ivy Plus/TDE campus farm meetings and communications

Conversations and interactions between campus farms would be one way to facilitate communication of some of the challenges and ideas for meeting farm goals and missions. Our study offers profiles for a subset of these farms and some of the activities offered and efforts made to fulfill their missions, but continued conversation is needed as young farms develop and as older farms consider new opportunities. Many of the schools in this study are similar in their interest in sustainability and structure as private, liberal arts schools, so fostering information sharing among them would help to frame ideas and suggestions within similar higher education contexts.

2. Collect student feedback

Particularly for farms with an educational mission, it is important to understand how students are learning from the farm. Our survey results serve as a baseline for the student experience at these schools, but are limited by the low response rate. However, as shown in our study, even at liberal arts farms with more focus on experiential learning of sustainable agriculture, broader food systems learning was also happening. Although student perspective and experience should not be the only factor influencing the actions of campus farms with educational missions, it is an important consideration to understand the broader impacts of

the farm on the student community and how they might use what they've learned in future endeavors.

3. Explore methods for financial diversification

Farms could consider increasing the funding they receive by diversifying funding streams. Some farms run CSA's, sell to their campus dining services, and sell at farmers markets, but they could take their sales beyond those markets and expand. For farms interested in keeping their sales within the university boundaries so as not to compete with local farmers, this could mean diversifying products for university CSAs or campus farmers' markets with value-added and specialty products. Exploring campus farm services to the university could be an option. Resources are often a limiting factor in a farm's ability to accomplish goals and meet a mission. Taking small steps towards financial diversification through the farm's production and activities could help supplement grant funds and donations to allow the farm to better function and support the mission and goals.

4. Identify how community engagement or outreach fits into the campus farm experience at your school

As described in our discussion, community is important to the student experience on the farms. If farms have a mission that is primarily educational, understanding how community engagement can enhance this mission either by drawing in more students or offering diverse experiences can help to achieve that mission and student understanding of food and agriculture. Farms at liberal arts institutions are uniquely positioned to engage with multiple disciplines through more formal classroom engagement and labs or informal community volunteer days and social events. Even at farms where production is a primary focus within the mission, bringing together different actors in the dining supply chain offers a

community experience that is important to the university and students. Leveraging the community experience can help achieve other goals and reinforce the importance of the farm to the university or outside community.

Works Cited

- “About Real Food Challenge.” 2016. *Real Food Challenge*.
<http://www.realfoodchallenge.org/about-real-food-challenge>.
- “About the Endowment.” 2009. *The Duke Endowment*. January 9.
<http://dukeendowment.org/about/about-the-endowment>.
- Barlett, Peggy F. 2011. “Campus Sustainable Food Projects: Critique and Engagement.” *American Anthropologist* 113 (1): 101–15. doi:10.1111/j.1548-1433.2010.01309.x.
- Committee on the Future of the Colleges of Agriculture in the Land Grant System. 1995. *Colleges of Agriculture at the Land Grant Universities: A Profile*. Washington, D.C.: National Academies Press. <http://www.nap.edu/catalog/4980>.
- “Duke Campus Farm: Five Year Strategic Plan.” 2015. The Duke Campus Farm.
<http://sites.duke.edu/farm/files/2015/02/Duke-Campus-Farm-Strategic-PlanfinalPDF.pdf>.
- Francis, C.A., N. Jordan, P. Porter, T.A. Breland, and G. Lieblein. 2011. “Innovative Education in Agroecology: Experiential Learning for a Sustainable Agriculture.” *Critical Reviews in Plant Sciences*.
http://digitalcollections.dordt.edu/cgi/viewcontent.cgi?article=1136&context=faculty_work.
- Godfray, H. Charles J., Ian R. Crute, Lawrence Haddad, David Lawrence, James F. Muir, Nicholas Nisbett, Jules Pretty, Sherman Robinson, Camilla Toulmin, and Rosalind Whiteley. 2010. “The Future of the Global Food System.” *Philosophical Transactions of the Royal Society of London B: Biological Sciences* 365 (1554): 2769–77. doi:10.1098/rstb.2010.0180.

- Gomiero, Tiziano, David Pimentel, and Maurizio G. Paoletti. 2011. "Environmental Impact of Different Agricultural Management Practices: Conventional vs. Organic Agriculture." *Critical Reviews in Plant Sciences* 30 (1-2): 95–124. doi:10.1080/07352689.2011.554355.
- Griswold, Eliza. 2012. "How 'Silent Spring' Ignited the Environmental Movement." *The New York Times*.
http://www.tinkscience.com/uploads/1/4/2/9/14291620/how_%E2%80%98silent_spring%E2%80%99_igni..._movement_-_nytimes.com.pdf.
- "Growing Sustainable Food and Farming Efforts on College Campuses." 2016. *The Duke Endowment*. February 2. <http://dukeendowment.org/our-work/growing-sustainable-food-and-farming-efforts-on-college-campuses?section=our-strategy>.
- Holt, Steve. 2015. "Majoring in Food: Colleges Offering More Courses, Degrees." *Civil Eats*. September 22. <http://civileats.com/2015/09/22/majoring-in-food-colleges-offering-more-courses-degrees/>.
- Horrigan, Leo, Robert S Lawrence, and Polly Walker. 2002. "How Sustainable Agriculture Can Address the Environmental and Human Health Harms of Industrial Agriculture." *Environmental Health Perspectives* 110 (5): 445–56.
- "Ivy Plus." 2016. *Yale Sustainability*. <http://sustainability.yale.edu/people-partners/strategic-external-partnerships/ivy-plus>.
- "Ivy Plus Sustainability Working Group." 2016. *Cornell Sustainable Campus*.
<http://www.sustainablecampus.cornell.edu/initiatives/ivy-plus-sustainability-working-group>.

- Kolb, Alice Y., and David A. Kolb. 2005. "Learning Styles and Learning Spaces: Enhancing Experiential Learning in Higher Education." *Academy of Management Learning & Education* 4 (2): 193–212. doi:10.5465/AMLE.2005.17268566.
- LaCharite, Kerri. 2014. "Cultivating Sustainability: Impact of Campus Agriculture Projects on Undergraduate Student Connections to Nature, Environmentally Responsible Behaviors, and Perceptions." Prescott College.
<http://pqdtopen.proquest.com/doc/1655360739.html?FMT=AI>.
- . 2015. "Re-Visioning Agriculture in Higher Education: The Role of Campus Agriculture Initiatives in Sustainability Education." *Agriculture and Human Values*, June, 1–15.
doi:10.1007/s10460-015-9619-6.
- Lacity, Mary C., and Marius A. Janson. 1994. "Understanding Qualitative Data: A Framework of Text Analysis Methods." *Journal of Management Information Systems* 11 (2): 137–55.
doi:10.1080/07421222.1994.11518043.
- Leis, Anna, M.Susie Whittington, Mark Bennett, and Matthew Kleinhenz. 2011. "Student Farms at United States Colleges and Universities: Insights Gained from a Survey of the Farm Managers." North American Colleges and Teachers of Agriculture.
https://www.nactateachers.org/attachments/article/502/Leis_March%202011%20NACTA%20JOURNAL-2.pdf.
- Lyson, Thomas A. 2000. "Moving Toward CIVIC Agriculture." *Choices: The Magazine of Food, Farm and Resource Issues*. Expanded Academic ASAP.
- Newman, Stephen Martinez Michael S. Hand, Michelle Da Pra, Susan Pollack, Katherine Ralston, Travis Smith, Stephen Vogel, Shellye Clark, Luanne Lohr, Sarah Low, Constance. 2016.

“USDA Economic Research Service - ERR97.” Accessed April 1.

<http://www.ers.usda.gov/publications/err-economic-research-report/err97.aspx>.

O’Leary, Zina. 2005. *Researching Real World Problems*. SAGE.

Parr, Damian M., and Cary J. Trexler. 2011. “Students’ Experiential Learning and Use of Student Farms in Sustainable Agriculture Education.” *Journal of Natural Resources and Life Sciences Education* 40 (1): 172. doi:10.4195/jnrlse.2009.0047u.

Parr, Damian M., Cary J. Trexler, Navina R. Khanna, and Bryce T. Battisti. 2007. “Designing Sustainable Agriculture Education: Academics’ Suggestions for an Undergraduate Curriculum at a Land Grant University.” *Agriculture and Human Values* 24 (4): 523–33. doi:10.1007/s10460-007-9084-y.

Rea, Louis M., and Richard A. Parker. 2005. *Designing and Conducting Survey Research: A Comprehensive Guide*. Wiley.

Sayre, Laura, and Sean Clark. 2011. *Fields of Learning: The Student Farm Movement in North America*. University Press of Kentucky.

“STARS Technical Manual.” 2016. version 2.1. The Association for the Advancement of Sustainability in Higher Education.

“The Land-Grant Tradition.” 2012. Association of Public and Land-Grant Universities. <http://www.aplu.org/library/the-land-grant-tradition/file>.

Wezel, A., S. Bellon, T. Doré, C. Francis, D. Vallod, and C. David. 2009. “Agroecology as a Science, a Movement and a Practice. A Review.” *Agronomy for Sustainable Development* 29 (4): 503–15. doi:10.1051/agro/2009004.

Appendix I: Survey for sustainability and farm managers

You have been selected to participate in a survey on campus farms administered by two Duke University Nicholas School of the Environment graduate students. The responses to this survey will help inform our research in understanding the role of campus farms in developing food literacy in university settings. We hope to focus in on several campus farms from our initial list of respondents, and may follow up with a request for an interview at a later time. The results of this survey will be published in a report and presented as part of our Master's Project in Spring 2016. We are happy to share the results and our final report with you at that time.

Please provide the name of the university that you work or volunteer for

Does the university have a campus farm?

- Yes
- No

Please indicate your role at the university (check all that apply).

- Campus farm manager
- Sustainability staff member
- Student
- Other _____

How old is the campus farm (in years)?

Who is in charge of managing the farm (check all that apply)?

- Farm manager
- Student(s)
- Other _____

How many paid staff members work on the farm?

- 0
- 1
- 2
- 3
- More than 3

Does the farm have a Community Supported Agriculture (CSA) program?

- Yes
- No

Does the farm implement sustainable farming practices?

- Yes
- No

Does the farm supply food to campus eateries, including dining halls?

- Yes
- No

What kinds of foods does the farm provide to the campus eateries and dining halls (check all that apply)?

- Vegetables
- Fruits
- Chicken
- Livestock
- Fish
- Other _____

If the farm offers volunteer opportunities for students, how many students volunteer on a weekly basis?

- The farm does not have volunteer opportunities
- Less than 5
- 5-10
- 10-20
- Greater than 20

Do any undergraduate classes use the farm as part of the curriculum i.e. field trips to the farm?

- Yes
- No

How many undergraduate classes use the farm as part of the curriculum?

- 0
- 1
- 2
- 3
- More than 3

How often do these undergraduate classes visit or make use of the farm during the semester?

- Never
- Once a semester
- 2-3 times a semester
- Once a month
- Once a week
- 2-3 times a week
- More than 3 times a week
- Daily

What undergraduate classes use the farm as part of the curriculum? Please list the course names if known.

What topics are taught in these courses through the experiences on the farm?

- Farming techniques
- Sustainability
- Culture
- History
- Other _____

Are there other ways for students to get involved with the farm besides coursework and volunteering? Please describe.

How important are the following activities, if applicable, to the farm's mission?

	Not Applicable	Not Important	Somewhat Important	Important	Very Important
Supplying food	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Educating students	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
CSA	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Research	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Providing volunteer opportunities to students	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please rate the importance of the following topics to the farm's educational efforts, if any:

	Not Applicable	Not Important	Somewhat Important	Important	Very Important
Farming techniques	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Environmental topics	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Historical topics	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cultural topics	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Social issues in agriculture	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Is there any interest in a campus farm from students?

- Probably yes
- Maybe
- Probably not
- Definitely not

Is there any interest in a campus farm from faculty or board members?

- Probably yes
- Maybe
- Probably not
- Definitely not

Please describe the primary reasons the university does not have a campus farm.

Does the university have courses or activities that relate to sustainable agriculture outside of a farm?
Please describe them below.

Is there anything else you would like us to know about the university or campus farm?

Appendix II: Interview guide

Thank you for taking time out of your day to chat with us. We'll be asking you some questions about the past, present, and future of your campus's farm. You can skip any question you choose, and you may give as long of an answer as you wish. We anticipate that this interview will take between 20 and 30 minutes.

1. Past

- a. Tell us about the background of your farm.
- b. When was the farm founded?
- c. How did the farm come to fruition?
- d. How was the farm funded? Did you participate in any fundraising activities?

2. Present

- a. Tell us about the current state of your farm. How many people work or volunteer with you? What do you produce?
- b. What is your farm's mission, if you have one?
- c. What types of activities do you host in order to fulfill that mission?
- d. Do you think the students who engage with the farm are aware of the mission of your farm?
 - i. Why or why not?
- e. What do you want students to take away from their experience on the farm?
- f. What duties are student workers or volunteers assigned?
- g. Do you collect feedback in any way from students who engage with the farm?
- h. What types of classes come to the farm?
 - i. How do those classes get involved with the farm?
- i. How do you prioritize goals/activities to meet your mission?
- j. What would you consider the most important aspect of the farm to your mission?
- k. How would you describe your balance between working on farm duties and meeting your mission?
 - i. Does spending time with classes, volunteers, training workers etc. take a significant amount of time away from your ability to fulfill your duties?
- l. Yes or no: have you experienced any financial issues?

3. Future

- a. Do you currently have plans to expand your farm?
 - i. If no, have you been considering expanding but don't have solid plans?
- b. Do you intend to change your mission if your farm expands? Would you?
- c. What would you like to see on your farm in 5 years?

Thank you so much for completing our interview. We highly appreciate all of the information you have provided for us. Again, our final product will be available to the public in April or May of 2016, and we are happy to share our results with you.

Appendix III: Student survey

You have been selected to participate in a survey on campus agriculture administered by two Duke University Nicholas School of the Environment graduate students. Your responses to this survey will help inform our research efforts in understanding the role of campus agriculture projects in the university setting. The results of this survey will be published in a report and presented as part of our Master's Project in Spring 2016. We appreciate your interest, time, and participation in our survey!

What is the name of your college or university?

- Brown University
- Columbia University
- Cornell University
- Dartmouth College
- Davidson College
- Duke University
- Furman University
- Georgetown University
- Harvard University
- Johns Hopkins University
- Johnson C. Smith University
- MIT
- Princeton University
- Stanford University
- University of Chicago
- University of Pennsylvania
- Yale University

What year are you in your undergraduate degree?

- Freshman
- Sophomore
- Junior
- Senior
- Other (please type below) _____

What is your undergraduate major?

What is your gender?

- Male
- Female
- Other (please type below) _____

How many times have you visited a farm or community garden prior to starting your undergraduate studies?

- Never
- Once or twice
- 2-3 times
- 3-5 times
- 5-10 times
- Greater than 10 times

Did you grow up on a farm?

- Yes
- No

Does your campus have a farm or garden for food production, education, research or other food related purposes?

- Farm
- Garden
- Both farm and garden
- I don't know
- Neither

In what capacity have you interacted with the campus farm or garden?

- Volunteer
- Student job
- Research
- Internship
- Class (please name the class) _____
- Social events
- I have never interacted with the campus farm or garden
- Other (please type below) _____

How often do you visit the campus farm or garden?

- Every day
- 2-3 times a week
- Once a week
- A couple times a month
- Once a month
- A couple times a semester
- Once a semester
- Once a year
- Other (please type below) _____

Indicate which statement best describes your level of knowledge of food production (farming, management practices, resource requirements, etc.)

- I have high knowledge of food production
- I have considerable knowledge of food production
- I have little knowledge of food production
- I have no knowledge of food production

Indicate which statement best describes your level of knowledge of the food system (where food comes from, food policy, distribution, etc.)

- I have high knowledge of the food system
- I have considerable knowledge of the food system
- I have little knowledge of the food system
- I have no knowledge of the food system

Indicate your level of knowledge of the following topics as they relate to food and agriculture:

	No knowledge	Little knowledge	Some knowledge	A lot of knowledge
Farming	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local food	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Food and the environment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Food systems	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
History of food	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Culture and food	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nutrition	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Food policy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Food scarcity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Technology in food production	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Indicate your level of interest in the following topics:

	No interest	Little interest	Some interest	A lot of interest
Farming	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local food	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Food and the environment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Food systems	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
History of food	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Culture and food	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nutrition	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Food policy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Food scarcity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Technology in food production	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How important are the following in contributing to your knowledge of agriculture and food related issues at your college or university?

	Unimportant	Neither Important nor Unimportant	Somewhat Important	Very Important	Not Applicable
Conversations with others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Readings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Classes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lectures	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Campus farm/garden	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Social events	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
School clubs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Farmers Markets	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Conferences	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dining halls	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other (please type below)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

What motivates you to spend time on the campus farm or garden?

Please describe three things you learned from the campus farm or garden.

What do you like most about the campus farm or garden?

In your opinion, what is the purpose or mission of the campus farm or garden?

How does the campus farm or garden contribute to your educational experience?

Indicate your level of agreement with the following statement: My experiences on the campus farm or garden have improved my understanding of the food system.

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10

Based on your rating in the previous question, please describe how your experiences on the campus farm or garden have improved your understanding of the food system.

In what ways would you improve or change the campus farm or garden?

Appendix IV: Node structure for student surveys exported from NVivo

Name	Sources	References
Students	1	745
Education	1	161
Diverse Interactions	1	12
Experiential Learning	1	14
Farming	1	49
Effort	1	6
Food system	1	47
History	1	1
Management	1	15
Process	1	12
Social	1	7
Personal	1	11
Career	1	1
Mental break	1	2
Future ideas or Improvements	1	64
Community Outreach	1	3
Educational opportunities	1	5
Funding	1	4
Personnel support	1	4
Proximity to campus	0	0
Size	1	6
Structure	1	1
Student opportunities for involvement	1	7
University Outreach	1	5
Major	1	40
Education	1	1
Engineering	1	1
Environmental	1	10
Humanities	1	11
Anthropology	1	2
Art	1	1
English	1	5
History	1	2
Religion	1	1
Industrial and Labor Relations	1	1
Math and Sciences	1	12
Agricultural Science	1	1
Animal Science	1	1
Biology	1	7
Computer Science	1	1
Mathematics	1	2
Public Health	1	3

Public Policy	1	1
Motivation	1	118
Career Aspirations	1	3
Community	1	29
Campus community	1	18
Greater Community	1	5
Experiential learning	1	9
Food Production	1	8
Food System	1	1
Personal well-being	1	32
University Impact	1	7
Purpose and Mission	1	75
Community	1	12
Education	1	23
Food system	1	4
Production for Campus	1	8
University	1	274
Cornell University	1	28
Dartmouth College	1	18
Davidson College	1	107
Duke University	1	19
Furman University	1	27
Harvard University	1	20
Johns Hopkins University	1	55

Appendix V: Node structure for staff in-depth interviews

Name	Sources	References
Farm	9	46
Funding	8	20
Operations	9	26
Staff	9	130
Challenges	7	15
Future of the Farm	8	20
Purpose or Mission	9	37
Community Outreach	4	13
Education	8	20
Production	2	2
Student Involvement	9	55
Events and Activities	4	4
The Farm's Place	2	3