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A call for collaboration among food systems programs in higher education to train the future workforce

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A well-trained food systems workforce is in high demand, and food systems education programs are proliferating in higher education. However, these programs often struggle to embody the full interdisciplinary scope of the field of food systems, in part due to the limitations of traditional academic structures. Here, we present an inventory of existing U.S. food systems educational programs which showcases the breadth of their geographic distribution and disciplinary contexts. We pair this with a case study of two geographically proximal, highly complementary programs, one at a land grant university and one within a school of public health. While the individual programs face challenges in achieving full interdisciplinarity, their pairing showcases that striking opportunities exist to augment interdisciplinarity through inter-institutional collaboration. More models of successful inter-institutional collaborative food systems education are needed. Growth in this area would be aided by external funding for proof-of-concept models, fostering learning networks across disciplinarily distinct programs, and fighting the mission creep of individual programs striving to "do it all" at the expense of quality, stability, or an appreciation for the value of diverse core strengths.

KEYWORDS

higher education, program, workforce, food systems, collaboration, university, institution

1 Introduction

Postsecondary food systems education programs in the U.S. have proliferated in recent years (Hartle et al., 2017) to meet the burgeoning opportunities in the sustainable food systems workforce (Den Boer et al., 2021). Yet effectively preparing students for jobs in sustainable food systems, which can span many different disciplines from economics to human and natural sciences to waste management, presents significant challenges for these programs (AgCareers, 2023).

One of the greatest challenges is developing and sustaining truly interdisciplinary programs within traditional academic structures. While most new programs embrace the critical importance of inter- or trans-disciplinary approaches (Valley et al., 2018), and while several examples exist in which novel interdisciplinary units have been formed explicitly for the study of food systems (UBC, 2023; UVM, 2023), the preponderance of today's food systems education programs seem to have developed within various disciplinary units (Hilimire et al., 2014), which inevitably influence the framing, scope, and content of these programs. Indeed, experience from adjacent fields such as environmental and sustainability education illustrates that interdisciplinary programs are notoriously difficult to support within traditional academic structures (Vincent et al., 2016). Programs whose administration is deliberately interdisciplinary face the obstacles and disadvantages of operating within institutions whose core organizational structure is by discipline (Hilimire et al., 2014).

Moreover, because many food systems education programs have developed from various disciplinary units, such as agriculture, environmental science, or public health (Hilimire et al., 2014), they often struggle to expose students to truly interdisciplinary opportunities while remaining true to core strengths (Ebel et al., 2020). This is because not every institution specializes in every discipline, and expansion into additional disciplines may not be feasible or supported by the institution. Expertise and opportunity in some areas key to the study of food systems may well be concentrated at other institutions, but working across institutions to tap into this expertise is often discouraged by prevailing structures.

How can food systems educational programs become more interdisciplinary—exposing students to holistic approaches that integrate efforts across disparate disciplines—within the constraints and limitations of traditional academic structures? Here, we present an inventory of U.S. postsecondary food system educational programs, focusing on their geographic distribution and disciplinary context, followed by a case study exploring the challenges of achieving meaningful and stable interdisciplinarity within a single program and the opportunities of a collaboration-based, cross-institution model.

2 Current landscape of food systems programs in U.S. higher education

While other researchers have cataloged interdisciplinary food-related academic programs broadly—by including food studies and sustainable agriculture (Hartle et al., 2017)—we limit this inventory to programs that specifically include "food system(s)" in their name, in order to focus on programs that recognize food systems as an academic field of study and are formally committed to training future leaders in this field.

2.1 Program inventory: approach

We inventoried programs within accredited U.S. institutions of higher education with "food system(s)" in the title of the degree, certificate, or option. We included all common degree program types (associates, bachelors, masters, doctoral) as well as undergraduate minors, undergraduate or graduate certificates, and non-transcriptable areas of study, emphasis, or concentration within degree programs.

Programs were identified by reviewing lists from Valley et al. (2020) and Hartle et al. (2017); reviewing lists maintained by the Northeast Sustainable Agriculture Working Group (NESAWG) (2023), the Association for the Study of Food and Society (ASFS) (2023), and the Sustainable Agriculture Education Association (SAEA) (2023); and conducting Google searches that paired institution and program names with "food systems degree," "food systems graduate," or "food systems certificate." Inventory searches were completed in March 2022. Thirty-two percent of the programs were identified by multiple sources. Each program's website was reviewed to determine the degree or program type, the school(s) or college(s) with which it is affiliated, and the state in which it is located.

2.2 Program inventory: findings

The search yielded a total of 107 unique programs at 72 institutions, listed in Supplementary Table S1. Of the 72 institutions, 46 housed a single program, 18 housed two programs, seven housed three programs, and one institution housed four programs. Included in the inventory were four doctoral, 22 master's, 42 bachelor's, and 4 associate's degrees programs, as well as 28 non-degree paths (e.g., minors, certificates) within undergraduate programs and 11 non-degree paths within graduate programs.

Thirty-seven states had at least one higher education institution with a food systems program, while 13 did not (Figure 1A). This does not indicate a complete lack of food systems training in these 13 states, only that there were no programs with "food system(s)" in their titles within institutions of higher education there as of March 2022. Of the states with food systems programs, 17 had a single institution with one or more food systems programs and 20 had more than one institution with food systems program(s). Of these, nine states had two institutions, nine states had three institutions, and two states (Illinois and Michigan) had four institutions with food systems programs.

Administratively, the largest portion of the 107 total food systems programs were housed within schools or colleges of agriculture ($n = 44$, 41%), with the most, but not all, at Land Grant Universities (Figure 1B). The second largest grouping was within health sciences schools or colleges ($n = 11$, 10%), with the majority belonging to public health schools or accredited programs. The remaining programs ($n = 52$, 49%) were housed within other administrative units, which included schools and colleges of environmental sciences, arts and sciences, and programs at technical and community colleges. Notably, only six programs were centrally or jointly administered (i.e., with program administration housed outside of—or spread across multiple—disciplinary schools and/or colleges), four of which included a college of agriculture or veterinary medicine as one of their administrative units and two of which included affiliation with a public health school or program.

This inventory illustrates that food systems educational programs are widespread geographically, with many states housing multiple programs. The inventory also finds that most programs are academically rooted in a disciplinary school or college—following traditional academic structures—rather than jointly administered.

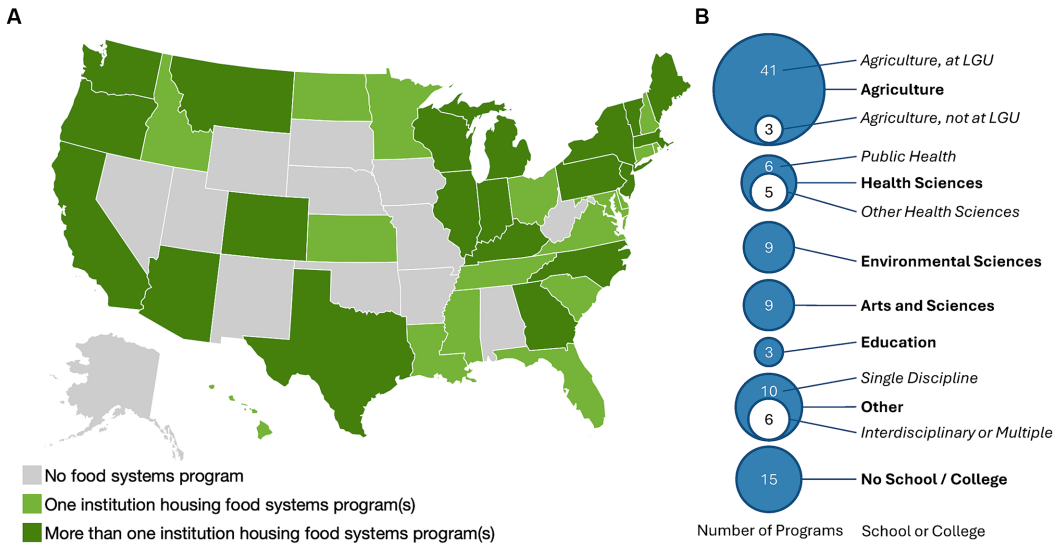

FIGURE 1
Where are U.S. food systems programs? **(A)** Geographic distribution by state of food systems programs at U.S. institutions of higher education. **(B)** Primary administrative homes (school or college) of food systems programs. All colleges and schools with agriculture in their name were categorized as Agriculture. This category may also include veterinary medicine, and natural resource, environmental, life, or natural sciences. Colleges and schools including environment, natural resource, or natural sciences–but not agriculture–in their name were categorized as Environmental Sciences. Arts and Sciences includes liberal arts, arts, humanities, and social sciences. Public Health includes accredited schools of public health as well as accredited public health programs in various schools. Other Health Sciences includes medicine, pharmacy, and human sciences. Education may also include health and human sciences. Other includes both schools or colleges not clearly fitting within one of the preceding categories (Single Discipline) and programs administered centrally or between multiple schools/colleges (Interdisciplinary or Multiple). No School/College is comprised of programs where no disciplinary subunit at the school/college level exists (e.g., at community and technical colleges). LGU: land-grant university.

3 Washington State case study

In Washington State, food is a key component of the economy (WSDA, 2023). The state is well-positioned to advance food systems innovation and workforce training because of its geographic location—poised to experience and adapt to numerous food system-related climate stressors (May et al., 2018; Otten et al., 2021)—and because its public and private organizations, which include a Land Grant University (LGU) at Washington State University (WSU) (2023) and a School of Public Health (SPH) at the University of Washington (UW) (2023), are already investing in food- and sustainability-related efforts.

In 2020, UW and WSU were jointly awarded a USDA-NIFA Higher Education Challenge (HEC) planning grant to explore an inter-institutional model for food systems education. As Washington State's two research-intensive universities, UW and WSU feature notable similarities and differences. Each operates multiple campuses and houses relatively large student bodies [3 campuses and over 50,000 students at UW, 5 campuses and nearly 30,000 students at WSU (NCES, 2023)]. However, while UW's main campus is located in the dense urban environment and maritime climate of Seattle, WSU's main campus is approximately 250 miles away in Pullman—a rural area with an inland climate. Furthermore, as a LGU and a SPH, WSU and UW differ markedly in faculty expertise, degrees offered, student body, and student career paths. For example, LGUs have expertise in many of the applied sciences that are foundational to food systems, such as agronomy, horticulture, soil science, and animal science. SPHs house expertise in domains that center human health, such as food security and access, nutrition, and occupational health. LGUs are critical hubs for regionally-tailored agricultural research and help steward a wide range of agricultural and natural resource employer and community networks (USDA, 2023a) while SPHs are hubs for nutritional, occupational, epidemiological and environmental health research, working closely with government agencies and community health networks (ASPPH, 2023). A LGU-SPH pairing could present a robust opportunity to achieve much greater interdisciplinarity and could serve as a model for other states—since many house both a LGU and a SPH—and a network of such pairings could contribute substantively to the innovative practices needed to train the future food systems workforce.

3.1 Case study: approach

This case study deliberately brought together UW and WSU undergraduate food systems programs to explore the possibilities of an inter-institution model for food systems education. At UW, the program was a recently launched BA in Food Systems, Nutrition, and Health (FSNH) [University of Washington (UW), 2023], housed within the School of Public Health, with strong ties to hunger relief networks and urban organizations. At WSU, the program was a BS in Agricultural and Food Systems (AFS) [Washington State University (WSU), 2023], housed within the College of Agricultural, Human, and Natural Resource Sciences and drawing on the LGU's longstanding relationships with the agricultural sector and statewide network of extension offices. The two programs are strikingly complementary both in content and context, and faculty were interested in exploring opportunities for collaboration.

We critically examined programmatic synergies and collaborative opportunities through student interest surveys, a SWOT (strengths, weaknesses, opportunities, and threats) analysis, and an inter-institutional workshop. Case study methods are available in the Supplementary materials and summarized here. In brief, the student survey was designed to gauge disciplinary interests among students at each institution, as well as interest in various forms of UW-WSU joint learning opportunities. For the SWOT analysis we conducted a series of semi-structured interviews with faculty, staff, and leadership across the two institutions, focusing on their perceptions of strengths, weaknesses, opportunities, and threats related to their institution's program. This was followed by thematic analysis (Braun and Clarke, 2012) of interview notes and transcripts. Results of both analyses (SWOT and student surveys), as well as additional background about program characteristics and future possibilities, were shared with faculty, staff, and leadership from both programs at an interinstitutional workshop in 2021 that included small group brainstorming sessions, large group discussion, and networking opportunities.

3.2 Case study: findings

The survey revealed striking differences in student core interests between the two institutions corresponding closely to the institutions' differing emphasis areas (Figure 2A), with UW students tending to favor public health and various social sciences compared to WSU students' prioritization of agricultural sciences. These results are not surprising, and reinforce the notion that different food systems education programs have differing emphases and serve differing student interests, often reflective of their institutional backdrops. However, when asked if there were additional subject areas beyond their core interests into which they would like to expand their food systems education if possible, students frequently selected not only other emphasis areas of their *own* institution, but also areas in which the *other* institution has comparatively greater strength (Figure 2A). Examples include UW student interest in *Agricultural sciences* and *Organic and sustainable agriculture*, and WSU student interests in *Food culture, anthropology, and/or history* and *Fisheries*. This suggests that, from the student perspective, there could be value in programmatic linkages between the two institutions. Indeed, students expressed strong interest in cross-institutional learning opportunities, and experiential learning in particular. More than half of students surveyed at each institution expressed interest in the four joint experiential learning formats presented as potential UW-WSU cross-institution options (community-based projects, field experiences, internships, and applied research).

A comparison of SWOT analyses from the UW FSNH and WSU AFS programs revealed several strengths and weaknesses shared by the two programs, as well as complementary strengths such as UW's urban setting and WSU's extension network, and complementary weaknesses such as the UW program's need for more agricultural sciences content and the WSU program's need for more population health and social science content (Figure 2B). Such findings highlight potential pathways for leveraging both common and complementary strengths to address shared weaknesses and create new opportunities to better serve the state and region through inter-institutional collaboration.

Discussions of opportunities and threats revealed strikingly consistent themes. While demand for food systems education is growing, SWOT participants at both institutions worried about risks—both internal and external—that accompany rapid growth. On the prospect of rapid internal growth, one participant noted that "there's the worry of growing beyond our ability to teach critically and thoughtfully," while on the rapid proliferation of food systems programs in higher education broadly, another participant raised concern over a trend of "slapping the title of food systems on just about anything." The difficulty of securing stable funding for interdisciplinary educational models was also a shared concern. Further, participants noted the challenges of maintaining a program that is both meaningfully interdisciplinary and at the same time nimble enough to respond to the rapidly evolving landscape of food systems research and workforce needs. Importantly, while some spoke of the rapidly changing food systems landscape as a major threat, others framed it as a key opportunity for focusing programmatic aims and developing meaningful collaborations. Overall, the SWOT analysis revealed numerous ways in which inter-institutional collaboration could help food systems education programs to reframe threats and challenges as opportunities for mutual benefit (Figure 2B, "Collaborative Solutions").

Reflecting on these combined findings, interinstitutional workshop participants identified several readily achievable measures that might be pursued as first steps towards broader programmatic collaboration. These included the creation of a joint seminar series for student research and career exploration, initiation of an annual faculty co-learning retreat, and development of a joint certificate program centered around experiential learning.

4 Discussion

It has long been recognized that challenges in complex systems are best addressed by interdisciplinary teams (Weaver, 1948), and the value of an interdisciplinary approach to food systems education is widely acknowledged (Hilimire et al., 2014). Yet a narrower disciplinary scope persists for many programs (Figure 1B) due especially to barriers associated with the foundational structure of academia (Weaver, 1948; Hartle et al., 2017). We propose a strategy that accepts the realities of academic structures and disciplinary siloing, working around these limitations to achieve meaningful interdisciplinarity through cross-institutional collaborations.

4.1 Combining disciplinary strengths across institutions

Examples of cross-institutional collaboration models exist. A consortium of higher education institutions in the U.K. launched a cross-institutional food systems training program in 2015. This graduate-level Interdisciplinary Food Systems Training and Learning program (IFSTAL) forms linkages between institutions and faculty with expertise in numerous food systems-relevant disciplines including agricultural, health, and environmental sciences; food and agriculture economics, policy, and governance; and food supply chain

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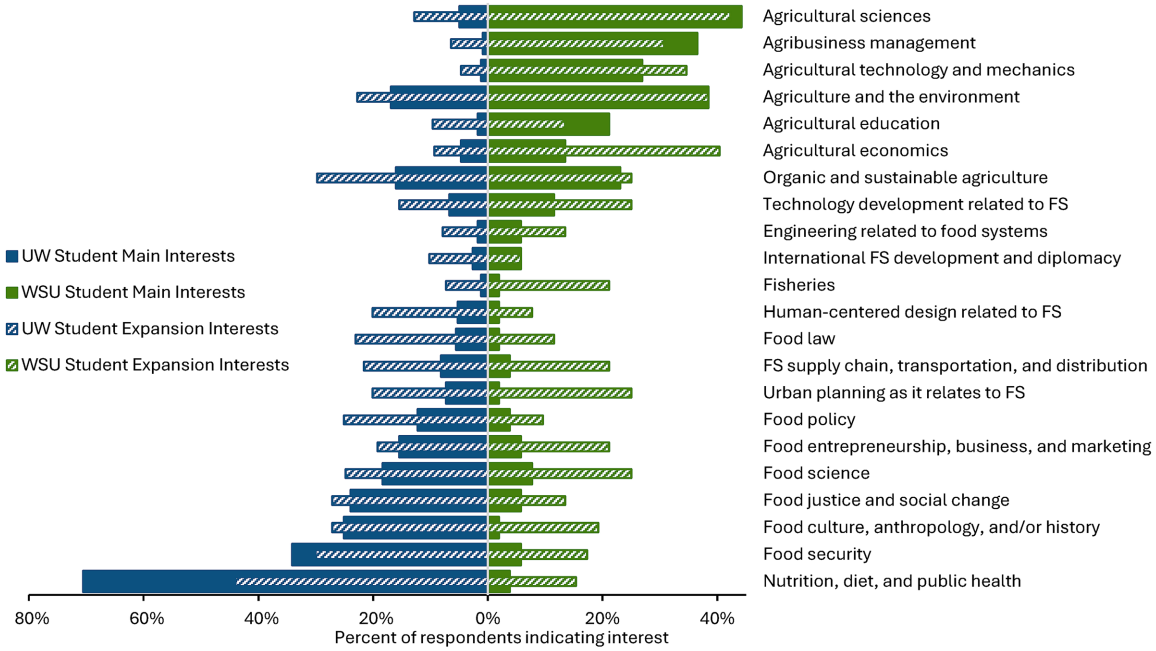
A



B

STRENGTHS	Shared	Complementary	
		UW	WSU
	• Faculty expertise and dedication • Research activity • Community partnership • On-campus experiential learning • Campus-wide programs and support for undergraduate learning	• Population health context • Connections to other schools, departments, and disciplines • Strong enrollment • Urban setting	• Relationship with industry • Breadth of disciplinary foundations • Internship opportunities • Extension network
WEAKNESSES	Shared	Complementary	
		UW	WSU
	• Funding challenges • Faculty work burden • Disciplinary siloing • Need for clearer workforce training and pipeline • Uncertainty about future growth/direction	• Young program – challenges to develop • Need to develop a broader spectrum of systems connections: e.g., agricultural science	• Established program – challenges to adapt • Need to develop a broader spectrum of systems connections: e.g., population health and social science
OPPORTUNITIES	Shared		
	• Develop UW/WSU connection • Grow and link with more disciplines within and beyond institutions • Take stock of current programs to calibrate and evolve • Leverage food systems growth into funding opportunities and improved student experiences • Create stronger networks across urban, peri-urban, suburban, and rural communities • Leverage the unique regional strengths (relevant to both programs) related to the food system: collaborative messaging around opportunities in Washington State food systems studies, shared recruitment, etc.		
THREATS	Shared	Collaborative Solutions	
	• External competition (proliferation of food systems programs within higher education) • Rapidly changing landscape (challenge of keeping up with new and rapidly evolving food systems field and job market and achieving meaningful interdisciplinarity) • Pressure to align with funding interests (challenges of striking and maintaining balance)	• Multiplier effect through collaboration – focus on regional strengths, ways to embrace and leverage differing paradigms embodied by the two programs • Keeping up through linking up (e.g., collaborative programming, peer-to-peer learning through regional network development, taking advantage of technological advances to adapt to a new generation of students) • Diversify funding sources by building a multi-institutional food systems research, education, and extension nexus	

FIGURE 2
Complementarity of programs in Washington State. **(A)** Student survey results. UW and WSU food systems students were asked to select up to three main areas of interest and an unlimited number of additional areas of interest into which they would like to expand their food system education if available. **(B)** Results of SWOT analysis with UW and WSU programmatic faculty, staff, and leadership. Under the Threats category, Collaborative Solutions were developed by the joint UW/WSU study team after analyzing responses across all categories. FS: food systems; SWOT: strengths, weaknesses, opportunities, threats; UW: University of Washington; WSU: Washington State University.

analysis (Reed et al., 2017). Students in the IFSTAL program benefit from this extensive network through a variety of traditional and experiential learning and workplace engagement platforms designed to augment their primary graduate training with the interdisciplinary theory, knowledge, and skills that are essential for food systems professionals.

That the IFSTAL program has lasted beyond an initial three-year startup funding period (Reed et al., 2017) and has now successfully trained thousands of postgraduates and professionals over eight years of operation (IFSTAL, 2022) underscores the success of the collaborative model. Yet IFSTAL is, to the authors' knowledge, a unique example with no successfully established analogs elsewhere. What might such a training network look like in the U.S. context? Our program inventory (Figure 1) shows that many regions of the U.S. are already served by at least one higher education food systems program, and some regions have multiple programs per state in several adjacent states (Figure 1A). With nearly half of food systems programs situated within an agricultural context and the rest distributed across other disciplines including the health, environmental, and social sciences (Figure 1B), different programs clearly also possess a variety of different core strengths. Thus the necessary program elements for cross-institutional collaboration already exist, but the model for success does not.

The Washington State case study offers a more detailed examination of a potential cross-institutional collaboration model in a regional context (Figure 2). Faculty and staff from both institutions clearly recognized the potential benefits of forming linkages between the two programs and identified potential starting points. However, the SWOT analysis (Figure 2B) underscores persistent challenges that interdisciplinary academic programs must overcome to achieve long-term stability, including the need to develop new program administration and funding models that work within current overarching academic administrative models, balancing depth with nimbleness, and keeping pace with shifting trends.

4.2 Catalyzing and stabilizing interdisciplinary collaboration

Understanding how to both catalyze and stabilize interdisciplinary food systems education programs is of paramount importance. It is no surprise that case study interviewees listed disciplinary siloing, lack of support systems for interdisciplinary models, and overload of faculty among their chief concerns. This aligns with reports from other programs (Evans, 2015) and also makes intuitive sense. Working towards goals not supported within existing institutional and funding structures is exhausting and destabilizing. Outstanding programs may emerge rapidly through sparks of inspiration, enthusiasm, and hard work, but can just as quickly fade if the individuals involved burn out or move on, or if financial and administrative support shifts. Academic institutions can foster a culture of collaboration that generates opportunities for the exchange of ideas, such as cross-discipline research seminars and conferences, and that provides resources and support for interdisciplinary research, such as through grants and other incentives (Carter, 2023). Concrete steps that can be taken in this direction include:

4.2.1 Fund proof-of-concept models

While the responsibility of sustainably supporting truly interdisciplinary programs ultimately lies with colleges and universities, successful proof-of-concept models are first needed to demonstrate student interest, impact, and long-term viability. External funding can provide a bridge, supporting a sufficient number of pilot projects to serve as models for longer-term institutional investments. One such external funding model in the U.S. is the USDA HEC program, which explicitly encourages collaborations between two or more institutions to strengthen institutional capacities and respond to emerging needs of food and agricultural education (USDA, 2023b).

4.2.2 Build learning networks

Fostering network-building and mutual support for professional development among food systems educators is another way to promote collaboration between programs. Scholars and program architects must be encouraged to learn about other programs, different framings, and potential ways to work together (Hollmén, 2015). Fully-engaged teamwork, often undervalued in academic models built around individual accomplishments (Lin, 2008), must be rewarded such that greater incentive exists for individuals and programs to learn from and collaborate with one another.

4.2.3 Fight mission creep

There is a natural inclination—among individuals and programs alike—to attempt to do 'in house' everything that an individual or program deems important. This inclination is perhaps particularly acute in the competitive environment of academia. Yet such tendencies fail to recognize a key principle of interdisciplinary work: that there is strength in mixed teams (Weaver, 1948), and that attempting to 'do it all' too often results in watering down or otherwise jeopardizing core strengths. To provide students with the best possible interdisciplinary training, food systems programs must embrace the exciting prospects of combining deep and complementary expertise through collaboration, not competition.

5 Conclusion

Meeting the urgent and complex food systems challenges of today, and facing those of tomorrow, requires a paradigm shift in how practitioners entering this rapidly evolving field are trained (Den Boer et al., 2021). It is not realistic for most individual programs or institutions to hire and house the myriad and disparate disciplines that make up the interdisciplinary field of food systems. More importantly, it misses the opportunity to hone core strengths, celebrate variety, work with complementary partners, and prepare students to do the same. We call on academic administrators to encourage and reward collaboration between complementary educational programs to improve student access to training that is truly interdisciplinary. Taking stock of existing programs and their core strengths, as we have done through this inventory, can advance this goal. At the same time, we call on funders to support the exploration and development of a wide variety of collaborative structures so that new models for success might emerge. With the proliferation of food systems programs across higher education institutions in the U.S., ample possibilities exist for exciting new collaborations that can both strengthen existing programs and transform food systems education.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by the University of Washington Human Subjects Division. The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation was not required from the participants because the study was determined to qualify for exempt status. Survey participants provided written consent and interview participants provided verbal consent.

Author contributions

SC: Conceptualization, Data curation, Funding acquisition, Project administration, Visualization, Writing – original draft. AI: Data curation, Formal analysis, Investigation, Writing – original draft. VJ: Investigation, Writing – review & editing. AK: Investigation, Writing – review & editing. HH: Writing – review & editing. LL: Conceptualization, Funding acquisition, Writing – review & editing. MS: Data curation, Formal analysis, Writing – review & editing. JO: Conceptualization, Data curation, Formal analysis, Funding acquisition, Project administration, Writing – original draft.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fsufs.2023.1306525/full#supplementary-material

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