Food Production as a Niche Innovation in Higher Education

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Abstract Institutions of higher education, which have historically responded to the cultural, economic, and technological needs of society, possess great potential for influencing societal transitions towards sustainability. Today, colleges and universities are experimenting with campus-based social innovations that integrate infrastructure, operations, curriculum, research, and funding while communicating new ways of thinking within and outside of the campus community. Food production, for example, has created an integrating context for sustainability on campuses throughout the country and has been praised for its impact. This exploratory study examines the role of colleges and universities in facilitating the diffusion of campus-based food production. Considering food production as a niche level innovation in higher education, we measure the success of this niche as determined by its potential to grow and facilitate the diffusion of innovative practices that influence larger transitions towards sustainability. The transition management (TM) framework is utilized to examine 281 examples of social innovation on college campuses collected from the Association for the Advancement of Sustainability in Higher Education's (AASHE) Database of Campus Sustainability Case Studies and the Sustainability Tracking, Assessment & Rating System (STARS). We find that while necessary processes for successful niche growth are present, the data provides less evidence of the conditions necessary for innovation diffusion.

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1 Introduction

From establishing long term visions through national commitments to implementing real-world solutions to context specific problems of sustainability, institutions of higher education function at multiple levels of engagement. At one level, these institutions influence broader social commitments to the increasingly complex challenges of accelerating environmental, social, and technological change (Stephens et al. 2008). For example, International declarations such as Agenda 21, the Kyoto Declaration, and the Talloires Declaration have established long term goals that guide higher education's role in shaping a sustainable future (United Nations 1992; UNESCO 1990; ULSF 1999). At another level of engagement, campuses have integrated sustainability into their practices and policy. In the United States, 685 campuses have signed the American College and University President's Climate Commitment (ACUPCC) since 2007, demonstrating environmental leadership through the integration of sustainability into the institutional infrastructure, operations, curriculum, research and funding. At a third level of engagement, faculty, staff, and students are actively involved in experimenting with sustainable alternatives as a means to facilitate learning while also responding to societal challenges. As a result, campuses around the world are creating local innovations, in some cases unifying infrastructure, operations, curriculum, research, and funding through projects that serve as integrating contexts for sustainability (Eatmon et al. 2015). These campus innovations contribute to sustainable transitions by modeling practices and problem solving, facilitating research focused on real-world issues, and forming relationships between institutions of higher education and other societal actors (Stephens et al. 2008).

Campus based food production is one innovation that has proliferated in recent years and become a new focal point of sustainability efforts within higher education (Barlett 2011). These initiatives have largely developed in reaction to the negative social and environmental impacts of conventional agricultural food systems (Hamm 2008; Kloppenburg et al. 1996). Producing food locally reduces reliance on carbon-based fossil fuels and addresses problems of urban food insecurity. Food initiatives also result in the reduction of poorly maintained and vacant lots, improvements in the image and identity of neighborhoods, and cultivation of a stronger sense of community (Kaufman and Bailkey 2000; Glover 2004; Macias 2008). Most initiatives are characterized by interrelated components that include environmental education, sustainability research, food service operations, marketing opportunities, and community outreach programs that have the potential to

impact the surrounding food system (Barlett 2011; Hassanein 2008; Lyson 2004). These efforts advance community objectives of public health, social justice, economic development, and environmental protection while enhancing analytical skills, creativity, social networks, and commitment to service within the community (Pothukuchi 2012).

To what extent are campus-based food production initiatives facilitating the diffusion of innovative practices? Social science research provides useful tools for understanding how the activities of higher education institutions, involving multiple actor interactions at various organizational levels over time, promote change in broader socio-technical systems. For example transitions studies and socio-technical system theory have made contributions to the transition management (TM) framework. This framework has been used to consider higher education institutions as subsystems of socio-technical systems that co-evolve as a result of changing economic, cultural, technological and organizational forces (Stephens and Graham 2010). A multilevel perspective (MLP) of these institutions, taken from innovation studies, views their activities as occurring across macro, meso, and micro scales, which can be useful for understanding how innovation processes lead to change in socio-technical systems (Smith et al. 2010). Strategic Niche Management (SNM) theory goes beyond the TM framework to examine the internal dynamics at the micro (niche) organizational level, the level at which we consider campus food production.

In this chapter we utilize these social science tools in order to examine the success of campus food production in facilitating innovation diffusion and influencing broader change. We do so by analyzing data collected from two databases maintained by the American Association of Sustainability in Higher Education (AASHE). Our analysis targets the communication of niche scale campus innovation initiatives among association members in order to measure the presence of replication (growth of similar projects within the niche that brings about aggregative change) and scaling (growth that draws more participation in the niche) (Seyfang and Haxeltine 2012). Following from SNM theory, both measures are used in this study as indicators of niche success. In the next section we discuss sustainability innovations in more detail before presenting the TM framework and SNM theory as useful analytical tools.

2 Food Production as a Social Innovation

Innovation has been a critical means of addressing the challenges of human survival and progress throughout history. According to Rogers (1983), an innovation is "an idea, practice, or object that is perceived as new by an individual or other unit of adoption." Innovations differ from inventions in that they do not have to be original but rather they must be new to the adopter and an improvement on the status quo (Phills et al. 2008). As a result, invention often requires attention to technology while innovation requires attention to people (Denning 2004). Academic research on

innovation began in the field of economics and has been applied to the study of urban and regional development, public policy, and management (Cajaiba-Santana 2014).

More recently innovation theory has been applied to the study of social change. There is no agreed upon definition of social innovation, but it can be thought of as "new ideas, institutions, or ways of working that meet social needs more effectively than existing approaches" (Reeder et al. 2012). In the case of environmental challenges such as climate change, social innovations address "wicked" problems that do not have clear solutions but rather require the development of shared understanding across stakeholders with varied perspectives and competing interests (Davies et al. 2012). Social innovation in environmental sustainability, or sustainability innovation, can take on many forms such as recycling businesses, sustainable housing cooperatives, and farmers markets (Seyfang and Smith 2007). Activities often go beyond greening business to take into consideration bottom-up solutions designed to address the needs and interests of the local communities being served (Seyfang and Smith 2007).

For example after purchasing land in 1993, former professional basketball player Will Allen started Growing Power in 1999 to provide fresh food and education to communities in Milwaukee. The main facility's location was once known as "greenhouse alley" for the ornamental greenhouses that were present as far back as the 1920s. Today Growing Power is one of the last functional farms within Milwaukee city limits. The main site is one of twenty farms owned by Growing Power dispersed throughout the city. The farm collects 80,000 pounds of food waste each week from 22 Wal-Mart stores in southeastern Wisconsin to compost and create rich soil for growing produce. Growing Power has over 3000 volunteers as well as partnerships with universities and k-12 schools to maintain their production. The permaculture farm practices beekeeping, aquaponics, and animal husbandry while producing its own soil through vermiculture composting. The organization has been established as a 501(c)(3) not-for-profit organization and takes advantage of incentives such as zero tax liability and access to grant funding, donations, and volunteer services (Goodman 2011). Growing Power's major sources of funding are grants, fee-for-service programs, product sales, and contributions. All revenue that exceeds the organization's costs are reinvested into the activities of the organization, furthering the organization's goals.

The "social" nature of this innovation can be viewed in several ways. One way in which the term "social" has been used is to describe the social motivations of enterprising individuals like Will Allen (Phills et al. 2008). Social entrepreneurship has been the focus of research efforts that examine the characteristics of innovators. These entrepreneurs are distinguished from business entrepreneurs in that they measure value as more than revenue generation alone. Social entrepreneurs play a key role in the development of social innovations as their missions are often driven by the creation of social value, which becomes essential to every aspect of decision-making. Characteristics of social entrepreneurs include pursuit of new opportunities, engagement in innovation processes, actions taken independent of current resource availability, and accountability to stakeholders and outcomes (Dees 1998). In addition, social entrepreneurs are able to identify injustices, develop

social value propositions, and alleviate suffering through "inspiration, creativity, direct action, courage, and fortitude" (Martin and Osberg 2007).

The term "social" has also been used to describe the legal status of social organizations like Growing Power (Phills et al. 2008). If the examination of social entrepreneurs answers questions of who does social innovation, the examination of social enterprises answers questions of how. According to Dart (2004), "the term social enterprise is considered synonymous with organizations becoming more market driven, client driven, self-sufficient, commercial, or businesslike." Such factors as legal status and financial success of organizations have been the focus of this area of research (Schoning 2013). Activities such as revenue source diversification, fee-for service programs, private sector partnerships, and social purpose business are characteristic of these organizations (Dart 2004). One advantage of businesses-minded social enterprise is the potential to reduce reliance on external funding, however at the risk of succumbing to the pressures of prioritizing economic value over social value.

A third lens by which the term "social" may be viewed refers to the nature of the innovation's impact, such as Growing Power's provision of education and fresh food to local communities. While the study of social entrepreneurship and social enterprise focuses on the qualities of people and organizations that lead to the fulfillment of social goals, innovation itself is what creates social value (Phills et al. 2008). Some researchers argue that the concept of social innovation is a more useful construct than the concepts of social entrepreneurship and social enterprise. According to Phills et al. (2008) social innovations break down the barriers between the traditional activities of public, private, and non-profit sectors through the exchange of principles, resources, and responsibilities. Focusing on the process of creating social impacts allows for examination of value creation in public, private, and non-profit sectors by entrepreneurs and non-entrepreneurs alike.

Campus food production initiatives mimic social innovations like Growing Power in a campus microcosm that creates safe spaces for experimentation. As a result, students learn how to integrate various values, perspectives, and knowledge bases into critical thinking and problem-solving (Lourdel et al. 2005; Alshuwaikhat and Abubakar 2008; Yarime et al. 2012). They do this by capitalizing on distinct and often opposing perspectives, combining skills and knowledge from multiple sources and experiences, demanding that issues and positions are framed contextually, and applying theory to practice (Alshuwaikhat and Abubakar 2008; Lieberman and Hoody 1998; Cortese 2003; Schneider 2003; Sterling 2004; Huber and Hutchings 2004). These initiatives can often lead to collaborative efforts that create a mutually beneficial relationship between institutions and their surrounding communities (Alshuwaikhat and Abubakar 2008; Cortese 2003). As a result, students are given the opportunity to experiment with a variety of "real-world" solutions, thus utilizing campuses and surrounding communities as problem-solving laboratories (Barlett 2011; Huber and Hutchings 2004; Herrmann 2007; Lieberman and Hoody 1998; Orr 1992; McMillin and Dyball 2009). The protected space allows alternative ideas to develop in the absence of regime selection pressures, or factors at the meso level that prevent path-breaking

innovations at the micro level from outcompeting mainstream alternatives that are more aligned to existing values and practices (Smith and Raven 2012). These micro level protected spaces are also referred to as "niches" (Seyfang and Haxeltine 2012).

3 Socio-Technical Transitions and Strategic Niche Management

Transition Management is an analytical framework for understanding and promoting change in social systems that can be used as a prescriptive tool for management intervention or as a descriptive tool for understanding historical transitions (Stephens and Graham 2010). The multi-level perspective (MLP) of the TM framework recognizes interactions at three levels and organizes them into a nested hierarchy (Smith et al. 2010). At the highest scale of landscape processes, higher education institutions respond to societal forces that may be economic, cultural, environmental, or technological in nature. These may include external influences such as "costs and accessibility of higher education, the politics of education funding, society-wide economic conditions, climate change impacts, increasing costs of energy and food, and other global or macro-level factors that clearly influence decisions in higher education" (Stephens and Graham 2010, p. 613). These forces can place external pressure on regimes while creating opportunities for niches to create path-breaking solutions (Smith et al. 2010).

Regimes, nested within landscape processes, are the accepted norms and dominant practices of higher education institutions with respect to divisional structures, tenure and promotion practices, degree requirements, etc. (Stephens and Graham 2010). They place selective pressure on niche activities by reinforcing "mainstream, and highly institutionalized, way[s] of currently realizing social functions" (Smith et al. 2010, p. 6) perpetuating unsustainable practices as a result. Selective pressures may include established industry structures, technical standards, established research practices, market rules, public policies, and cultural values (Smith and Raven 2012). These structures create barriers for the diffusion of novel innovations that challenge the regime. For this reason regimes tend to follow incremental innovation patterns while non-incremental change that challenges the regime are developed in niche spaces (Smith et al. 2010).

Niche level activities are nested within the regime and facilitate opportunities for innovation through experimentation and learning. Unlike regimes, niche level activities rapidly change and evolve to answer new questions or to demonstrate new ideas. Niches provide "protective space" for innovations that would not otherwise survive the selection pressures of existing regimes. According Strategic Niche Management (SNM) theory, which addresses internal niche dynamics, successful niche growth requires managing expectations, building social networks, and learning (Seyfang and Haxeltine 2012). Managing expectations requires that niches communicate and attain clear goals. Building social networks leverages resources

that support the activities of the niche. Learning can be both shallow and deep; providing surface level information about the niche activity with respect to economic performance, adoption barriers, and user experience (first order learning) or provoking reflection on deeply held assumptions and beliefs about current practices (second order learning) (Smith 2007). Niches that are successful in facilitating diffusion and influencing regime change do so through (1) the replication of niche activities, (2) scaling projects to involve more actors, and (3) by translation of niche ideas beyond the niche to the mainstream (Seyfang and Haxeltine 2012).

In order to evaluate the success of campus food production as a niche in facilitating innovation diffusion, the authors examined two databases maintained by the North American Association for Sustainability in Higher Education (AASHE). The North American Association for Sustainability in Higher Education is a professional association that supports the development of new practices, knowledge dissemination, and policy change for the campus sustainability community. This is achieved through annual conferences and online communications. These activities create conditions for successful niche growth by providing communications channels for expectation management, social networking, and learning. What is less clear is whether sustainable innovation niches in higher education are facilitating diffusion and influencing regime change. In the next section we present data on innovative campus sustainability projects representing hundreds of US higher education institutions. We focus our attention on campus food production as a niche level innovation and consider whether there is evidence of replication and scaling that would, at least partially, indicate the successful growth of the niche and facilitation of innovation diffusion within the niche.

4 Methods

The "Campus Sustainability Case Studies" database is one of many resources that the AASHE provides to member organizations. The database contains case entries voluntarily submitted by project leaders at U.S. colleges and universities as part of AASHE's annual Campus Sustainability Awards program. The awards recognize projects that promote sustainability in any sector (operations, education, administration, community engagement) and places preference on projects that invest diverse stakeholders in addressing multiple components of sustainability.

The authors reviewed all 188 database entries submitted between June of 2010 and June of 2014. Each database entry contained information on project leadership and institutional affiliation and was divided into sections that included project overview, background, project goals, project implementation, timeline, financing, project results, lessons learned, and supplemental material. The authors used content analysis to systematically categorize each entry according to the language used to describe the goals of serving the campus and community through the provision of environmental services. Each project was coded and placed into one of the following eight categories: climate and energy, water, food and agriculture, health,

sustainable communities, waste reduction, and other. These categories are not mutually exclusive, and oftentimes overlap. For example, green building innovations can address issues of climate, energy, water conservation, and waste reduction simultaneously. For accounting purposes, each case entry was assigned to the category that best matched the project description. The authors also noted the enterprise orientation (the presence of a profitable business model) for each project to account for social enterprise as a type of sustainability innovation. The analysis therefore examines campus innovation from the perspective of social impact (creation of social value) as well organizational structure (market-driven or business minded orientation). As the data provides little information on leadership, we do not examine innovation from the perspective of social entrepreneurship here.

Institution type was noted in order to characterize representation across varying institutions. Of all degree granting institutions in the U.S. (excluding 2-year colleges), Doctorate level institutions account for 10 %, Masters and Baccalaureate institutions account for 24 % (each), and Special Focus institutions account for 42 % (United States Department of Education 2006). Table 1 shows that most cases examined were submitted by Doctorate granting institutions (71 %) with Baccalaureate institutions as the next highest proportion of cases (13 %) followed closely by Associate (8 %), Masters (6 %), and Special Focus (2 %) degree granting institutions respectively. Although Doctorate granting institutions account for only 10 % of all institutions, they compose the large majority of the social innovation cases reviewed. This may be due to the level of resources available for campus sustainability efforts or the communication of those efforts. Doctorate granting institutions generally have higher levels of research activity and expenditures than other institution types. They also rank highest in sustainability efforts as rated by AASHE's Sustainability Tracking, Assessment & Rating System (STARS), followed (in order) by Masters, Baccalaureate, Special focus, and Associate degree granting institutions (AASHE 2015).

Data was also collected from the description of each entry identifying the source of leadership for campus sustainability efforts. This data is not only important for identifying leaders who may be the impetus for sustainability efforts on campuses (the social entrepreneurs), but also for understanding the extent to which innovation efforts are occurring in isolation or as collaborations across conventional boundaries that divide students, faculty, and staff. Table 1 shows that projects were mostly led by a combination of students, faculty, and staff (43 %), followed by staff led projects (42 %) which are mostly the efforts of sustainability coordinators and administrators.

Table 1 Campus sustainability case studies database entries by institution type and project leadership

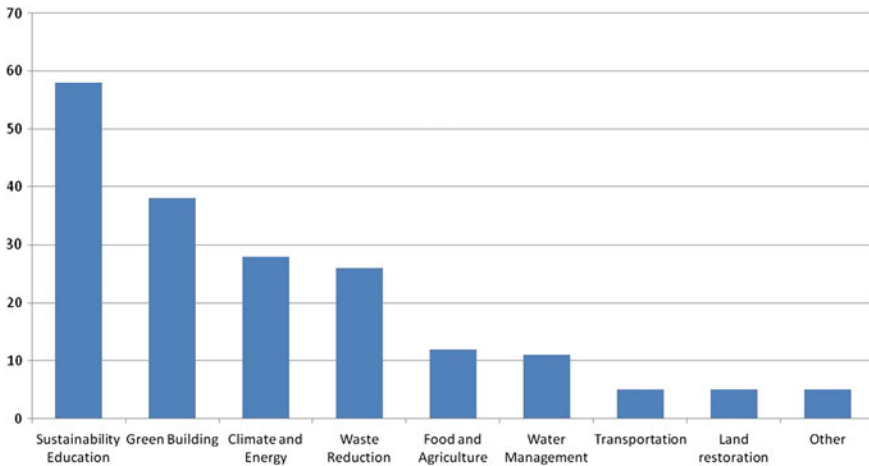| Degree level	# Cases	Leadership	# Cases
Doctorate	134	Mixed (students, faculty, and staff)	81
Masters	12	Staff	78
Baccalaureate	24	Students	15
Associate	15	Faculty	5
Special focus	3	Other	9

Fig. 1 Bar graph showing campus sustainability innovations by mission type

Figure 1 shows that almost 80 % of the innovations examined belong to the four categories of sustainability education, green building, climate and energy, and waste reduction. Sustainability education projects accounted for the largest proportion of projects (31 %) and can be described as activities designed to develop knowledge, skills, attitudes, and values regarding sustainability. Most sustainability education activities took the form of programs and events, which accounted for 79 % of the cases in this category. Green building, which accounted for 20 % of cases, included projects aimed at improving campus infrastructure and operations, the majority of which involved Leadership in Energy & Environmental Design (LEED) certification.

Climate and energy projects accounted for 15 % of all cases, most of which were energy and carbon offset projects. Waste reduction projects such as recycling, composting, and waste diversion, represented 14 % of all cases.

Although social innovations can occur within any type of organization, many perceive social innovation as the work of non-profit organizations (Dees 2003). This may be a result of conventional views of the roles of business entities. However many campus projects generate revenue that is often used for financing project activities. For example, the Food for Sustainability project at Allegheny College utilizes aquaponic systems for indoor, year round tilapia and lettuce production. The products are sold to Parkhurst Dining Services and are incorporated into the campus dining menu. The integration of food production into campus operations, faculty-student research, and civic engagement experiences has created a whole-systems approach to achieving campus sustainability that has increased the number of partnerships and interactions across the campus and community while creating space to explore new ideas (Eatmon et al. 2015). The authors found that only 9 % of cases utilized profit-driven business models in order to achieve a social mission, most of which were waste reduction and food and agriculture projects.

As the sample of profit driven business models was very small, the authors examined an additional 93 cases of sustainability enterprises from a separate database; AASHE's Sustainability Tracking, Assessment & Rating System (STARS). The rating system is used for tracking the performance of colleges and universities with respect to sustainability. Version 1.2 was used, which measures progress in education and research, operations and planning, administration, and engagement. According to AASHE (2015), 317 US Institutions have a STARS rating. The authors limited the search to AASHE member institutions using the "Type of Characteristic" and "Specific Characteristic" filters and used the reporting fields Category = "Education and Research", Subcategory = "Co-Curricular Education", Credit = "ER-T2–5: Sustainable Enterprise", Reporting Field = "A brief description of the enterprise". The authors used content analysis to systematically categorize each entry according to the language used to describe the goals of serving the campus and community through the provision of environmental services. Each project was coded and placed into one of the following six categories: climate and energy, water, food and agriculture, sustainable communities, waste reduction, transportation, and other. Figure 2 summarizes the results.

Food and agriculture projects accounted for 55 % of all sustainable enterprises. Projects in this category include farmers markets, food production systems, and café's. Forty-three percent of the database entries were classified as sustainable community, transportation, or waste reduction projects. Sustainable community projects accounted for 28 % of all STARS entries and included fair trade stores, thrift stores, and cooperative stores among others. Transportation, all entries of which were bike share or voucher programs, accounted for 9 % of all cases. Profit generating waste reduction programs such as recycling and composting represented 6 % of all entries.

Fig. 2 Pie graph showing campus sustainability enterprises by mission type
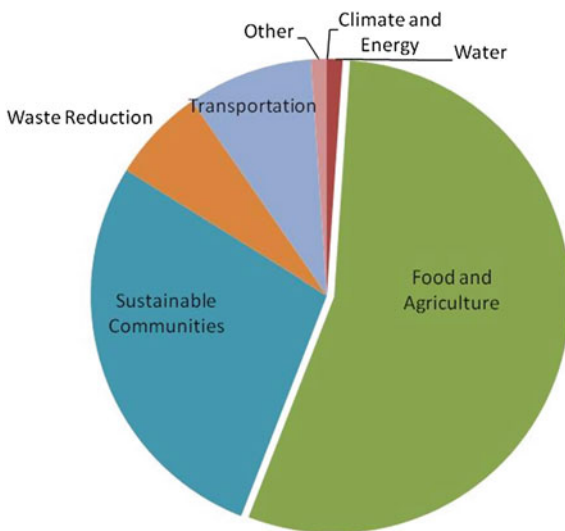
5 Discussion

Many institutions of higher education provide protective spaces, or niches, for campus-based social innovations such as food initiatives that are alternative means for meeting societal needs in a sustainable way. In this chapter, we presented the transition management (TM) framework and strategic niche management (SNM) theory to consider the success of campus food production as a niche in facilitating innovation diffusion and influencing regime change. A review of 188 case studies from an AASHE hosted database revealed that most of the sustainability innovation cases reviewed were either green building, climate and energy, or waste reduction activities while food and agriculture, transportation, and land restoration accounted for a much smaller proportion of cases. However food and agriculture, sustainable communities, and transportation represented the majority of the 93 sustainability enterprise cases examined in AASHE's STARS database.

The North American Association for Sustainability in Higher Education creates strong conditions for successful niche growth by providing communications channels for expectation management, social networking, and learning. However according to SNM theory, the facilitation of innovation diffusion and pressure towards regime change are dependent on replication (growth in number of initiatives), scaling (growth in participation), and translation of ideas from the niche to the mainstream (Seyfang and Haxeltine 2012). The data does not provide sufficient information to adequately grasp the extent to which translation of ideas from the niche to the mainstream is occurring, but several insights can be drawn regarding the extent to which replication and scaling are present.

The majority of the "Campus Sustainability Case Studies" database entries described projects in the categories of green building, climate and energy, and waste reduction, while only 11 of 188 entries described food and agriculture projects. In order for replication and scaling to be present, we would expect to see a larger proportion of projects involving larger numbers of participants. According to SNM theory, green building, climate and energy, and waste reduction projects may face less selection pressure than those exerted on food production activities. These selection pressures may come in the form of existing industry structures, dominant technologies and infrastructures, the established knowledge base, market practices, policy, and cultural factors and favor innovations that are aligned with the incumbent, dominant, and often mainstream values (Smith and Raven 2012).

For example, green buildings are viewed as long term investments as well as admissions marketing tools for a new generation of environmentally minded students. With more than 900 buildings certified and over 3000 registered with LEED, this standard is becoming increasingly popular on campuses nationwide (EfS Blueprint Network 2011). Similarly, campus commitments to reducing carbon footprints are becoming an increasingly common standard nationwide. According to the American College and University Presidents' Climate Commitment ACUPCC (2015), 697 colleges and universities are signatories to, 2151 have greenhouse gas inventories, and 533 have submitted climate action plans. Recycling

rates continue to increase each year in the United States and more Americans are becoming conscious of waste disposal behaviors. These landscape forces create regimes that are economically, technologically, politically, and culturally amenable to these types of niche activities.

Food production initiatives on the other hand face stronger selection pressure from incumbent regimes. For example with respect to market rules, small scale food production often requires that consumers are willing to pay higher prices in order to sustain the business model. Existing policies may stifle the use of available land, or hiring of full-time staff that can coordinate projects. Even the academic calendar, a policy established at the regime level, creates barriers for food production projects as many students are away during the summer when food production is at its peak. These factors might allow other niches to outcompete food production projects for resources and attention.

Although food production projects were not well represented in the first dataset, the STARS database of social enterprise projects revealed that food and agriculture projects represented more than half of the entries in the database. This contrast may be significant in that it signals that food and agriculture projects may be the most suitable niche for experimenting with ideas surrounding social enterprise. Food production easily lends itself to business principles and creates an excellent space testing ideas. Although our study shows that food production projects have not been heavily replicated or scaled, they may be a breeding ground new ideas surrounding social enterprise.

These results suggest that higher education institution regimes may be placing excessive pressure on food production activities occurring at the niche level. Changes in regime norms and practices might allow for more replication and scaling of these activities. For example, our data shows that very few faculty were independent leaders of food production projects. The affect of tenure and promotion policies on the work that faculty choose to engage in may be important for strengthening the niche. Policies that support campus food production with funding and resources are also important considerations for the growth of the niche.

6 Limitations

Our findings face several limitations due to the nature of the data utilized in this study. Self-selection bias can be attributed to the "Campus Sustainability Case Studies" data. The database contains case entries voluntarily submitted by project leaders as part of AASHE's annual Campus Sustainability Awards program, which recognizes projects that promote sustainability and places preference on projects that invest diverse stakeholders in addressing multiple components of sustainability. Database entries may reflect well established or noteworthy projects more so than projects in the earlier stages of development or those that lack adequate staffing to dedicate to communication activities. In addition, Doctorate granting institutions account for 71 % of all cases but only represent 10 % of colleges and universities in

the United States. Although it could be argued that these institutions have adequate resources for establishing, standards, best practices, and institutionalized learning necessary for creating strong niches, the sample is not representative of the entire population of US colleges and universities. More data should be collected in order to determine whether the patterns identified in this study hold true for the larger population of higher education institutions. Finally, this study relies heavily on SNM theory in evaluating niche governance, which takes into consideration the internal dynamics of the niche only. Factors beyond niche dynamics, such as pressure on regimes to become more sustainable, could ease the diffusion of food production initiatives into the mainstream (Smith 2007).

7 Conclusion

The TM framework and SNM theory offer useful analytical tools for understanding the role of niche level campus innovations in creating sustainable sociotechnical transitions. Few studies have applied TM and SNM to considerations of sustainability in higher education, and to the authors' knowledge no studies have specifically examined campus food production as a niche level activity. Although the results of this study are not generalizable, analysis of the data highlights important considerations. If institutions of higher education are to demonstrate leadership in creating pathways to sustainable sociotechnical transitions, selection pressures at the regime level must be carefully considered in order to facilitate the growth and diffusion of niche scale activities.

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