

A SUSTAINABLE AND CIRCULAR APPROACH TO FOOD SYSTEMS IN UNIVERSITIES: AN EXPLORATION OF POTENTIAL DIRECTIONS AND GOOD PRACTICES

RAMONA GIUREA¹, ANCA TULBURE², CRISTINA-ANCA DANCIU², OTILIA-CRISTINA MURARIU³,
LILIANA GEORGETA POPESCU¹, LUCA ADAMI⁴, FABIO CONTI⁵ & ELENA CRISTINA RADA⁵

¹Department of Industrial Engineering and Management, Lucian Blaga University of Sibiu, Romania

²Department of Food Industry and Environmental Protection, Lucian Blaga University of Sibiu, Romania

³Department of Food Technology, University of Life Sciences of Iasi, Romania

⁴Department of Civil, Environmental and Mechanical Engineering, University of Trento, Italy

⁵Department of Theoretical and Applied Sciences, Insubria University of Varese, Italy

ABSTRACT

The paper raises awareness of the importance of involving universities in the process of sustainable development in relation to food systems and with the implementation of food quality principles on consumer safety. The aim is to explore the concept of implementing a sustainable approach to food systems in universities by a bibliometric and content analysis. Drivers for the adoption of good practices in order to create a food system that supports environmental, social and economic well-being in agreement with SDGs both on campus and beyond were considered, including aspects regarding the attention to consumer health by ensuring the availability of quality, safe products. With the increasing global concern for sustainability and the growing recognition of the impact of food systems on the planet, universities have a unique opportunity to lead by example and promote sustainable practices within their campus. The paper presents key components of sustainable food system development in universities with references from the specific literature. Nowadays, the concerns of a sustainable food system development create a food system that is environmentally friendly, socially just, economically viable, and capable of meeting the nutritional needs and requirements in terms of product quality and safety assurance of the current and future generations. By implementing sustainable food system development, universities aim to create a positive impact on the environment, enhance student and staff learning experiences, support local communities and contribute to a more sustainable food future. Also, embracing sustainable practices, universities can become catalysts for change and inspire future generations to adopt sustainable food consumption habits.

Keywords: sustainable development, circular economy, universities, food systems, food quality management, municipal solid waste, safety and quality assurance.

1 INTRODUCTION

The paper raises awareness of the importance of involving universities in the process of sustainable development in relation to food systems and with the implementation of food quality principles on consumer safety in agreement with the Sustainable Development Goals (SDGs) and circular economy (CE) concepts. Fraser et al. were among the first scientist that raised the problem about the fragility and sustainability of our global food system and its local manifestations [1]. The universities play a crucial role in promoting sustainable development at all the levels and also in relation to municipal solid waste management, food systems, food quality principles implementation in order to ensure consumer safety [2]. Through research, education, and collaboration, universities can contribute significantly to addressing the challenges and finding innovative solutions for these problems in agreement with SDGs and CE concepts [3], [4].

Food systems are the driving force behind local and global change and power relations, affecting social, political, economic, health and environmental systems [5]. According to



HLPE, a sustainable food system (SFS) is a food system that ensures food security and nutrition for all in such a way that the economic, social and environmental bases to generate food security and nutrition of future generations are not compromised [6]. Therefore, the key criterion for a sustainable food system is guaranteeing food security for both present and future generations; in essence, any food system that fails to provide food security and sufficient nutritional value cannot be deemed sustainable [7]–[9]. One key aspect of a sustainable food system in universities is ensuring the safety and quality of the food provided to students, faculty, and staff [10]. This involves implementing robust food safety protocols, adhering to strict hygiene standards, and regularly monitoring and testing food products [11]. Quality assurance measures, such as sourcing food from reputable suppliers and conducting regular inspections, are also essential to maintain high standards [12].

SDG 12 (Responsible Consumption and Production) is related to this paper: it seeks to ensure sustainable patterns of production and consumption, including food systems [13]. Universities play a vital role in promoting sustainable food systems by adopting practices that prioritise safety, quality assurance and proper management and treatment of the food residues [14]. This shift towards sustainability is driven by the recognition of the environmental, social, and health impacts of food production, consumption, and management. A sustainable approach to food systems in universities must include also practices that minimise waste, conserve resources, support local and organic food producers, and promote healthy and nutritious options for the campus community [15], [16]. By adopting a sustainable approach to food systems, universities cannot only contribute to the well-being of their campus community but also serve as role models for sustainable practices in the wider community. They provide an opportunity to educate and raise awareness about the importance of sustainable food choices, fostering a culture of sustainability among students and staff.

2 MATERIALS AND METHODS

Materials and methods employed in this study involve a comprehensive literature review, analyses of existing university food systems, and case studies of successful sustainable practices. The methodology used for this study, including the research design is based on literature review, analysis of existing university food systems, and case studies of successful sustainable practices with the aim of identify key concepts, frameworks, and best practices related to sustainable food systems within universities. Data collection and results are presented below. The criteria used for selecting case studies and examples of successful sustainable practices in university food systems are related to aspects reported in Table 1.

Table 1: Criteria used for selecting papers in database.

Frame of reference	Criteria/Set criterion
Database	Scopus®
Publication date	2015–2023
Record document	Articles and reviews
Source type	Journals
Subject area	All
Language	English

The database used for this study is the Scopus® one and comprise journal articles and reviews. To ensure universal accessibility, only English language studies were included. The



Table 2: Matrix of results.

Author and year	Focus subject
Classens et al. [36]	Campus food systems alternatives (CFSA). Approach on structural, practice and/or policy change through the campus foodscape.
Guedes et al. [37]	Promotion of shifting from meat-centric to plant-rich diets.
Cruz et al. [38]	Sustainable public procurement.
Bertoldo et al. [39]	Education for public health practitioners and culinary educators: chefs as valuable stakeholders in developing solutions to confront pressing challenges concerning food systems among students.
Classens et al. [40]	Approach on CFSA; importance of pedagogical support for pathways toward more equitable/sustainable food systems.
Cleveland and Jay [41]	Climate and food policies in higher education. Importance of food system concerning HEI climate policies (food system greenhouse gas emissions).
Levkoe et al. [16]	Community–campus engagement can strengthen food movements. The importance of collaborations between academics and community-based organisations in order to fundamentally reorganise the way food is produced, distributed, and consumed as well as valued.
Pothukuchi and Molnar [42]	The importance of sustainable food systems leadership in universities.
Irazusta-Garmendia et al. [43]	Consumption of food group (meat and animal products and plant base food). Eating behaviour of students, sustainable diet and the link to generators of greenhouse gases in the food system.
Alarinta et al. [44]	Recycling, depositing, and proper discarding of plastics food packages.
Pretorius and Schönfeldt [45]	Driving the sustainable food system transformation agenda in partnership with other stakeholders.
Estandarte et al. [46]	Knowledge and expectations regarding sustainable food systems among students, students behaviours as consumers.
Blanco-Murcia et al. [47]	Sustainable food consumption within members of a university community toward sustainable diets.
Kretschmer and Dehm [48]	Sustainability transitions in university food service throughout organic meal planning and regional procurement.
Grech et al. [11]	Food sustainability governance policies and practices within universities.
Migliorini et al. [17]	Students' background knowledge, students' behaviour as consumers and food citizenship in developing skills, topics, preferences in teaching/learning methods.
Ringling and Marquart [8]	The role of universities in developing nutrition sensitive, environmentally resilient food systems.
Valley et al. [49]	Pedagogy for sustainable food systems education by achieving food security and environmental sustainability in the face of global change.



literature search was conducted in the years 2015–2023, taking into account the publications connected also with the SDGs. The analyses and synthesis of the collected data was carried out considering the subject of this paper in order to obtain an accurate understanding of it. Further, are presented as well as the search words: ‘sustainable food systems’, ‘higher education institution (HEI)’, ‘university’, ‘campus’; and their combination. Through the searches in the Scopus® database considering the above keywords, the following results were obtained:

- ‘sustainable food systems’ AND ‘higher education institutions (HEI)’: 1 paper;
- ‘sustainable food systems’ AND ‘universities’: 37 papers;
- ‘sustainable food systems’ AND ‘campus’: from 10 papers.

After eliminating duplicated articles, reading the title, abstract and keywords left 23 unique papers, and after the complete reading, five of them were excluded, 18 were finally selected to elaborate the content analysis. In Table 2 the matrix of results is reported.

3 RESULTS AND DISCUSSION

One of the most important points that higher education institutions can capitalise on is the potential of the academic community to engage and enhance the scenario through teaching, research and outreach in various fields of study to make a sustainable campus and for building a culture of sustainability in agreement with SDGs and CE, concerning waste, energy, transports and food systems [4], [5], [17]–[21]. In particular, higher education institutions can provide a link between knowledge and community dissemination [16]. In addition, they play a key role in sustainable development by training professionals not only for a better job but also for society [22]. Overall, the key components of the present paper presented in Table 3 focus on defining sustainable food systems in order to identifying challenges, proposing strategies for improvement, showcasing successful case studies, and offering recommendations for universities to enhance their food systems. The findings in literature review as examples of contribution to a sustainable food system within universities were grouped to the approaches shown in Table 4.

In order to extend the results, the following suggestions can be considered in future research on this topic indicated below and shown in Fig. 1. They incorporate relevant aspects from the literature, case studies and reports, ensuring a comprehensive overview of the subject matter.

- *Evaluation and monitoring.* Continuous evaluation and monitoring of sustainable food system initiatives are crucial to assess their effectiveness and identify areas for improvement. Case studies emphasise the need for universities to establish indicators and metrics to track the environmental, social, and economic impacts of their food system practices [23], [24].
- *Interdisciplinary research and innovation.* Sustainable food systems universities prioritise research and innovation to develop new knowledge, technologies, and practices that promote sustainable food systems. This includes collaborations across disciplines and sectors to address emerging challenges and develop effective solutions [25], [26].



Table 3: Exploring key components of the present paper concerning sustainable food systems in universities.

Sustainability: A sustainable HEI, partially or completely, in line with its mission of teaching, research, information, partnership and stewardship, should aim to minimise the negative environmental, economic, social and health impacts of its resource use on a regional or global scale, and to facilitate society's transition to a sustainable way of life [49]. Approach: Sustainability refers to the practice of managing food production, distribution, consumption, and waste within the university setting in a way that is environmentally responsible, socially equitable, and economically viable. This involves promoting sustainable food sourcing, reducing food waste, supporting local food producers, and educating the university community about the importance of sustainable food practices. Sustainability aims to create a food environment that is environmentally friendly, socially responsible, and economically viable, promoting education and awareness about the importance of sustainable food practices within the university community and beyond.
Circular economy (CE): The concept of CE can be related as an economic system that replaces the concept of 'end-of-life' with reduction, alternative reuse, recycling, and recovery of materials in production, distribution, and consumption processes. Its aim is to achieve sustainable development, creating a better-quality environment and greater economic and social justice for present and future generations [50]. Approach: Circular economy in the context of food systems in universities refers to creating a sustainable and efficient cycle of food production, consumption, and waste management, contributing to educational awareness by fostering a culture of sustainability and responsibility within the campus community. It involves shifting from a linear model of production and consumption to a more sustainable and regenerative system that aims to minimise waste and maximise the use of resources, rethinking and redesigning the way food is produced, distributed, consumed and disposed within the campus community.
Sustainable food system (SFS): It provides healthy food to meet today's food needs while maintaining healthy ecosystems for future generations with minimising negative environmental impacts, to support local production and distribution infrastructure to make nutritious food available, accessible and affordable for all, to ensure humane and equitable practices while protecting farmers, workers, consumers and communities [51]. SFS is a food system that aims to provide food security and nutrition for all while ensuring economic, social, and environmental sustainability for future generations. This requires profitability, broad-based societal benefits, and a positive or neutral impact on the natural environment [52]. Approach: SFS in universities refers to an approach to sourcing, producing, and consuming food on campus that minimises environmental impact, promotes health and well-being, supports local and ethical food producers, and fosters a sense of community and social responsibility. This includes practices such as sourcing ingredients from local and organic farms, reducing food waste, implementing plant-based meal options, supporting fair labour practices, and educating students about the environmental and social implications of their food choices. Overall, a sustainable food system in universities aims to create a more resilient, equitable, and environmentally conscious food system for the campus community. SFS in universities may also encompass educational programs, research initiatives, and partnerships with local food organisations to promote awareness and advocacy for sustainable food practices.

Table 4: Approaching sustainability and circularity along food systems in universities.

Directions	Description
Increased awareness and education	Universities are key institutions for promoting sustainability and can play a crucial role in raising awareness about sustainable food systems. Through educational programs, workshops, and campaigns, universities can effectively educate students and staff about the environmental, social, and economic impacts of food systems.
Holistic curriculum	Universities with sustainable food systems programs emphasise on the development of a holistic curriculum that integrates theory and practice. Due to the intricate nature of food systems, it is imperative that professionals from diverse fields receive training in food systems thinking, despite of their respective sectors or disciplines. Frequently characterised as multidisciplinary, interdisciplinary and transdisciplinary, sustainable food systems education (SFSE) is progressing quickly, providing a framework for training and equipping the next generation of food systems practitioners to compete in a dynamic and diverse labour market and to promote new professional opportunities for food system transformation.
Multidisciplinary approach	Sustainable food systems universities often adopt a multidisciplinary approach, involving faculties and departments from various disciplines such as agriculture, nutrition, environmental sciences, social sciences, and business. This approach helps in addressing the complex and interconnected challenges of food systems and includes collaborations across disciplines and sectors to address emerging challenges and develop effective solutions.
Behavioural change and student engagement	Studies highlight the importance of student engagement and active participation in promoting sustainable food systems on campus. Universities can encourage behavioural change by offering vegetarian or vegan food options, hosting sustainability-themed events, and incentivising sustainable practices. Additionally, involving students in decision-making processes, development of consumer safety documentation, implementation of pre-operational, operational and system procedures and empowering them to drive sustainability initiatives can lead to long-term behaviour change.
Collaboration with stakeholders	Universities recognise the importance of collaborating with various stakeholders to achieve sustainable food systems. Engaging stakeholders from multiple sectors, including farmers, consumers, services policymakers (industry representatives government control bodies, ISO consulting and certification organisations) and NGOs, is crucial for the success of sustainable food systems universities. Successful sustainable food systems in universities often involve collaboration among various stakeholders. This includes working with local farmers and suppliers to source fresh and sustainable food, partnering with student organisations and community groups to promote sustainable food practices (work and hygiene) and engaging with faculty members to incorporate sustainability into relevant academic programs. Case studies show that these collaborations lead to knowledge exchange, resource sharing, and increased engagement with sustainable practices.



Table 4: Continued.

Directions	Description
Campus food procurement	Several case studies highlight the significance of sustainable procurement policies in universities. These policies focus on sourcing local, organic, and fair-trade products, reducing food waste, and supporting small-scale farmers. Such practices not only promote environmental sustainability but also contribute to local economies and enhance the well-being of communities.
Plant-based food options	Plant-based diets have been shown to have a lower environmental impact compared to diets high in animal products. By offering a variety of delicious and nutritious plant-based meals, universities can promote healthier eating habits and contribute to reducing greenhouse gas emissions associated with animal agriculture.
Quality assurance programs	Universities with sustainable food systems implement quality assurance programs to maintain the quality of food served. This involves working closely with suppliers to ensure that they meet specific quality standards, periodically testing food samples to assess their quality, and continuously monitoring and improving the overall quality of the food service.
Advocacy and policy influence	Sustainable food systems universities play an important role in advocating for policy changes and influencing public discourse on sustainable food systems. This includes active involvement in policy-making processes, conducting research to inform policy decisions, and hosting conferences and events to raise awareness.
Sustainable food production initiatives	Universities have implemented various initiatives to produce food on campus, such as rooftop gardens, community gardens, and urban agriculture projects. These initiatives promote sustainable practices like organic farming, permaculture, and composting, reducing the reliance on conventional agriculture and mitigating environmental impacts.

- *Circular approach – circular economy.* Moving towards a circular economy approach to food systems will require communication, commitment and implementation at all levels [27]. By adopting a circular economy approach to food systems, universities can contribute to a more sustainable future by reducing waste, promoting resource efficiency, and creating a closed-loop system for food production and consumption [28]. A circular economy approach within universities also emphasises the importance of education and awareness. By organising workshops, seminars, and awareness campaigns, students and staff can be educated on the environmental, social, and health implications of their food choices. This knowledge empowers individuals to make informed decisions, opting for sustainable and ethical food options both on and off campus [29].
- *Safety and quality assurance.* Universities should prioritise sustainable food systems for safe and quality assurance. Ensuring safety and quality assurance in sustainable food systems within universities is of utmost importance for the health and well-being of students, faculty, and staff. Here are some key considerations to achieve this goal: food safety protocols, certifications and accreditation, supplier selection, regular testing and monitoring, transparency and labelling, staff training and education, feedback and continuous improvement [30]–[32]. It is necessary to implement good working and hygiene practices, supplier selection procedures, a rigorous reception of raw materials, based on a selection of suppliers by evaluating the quality of the products offered.



Hygiene procedures, the disinsectisation–disinfection–dermatisation programme as well as the self-monitoring programme implemented and subject to the principle of continuous improvement led to ensuring the safety of consumers within the universities. Hazard Analysis Critical Control Points (HACCP) principles can be implemented at the level of gastronomic points in universities in the form of quality manuals describing the working methods, procedures and HACCP plan that ensure the control of critical control points in the production flow.



Figure 1: The key approaches proposed for sustainable food systems in a circular and sustainable university model.

4 CONCLUSIONS

Results of our literature review suggest that universities have the potential to lead by example in promoting sustainable food systems in agreement with SDGs and CE. By integrating sustainable approaches into the food procurement, production, and education systems, universities can create positive impacts on the environment, health, and society as a whole.

The findings suggest that sustainable approaches to food systems in universities can contribute to improving food safety and quality assurance, thereby creating a healthier and more sustainable food environment for students and staff. By prioritising safety and quality assurance, universities can ensure that future generations are equipped with the knowledge and skills to adopt responsible consumption and production practices all connected with the environmental knowledges and FIT for 55 EU indications. Research suggests that sustainable food systems in universities can contribute to a variety of positive outcomes, including improved food safety and quality assurance. This can be achieved through careful selection of suppliers, rigorous food safety protocols, regular quality checks and proper management of the food residues. Sustainable approaches to food systems in universities also involve educating students and staff about food safety, quality assurance practices and environmental

knowledges. This can help create a culture of awareness and responsibility towards food safety in the university community.

A sustainable approach to food systems in universities must include implementation of practices such as sourcing locally produced food, reducing food waste and its residues, and promoting vegetable-based diets. The findings highlight the importance of a multidisciplinary approach, stakeholder engagement, experiential learning, research, and innovation, as well as knowledge dissemination in sustainable food systems universities, e.g. through new indicators [53] to be critically implemented in the sustainable university metrics [54]. They serve as good practices that can be adopted and adapted by many public and private institutions striving to contribute to sustainable systems not only for food but also for waste, energy and transport in agreement with CE and SDGs [33], [34].

In conclusion, universities play a crucial role in shaping the future of food systems by adopting a sustainable approach. Thanks to these efforts, universities not only contribute to a healthier planet but also prepare students to become agents of change in the global food system.

REFERENCES

- [1] Fraser, E.D.G., Mabee, W. & Figge, F., A framework for assessing the vulnerability of food systems to future shocks. *Futures*, **37**(6), pp. 465–479, 2005.
- [2] Munialo, S. et al., Gaps and opportunities in research on food systems; A micro-institutional analysis of the University of Nairobi. *Frontiers in Sustainable Food System*, **7**, 1125094, 2023.
- [3] Pothukuchi, K. & Molnar, S.A., Sustainable food systems at urban public universities: A survey of u-21 universities. *Journal of Urban Affairs*, **37**(3), pp. 341–359, 2015.
- [4] Rada, E.C., Magaril, E.R., Schiavon, M., Karaeva, A., Chashchin, M. & Torretta, V., MSW management in universities: Sharing best practices. *Sustainability*, **12**(12), 5084, 2020.
- [5] Sterling, E.J. et al., Centering equity in sustainable food systems education. *Frontiers in Sustainable Food System*, **5**, 737434, 2021.
- [6] CFS & HLPE, Food losses and waste in the context of sustainable food systems, 2014. <https://www.fao.org/cfs/cfs-hlpe/publications/hlpe-8/en>. Accessed on: 11 Jun. 2024.
- [7] Pasquier Merino, A.G., Sustainable food, consensus, and debates: A study on university campuses in Mexico City. *International Journal of Sustainability in Higher Education*, **23**(8), pp. 337–353, 2022.
- [8] Ringling, K.M. & Marquart, L.F., Intersection of diet, health, and environment: Land grant universities' role in creating platforms for sustainable food systems. *Frontiers in Sustainable Food System*, **4**, 70, 2020.
- [9] Danciu, C.A. et al., Overview of the sustainable valorization of using waste and by-products in grain processing. *Foods*, **12**(20), 3770, 2023.
- [10] Pretorius, B. & Schönfeldt, H.C., Opportunities for higher education institutions to develop sustainable food systems in Africa. *Frontiers in Sustainable Food System*, **7**, 1147115, 2023.
- [11] Grech, A., Howse, E. & Boylan, S., A scoping review of policies promoting and supporting sustainable food systems in the university setting. *Nutrition Journal*, **19**(1), 97, 2020.
- [12] Murariu, F., Voda, A.D. & Murariu, O.C., Researches on food safety assessment: Supporting a healthy lifestyle for the population from NE of Romania. *Journal of Biotechnology*, **305**(15), s68, 2019.



- [13] United Nations, SDG 12: Ensure sustainable consumption and production patterns. <https://sdgs.un.org/goals/goal12>. Accessed on: 11 Jun. 2024.
- [14] Andreottola, G., Ragazzi, M., Foladori, P., Villa, R., Langone, M. & Rada, E.C., The unit integrated approach for OFMSW treatment. *UPB Scientific Bulletin*, **74**(1), pp. 19–26, 2012.
- [15] Rojas, A., Valley, W., Mansfield, B., Orrego, E., Chapman, G.E. & Harlap, Y., Toward food system sustainability through school food system change: Think&EatGreen@School and the making of a community-university research alliance. *Sustainability*, **3**(5), pp. 763–788, 2011.
- [16] Levkoe, C.Z. et al., Collaboration for transformation: Community-campus engagement for just and sustainable food systems. *Journal of Higher Education Outreach and Engagement*, **20**(3), pp. 32–61, 2016.
- [17] Migliorini, P. et al., Students' knowledge and expectations about sustainable food systems in higher education. *International Journal of Sustainability in Higher Education*, **21**(6), pp. 1087–1110, 2020.
- [18] Žalėnienė, I. & Pereira, P., Higher education for sustainability: A global perspective. *Geography and Sustainability*, **2**(2), pp. 99–106, 2021.
- [19] Saitluanga, B.L. & Hmangaihzel, L., Transport mode choice among off-campus students in a hilly environment: The case of Aizawl, India. *Transport Problems*, **17**(3), pp. 163–172, 2022.
- [20] Schönbach, D.M.I., Altenburg, T.M., Marques, A., Chinapaw, M.J.M. & Demetriou, Y., Strategies and effects of school-based interventions to promote active school transportation by bicycle among children and adolescents: A systematic review. *International Journal of Behavioral Nutrition and Physical Activity*, **17**(1), 2020.
- [21] Vyas, A.M., Sirsa, A., Kushwah, G.S. & Ojha, A., Critical success factors for renewable energy usage by the students in campus: An exploratory case study. *IEEE Renewable Energy and Sustainable E-Mobility Conference*, 2023.
- [22] Ingram, J. et al., A future workforce of food-system analysts. *Nature Food*, **1**(1), pp. 9–10, 2020.
- [23] Kusters, C., ten Hove, H., Bosch, D., Herens, M. & Wigboldus, S., Conference report: Monitoring and evaluation for inclusive and sustainable food systems 3–4 April 2019, the Netherlands. Report/WCDI No. 19-066. <https://doi.org/10.18174/506604>. Accessed on: 11 Jun. 2024.
- [24] Blay-Palmer, A., Conaré, D., Meter, K., Di Battista, A. & Johnston, C., *Sustainable Food System Assessment: Lessons from Global Practice*, Taylor & Francis Group, 2020.
- [25] Blodgett, D.M. & Feld, M.N., Teaching an interdisciplinary course in sustainable food systems: Science and history meet in 'a world that works. *International Journal of Sustainability in Higher Education*, **24**(9), 2021.
- [26] Kok, K.P.W. et al., Transforming research and innovation for sustainable food systems: A coupled-systems perspective. *Sustainability*, **11**(24), 7176, 2019. <https://doi.org/10.3390/su11247176>.
- [27] Kok, K.P.W. et al., Transforming research and innovation for sustainable food systems: A coupled-systems perspective. *Sustainability*, **11**(24), 7176, 2019.
- [28] Ellen MacArthur Foundation, Towards the circular economy: Opportunities for the consumer goods sector, 2013.
- [29] Fassio, F. & Chirilli, C., The circular economy and the food system: A review of principal measuring tools. *Sustainability*, **15**(13), 10179, 2023.



- [30] Nunes, B., Pollard, S., Burgess, P., Ellis, G., de los Rios, I. & Charnley, F., University contributions to the circular economy: Professing the hidden curriculum. *Sustainability*, **10**(8), 2719, 2018.
- [31] Boqvist, S., Söderqvist, K. & Vågsholm, I., Food safety challenges and one health within Europe. *Acta Veterinaria Scandinavica*, **60**(1), 2018.
- [32] Vågsholm, I., Arzoomand, N.S. & Boqvist, S., Food security, safety, and sustainability: Getting the trade-offs right. *Frontiers in Sustainable Food Systems*, **4**, 16, 2020.
- [33] Garcia, S.N., Osburn, B.I. & Jay-Russell, M.T., One health for food safety, food security, and sustainable food production. *Frontiers in Sustainable Food Systems*, **4**, 1, 2020.
- [34] Giurea, R., Precazzini, I., Ionescu, G., Ragazzi, M. & Schiavon, M., Circular economy, waste and energy management for a sustainable agro-tourism. *AIP Conference Proceedings*, **2437**(1), 020097, 2022.
- [35] Giurea, R., Carnevale Miino, M., Torretta, V. & Rada, E.C., Approaching sustainability and circularity along waste management systems in universities: An overview and proposal of good practices. *Frontiers in Environmental Science*, **12**, 1363024, 2024.
- [36] Classens, M., Adam, K. & Srebot, S., Food systems change and the alternative campus foodscape. *Journal of Agriculture, Food Systems, and Community Development*, **12**(3), pp. 155–176, 2023.
- [37] Guedes, D. et al., Promoting plant-based eating in meat-centric meal contexts: A field study. *Public Health Nutrition*, pp. 1–9, 2023.
- [38] Cruz, J.L., Hewitt, R.J. & Hernández-Jiménez, V., Can public food procurement drive agroecological transitions? Pathways and barriers to sustainable food procurement in higher education institutions in Spain. *Agroecology and Sustainable Food Systems*, 2023.
- [39] Bertoldo, J., Hsu, R., Reid, T., Righter, A. & Wolfson, J.A., Attitudes and beliefs about how chefs can promote nutrition and sustainable food systems among students at a US culinary school. *Public Health Nutrition*, **25**(2), pp. 498–510, 2022.
- [40] Classens, M., Adam, K., Crouthers, S.D., Sheward, N. & Lee, R., Campus food provision as radical pedagogy? Following students on the path to equitable food systems. *Frontiers in Sustainable Food Systems*, **5**, 2021.
- [41] Cleveland D.A. & Jay, J.A., Integrating climate and food policies in higher education: A case study of the University of California. *Climate Policy*, pp. 16–32, 2020.
- [42] Pothukuchi, K. & Molnar, S.A., Sustainable food systems at urban public universities: A survey of u-21 universities. *Journal of Urban Affairs*, **37**(3), pp. 341–359, 2015.
- [43] Irazusta-Garmendia, A., Orpí, E., Bach-Faig, A. & González Svatetz, C.A., Food sustainability knowledge, attitudes, and dietary habits among students and professionals of the health sciences. *Nutrients*, **15**(9), 2023.
- [44] Alarinta, J., Närvä, M. & Wirtanen, G., Recycling of plastic food packages: A case study with Finnish university students. *Recycling*, **8**(1), 2023.
- [45] Pretorius, B. & Schönfeldt, H.C., Opportunities for higher education institutions to develop sustainable food systems in Africa. *Frontiers in Sustainable Food Systems*, **7**, 2023.
- [46] Estandarte, A., Gurgendze, T., Urushadze, T. & Ploeger, A., Knowledge and expectations regarding sustainable food systems among students from Georgian agricultural universities and Georgian food industry representatives. *Sustainability*, **14**(9), 2022.



- [47] Blanco-Murcia, L., Gomati de la Vega, I., Perdomo-Ortíz, J. & Rodríguez-Pinilla, J.P., Towards sustainable food consumption: Emerging tensions behind the plate in a Colombian university community. *Agroecology and Sustainable Food Systems*, **46**(5), pp. 758–788, 2022.
- [48] Kretschmer, S. & Dehm, S., Sustainability transitions in university food service: A living lab approach of locavore meal planning and procurement. *Sustainability*, **13**(13), 2021.
- [49] Valley, W., Wittman, H., Jordan, N., Ahmed, S. & Galt, R., An emerging signature pedagogy for sustainable food systems education. *Renewable Agriculture and Food Systems*, **33**(5), pp. 467–480, 2018.
- [50] Velazquez, L., Munguia, N., Platt, A. & Taddei, J., Sustainable university: What can be the matter? *Journal of Cleaner Production*, **14**(9–11), pp. 810–819, 2006.
- [51] Kirchherr, J. et al., Barriers to the circular economy: Evidence from the European Union (EU). *Ecological Economics*, **150**, pp. 264–272, 2018.
- [52] Story, M., Hamm, M.W. & Wallinga, D., Food systems and public health: Linkages to achieve healthier diets and healthier communities. *Journal of Hunger and Environmental Nutrition*, **4**(3–4), pp. 219–224, 2009.
- [53] Boiocchi, R., Adami, L., Rada, E.C. & Schiavon, M., Towards context-independent indicators for an unbiased assessment of environmental sustainability in higher education: An application to Italian universities. *Journal of Environmental Management*, **366**, 121658, 2024.
- [54] Boiocchi, R., Ragazzi, M., Torretta, V. & Rada, E.C., Critical analysis of the GreenMetric World university ranking system: The issue of comparability. *Sustainability (Switzerland)*, **15**(2), 1343, 2023.

